

File: Case 697

BROOKHAVEN OIL COMPANY

FIRST NATIONAL BANK BUILDING

(MAIL) P. O. BOX 644

Albuquerque, New Mexico

PHONE 7-8853

TELETYPE AQ-96

June 1, 1954.

Mr. R. R. Spurrier, Secretary
New Mexico Oil and Gas Conservation Commission
State Capitol
Santa Fe, New Mexico

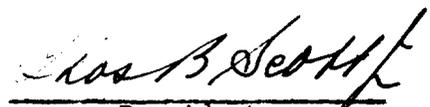
Dear Mr. Spurrier:

In accordance with the Transcript of Proceedings Case No. 697, Regular Hearing May 19, 1954, the undersigned submits the attached statement requesting that Lowry's application Case 697 be denied, either with or without continuance of the Case for further testimony and cross examination.

It is requested that Order R-349 be rescinded.

Very truly yours,

BROOKHAVEN OIL COMPANY
DACRESA CORPORATION



President

TBS:ms

CC: Gov. Edwin L. Mechem, Chairman
Mr. E. S. Walker, Member

1954 JUN 12 AM 8:40

MAIN OFFICE OCC

9 June 1954

Memorandum to W. B. Macey

Subject: Case 697

SOUTH BLANCO TOCITO RESERVOIR DATA:

STRUCTURE:

Lenticular sand reservoir. Occurs as sand lens in Tocito sandstone. Dips approximately 80 feet per mile northeast. Upper portion of sand is fairly porous and permeable. Lower portion is very tight and is productive only because of fracture system.

RESERVOIR DATA:

Permeability: Upper Sand: 121 mds. hor., 31.6 mds. vert. (gross pay)
Lower Sand: 1.06 mds. hor., .41 mds. vert.
Weighted Average Reservoir Permeability: ~~32.12~~ mds. hor. (Based on
Apparent K_w : 32.12 mds. 71 gross pay
Apparent K_g/K_o : .024 mds. section)

Porosity: Upper Sand 13.9 %
Lower Sand 11.0 %

*K = 109 mds based
on net pay section*

Saturation Pressure: 2051 psig
Reservoir Pressure, (7-26-51): 2197 psig
Reservoir Pressure, (4-1-54): 1944 psig
Pressure Drop per Thousand Barrels Produced: .273 psig
Reservoir Temperature: 175 deg. F.
Gas in Solution: 862 cu ft per bbl.
Producing GOR as of 6-51: 1510 cu ft per bbl.
Producing GOR as of 4-54: 1360 cu ft per bbl.
Formation Volume Factor: 1.52
Viscosity of Liquid Phase: .39 cps.
Average Sand Thickness: 11.0 feet. (net)

PRODUCTION:

Cumulative Oil to 5-1-54: 925,817 bbl.
Cumulative Gas to 5-1-54: 1,480,355 MCF
Production for year 1953: Oil: 404,906 bbl
Gas: 739,837 MCF
Water: .1 %

RESERVES:

Total reserves as of discovery: 13,602,220 bbls. (13,054,860 bbls upper sand)
(547,360 bbls lower sand)
Recovery Factors: Upper Sand: 25.00 %
Lower Sand: 10.00 %
Recoverable Reserves as of date of discovery: 3,330,230 bbls. (by primary rec.)
Remaining Recoverable Reserves as of 5-1-54: 2,404,413 bbls. (1314 bbls per acre)

DISCUSSION OF STATEMENT BY THOS. B. SCOTT JR.

Page 2 of statement:

1. A study of various pressure maintenance projects employing water as the pressuring medium shows many projects injecting 5, 6, or as high as 8 barrels of water per barrel of oil recovered.
2. Scott's statement concerning the decline of pressures in all areas except in the vicinity of the injection well serves to confirm the effectiveness of the water flood program in the reservoir.
3. True, well T-134 topped the Tocito at -168 feet while T-109 called same at -188 feet. However, T-134 is open in the interval -178 feet to -220, while T-109 produces from open hole below -190 feet, thereby reducing the net difference to 12 feet rather than 20 feet as Scott suggests. Even the 20 foot difference should make little difference in the effects of the water flood program particularly when considering the irregularities which could be present in the vertical delineation of this sand lens.

Page 3 of statement:

1. The wall rock of the injection well bore could easily become clogged with sediment, organic matter and particularly precipitated salts. It would therefore be logical to assume that the "injectivity index" of a water injection well would suffer a gradual reduction as the flood program progresses and that a gradual build-up in pressure would be noted although the volume of water injected remained constant.
2. T-157 is directly southwest of the injection well, T-134. The South Blanco Tocito structure dips to the northeast. Therefore, the water is seen to be migrating up-structure as it should. A water influx pattern in a water flood project such as this would take the form of a truncated ellipse or lemniscate when viewed from above. Such ellipse would have the "a" or long axis running directly through the injection well, with the injection well located at or near the lower end of the axis, depending on the dip of the structure. The long axis of the figure would trend directly up-dip. Assuming this influx pattern to be the case here, T-157 would be the logical well to water out first since it lies directly up-dip from the injection well and hence directly on the long axis of an elliptical water influx pattern. A radial influx pattern such as Mr. Scott assumes to exist could only be obtained if all recovery wells remained shut in while the water injection program continued.
3. Scott's contention that the pay thickness increases down dip is apparently based on a very scanty bit of information. 11.2 feet of pay section were encountered in well T-85, .2 feet above the average for the reservoir. 8.2 feet of pay were encountered in well D-83 which is even closer to Scott's property than is T-85. While I cannot say for certain that the pay section increases in thickness down dip, I can say without fear of much contradiction that the permeability in the Tocito section very definitely decreases. Lowry found the Tocito so tight in D-83 that they were unable to complete a commercial well in the section. The permeability in T-85 is well below the average at 5.1 mds.

Page 4 of statement:

1. Pressure maintenance through gas injection is not too attractive a proposition in the South Blanco Tocito reservoir due to a high apparent K_g/K_o ratio. This is a situation which has been aggravated since discovery due to the increased ratio of gas to oil in the reservoir. The ratio encountered here approximates ~~2.0-3.0~~ at 30 % saturation.

oil → see note at end of memo, .024

Another factor to be considered when contemplating gas injection as a means of pressure maintenance in this reservoir is the rapid rise in GOR's during the early life of the field. These high GOR's were apparently caused by high rates of production at that time. This rapid increase in GOR's indicates that there will be higher gas saturation in the vicinity of the producing well bores than in the unproduced segments of the reservoir. This variation in gas saturation throughout the reservoir would promote gas channelling, thereby reducing the efficiency of a gas injection program.

In a flat dipping structure such as this, it is reasonable to assume that injected gas would channel directly through to recovery wells, thereby preventing the maintenance of uniform pressure conditions.

I realize that the plan to inject water into well T-123 is now abandoned due to the reluctance of Johnston to join in the pressuring plan, and that Scott's objection to water injection is necessarily abandoned also as far as this well is concerned. I include the above considerations to call your attention to the situation as it does exist, and to comment at this time on any program proposing gas injection which may come up in the future.

2. Well D-83 is a commercial gasser completed in the Dakota. However, the question involved in deciding the merits of plugging this well back to the Tocito for use as an injection well is a question of economics and conservation rather than a question of conservation as such. Economics favor the plugging back of this well to use it as a water injection well for the purpose of pressure maintenance in the Tocito oil reservoir thereby contributing to the increased ultimate recovery of oil from the Tocito. This is especially true since Lowry's intention is to recomplate the well in the Dakota when its usefulness as a water injection well is ended. Should Lowry actually do as they propose in effecting this recompletion, the interests of conservation would be served providing, of course, the value of the Dakota gas is not lessened in the interim.

3. It would be possible to set a bridging plug in D-83 and employ the well for injection purposes by recompleting in the Tocito at a depth of approximately -170 feet. Well T-85, located approximately 1/2 mile distant, is completed at a depth of -180 feet, 5 feet below the top of the Tocito. T-109 is completed at -190 feet or 2 feet below the top of the Tocito, and is located 1 1/2 miles distant from D-83. These differences in elevation, particularly over these distances, should make little or no difference in the effectiveness of the water flood. Any up-dip force exerted by the injected water also has a down-dip component which is directly proportional to the volume of water injected. It looks to me as if T-85 would make a better injection well than would D-83. The permeability in T-85 is 5.1 mds. against 3.9 mds in D-83. Permeability to water in T-85 is given as .160 mds while water permeability in D-83 runs only .106 mds. T-85 produces on the order of 17 BOPD so the loss of the well would make little difference in the overall production picture.

4. As for any damage to oil reserves under the NW/4 of section 5 owned by Brookhaven and Dacresa, such damage is possible providing there are any oil reserves under this piece of real estate. It is noted that D-83, the nearest Tocito test to the NW/4 of the section could not make a well in the Tocito. Permeability in D-83 is only 3.9 mds and permeability in T-85, another close well, is only 5.1 mds. Tocito porosity in both D-83 and T-85 was below average being 10.6 and 11.2 % respectively. Pay section in D-83 (Tocito) is but 8.2 feet. Sounds to me as if the lens is lensing out in the direction of the NW/4 of section 5. Also, as mentioned above, any water injection program has a component of force in both the up-dip and down-dip directions. A down-dip flood is not so efficient as is an up-dip flood, and is effective to a degree directly proportional to the volume of water introduced into the reservoir. When this fact is considered, it seems quite possible that the reservoir under the NW/4 of

section 5 could be helped just as easily as it could be harmed. The reservoir has good vertical permeability, thereby allowing fluids to segregate easily within the confines of the reservoir.

5. It is within the realm of possibility that, in the later stages of the pressuring program, oil now under the Lowry properties could wind up under the Johnston properties. Recommendations to be made at the end of this memorandum will help to counteract such migration and serve to protect the correlative rights of those concerned.

Page 5 of statement:

1. Eventually, it may be necessary to employ well T-109 as an injection well and to drill additional injection wells in the south half of section 4, in section 6 or 32 and in section 31. Drilling of these additional wells would assist in maintaining a uniform rate of frontal advance upstructure — a desirable feature in any water flood program.

2. Based upon my study of the South Blanco Tocito reservoir, I find that the reservoir lends itself particularly well to pressure maintenance through water injection. This is the only practical method of obtaining increased ultimate recovery. The injection of gas is not too attractive a proposition as mentioned earlier.

Page 6 of statement:

1. I can see no reason why Lowry should not be allowed to produce into a common tank battery so long as they meter the production of each lease separately. The ownership of both leases presently concerned is identical. Even though the ownership picture may change in the future as Scott points out, such changes would be made with the knowledge that the leases produce into common tankage, and I can foresee no difficulties of any consequence arising because of such ownership changes, particularly if the entire reservoir is unitized.

