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.

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.

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.

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?

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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 (°API @ 60°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 (°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

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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

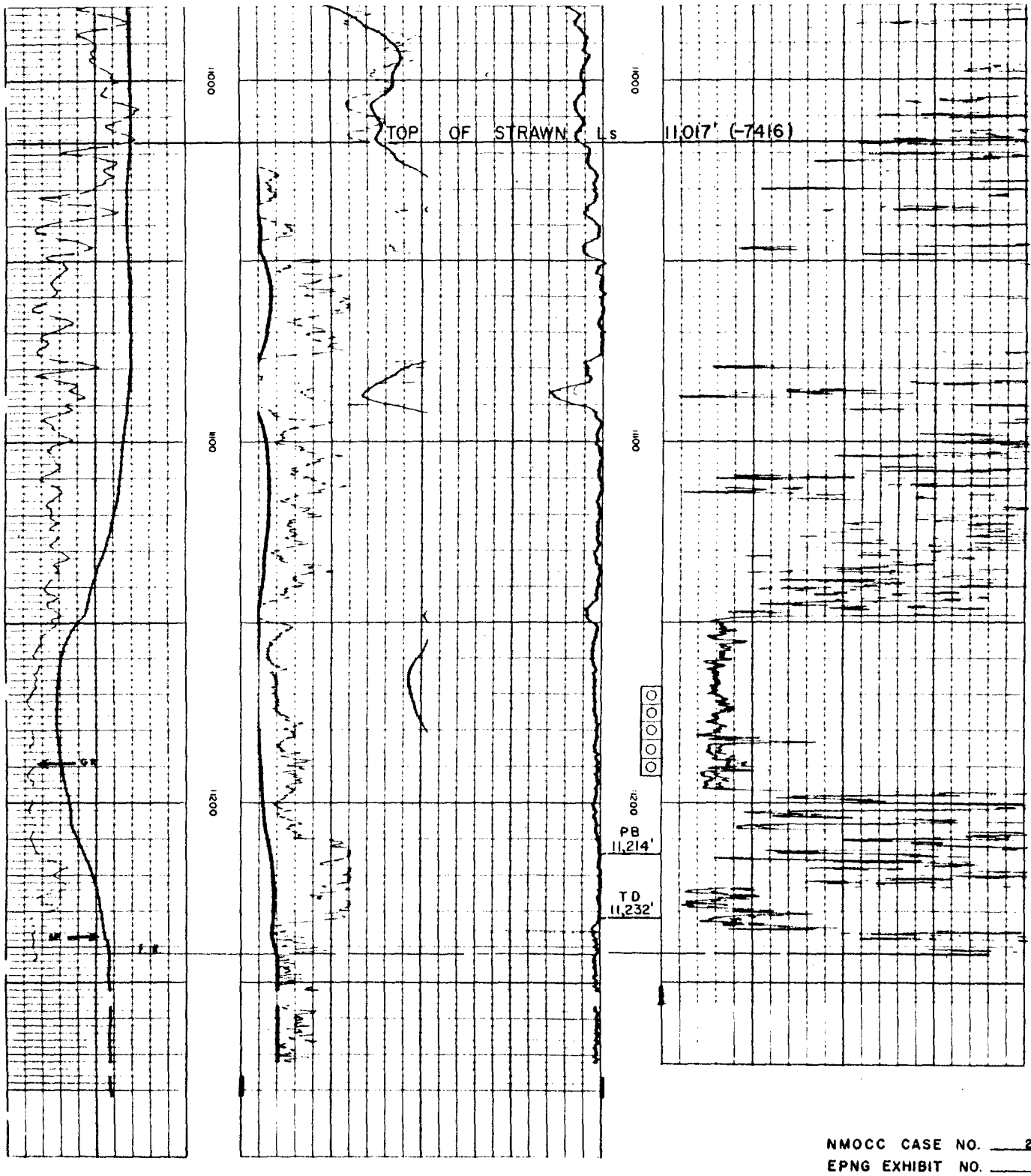
ELEV. 3600 D.F.

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. 2469

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.

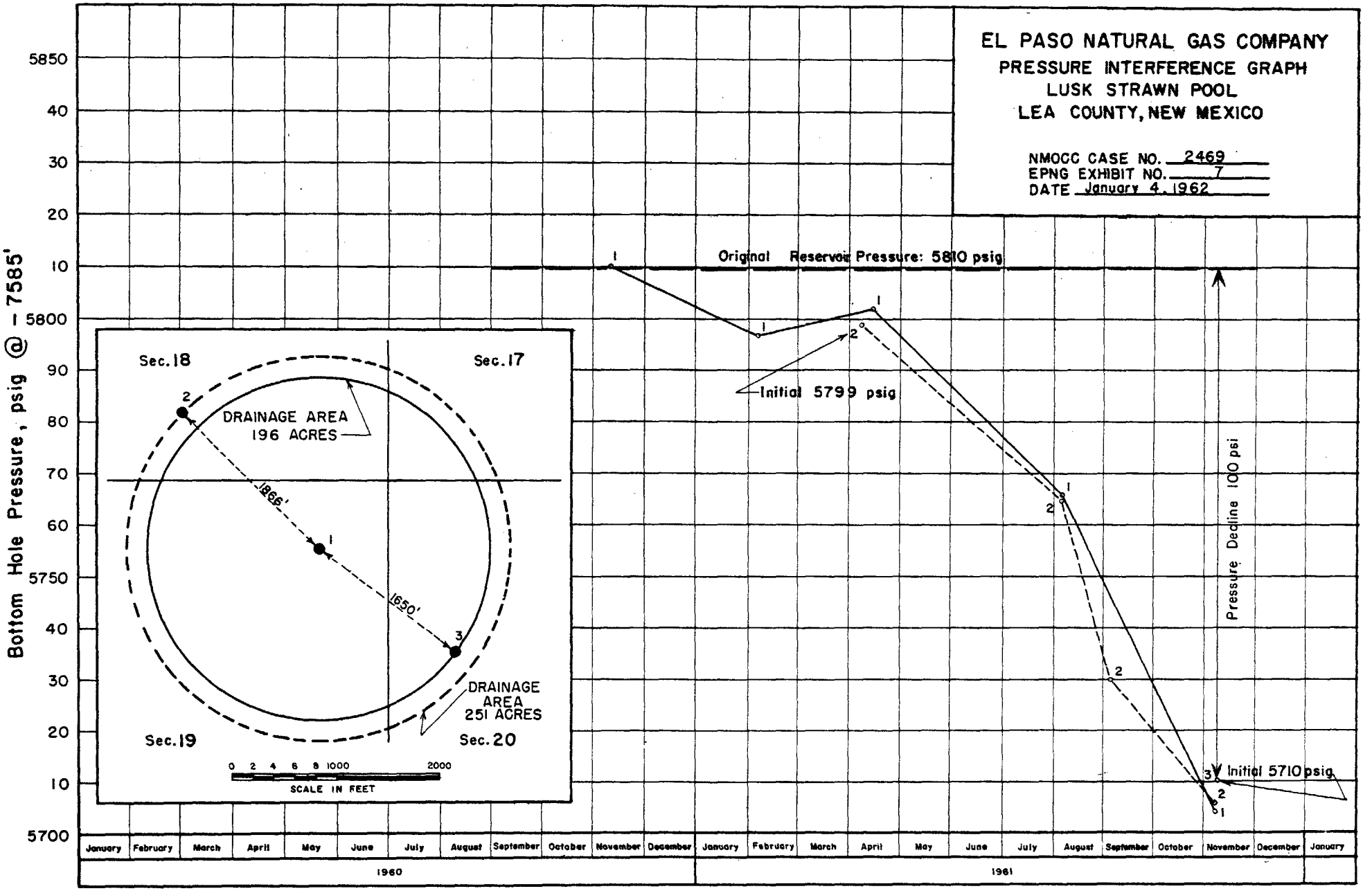
(2) Total Strawn Porosity Interval was not cored in this well.