COMMENTS ON LOWRY'S APPLICATION:

1. The only quarrel (a weak one) I can find with Lowry's application and the proposed order presented by Jason W. Kellahin Esq., is Lowry's intention to use well D-83 as their second injection well. It is my thought that well T-85 would better serve the purpose due to the greater permeabilities encountered as pointed out in paragraph 5, page 3 of this memorandum. Bear in mind that both well D-83 and T-85 will eventually be employed as water injection wells regardless of any characteristics which may make one better for the purpose than the other.

RECOMMENDATIONS:

1. I agree with Mr. Scott in that some sort of cooperative agreement between Lowry, Johnston and possibly others should be effected for the purpose of conducting a pressure maintenance program by water injection in the entire reservoir. Unitization of the Tocito zone would remove a great number of petty differences between operators and would lay the groundwork for a 100% effective water flood operation. Mayhaps the Commission could write an order intended to promote such an agreement.

2. I recommend that the Commission conduct a study to determine an optimum producing rate for this reservoir along with the determination of an optimum water injection rate at an optimum pressure. My calculations show the rupturing pressure for this reservoir to be approximately 8,000 psi. The current injection pressure is consider-

ably under this figure, but may not be an optimum.

3. I recommend that Lowry's application for an extension fo the current water flood program be approved, but that they reconsider lightly their proposal to convert well D-83 to a water injection well in preference to well T-85.

4. I recommend that Lowry be permitted to produce into a common tank battery providing they meter production from each lease separately, and that they run periodic tests on each well to determine the water-oil ratio.

HNR

NOTE: Refer to last paragraph, page 2 of memorandum

The apparent K_g/K_o ratio of .024 was calculated assuming a free gas saturation of 2.7 percent with total oil in reservoir of 10,000,000 barrels. This is a minimum volume of oil and hence would provide the highest ratio. This ratio is appreciably higher than any published ratio for similar reservoirs with similar free gas saturation.

Assuming a free gas saturation of 3.5 percent -- which more nearly approximates reservoir conditions as they now exist -- and assuming 10,000,000 barrels of oil in the reservoir, the K_g/K_o ratio figures out to .049 -- still much higher than any published ratio for reservoirs with similar free gas saturation.

HNR

BROOKHAVEN OIL COMPANY

FIRST NATIONAL BANK BUILDING

(MAIL) P. O. BOX 644

Albuquerque, New Mexico

PHONE 7-8853

TELETYPE AQ-56

MAIN OFFICE OCC

JUN 11 9:24

June 11, 1954.

New Mexico Oil Conservation Commission
State Capitol
Santa Fe, New Mexico

Att: Mr. R. R. Spurrier, Secretary

Dear Sirs:

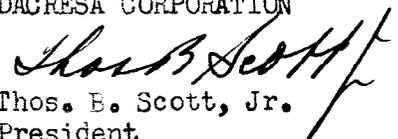
Referring to Case 697 and to the undersigned's statement sent you under cover of June 1st, we are in receipt today of copy of letter dated June 9th from Mr. Kellahin, Attorney for Lowry et al Operating Account, to the New Mexico Oil Conservation Commission, wherein he requests withdrawal from consideration the utilization of well T-123 for water injection purposes, giving as reason the lack of full cooperation on the part of Johnston Oil and Gas Company, owners of offsetting leases.

It is our understanding from said letter, that Lowry et al Operating Account continues to seek approval to plug back well D-83 (located in the NW/4 SE/4 of Section 5-26N-6W), from the Dakota formation where it is now producing commercially, to the Tocito formation, and, without producing it or even attempting to produce it from said Tocito formation, to inject water into said formation.

Please be advised that the undersigned companies own all the lease rights below the Pictured Cliffs formation under the NW/4 Section 5-26N-6W, offsetting to the northwest well D-83, and that there has been no attempt for agreement nor is there presently any understanding between Lowry et al Operating Account and the undersigned with reference to water injection in well D-83; and, without such an agreement or the unitization of the NW/4 of Section 5 with the other three-fourths of this section, it would not be feasible for Lowry to inject water into the Tocito formation in well D-83, this being the same reasoning as is acknowledged with reference to the Johnston properties and well T-123. As a matter of fact, injection of water in well D-83 without unitization of Section 5 would be highly damaging to the lease rights owned by the undersigned in the NW/4 of said section. Please refer to our statement of June 1, 1954, page 4, second paragraph under "Comment".

Very truly yours,

BROOKHAVEN OIL COMPANY
DACRESA CORPORATION


Thos. E. Scott, Jr.
President

TBS:ms

CC: Gov. Edwin L. Mechem, Chairman
Mr. E. S. Walker, Member
Lowry et al Operating Account
Mr. Jason W. Kellahin
Mr. Jack M. Campbell

Case 697

MAIN OFFICE
BROOKHAVEN OIL COMPANY
INTERNATIONAL BANK BUILDING
(MAIL) P. O. BOX 644
Albuquerque, New Mexico
PHONE 7-4453 46
TELETYPE AQ-96

1954 JUL 29 AM 11:53

July 29, 1954.

Lowry et al Operating Account
P. O. Box 8008
Albuquerque, New Mexico

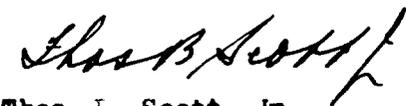
Gentlemen:

Please be advised that the undersigned notes that you have failed to offset Johnston's #6 Tocito well located in the Southeast Quarter (SE/4) of Section 6, Township 26 North, Range 6 West.

Having an overriding royalty under the Southwest Quarter (SW/4) of Section 5, Township 26 North, Range 6 West, I wish to advise that we will require your drilling an offset to the Tocito formation in the Southwest Quarter (SW/4) of Section 5 in order to avoid drainage by Johnston's well #6.

Very truly yours,

BROOKHAVEN OIL COMPANY
DACRESA CORPORATION



Thos. E. Scott, Jr.
President

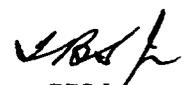
TTS:ms

CC: U.S. Geological Survey
P. O. Box 6721
Roswell, New Mexico

Mr. W. B. Macey
Oil Conservation Commission
State Capitol
Santa Fe, New Mexico

P.S. to Mr. Macey:

For your information re Case 697.


TESJr.

Lowry Oil Company

P. O. Box 8008

Albuquerque, New Mexico

July 23, 1954

7m
Case 697
file
MAIN OFFICE CCC

1954 JUL 23 AM 9:41

Oil Conservation Commission
Box 871
Santa Fe, New Mexico

Attention: Mr. W. B. Macy
Secretary and Director

Gentlemen:

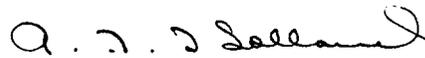
Lowry et al Operating Account presented Case Number 697 on July 21, 1954, requesting approval of certain plans from the New Mexico Oil Conservation Commission relating to the expansion of the pressure maintenance project for the South Blanco Tocito Pool.

At this Hearing Mr. Thomas B. Scott stated to the Commission, in substance, that no consideration had been given toward unitization of properties in the South Blanco Tocito Pool. This statement was refuted by Mr. Jason Kellahin representing Lowry Oil Company, and the Commission was advised that Mr. Scott had received a letter stating that unitization of properties would be considered providing the drilling of a test well proved his leases productive.

A copy of the above-mentioned letter was not available for presentation to the Commission during the proceedings of the Hearing. Attached for your information and file is a photostatic copy of our copy of the letter which was written by Mr. T. G. Lowry to Mr. Thomas B. Scott proposing unitization of properties providing a test well proves production.

Yours very truly,

LOWRY OIL COMPANY



A. F. Holland

AFH:mhw

encl.

cc: Mr. Jason Kellahin
Mr. Thomas B. Scott

LAW OFFICES

ECKERT, PETERSON & LOWRY

FIELD BUILDING

135 SOUTH LA SALLE STREET

CHICAGO 5

WALTER H. ECKERT

614-1444

T. M. EEMAN

614-1444

ANDOVER 3-7300

ABER PETERSON
TIMOTHY G. LOWRY
OWEN RALL
HENRY F. W. BARBER
WALTER A. ROSE
J. HENRY RYDER
HAROLD W. COFF
RICHARD J. HENRIE
J. BRADLEY MATHIAS
WILLIAM A. CANNON
LEWIS E. BILKELLY JR.
WALTER P. STEFFEN
GERHARD E. SEIDEL
HERBERT C. LOTH JR.
ELMER L. SANDOUST JR.
FRANK J. SWENSON
ROBERT S. SCHLIGER
JOHN W. GILLIGAN
THEODORE J. TOMMAS

June 21, 1954

**Mr. Thomas B. Scott, Jr., President
Brookhaven Oil Company
First National Bank Building
Albuquerque, New Mexico**

Dear Tom:

I'm afraid I do not entirely comprehend the suggestion in your letter of June 18th.

Is it that you propose that we now assign to you an additional ORR of 2-1/2% on some 13,700 acres, of which about 2500 are proven producing Tocito, in return for an assignment of lease rights below the Pictured Cliff on your 160 acres which is neither producing nor proven?

If so, I don't think we can get together, and suggest that if you can get someone to drill a test well on your 160, that we then unitize on a basis of acre feet of pay for the water injection program if your test proves production, which we believe is quite uncertain.

I would appreciate it if you would discuss this preliminarily with Red Hunt.

Very truly yours,

TGL/H

cc: A. A. Hunt



7
Case 671

Lowry Oil Company

MAIN OFFICE OCC

P. O. Box 8008

Albuquerque, New Mexico

1954 JUN 15 AM 8:19 June 14, 1954

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

Attention: Mr. R. R. Spurrier
Secretary and Director

Dear Mr. Spurrier:

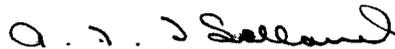
On May 19, 1954, the New Mexico Oil Conservation Commission heard Case No. 697 relating to an application by Lowry et al Operating Account for permission to expand the pressure maintenance project for the South Blanco Tocito Pool. At this hearing it was stated that attempts were being made to secure a cooperative program in the pool by securing the participation of the Johnston Oil and Gas Company in the project.

Subsequent to the hearing the Johnston Oil and Gas Company have advised that they do not desire to participate in the pressure maintenance program at this time. They have further advised that they have no objection to the pressure maintenance project now being operated by Lowry, and that they have no objection to our proceeding to inject water in any of the Tocito wells operated by Lowry et al Operating Account.

Attached for your information and file is a photostatic copy of the letter received from the Johnston Oil and Gas Company stating they have no objection to the operation of a pressure maintenance project by the Lowry et al Operating Account in the South Blanco Tocito Pool.

Yours very truly,

LOWRY OIL COMPANY



A. F. Holland

AFH/leh

Enclosure

CC: Mr. Jason W. Kellahin w/encl
Mr. Tom B. Scott w/encl

OIL CONSERVATION COMMISSION

P. O. BOX 871

SANTA FE, NEW MEXICO

July 6, 1954

Mr. Thomas B. Scott
Brookhaven Oil Company
P. O. Box 644
Albuquerque, New Mexico

Dear Mr. Scott:

RE: OCC Case 697

We attach for your information copy of the legal notice as sent out today in Case 697, which as you will note is being readvertised for special hearing at 9 a.m. on July 21, 1954.

Very truly yours,

W. B. Macey
Chief Engineer

WBM:nr

C

O

P

Y

For
Case 697
file

BROOKHAVEN OIL COMPANY

FIRST NATIONAL BANK BUILDING

(MAIL) P. O. BOX 644

Albuquerque, New Mexico

TELETYPE AQ-96

MAIN OFFICE OCC

1954 JUL 23 AM 9:41
PHONE 7-8853

July 23, 1954.

Mr. William G. Macey
New Mexico Oil Conservation Commission
State Capitol
Santa Fe, New Mexico

SUBJECT: OCC Case 697

Dear Mr. Macey:

Attached is correspondence between Mr. Tim G. Lowry and myself relative to unitizing the NW/4 of Section 5-26N-6W, owned by us in Lowry's water flooding program. This is the Lowry letter that Mr. Kellahin was unable to produce at the hearing on last Wednesday and it is the only letter I have ever received from Mr. Lowry relative to the subject.

I believe you will see that Mr. Lowry, after making his original telephone suggestion as explained in the first paragraph of my letter to him of June 18th, was not too much in earnest and merely wanted me to get a well drilled in the NW/4 of Section 5 for his benefit. From the map you will see that Lowry has to eventually drill some oil wells in the S/2 of Section 5 because of an offset obligation for the requirements of development.

Very truly yours,

BROOKHAVEN OIL COMPANY
DACRESA CORPORATION

Thos. E. Scott, Jr.
Thos. E. Scott, Jr.
President

TES:ms

Enc. - Copy of letter 6/18/54 to Mr. Lowry
Copy of letter 6/21/54 from Mr. Lowry

- C O P Y -

June 18, 1954

Mr. Timothy G. Lowry
Eckert, Peterson & Lowry
135 South La Salle St.
Chicago 3, Illinois

Dear Tim:

I have been thinking over our telephone conversation the other day wherein you requested that the undersigned companies consider giving up their lease rights below the Pictured Cliffs in the NW/4 of Section 5, Township 26 North, Range 6 West, for an overriding royalty on all of Lowry's leases which these companies originally sold to Boswell and including this NW/4 of Section 5.

This problem I have approached from a producing acreage and a reserve basis, which I will attempt to describe.

1. Presently the NW/4 of Section 5 is about 1/28th of the present and future possibilities in the Tocito. Therefore an override in the whole should be based on 1/29th, or approximately a 3.5% override on the producing and prospective Tocito area.
2. Inasmuch as we would be willing to gamble with you on future possibilities on the whole area you have under lease, not only the Tocito, I might be able to persuade the directors and stockholders of the undersigned companies to transfer to you all of our lease rights under the NW/4 of Section 5 below the Pictured Cliffs formation for a 2 $\frac{1}{2}$ % overriding royalty on all of your holdings as mentioned above. This would include the attached list of leases and their descriptions.
3. As to the SE/4 of Section 15 and SW/4 of Section 13, all of the lease rights today are subject to the Mead Contract. Unless Mead drills a Dakota test on each of these by September 19, 1956 and offsets any wells that you might drill, the lease rights below the Pictured Cliffs must be relinquished by Mead to us. From this you will see that I can not negotiate on these two quarter sections at the present time and possibly you may never want them anyway.

With kindest regards, I remain,

Very truly yours,

BROOKHAVEN OIL COMPANY
DACRESA CORPORATION

Thos. F. Scott, Jr.
President

TES:ms

C O P Y

ECKERT, PETERSON & LOWRY
135 South La Salle Street
Chicago 3, Illinois

June 21, 1954.

Mr. Thomas E. Scott, Jr., President
Brookhaven Oil Company
First National Bank Building
Albuquerque, New Mexico

Dear Tom:

I'm afraid I do not entirely comprehend the suggestion in your letter of June 18th.

Is it that you propose that we now assign to you an additional ORR of 2-1/2% on some 13,700 acres, of which about 2500 are proven producing Tocito, in return for an assignment of lease rights below the Pictured Cliff on your 160 acres which is neither producing nor proven?

If so, I don't think we can get together, and suggest that if you can get someone to drill a test well on your 160, that we then unitize on a basis of acre feet of pay for the water injection program if your test proves production, which we believe is quite uncertain.

I would appreciate it if you would discuss this preliminarily with Red Hunt.

Very truly yours,

(Sgd.) Tim G. Lowry

TGL/H

cc: A. A. Hunt

OIL CONSERVATION COMMISSION

P. O. BOX 871

SANTA FE, NEW MEXICO

October 26, 1954

Mr. Thomas B. Scott, jr.
Brookhaven Oil Company
P. O. Box 644
ALBUQUERQUE, NEW MEXICO

Dear Sir:

We enclose copy of Order R-532 issued by the New Mexico
Oil Conservation Commission in Case 697.

Very truly yours,

W. B. Macey
Secretary-Director

WBM:mr

cc: Mr. Jack Campbell, Attorney
J. P. White Building
Roswell, N M

C
O
P

Lowry Oil Company

P. O. Box 8008

Albuquerque, New Mexico

June 3, 1954

Case 697
MAIN OFFICE OCC
1954 JUN 4 AM 8:43

New Mexico Oil Conservation Commission
Santa Fe, New Mexico

Attention: Mr. R. R. Spurrier

Dear Mr. Spurrier:

On May 19, 1954 the New Mexico Oil Conservation Commission heard Case Number 697 relating to Lowry et al Operating Account's request to enlarge its pressure maintenance program and provide for a central tank battery oil system. At this hearing, by testimony, I stated that two Federal leases were now productive of oil for our properties and that the royalty interest and overriding royalty interests were identical for these leases.

Mr. A. L. Cogin, representing W. C. Smith, one of the overriding royalty owners, stated that the overriding royalty interests were not identical for the two leases involved. Although I had checked Division Orders on these properties prior to the hearing, and was certain, according to our records, that the royalties were identical, I did not advance arguments to Mr. Cogin's statement.

During this present week, I have again checked with Malco Refineries, Incorporated in regard to the royalty interests of the leases involved, and their Division Orders and Abstracts reveal the following royalty and overriding royalty interests for Lowry et al Operating Account, Federal Leases New Mexico 03551 and SF 079035-A.

ROYALTY

FEDERAL GOVERNMENT

.1250000 of 8/8

NAME

OVERRIDING ROYALTY AND WORKING INTEREST

PERCENTAGE OF 7/8

Doris Elaine Mims	.0009524
Dacresa Corp.	.0161142
Brookhaven Oil Corp.	.0124571
Robert Mims	.0009524
P. T. Bee	.0003810
S. B. Petree	.0003810
W. C. Smith	.0003810
J. W. Bartlett	.0003810
Frank A. Schultz	.0003810
R. L. Crockett	.0019048
Working Interest	.9657141

The royalty and overriding royalty interest on the subject leases are identical according to available records.

Yours very truly,

LOWRY ET AL OPERATING ACCOUNT

A handwritten signature in cursive script, appearing to read "A. F. Holland".

A. F. Holland

AFH:mhw

cc: J. W. Kellahin

MAIN OFFICE OCC

BROOKHAVEN OIL COMPANY

FIRST NATIONAL BANK BUILDING

(MAIL) P. O. BOX 644

Albuquerque, New Mexico

PHONE 7-8853

TELETYPE AQ-96

1954 JUN 14 AM 9:24

June 11, 1954.

New Mexico Oil Conservation Commission
State Capitol
Santa Fe, New Mexico

Att: Mr. R. R. Spurrier, Secretary

Dear Sirs:

Referring to Case 697 and to the undersigned's statement sent you under cover of June 1st, we are in receipt today of copy of letter dated June 9th from Mr. Kellahin, Attorney for Lowry et al Operating Account, to the New Mexico Oil Conservation Commission, wherein he requests withdrawal from consideration the utilization of well T-123 for water injection purposes, giving as reason the lack of full cooperation on the part of Johnston Oil and Gas Company, owners of offsetting leases.

It is our understanding from said letter, that Lowry et al Operating Account continues to seek approval to plug back well D-83 (located in the NW/4 SE/4 of Section 5-26N-6W), from the Dakota formation where it is now producing commercially, to the Tocito formation, and without producing it or even attempting to produce it from said Tocito formation, to inject water into said formation.

Please be advised that the undersigned companies own all the lease rights below the Pictured Cliffs formation under the NW/4 Section 5-26N-6W, offsetting to the northwest well D-83, and that there has been no attempt for agreement nor is there presently any understanding between Lowry et al Operating Account and the undersigned with reference to water injection in well D-83; and, without such an agreement or the unitization of the NW/4 of Section 5 with the other three-fourths of this section, it would not be feasible for Lowry to inject water into the Tocito formation in well D-83, this being the same reasoning as is acknowledged with reference to the Johnston properties and well T-123. As a matter of fact, injection of water in well D-83 without unitization of Section 5 would be highly damaging to the lease rights owned by the undersigned in the NW/4 of said section. Please refer to our statement of June 1, 1954, page 4, second paragraph under "Comment".

Very truly yours,

BROOKHAVEN OIL COMPANY
DACRESA CORPORATION

Thos. B. Scott, Jr.
Thos. B. Scott, Jr.
President

TES:ms

CC: Gov. Edwin L. Mechem, Chairman
Mr. E. S. Walker, Member
Lowry et al Operating Account
Mr. Jason W. Kellahin
Mr. Jack M. Campbell

Lowry Oil Company

MAIN OFFICE 000 P. O. Box 8008

*Curry
W. B. Macey*

Albuquerque, New Mexico

NOV 3 1954
November 3, 1954

Mr. W. B. Macey
New Mexico Oil Conservation Commission
Santa Fe, New Mexico

Dear Mr. Macey:

This will acknowledge receipt of New Mexico Oil Conservation Commission Order No. R-532 dated October 4, 1954, granting the application of Lowry et al Operating Account to extend its pressure maintenance program for the South Blanco Tocito Pool, Rio Arriba County, New Mexico.

In behalf of Lowry Oil Company I wish to express appreciation for the granting of this order which I believe will permit a greater ultimate oil recovery from the South Blanco Tocito Pool. The continuing co-operation by yourself and members of your staff in the many problems relating to this field is greatly appreciated.

Yours very truly,

LOWRY OIL COMPANY

A. F. Holland

A. F. Holland

AFH/leh

Lowry Oil Company

P. O. Box 8008

Albuquerque, New Mexico

PLAIN OFFICE 000

JUL 23 1954

July 23, 1954

Oil Conservation Commission
Box 871
Santa Fe, New Mexico

Attention: Mr. Dusty Rhoades

Dear Dusty:

Attached in accordance with your request are the following:

1. Report of Gas-Oil Relative Permeability Determinations for the Lowry et al Operating Account Well T-129 of the South Blanco Tocito Pool.
2. Replotting of the Relative Permeability Data presented in Item 1 above.