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

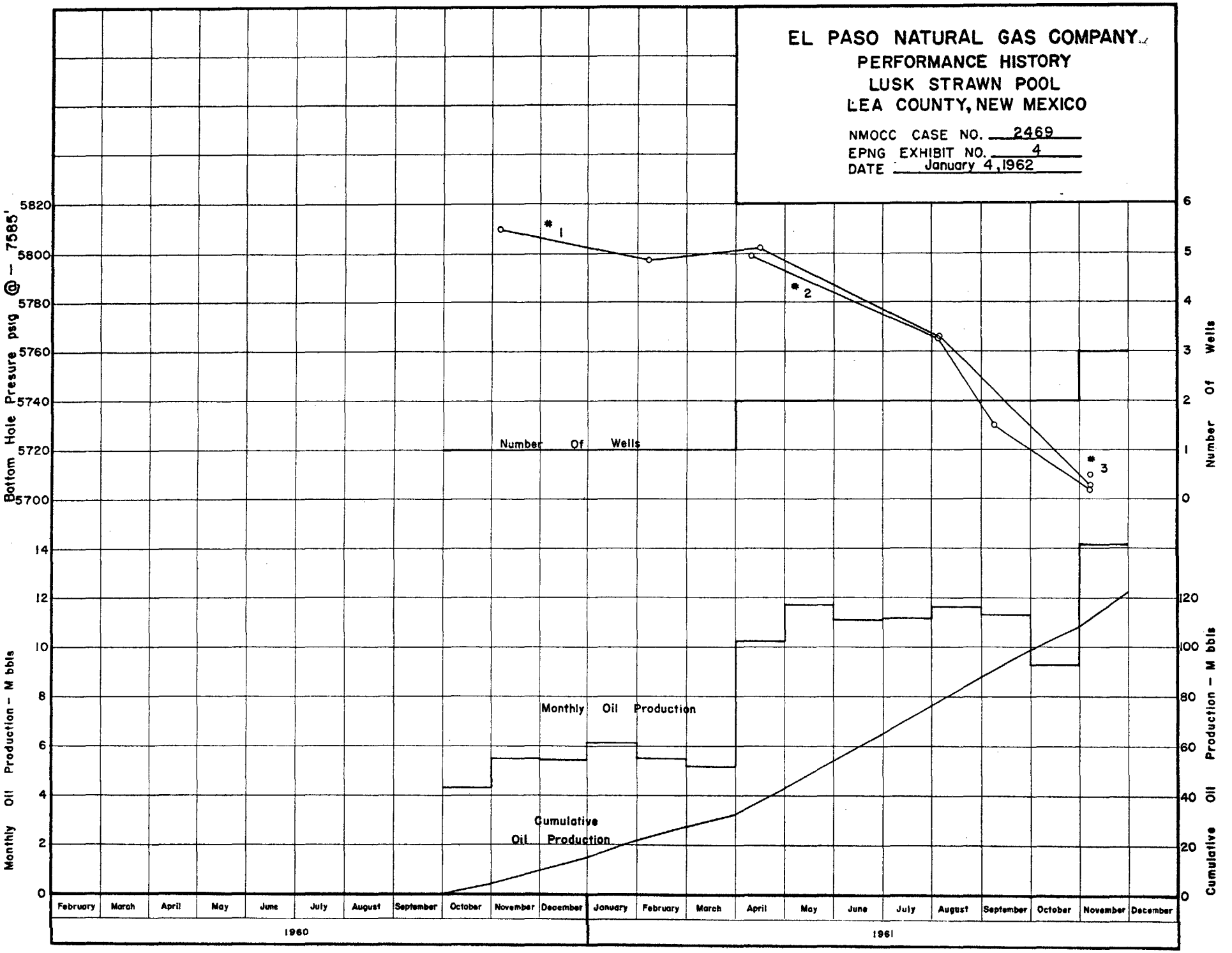
NMOCC CASE NO. 2469
EPNG EXHIBIT NO. 7
DATE January 4, 1962



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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WESTERN UNION
TELEGRAM

W. P. MARSHALL, PRESIDENT

1201 (4-60)

SYMBOLS
DL = Day Letter
NL = Night Letter
LT = International Letter Telegram

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

MAIN OFFICE OCC

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

CLASS OF SERVICE
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WESTERN UNION
TELEGRAM

W. P. MARSHALL, PRESIDENT

1201 (4-60)

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MAIN OFFICE OCC
1962 FEB 14 PM 4 35

LA193 KB235
1962 FEB 15 AM 8:54

K BRA166 NL PD=WUX 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

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

Dear Sir:

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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. Garrett Whitworth
Mr. Oliver Seth
Mr. O. P. Nicola

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

1220
R-4-60

SYMBOLS
DL = Day Letter
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MAIN OFFICE OCC

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1962 MAR 12 PM 12 59

~~LA102 KA240~~
1962 MAR 12 PM 1:40

K OCA338 LONG PD=WUX OKLAHOMA CITY OKLA 12 135P CST=
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=

El Paso Natural Gas Company

FIELD WELL COSTS

Exhibit # R 2

Lease Name	Unit	Well No.	1
Location	NE 19, T-19-S, R-22-E	County	Lea
Formation	Dev. Wolfcamp/Strawn	Est. Total Depth:	11,232'

						PRODUCING WELL		DRY HOLE
						Sub.	Total	
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	11,[illegible]	Ft.	7	Inch.	$/Ft.	54,000		
_____	_____	Ft.	_____	Inch.	$/Ft.			
_____	_____	Ft.	_____	Inch.	$/Ft.			
Tubing	11,[illegible]	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.

PARTNER'S APPROVAL:

Date

By

ILLEGIBLE

El Paso Natural [illegible]

[illegible] FIELD WELL COSTS

[illegible] Exhibit # R 3

Lease Name: [illegible]s [illegible]t	Well No.: 2	Unit: [illegible]C
Location: [illegible]E/ [illegible]2, T-19-S, R-32-E	County: Lea	State: NM
Formation: Stra[illegible] [illegible]orrow - Devonion	Est. Total Depth: 13,974'	

						PRODUCING WELL		DRY HOLE
						Sub.	Total	
TUBULAR GOODS								
Surface Casing	4,[illegible]	Ft.	13-3/8	Inch.	$/Ft.	$ 50,300		$
Int. Casing	[illegible]1,[illegible]	Ft.	9-5/8	Inch.	$/Ft.	97,900		
Prod. Casing		Ft.		Inch.	$/Ft.			
Liner	2,[illegible]	Ft.	5"	Inch.	$/Ft.	6,100		
		Ft.		Inch.	$/Ft.			
Tubing	[illegible]	Ft.	2-3/8	Inch.	$/Ft.	7,800		
	2,[illegible]	Ft.	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	
[illegible]DUCTION 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	
Total Direct Cost						665,600	665,600	
Legal, Stor[illegible], Supervision, etc.						65,400	65,400	
~~ESTIMATED~~ TOTAL COST						$ 731,000	$ 731,000	$

SHARING 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

Prepared By

[illegible] By

ILLEGIBLE

PARTNER'S APPROVAL:

Date

By

C ST ... # R-4

...32 (Rev. ...)