We appreciated your complete study of our pressure maintenance enlargement proposals and the full investigation you made relating to the impracticality of gas injection for this pool.

If there is any additional information you need, we will gladly supply it.

Yours very truly,

LOWRY OIL COMPANY

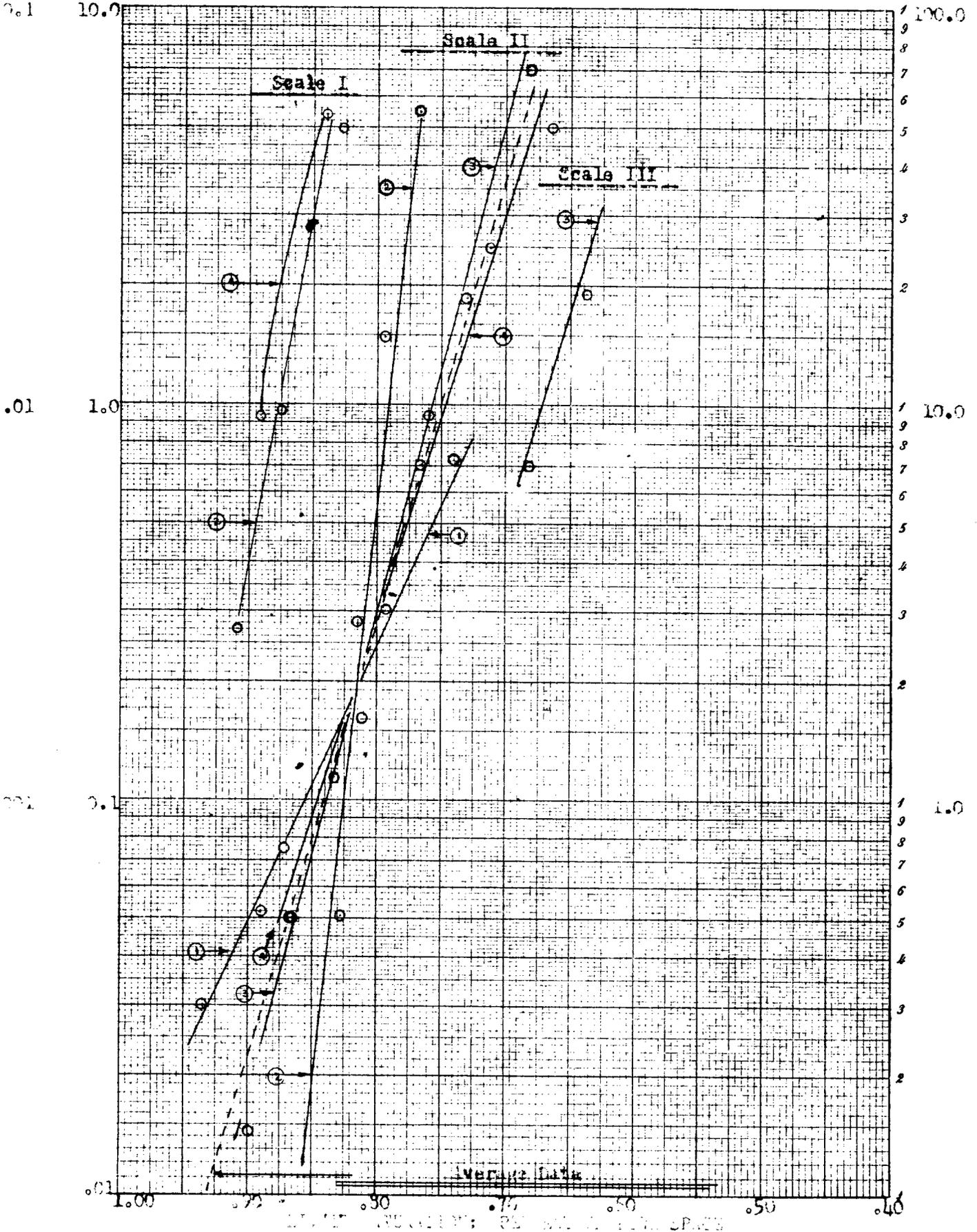
A. F. Holland

A. F. Holland

AFH:mhw

Scale I Scale II

Scale III



(1) Perm. 1.30 rd.
 (2) Perm. 1.30 rd.

(1) Perm. 1.30 rd.
 (2) Perm. 1.30 rd.

CODING BOOK COMPANY, INC. NORWOOD, MASSACHUSETTS



NO. 3115. 20 DIVISIONS PER IN. (120 DIVISIONS) BY 3 3/4 INCH CYCLES RATIO RULING. Grid Size: 1/16" x 1/16" (120 divisions per inch)

Petroleum Production Engineering Co.

Reservoir and Engineering Analyses

P. O. BOX 4111
TULSA, OKLAHOMA

June 6, 1953

FILE NO.
LO-860

Lowry Oil Company
616 East Central Avenue
Albuquerque, New Mexico

Attention: Mr. A. F. Holland

Subject: Gas-Oil Relative Permeability
Determinations for
Lowry Oil Company
Federal 23-49-129 Well
Tocito Sandstone Reservoir
Pettigrew Tocito Field
Rio Arriba County, New Mexico

Gentlemen:

You will find enclosed a report presenting the results of gas-oil relative permeability determinations made on four samples of cores from the Tocito Sandstone Reservoir in the Federal 23-49-129 Well, Pettigrew Tocito Field, Rio Arriba County, New Mexico. All of the samples used in the tests were drilled samples of approximately $1\frac{1}{2}$ " in diameter and 2" in length.

The core samples were subjected to gas-oil relative permeability measurements using dynamic displacement of oil by gas. Simultaneous flow of oil and gas through the cores in the presence of irreducible minimum interstitial water, using methods to eliminate or minimize capillary end effects, permitted the acquisition of the data reported herein.

In saturating the samples prior to making the relative permeability measurements, the irreducible minimum interstitial water saturation was effected by the capillary pressure technique using as a displacing medium a portion of the same oil later used in the relative permeability determinations.

As used herein, K_g may be defined as the equilibrium permeability to gas at the particular gas phase saturation indicated, measured during the simultaneous flow of both oil and gas in the presence of irreducible minimum interstitial water. Likewise K_o may be defined as the equilibrium permeability to oil at the particular gas phase saturation indicated, measured during the simultaneous flow of both oil and gas in the presence of irreducible minimum interstitial water.

The gas-oil relative permeability for a given gas phase saturation, as represented by the symbol K_g/K_o , is the quotient of the above defined values of K_g and K_o as determined at that particular gas phase saturation.

Petroleum Production Engineering Co.

File No. LO-860

The relative permeability to gas for a given gas phase saturation, as represented by the symbol K_{rg} , is the ratio of the above defined K_g at that particular gas saturation to the K_g at 100% gas saturation.

The relative permeability to oil for a given gas phase saturation, as represented by the symbol K_{ro} , is the ratio of the above defined K_o at that particular gas saturation to the K_o with irreducible minimum interstitial water present and with zero gas phase saturation.

Figures 1 through 4, pages 8 through 11, show the graphical presentations of K_{rg} and K_{ro} versus the gas phase saturation.

Figures 5 through 8, pages 12 through 15, show the graphical presentations of the K_g/K_o values versus the gas phase saturation.

It will be noted that the relative permeability curves shown on the graphs do not necessarily pass through all of the points determined from actual permeability measurements. It is believed, however, that the experimentally determined values are accurate as measured. The reason the plotted values do not fall on a smooth curve is believed to be a result of irregularities in the pore size distribution combined with the tortuosity of the permeability channels within the particular core sample tested. The smooth curves shown are believed to more accurately represent the relative permeability performance characteristics that would be applicable to the reservoir as a result of a tendency for the different saturation distributions in the individual permeability channels to exert an equalizing influence on one another in the reservoir as a whole. It is emphasized, however, that the shape of the curves is a matter of interpretation.

We hope that these data will prove valuable in your effort to determine the optimum recovery technique to be applied to this reservoir.

Yours very truly,



HSDeyo: gad
Enclosures

Petroleum Production Laboratories, Inc.

TELEPHONE Victor-0871

Dallas, Texas

June 5, 1953

ADDRESS ALL
CORRESPONDENCE TO
P. O. BOX 2856

ADDRESS ALL
SHIPMENTS TO
407 SOUTH HASKELL

File No. LO-860

Petroleum Production Engineering Co.
P. O. Box 4111
Tulsa, Oklahoma

Gentlemen:

Transmitted herewith are the tabular data and curves showing the results of the laboratory determinations of the gas-oil relative permeability and related information obtained in accordance with your instructions for the four samples of cores submitted from the Federal 23-49-129 Well, Tocito Sandstone Reservoir, Pettigrew Tocito Field.

Respectfully yours,

Tom Halliburton

Enclosures

Petroleum Production Engineering Co.

File No. IO-860

INDEX

		<u>Page</u>
	<u>LIST OF TABULAR DATA</u>	
Table I	Porosity, Irreducible Minimum Interstitial Water Saturation, and Single Phase Permeability Measurements. .	5
Table II	Effect of the Presence of Irreducible Minimum Interstitial Water on the Permeability to Oil at 100% Liquid Saturation.	6
Table III	Gas Phase Saturation Vs. the Correspond- ing Relative Permeability Determinations and Gas and Oil Permeability Measurements made with Both Phases Flowing in the Presence of Irreducible Minimum Interstitial Water.	7

LIST OF FIGURES

Figures 1-4	Relative Permeability Relationships Showing K_{ro} and K_{rg} Vs. Gas Phase Saturation.	8
Figures 5-8	Relative Permeability Relationships Showing K_g/K_o Vs. Gas Phase Saturation. .	12

Petroleum Production Laboratories, Inc.

DALLAS, TEXAS

File No. LO-860

POROSITY, IRREDUCIBLE MINIMUM

INTERSTITIAL WATER SATURATION, AND SINGLE PHASE

PERMEABILITY MEASUREMENTS

<u>Core Sample Number</u>	<u>Depth (Ft.)</u>	<u>Specific Permeability To Air (md.)</u>	<u>Specific Permeability To Oil (md.)</u>	<u>Specific Permeability To Formation Water (md.)</u>	<u>Porosity (%)</u>	<u>Irreducible Minimum Interstitial Water % Pore Space</u>
1	6597.2-98.0	3.65	2.55	1.64	11.8	13.6
2	6589.2-89.8	11.3	8.72	7.01	11.4	17.1
3	6593.1-93.7	145	125	113	17.4	22.4
4	6590.2-90.7	436	418	380	19.5	17.1

Petroleum Production Laboratories, Inc.

DALLAS, TEXAS

File No. LO-860

EFFECT OF THE PRESENCE OF IRREDUCIBLE MINIMUM INTERSTITIAL WATER

ON THE PERMEABILITY TO OIL AT 100% LIQUID SATURATION

<u>Core Sample Number</u>	<u>Permeability to Oil (md.)</u>	
	<u>100% Oil Saturation</u>	<u>Oil Plus Interstitial Water</u>
1	2.55	1.63
2	8.72	6.04
3	125	110
4	418	377

Petroleum Production Laboratories, Inc.

DALLAS, TEXAS

File No. LO-860

GAS PHASE SATURATION VS. THE CORRESPONDING RELATIVE PERMEABILITY

DETERMINATIONS AND GAS AND OIL PERMEABILITY MEASUREMENTS MADE WITH BOTH PHASES FLOWING

IN THE PRESENCE OF IRREDUCIBLE MINIMUM INTERSTITIAL WATER

Core Sample Number	Gas Phase % Pore Space	K_g (md.)	K_o (md.)	K_{rg} (Relative To 100% Gas Saturation)	K_{ro} (Relative to Oil Permeability With Interstitial Water Present)	K_g/K_o
1	6.4	0.0318	1.04	0.0087	0.638	0.0306
	11.0	0.0365	0.700	0.0100	0.429	0.0521
	12.7	0.0402	0.535	0.0110	0.328	0.0751
	18.9	0.0493	0.307	0.0135	0.188	0.161
	25.9	0.0971	0.134	0.0266	0.082	0.725
2	9.2	0.0061	2.22	0.00054	0.368	0.0027
	12.5	0.0146	1.50	0.00128	0.248	0.0097
	17.2	0.0355	0.707	0.00314	0.117	0.0502
	20.6	0.595	0.403	0.0527	0.0667	1.48
	23.3	1.32	0.242	0.117	0.0401	5.45
3	10.1	0.497	34.1	0.0034	0.310	0.0146
	13.8	1.32	26.3	0.0091	0.239	0.0502
	18.5	3.42	12.1	0.0236	0.110	0.283
	23.4	5.24	7.48	0.0361	0.0680	0.701
	26.9	8.90	4.75	0.0614	0.0432	1.87
	31.8	18.7	2.67	0.129	0.0243	7.00
	36.2	29.7	1.56	0.205	0.0142	19.0
4	10.9	0.947	102	0.0022	0.271	0.0093
	13.4	4.52	84.5	0.0104	0.224	0.0535
	16.7	6.10	53.8	0.0140	0.143	0.113
	20.7	11.3	37.1	0.0259	0.0984	0.305
	24.1	24.1	25.7	0.0553	0.0682	0.938
	28.8	32.9	13.3	0.0755	0.0353	2.47
	33.5	43.5	8.72	0.0998	0.0231	4.99

Petroleum Production Laboratories

Laboratory and Reservoir Engineering Analysis

Dallas, Texas

File No. LO-660

RELATIVE PERMEABILITY RELATIONSHIP

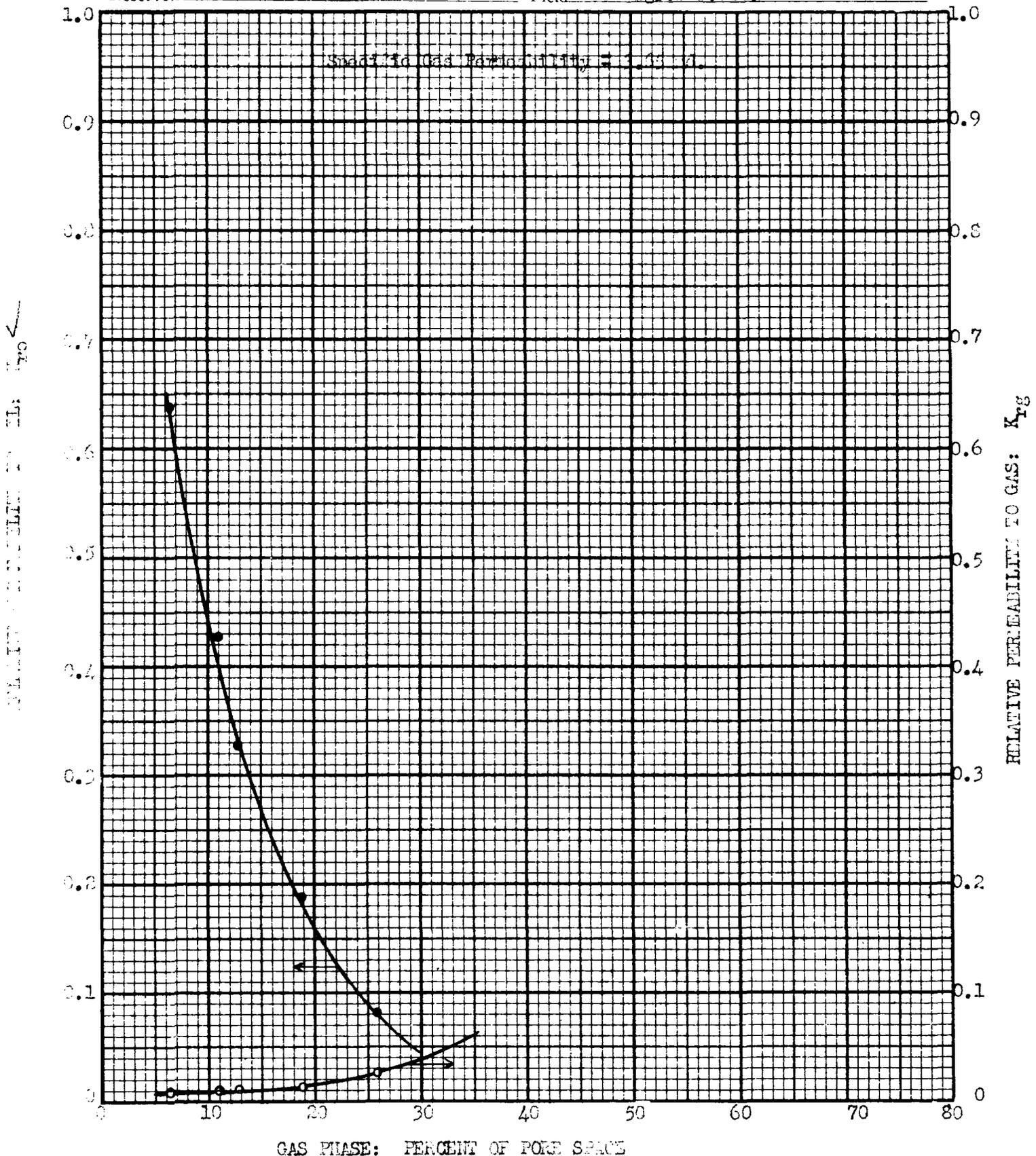
CORE SAMPLE NO. 1

Company Lowry Oil Company

Well Federal 23-49-129

Reservoir Tocito Sandstone

Field Petroleum Tocito



GAS PHASE: PERCENT OF PORE SPACE

Figure 1

Petroleum Production Laboratories

Laboratory and Reservoir Engineering Analysis

Dallas, Texas

File No. LO-860

RELATIVE PERMEABILITY RELATIONSHIP

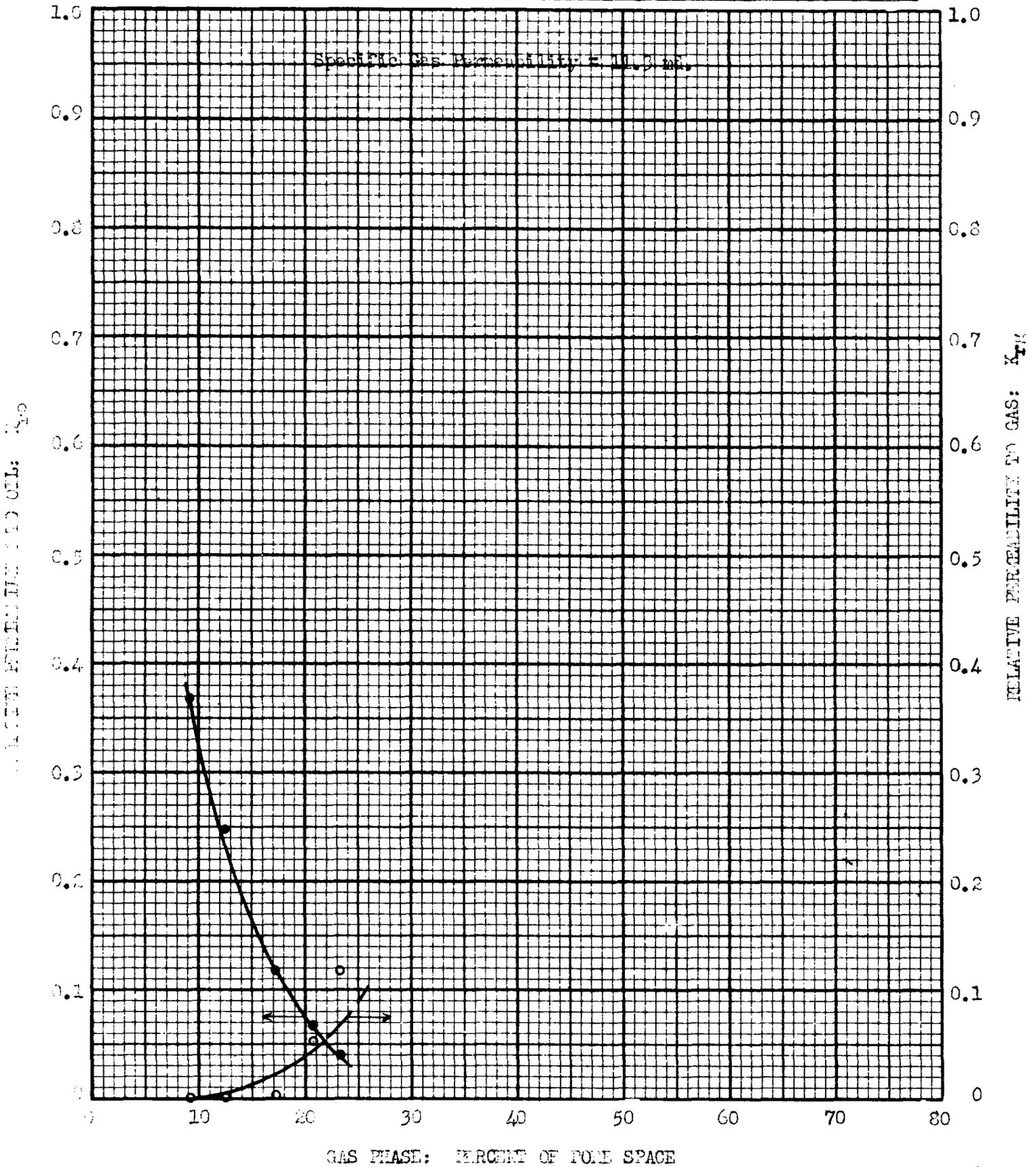
CORE SAMPLE NO. 2

Company Lowry Oil Company

Well Federal 23-49-129

Reservoir Tocito Sandstone

Field Pettigrew Tocito



Petroleum Production Laboratories

Laboratory and Reservoir Engineering Analysis

Dallas, Texas

File No. LO-860

RELATIVE PERMEABILITY RELATIONSHIP CORE SAMPLE NO. 3

Company Lowry Oil Company Well Federal 23-49-129
Reservoir Tocito Sandstone Field Pettigrew Tocito