Lease Name	Well No.	
...as. ...it	3	...C
Location: ...NW/...), T-19-S, R-32-E	County: Lea	N... Mexico
Formation: ...ra... ...orrow	Est. Total Depth: 12,621'	

	PRODUCING WELL Sub.	PRODUCING WELL Total	DRY HOLE
TUBULAR GOODS			
Surface Casing ... Ft. 20 Inch. ... $/Ft.	$ 346		$
Int. Casing ... Ft. 13-3/8 Inch. ... $/Ft.	5,606		
Prod. Casing 4,... Ft. 9-5/8 Inch. ... $/Ft.	26,635		
2,... Ft. 5-1/2 Inch. ... $/Ft.	32,331		
... Ft. ... Inch. ... $/Ft.			
Tubing ... Ft. 2-1/16 Inch. ... $/Ft.	8,608		
12,3... 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		116,438	
Daywork ... Day ... $/Day			
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 ... Lb.			
Tank Rental			
SPECIAL SERVICES: (Survey 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 ... ...nt (shoes, collars, etc.)	3,200		
Bridge ... and Retainer			
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. xxxxxxxxxxxxxxxxx	20,222	20,222	
...complete ESTIMATED TOTAL COST	$ 374,896	$ 374,896	$

...NTEREST

...Natural Gas Company

ESTIMATED COST ONLY — Each participating owner to pay proportionate share of actual well cost subject to operating agreement.

ILLEGIBLE

PARTNER'S APPROVAL:

Date

By

Approved ...

El Paso Natural Gas Company

WELL COST ESTIMATE

Form [illegible]-52 (Rev. 4-59)

El Paso [illegible] Exhibit # R-5

Lease Name	Well No.	Field
Lusk Deep Unit Area	Single Completion Development	Lusk Deep Unit
Location	**County**	**State**
T-19-S, R-32-E	Lea	New Mexico
Formation	**Est. Total Depth:**	
Strawn - Single	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

Prepared By

Approved By

ILLEGIBLE

PARTNER'S APPROVAL:

Date

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
2 Copies	Three States Natural Gas Company 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 News Globe Building Amarillo, Texas
2 Copies	Three States Natural Gas Company 1700 Corrigan Tower Building Dallas, Texas

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 (FV)

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	5693 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.

Reservoir Fluid SAMPLE TABULAR DATA

PRESSURE PSI GAUGE	PRESSURE-VOLUME RELATION @ 161 °F., RELATIVE VOLUME OF OIL AND GAS, V/VSAT.	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/VR
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
VSAT. = Volume at saturation pressure and the specified temperature.
VR = Residual oil volume at 14.7 PSI absolute and 60° F.

Reservoir Fluid SAMPLE TABULAR DATA

PRESSURE PSI GAUGE	PRESSURE-VOLUME RELATION @ 161 °F., RELATIVE VOLUME OF OIL AND GAS, V/VSAT.	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/VR
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
VSAT. = Volume at saturation pressure and the specified temperature.
VR = Residual oil volume at 14.7 PSI absolute and 60° F.

Form 32938

CORE LABORATORIES, INC.

Petroleum Reservoir Engineering

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		
4101	0.5409	1.050	0.865
4051	0.5459	1.040	0.849
3977	0.5531	1.031	0.825
3902	0.5597	1.015	0.823
3800	0.5668	0.994	0.811
3674	0.5754	0.964	0.799
3527	0.5840	0.934	0.784
3352	0.5937	0.901	0.774
3100	0.6063	0.864	0.766
2752	0.6221	0.823	0.765
2351	0.6383	0.794	0.772
1950	0.6540	0.777	0.787
1550	0.6697	0.766	0.813
1150	0.6848	0.781	0.843
748	0.7010	0.810	0.886
347	0.7189	0.904	0.933
130	0.7369	1.135	0.967
0	0.7704	1.666	

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 55849

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			

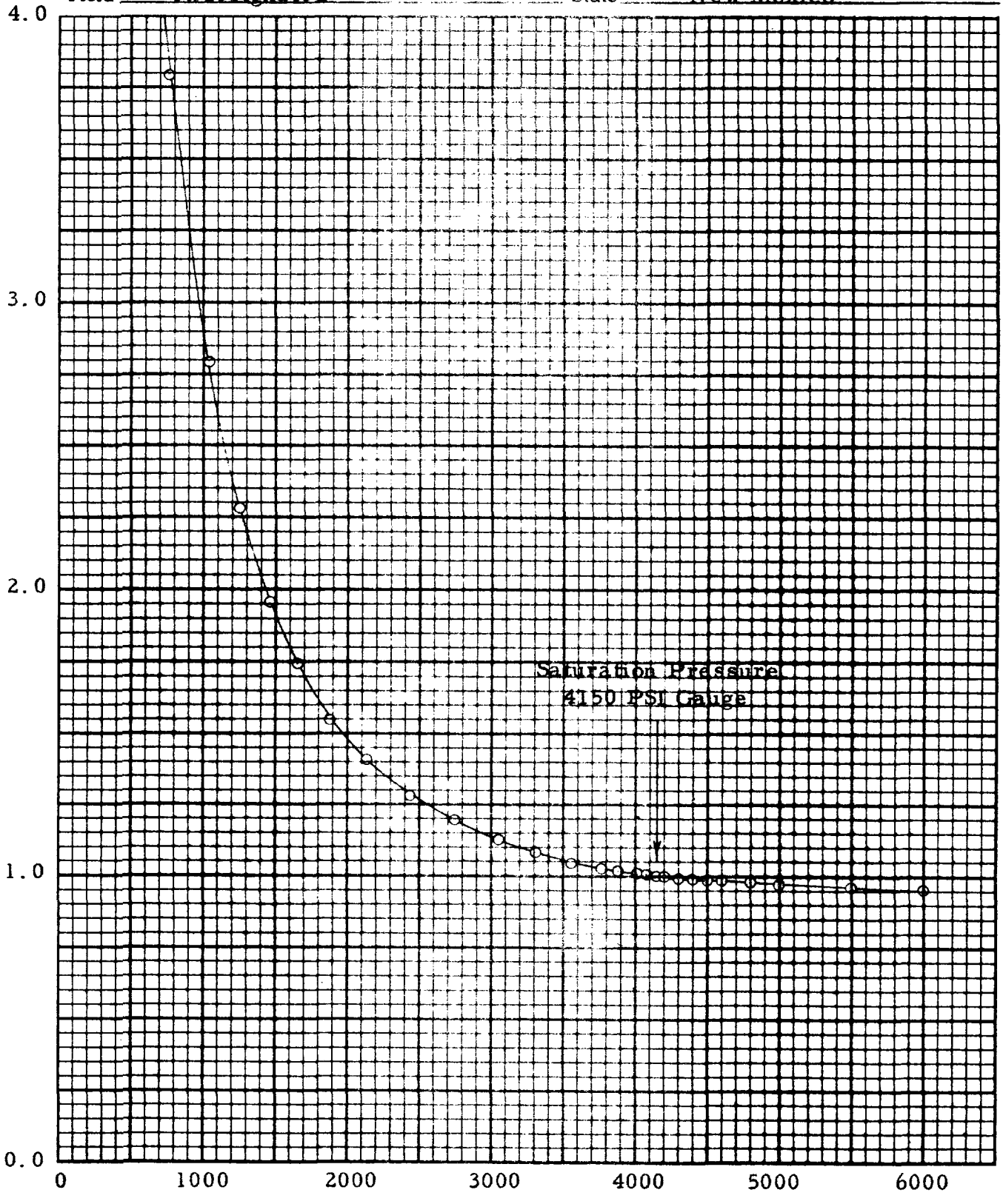
Core Laboratories, Inc.
Reservoir Fluid Division