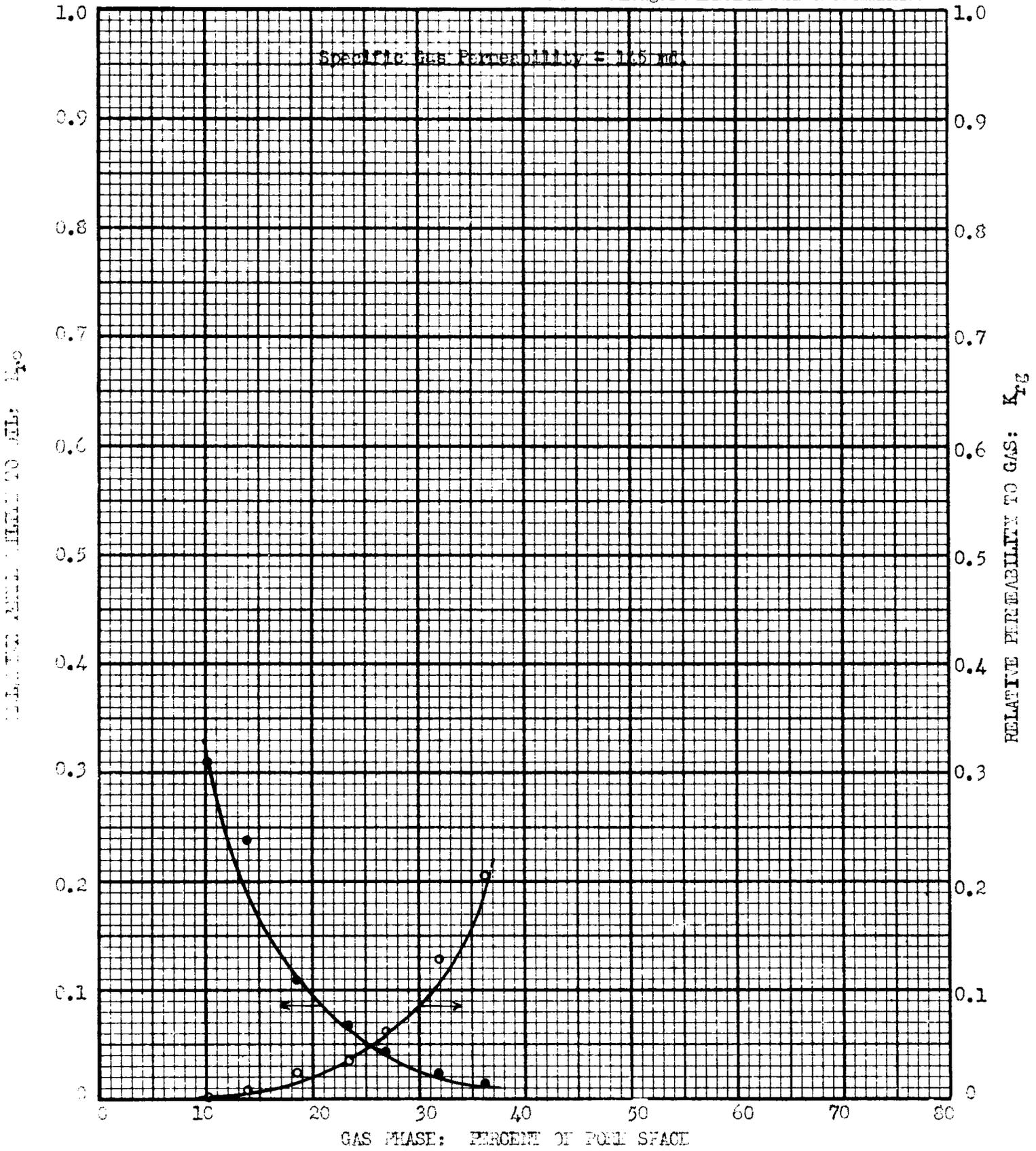


Figure 3

Petroleum Production Laboratories

Laboratory and Reservoir Engineering Analysis

Dallas, Texas

File No. 10-860

RELATIVE PERMEABILITY RELATIONSHIP

CORE SAMPLE NO. 4

Company Lowry Oil Company

Well Federal 03-79-129

Reservoir Tocito Sandstone

Field Pattigrew Tocito

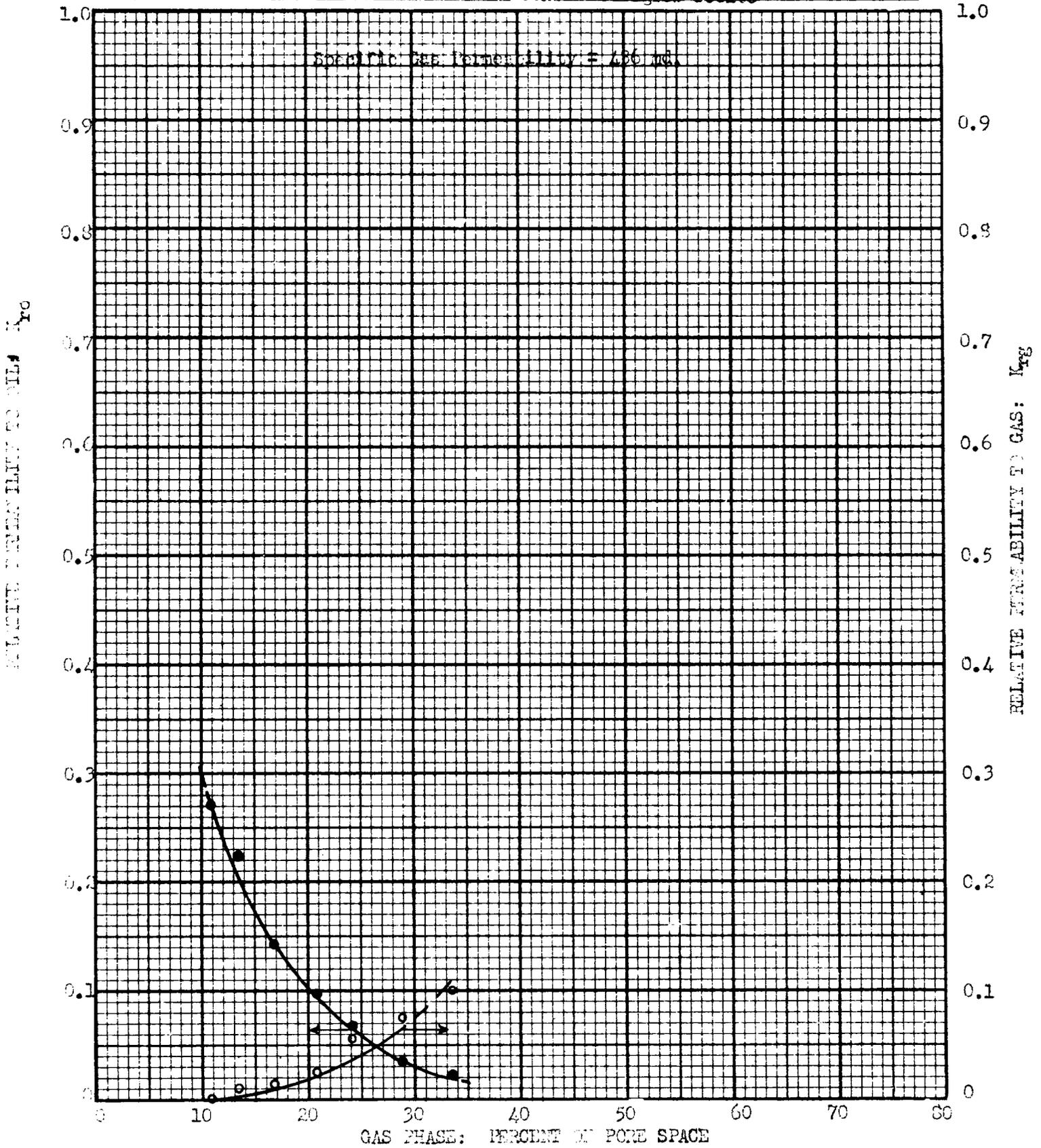


Figure 4

Pet. um Production Laboratories Inc.

Laboratory and Reservoir Engineering Analysis

Dallas, Texas

File No. LO-860

RELATIVE PERMEABILITY RELATIONSHIP

CORE SAMPLE NO. 1

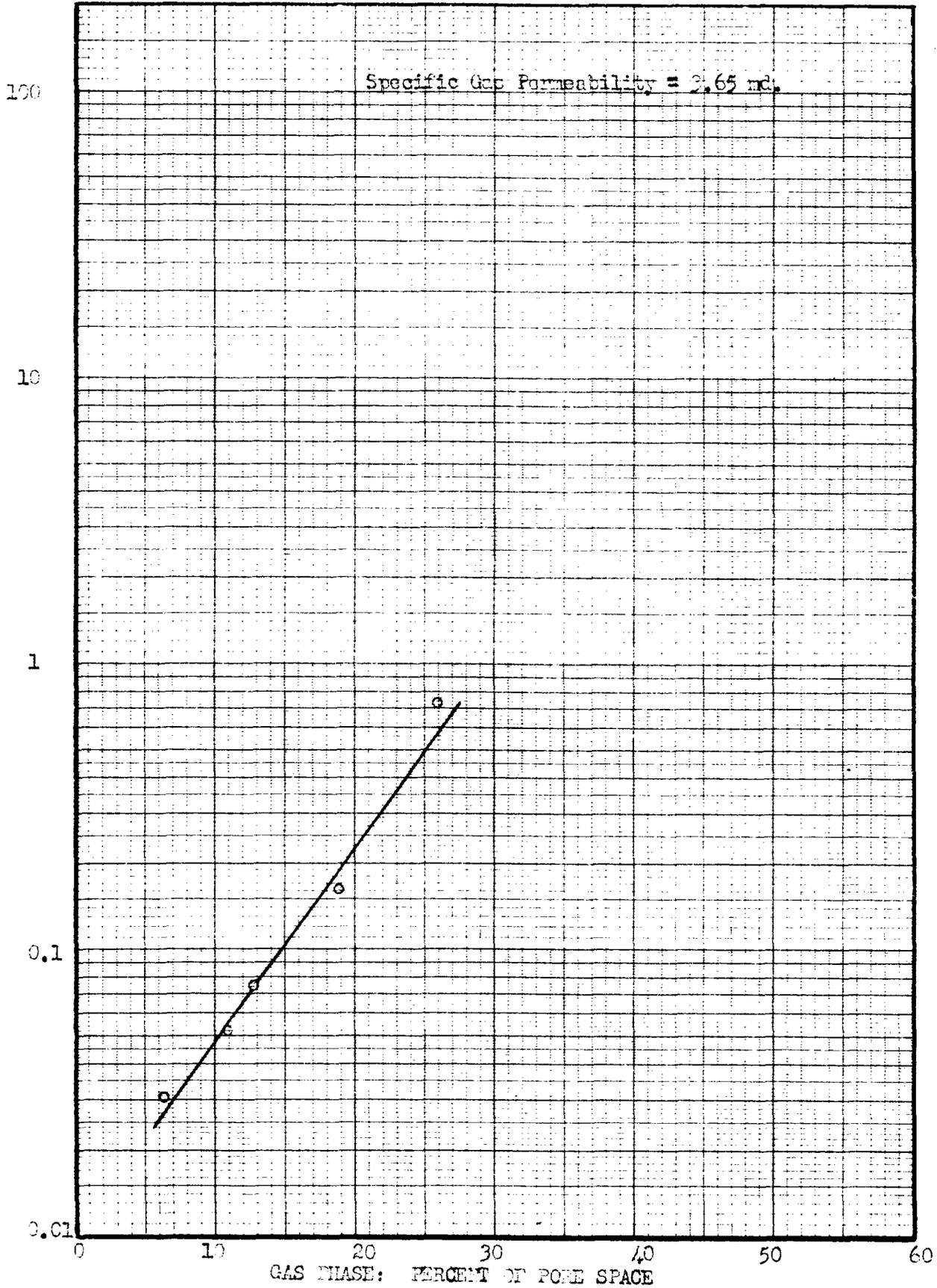
Company: Lowry Oil Company

Well: Federal 23-49-129

Reservoir: Tocito Sandstone

Field: Pettigrew Tocito

GAS-OIL RELATIVE PERMEABILITY: $k_{r,g}/k_{r,o}$



Petroleum Production Laboratories, Inc.

Laboratory and Reservoir Engineering Analysis

Dallas, Texas

File No. LO-860

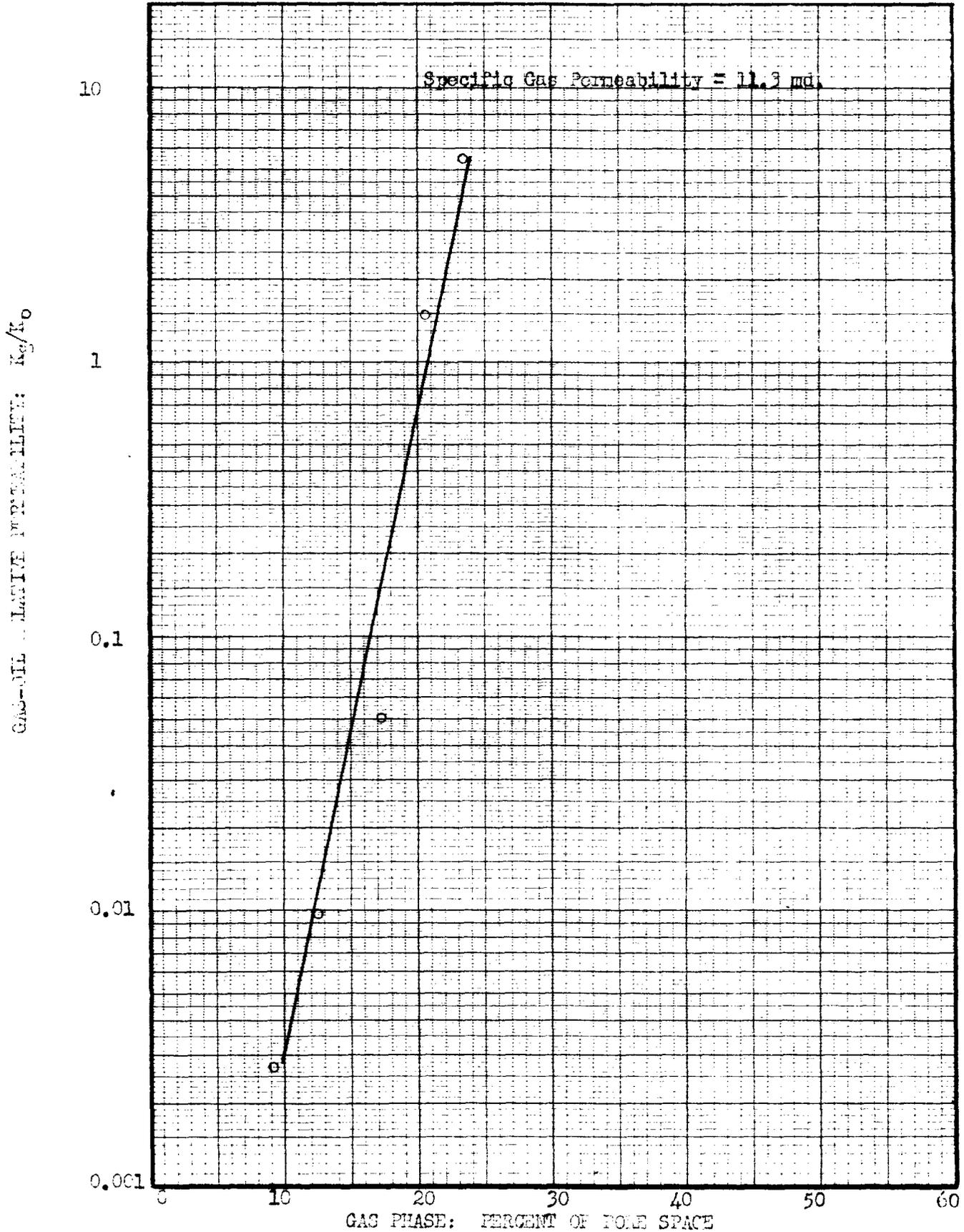
RELATIVE PERMEABILITY RELATIONSHIP
CORE SAMPLE NO. 2

Company Lowry Oil Company

Well Federal 23-49-129

Reservoir Tocito Sandstone

Field Pettigrew Tocito



Petroleum Production Laboratories, Inc.

Laboratory and Reservoir Engineering Analysis

Dallas, Texas

File No. LO-860

RELATIVE PERMEABILITY RELATIONSHIP

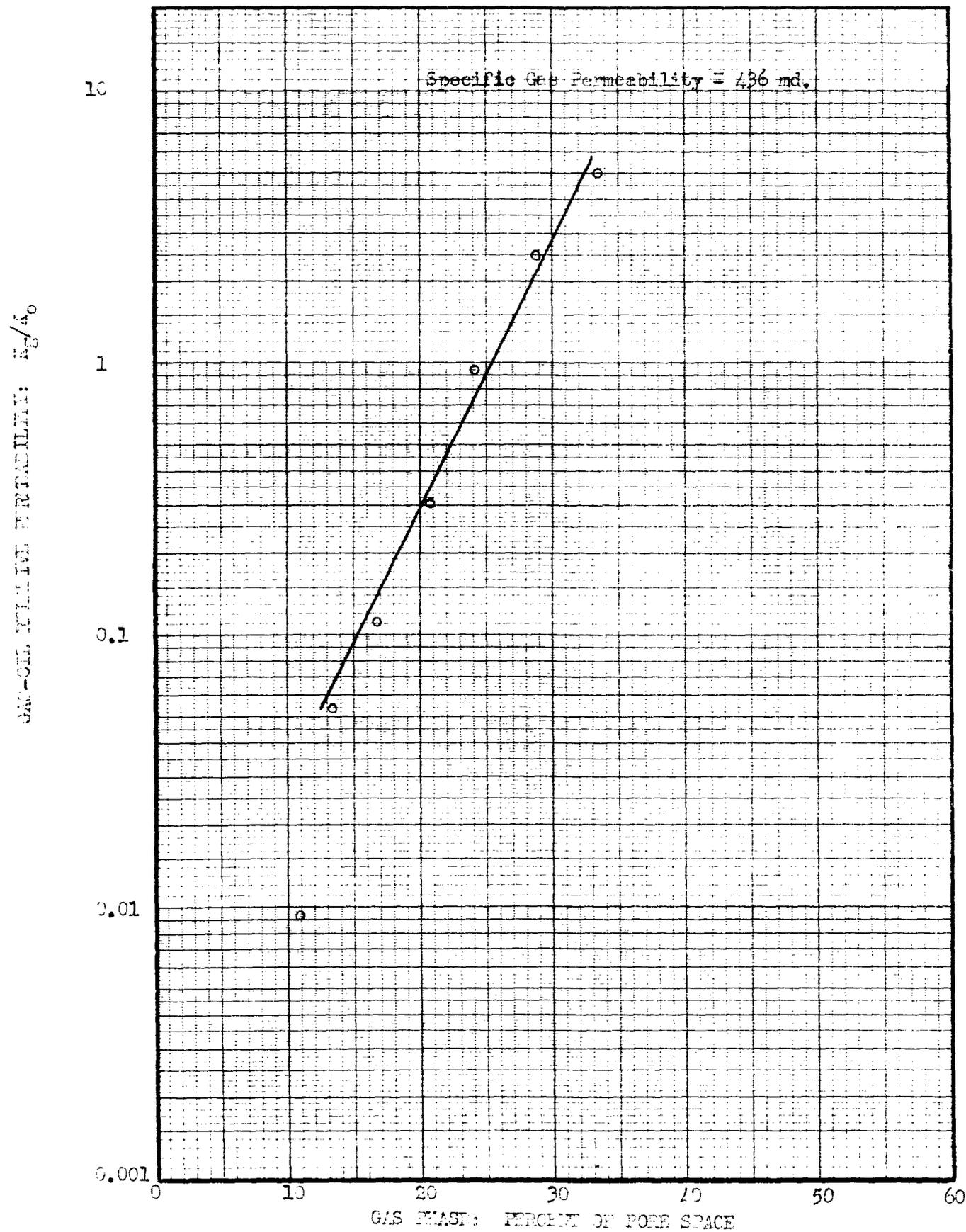
COLE SAMPLE NO. 4

Company: Lowry Oil Company

Well: Federal 23-42-129

Reservoir: Tocito Sandstone

Field: Pettigraw Tocito



Petroleum Production Laboratories Inc.