P. L. Moses (FV)

P. L. Moses,
Operations Supervisor

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

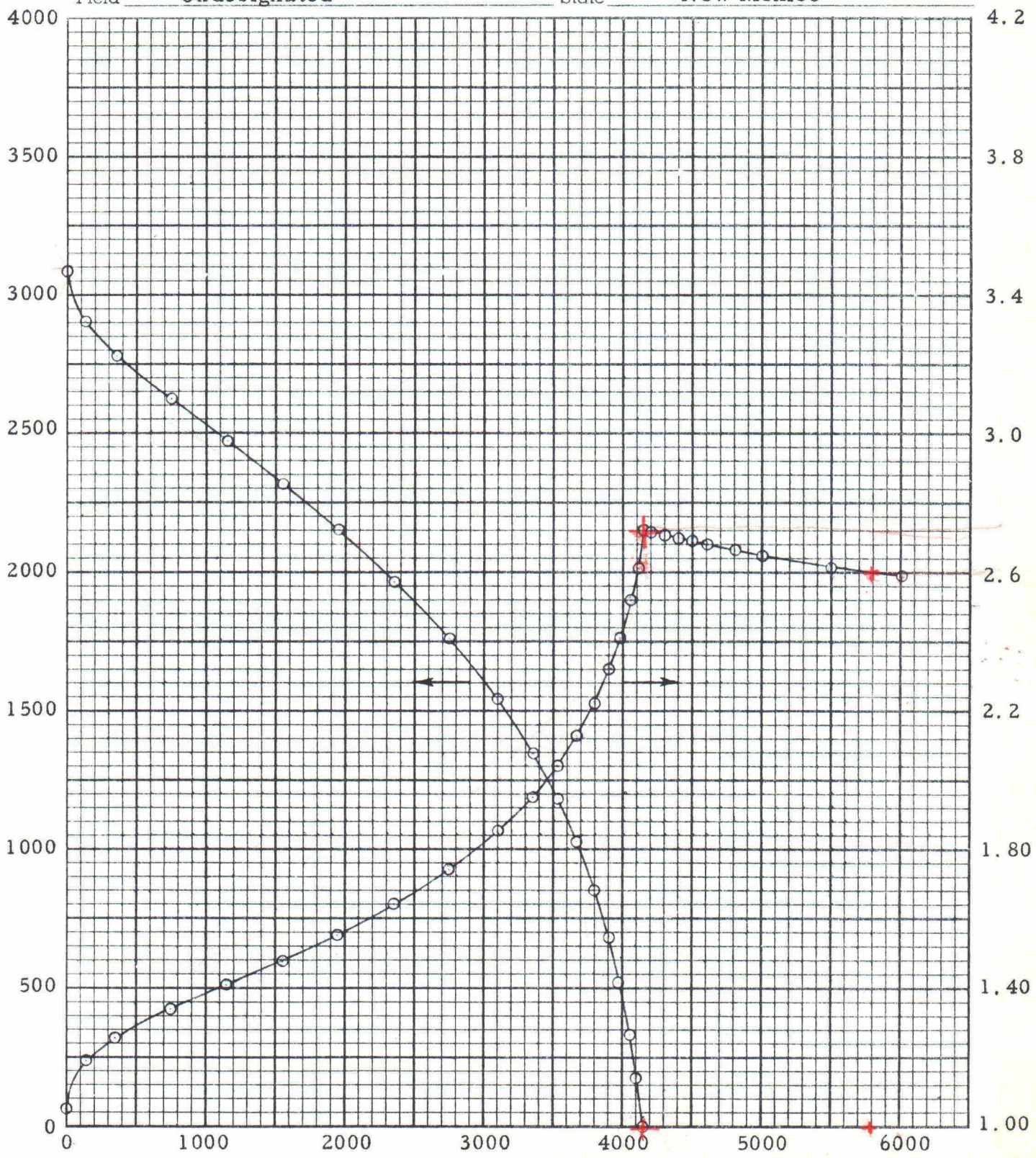


RELATIVE VOLUME: V/Vs

PRESSURE: POUNDS PER SQUARE INCH GAUGE

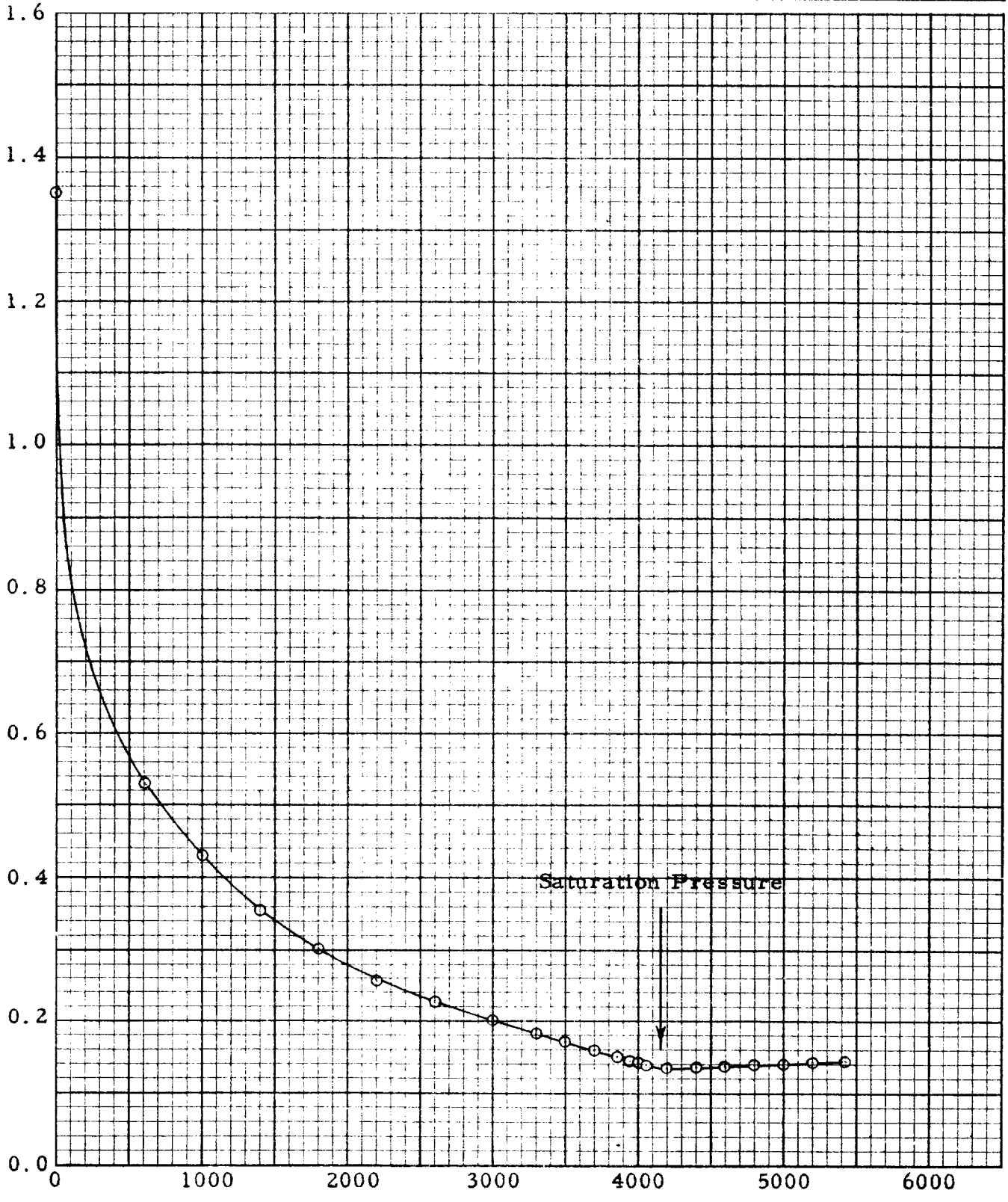
DIFFERENTIAL VAPORIZATION OF RESERVOIR FLUID

Company El Paso Natural Gas Company Formation Strawn
Well E. P. Lusk No. 2 County Lea
Field Undesignated State New Mexico



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



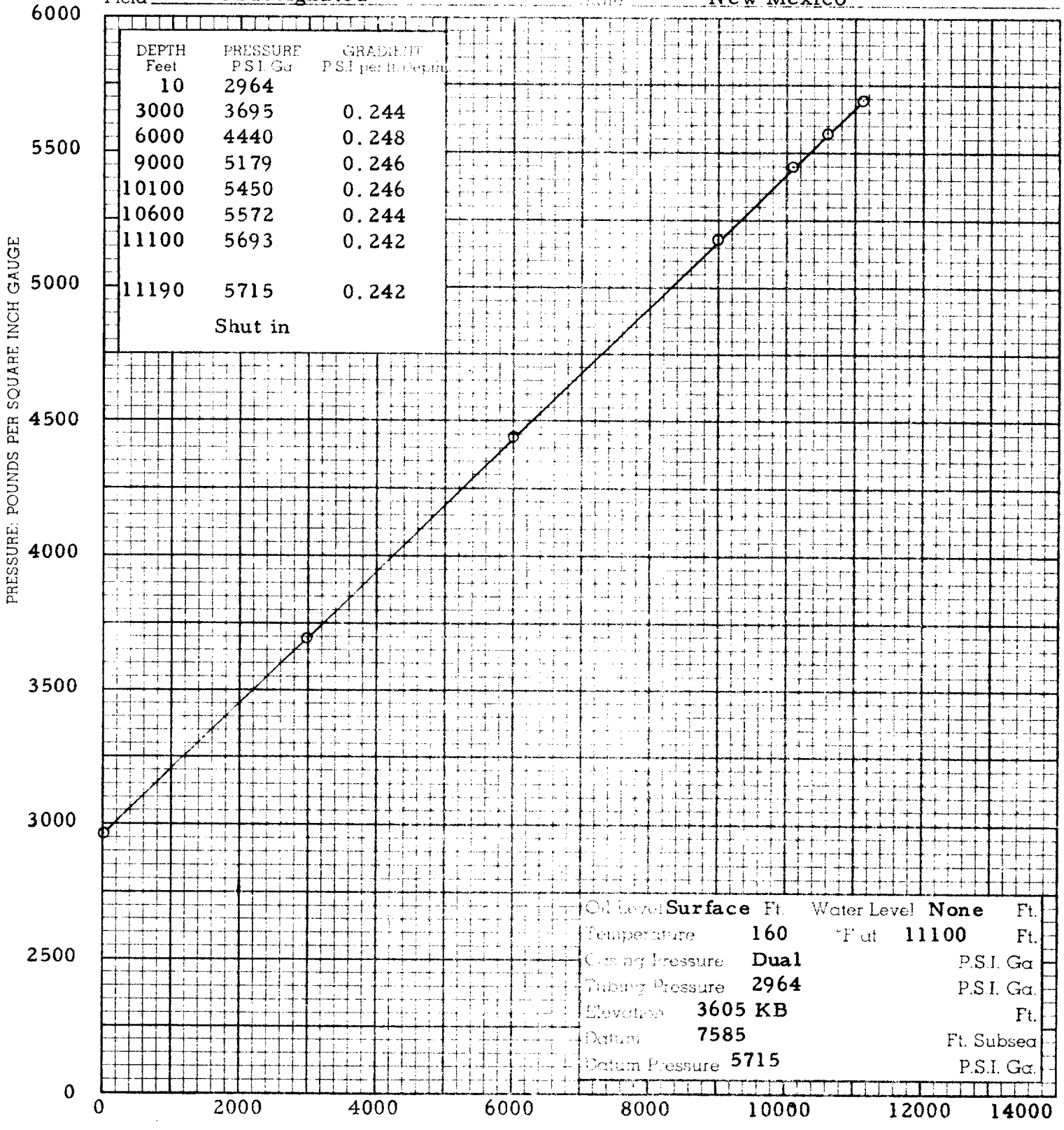
VISCOSITY CENTIPOISES

PRESSURE, POUNDS PER SQUARE INCH GAUGE

Company El Paso Natural Gas Company Formation Strawn
Well E. P. Lusk No. 2 County Lea
Field Undesignated State New Mexico

DEPTH Feet	PRESSURE P.S.I. Ga	GRADIENT P.S.I per ft. Depth
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.

Case No.

2469

Large Exhibits

R-31-E

R-32-E

T 19 S

T 19 S

COUNTY

COUNTY

U.S.

U.S.

LUSK UNIT

E.P.N.G.

I.P Strn 641
Pf 120/11,220-11,250
I.P Morr 31,500 M
Pf 36/12,380-12,398

Elev 3605
-7465

E.P.N.G. Elev 3601
-7416

I.P Bn SP 141
Pf 36/8759-8777
I.P Strn 732
Pf 50/11,168-11,193

E.P.N.G.

Elev 3593
-7564

I.P Strn 285
Pf 120/11,310-11,340
I.P Morr 30,000 M
Pf 60/12,370-12,390

-6700 -6800 -6900 -7000 -7100 -7200 -7300 -7400 -7500 -7600 -7600 -7700 -7800 -7900 -8000 -8100 -8200 -8300 -8400 -8500 -8600 -8700

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

EDDY

LEA

EXHIBIT 1

LUSK DEEP UNIT

LEA AND EDDY COUNTIES, NEW MEXICO

STRUCTURE CONTOUR MAP

CONTOUR DATUM - TOP STRAWN Ls

CONTOUR INTERVAL - 100'

DECEMBER 1961

LEGEND

- INITIAL PARTICIPATING AREA STRAWN FORMATION
- FIRST REVISION
- PROPOSED SECOND REVISION STRAWN FORMATION

0 1/4 1/2 3/4 1 2

SCALE IN MILES

NMOCC CASE NO. 2469
EPNG EXHIBIT NO. 1
DATE January 4, 1962

LARGE FORMAT EXHIBIT HAS BEEN REMOVED AND IS LOCATED IN THE NEXT FILE

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

April 3, 1961

REPLY TO
P. O. BOX 4337
MIDLAND, TEXAS

El Paso Natural Gas Company
19th Floor, Wilco Building
Midland, Texas

Attn: Mr. L. C. Zinc

Subject: Core Analysis
Lusk Deep Unit No. 2 Well
Lea County, New Mexico
Location: Sec. 18-T19S-R32E

Gentlemen:

Strawn formation analyzed between 11,221 and 11,276 feet is interpreted to be oil productive where permeable. A formation treatment may possibly be necessary to increase flow rates. Average core analysis values and calculated original stock-tank oil in place have been prepared for the permeable feet analyzed in the interval and are given on page one of the report.

Formation analyzed between 8762 and 8795 feet is interpreted to be essentially nonproductive due to very low permeability. Formation analyzed from 13,640 to 13,691 feet is virtually impermeable; however, any fluid produced from the zone is expected to be water due to the unfavorable residual fluid saturations.

Thank you for the opportunity to be of service to you.

Very truly yours,

Core Laboratories, Inc.

R S Bynum Jr (R)

R. S. Bynum, Jr.,
District Manager

RSB:LW:bd

Form F-11B

CORE LABORATORIES, INC.

Petroleum Reservoir Engineering

DALLAS, TEXAS

Page 1 of 1 File WP-3-1593
Well Lusk Deep Unit No. 2

CORE SUMMARY AND CALCULATED RECOVERABLE OIL

FORMATION NAME AND DEPTH INTERVAL: Strawn 11,221.0 - 11,276.0

FEET OF CORE RECOVERED FROM ABOVE INTERVAL		54.0	AVERAGE TOTAL WATER SATURATION: PER CENT OF PORE SPACE		36.7
FEET OF CORE INCLUDED IN AVERAGES		33.3	AVERAGE CONNATE WATER SATURATION: PER CENT OF PORE SPACE	(c)	36.7
AVERAGE PERMEABILITY: MILLIDARCYS	Max. 90°	12 3.0	OIL GRAVITY: °API	(e)	48
PRODUCTIVE CAPACITY: MILLIDARCY-FEET	Max. 90°	400 100	ORIGINAL SOLUTION GAS-OIL RATIO: CUBIC FEET PER BARREL	(e)	1130
AVERAGE POROSITY: PER CENT		4.1	ORIGINAL FORMATION VOLUME FACTOR: BARRELS SATURATED OIL PER BARREL STOCK-TANK OIL	(e)	1.69
AVERAGE RESIDUAL OIL SATURATION: PER CENT OF PORE SPACE		5.8	CALCULATED ORIGINAL STOCK-TANK OIL IN PLACE: BARRELS PER ACRE-FOOT		119

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.

CORE LABORATORIES, INC. *Petroleum Reservoir Engineering*

COMPANY EL PASO NATURAL GAS COMPANY — FILE NO. WP-3-1546

WELL LUSK DEEP UNIT NO. 1 — DATE 9-22-60 — ENGRS. BOONE

FIELD WILDCAT — FORMATION AS NOTED — ELEV.

COUNTY LEA — STATE NEW MEXICO — DRLG. FLD. WATER BASE MUD — CORES DIAMOND 3 1/2"

LOCATION 660 FN & EL SEC 19-T19S-R32E — REMARKS SAMPLED AS DIRECTED BY CLIENT

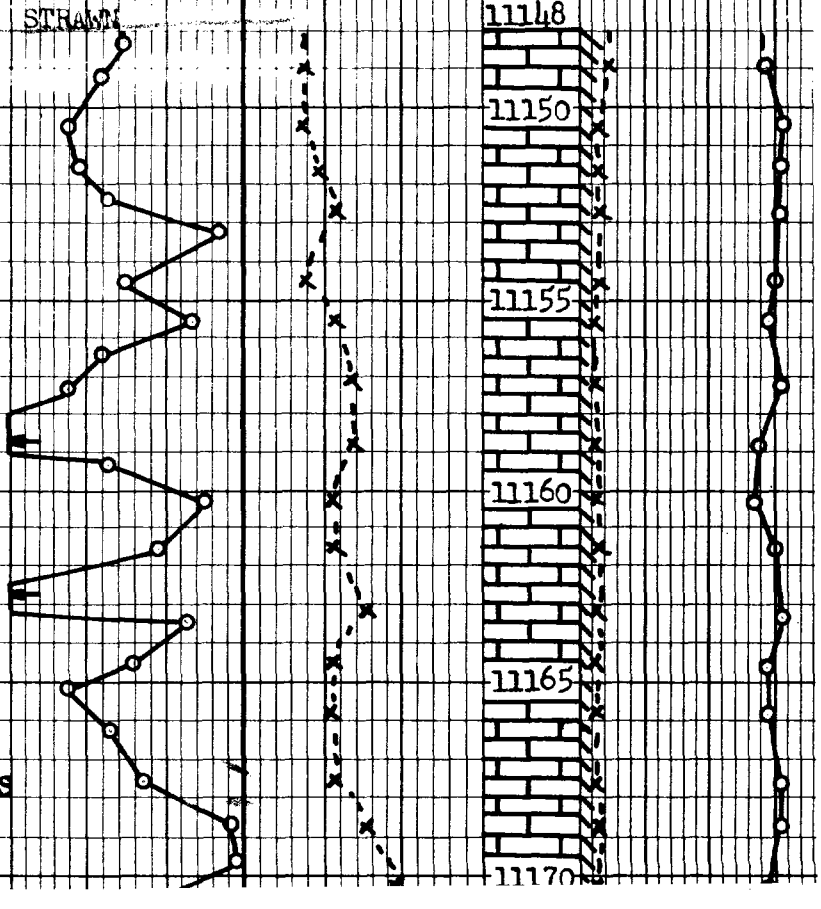
COMPLETION COREGRAPH

SAND, SHALE, LIMESTONE, DOLOMITE, CONGLOMERATE, OOLITES, CHERT, ANHYDRITE

SAMPLE CHARACTERISTICS
F=Fractured L=Laminated FG; MG; CG=Type Grain Size S=Stylolitic V=Vuggy

PROBABLE PRODUCTION
O=Oil W=Water G=Gas T=Transitional

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY, MD. * = Horizontal Perm Plug HORIZONTAL MAX	HORIZONTAL 90°	POROSITY %	RESIDUAL SATURATION % PORE SPACE OIL	RESIDUAL SATURATION % PORE SPACE TOTAL WATER	
		WHOLE-CORE ANALYSIS					
1	11148.0-49.6	15	6.4	11.5	12.6	28.3	FV
1A		18	10				
2	11149.6-51.1	22	9.6	11.8	9.6	22.9	V
3	51.1-52.1	21	18	10.9	8.3	24.4	V
4	52.1-53.5	17	13	9.9	8.3	24.8	V
4A		2.6	0.2				
5	11153.5-55.0	15	6.4	11.0	9.0	25.0	V
6	55.0-56.4	6.2	5.3	9.6	6.4	26.2	FV
7	56.4-58.0	18	0.3	8.9	6.3	21.6	VF
7A		22	20				
8	11158.0-59.5	* 49	* 33	8.2	7.6	30.3	VF
9	59.5-61.0	17	10	9.6	6.4	32.2	VS
9A		5.2	0.4				
10	11161.0-62.3	11	0.5	9.5	8.0	25.0	VF
11	62.3-63.9	69	12	7.6	6.5	21.7	VF
11A		6.9	4.8				
12	11163.9-65.0	14	7.5	9.6	7.1	26.6	VF
13	65.0-66.5	22	11	9.2	7.4	27.6	VF
13A		17	10				
14	11166.5-68.0	13	11	9.8	6.8	22.3	VFS
15	68.0-69.4	1.9	<0.1	7.4	9.7	20.3	VF
16	69.4-71.0	0.1	0.1	5.9	7.4	27.5	VF



CORE LABORATORIES, INC. *Petroleum Reservoir Engineering*

COMPANY EL PASO NATURAL GAS COMPANY FIELD WILDCAT FILE WP-3-1593

WELL LUSK DEEP UNIT NO. 2 COUNTY LEA DATE 12-14-60

LOCATION 660 FS & 1980 FS SEC 18-T19S-R32E STATE NEW MEXICO ELEV. 3605' DF

CORE-GAMMA CORRELATION

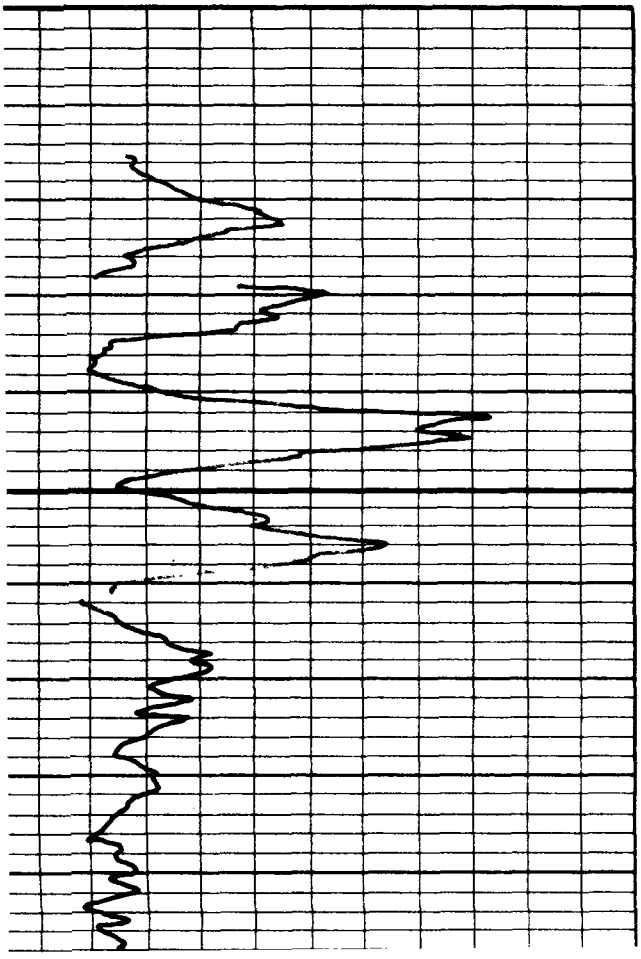
VERTICAL SCALE: 5" = 100'

CORE-GAMMA SURFACE LOG

(PATENT APPLIED FOR)

GAMMA RAY

RADIATION INCREASE →



COREGRAPH

TOTAL WATER

PERCENT TOTAL WATER

80 60 40 20

PERMEABILITY

MILLIDARCYS

10 5 0

POROSITY

PERCENT

10 5 0

OIL SATURATION

PERCENT PORE SPACE

0 20 40 60 80

BONE SPRINGS

8715

8750

CORE LABORATORIES, INC. *Petroleum Reservoir Engineering*

COMPANY EL PASO NATURAL GAS COMPANY FIELD WILDCAT FILE WP-3-1546

WELL LUSK DEEP UNIT NO. 1 COUNTY LEA DATE 9-22-60

LOCATION 660 FN & EL SEC 19-T19S-R32E STATE NEW MEXICO ELEV.

CORE-GAMMA CORRELATION

VERTICAL SCALE: 5" = 100'

CORE-GAMMA SURFACE LOG

(PATENT APPLIED FOR)

GAMMA RAY

RADIATION INCREASE →

COREGRAPH

TOTAL WATER

PERCENT TOTAL WATER

80 60 40 20

PERMEABILITY

MILLIDARCYS

20 10 0

POROSITY

PERCENT

10 5 0

OIL SATURATION

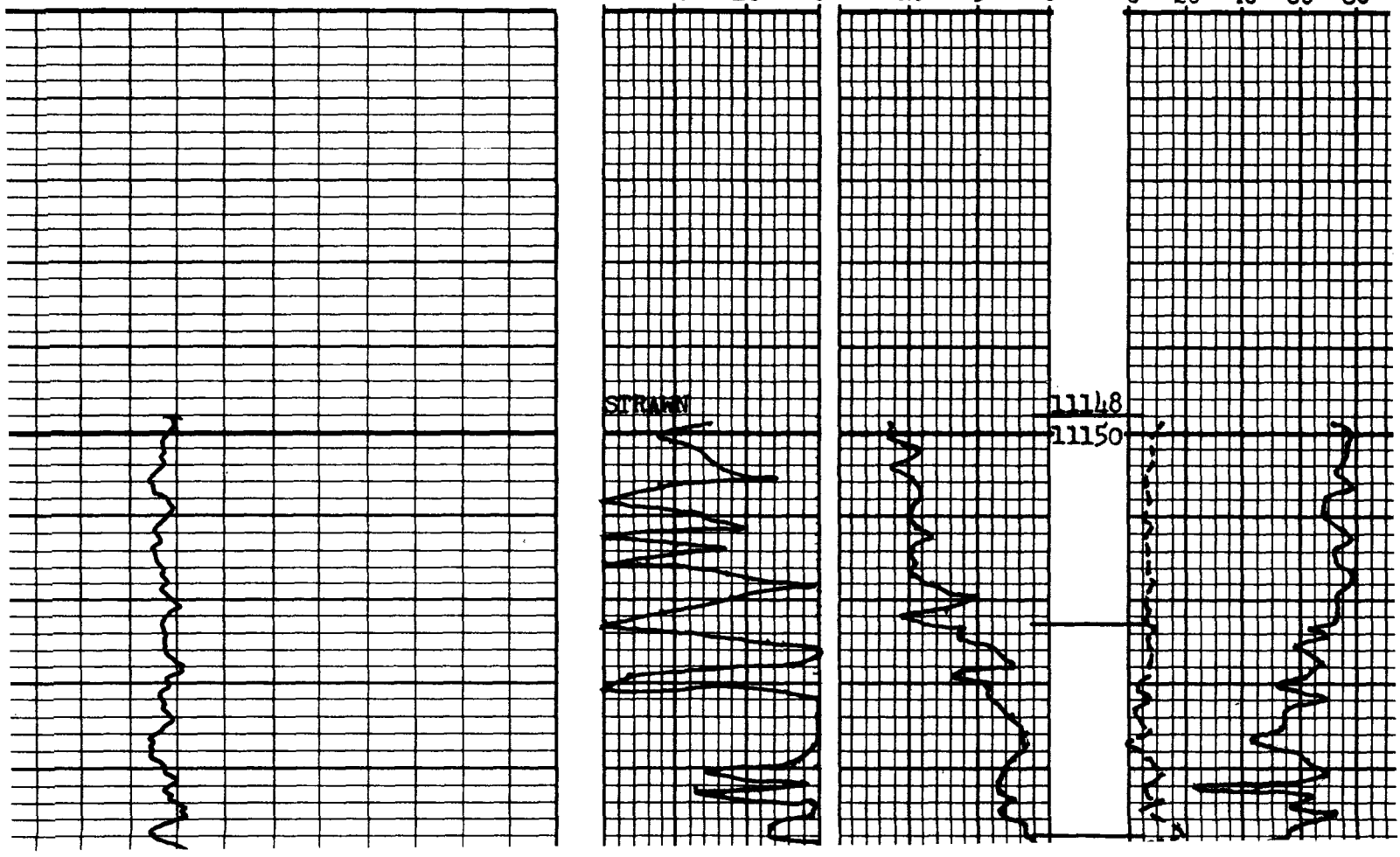
PERCENT PORE SPACE

0 20 40 60 80

STRAWN

11148

11150



CORE LABORATORIES, INC. *Petroleum Reservoir Engineering*

COMPANY	EL PASO NATURAL GAS COMPANY			FILE NO.	WP-3-1593
WELL	LUSK DEEP UNIT NO. 2	DATE	12-18-60	ENGRS.	BOONE
FIELD	UNDESIGNATED	FORMATION	AS NOTED	ELEV.	3605' DF
COUNTY	LEA STATE NEW MEXICO	DRLG. FLD	DRILLING MILK*	CORES	DIAMOND 4 3/8"
LOCATION	1980 FE & 660 FSL SEC 18-T19S-R32E	REMARKS	SAMPLED AS DIRECTED BY CLIENT *-DIESEL OIL ADDED		

COMPLETION COREGRAPH

SAND | LIMESTONE | CONGLOMERATE | CHERT | ANHYDRITE
SHALE | DOLOMITE | OOLITES

SAMPLE CHARACTERISTICS
F=Fractured L=Laminated FG; MG; CG=Type Grain Size S=Stylolitic V=Vuggy

PROBABLE PRODUCTION
O=Oil W=Water G=Gas T=Transitional

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY, MD. * = Horizontal Perm Plug HORIZONTAL MAX.	90°	POROSITY %	RESIDUAL SATURATION % PORE SPACE OIL	TOTAL WATER
		WHOLE-CORE ANALYSIS				

PERMEABILITY O—O MILLIDARCYS 10 5

POROSITY X---X PERCENT 10. 5

TOTAL WATER O—O PERCENT PORE SPACE 75 50 25

OIL SATURATION X---X PERCENT PORE SPACE 25 50 75

R-31-E

R-32-E

T 19 S

2 | 1 | 6 | 5 | 4

STATE — US

PAN AM. — CONT. | CARPER DRLG. | PAN AM.- CONT. | CONTINENTAL | RUBY C. BELL | JOHN H. TRIGG

JOHN H. TRIGG

11 | 12 | 7 | 8 | 9

CONTINENTAL | ROBERT G. PAYNE SHELL (OPERATOR) | CONTINENTAL – PAN AMERICAN | L.V. WAGGONER

SHELL | EL PASO | J.H. TRIGG

US | US | US | PAN AM. | J.H. TRIGG | US | US

SINCLAIR | CONTINENTAL | PAN AM.- CONT. | SHELL | EL PASO- GULF | EL PASO | HUMBLE

Grant Peel et ux

W.G. ROSS | C.B. READ | SHELL | EL PASO, PHILLIPS, KERR-McGEE | SHELL

14 | 13 | 18 | 17 | 16

KERR-McGEE – PHILLIPS | ANGLE & DICKES | PAN AM. CONT. | KERR McGEE - PHILLIPS | EL PASO, PHILLIPS, KERR-McGEE | SHELL | EL PASO – PHILLIPS - KERR McGEE | GULF | EL PASO | STATE

EL PASO(opr. rts below 6500') | PHILLIPS & Kerr McGee | SOUTHERN CALIFORNIA PET., ET AL

TD-13974
640-BO (strawn)
2 ● 31500 MCF – (morrow)

EL PASO | EL PASO

Phillips & Kerr McGee | Phillips & Kerr McGee | Southern California Pet. et al | Grant Peel et ux

US | US | US | US | US | STATE

C.E. JONES T.S.N.G. & Delhi-Tayor (operators) | C.E. JONES Delhi-Taylor- (operator) | CHARLES E. JONES DELHI-TAYLOR (OPERATOR) | EL PASO | EL PASO | EL PASO-PHILLIPS-KERR McGEE | EWELL H. MUSE JR

● 1
TD-11232
732-BO (strawn)

Harvey E. Roelofs

SOCONY MOBILE

● 3
TD-12621
285-BO (strawn)
30000-MCF (morrow)

23 | 24 | 19 | 20 | 21

EL PASO | EL PASO-GULF

Delhi-Taylor | GULF

EL PASO KERR-McGEE PHILLIPS GULF | EL PASO

Phillips, etal | Delhi-Taylor

EL PASO | EL PASO KERR-McGEE PHILLIPS

Kerr-McGee & Phillips | Southern California Pet., et al

US | US DELHI-TAYLOR | US | PHILLIPS & KERR McGEE US | US

CHARLES E. JONES DELHI-TAYLOR(operator) | CHARLES E. JONES DELHI-TAYLOR (OPERATOR) | C.E. JONES Delhi-Taylor (opr. rts) | EDNA I. HALL | SO. CAL.-CULBERTSON & IRWIN EL PASO (OPR. RTS. BELOW 4500') | SOCONY MOBILE

KERR-McGEE - PHILLIPS

26 | 25 | 30 | 29 | 28

GULF | E.I. HALL | SHELL | P.E. Haskins | SO. CAL. Culbertson & Irwin | EWELL H. MUSE JR.

Del Basin Corp.

US | US | US | US | US

LUSK DEEP UNIT

LEA & EDDY COUNTIES, NEW MEXICO

EL PASO NAT. GAS COMPANY - OPERATOR

UNIT AREA BOUNDARY

LUSK STRAWN POOL

SLANTED LETTERING-LESSEE OF RECORD

VERTICAL LETTERING-WORKING INTEREST OWNER

ACREAGE SURROUNDING UNIT

VERTICAL LETTERING-WORKING INTEREST OWNER & LESSEE OF RECORD

OTHER INTEREST-AS INDICATED

SCALE — 2" = 1 MILE

NMOCC CASE NO. 2469
EPNG EXHIBIT NO. 12
JAN. 4, 1962