Laboratory and Reservoir Engineering Analysis

Dallas, Texas

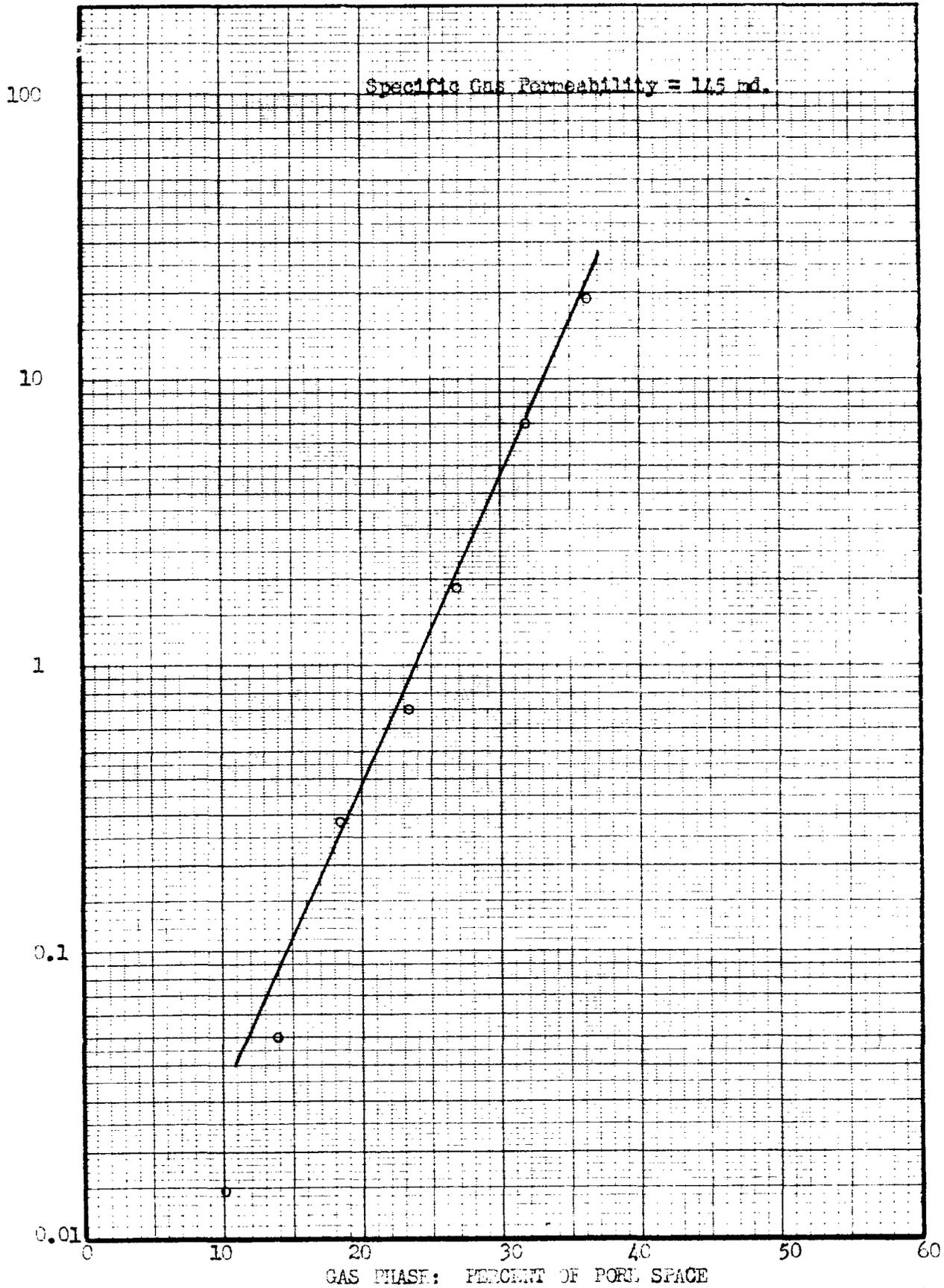
File No. LO-860

RELATIVE PERMEABILITY RELATIONSHIP CORE SAMPLE NO. 3

Company: Lowry Oil Company
Reservoir: Tocito Sandstone

Well: Federal 29-49-129
Field: Pettigrew Tocito

GAS-OIL RELATIVE PERMEABILITY: $K_{g/o}$



SUMMARY STATEMENT TO NEW MEXICO OIL AND GAS CONSERVATION COMMISSION
BY THOS. B. SCOTT, JR., PRESIDENT
OF BROOKHAVEN OIL COMPANY AND DACRESA CORPORATION
JUNE 1, 1954.

IN CASE NO. 697 - TO EXTEND THE PILOT PRESSURE MAINTENANCE PROGRAM IN THE SOUTH BLANCO TOCITO OIL POOL AND PERMISSION TO GAUGE OIL AT COMMON TANK BATTERY. Brookhaven Oil Company and Dacresa Corporation are overriding royalty owners in all of the Lowry Tocito oil production and are the lease owners below the Pictured Cliffs formation of NW/4 Section 5, Township 26 North, Range 6 West, offsetting one of the proposed water injection wells (D-83).

REFERENCE:

CASE NO. 537 - Re Spacing Wells Tocito Sandstone South Blanco Tocito Pool, Rio Arriba County.

CASE NO. 555 WITH RESULTING ORDER R-349 - Re Pilot Pressure Maintenance Program South Blanco Tocito Pool, Rio Arriba County.

CASE NO. 607 - Re Oil Proration San Juan Basin.

CASE NO. 697 - Re Extension Pilot Pressure Maintenance Program and Permission to Gauge Oil at Common Tank Battery, South Blanco Tocito Pool, Rio Arriba County, together with Transcript of Proceedings before the Oil Conservation Commission May 19, 1954.

REQUEST:

Because of the scope and the seriousness of Case No. 697, as it affects conservation of oil and gas, and correlative rights, it is requested that this statement be included in the proceedings of the Case, and the Case be continued for further testimony and cross examination at the Oil Conservation Commission hearing the middle of June, 1954.

STATEMENT:

The undersigned, Thos. B. Scott, Jr., has testified previously before the Oil and Gas Conservation Commission. The undersigned is a graduate of Harvard College, Class of 1918, with concentration in mathematics and studies in engineering and geology. The undersigned has been in the oil and gas producing and pipeline business continuously since 1919, both in the field and in executive positions; i.e. two years with the Empire Gas & Fuel Co. in Oklahoma and Kansas, seventeen years with the Standard Oil Company (New Jersey) and its subsidiaries in Oklahoma, Kansas, Argentina,

Bolivia, and executive offices in New York, and thereafter to the present (15 years) as head or manager of independent oil and gas producing companies and operations.

CASE 555 AND RESULTS

Lowry et al Operating Account, in Case 555, petitioned and was granted by the Commission under date of July 16, 1953, by Order R-349, permission to establish a pilot pressure maintenance program by injecting water into the Tocito sand in one or both of two wells, namely, T-109 located in the SW/4 SW/4 of Section 3-26N-6W and T-134 located in the NE/4 NW/4 of Section 10-26N-6W, South Blanco Tocito Pool, Rio Arriba County, New Mexico.

COMMENT

Since this permission was granted, water has been injected into the Tocito sand since October 1953 in only one of the two wells, namely, No. T-134. Previous to injecting water, this well produced oil and gas from the Tocito formation. The amount of water injected into this one well since November 1953 is greater than oil produced from twelve Tocito wells on the Lowry properties. At the same time, the relatively rich casinghead gas from the oil production of these twelve wells has been blown to the air, with the result that, except in the vicinity of the input well, bottom hole pressures continue to decline. (The amount of casinghead gas produced and blown to the air, according to Lowry's records for the first four months of 1954, amounts to approximately one-third of the total gas produced and marketed from approximately thirty-one Pictured Cliffs wells on the Lowry properties.) This gas, being relatively rich casinghead gas, contains liquid petroleum products and casinghead gasoline.

The pool has been producing and marketing oil since September 1951.

Up to the time of injection water (October 1953), no water, except connate, has been found in the Tocito sand formation. The oil is of high gravity, containing, in many cases, free gas and gas in solution. The field is not defined. The water injection well, T-134, is not the lowest well in the field, the same being structurally, on top of the Tocito sandstone, approximately 20 feet higher to its northwesterly offset. No offsets have been drilled to the north, northeast, east and southeast. In these directions, no Tocito drilling has been made although from the contour map it appears likely that the pool will extend a considerable distance in the general east and southeast direction. The injection well, T-134, was the original well in the field drilled to the Dakota sandstone, but due to mechanical difficulties, it was a poor producer and plugged back to the Tocito formation, where a window was cut in the casing. From this formation it produced approximately 20 barrels per day, plus gas. The Schlumberger of the Tocito

formation in this well indicates the sand to be as good, if not better, than any other well in the field. It is assumed that the well did not produce greater quantities of oil because the sand was mudded up. The injection pressure is constantly rising although the amount of water injected is not increasing.

Injected water, as shown in the Transcript of Proceedings, is first showing up dip in the southwest offset T-157. This well also shows the best reduction in gas oil ratios. These facts are evidence that the water, following the strands of the greatest porosity and permeability, is not moving from the injection well in a uniform manner. In other words, oil will be trapped behind the water table.

The South Blanco Tocito Pool is not a "pilot" pressure maintenance program. It is experimental as indicated in the Commission's Order R-349.

The South Blanco Tocito Pool remains to date undefined except for probably three dry holes (see Exhibit A and B), namely,

Johnston's well SE/4 Sec. 30-27N-6W

Lowry et al wells NE/4 Sec. 16 and NW/4 Sec. 24-26N-6W,

these wells being some distance from present production. Johnston has recently extended the pool northwest in well #10 in the SE/4 of Section 36-27N-7W. The east end and the north borders of the pool still remain undefined with excellent chances of large amounts of additional production. Spacing of the present oil wells is not uniform. The characteristics of the Tocito sand are:

Original production marketed September 1951,
Original B.H.P. 2200 to 2250# P.S.I.,
Present B.H.P. 1800 to 2050# P.S.I. depending
on the date of first production and
the amount of oil and gas produced,
Thickness 10 to 30 feet, with greater thickness
down dip,
Porosity averages approximately 15%,
Permeability averages approximately 138 millidarcys,

porosity and permeability varying throughout the thickness of the sand in each well and from well to well

Gas oil ratios - original - unavailable
present - see transcript

CASE 697

This new case No. 697 asks extension of the "pilot" pressure maintenance program, requesting approval of injecting water into three wells, namely, T-123, NE/4 Sec. 7-26N-6W (this being a gas well presently shut-in and, structurally on the top of the Tocito sand, the highest well in the pool), well D-83, NW/4 SE/4 Section 5-26N-6W (after plugging back from the Dakota formation from which it is now producing to the Tocito formation), and Johnston's well No. 11 in the SE/4 SW/4 Section 6-26N-6W (presently shut in as a very high gas oil ratio well) with continuing permission to inject water into T-109, SW/4 Section 3-26N-6W.

COMMENT

Well T-123 should be used as a gas injection well with that gas presently being blown to the air supplemented, if practical, by gas from the Dakota and Pictured Cliffs formations. If water were injected into this well, it would eventually disperse water throughout the Tocito formation, not only on Lowry's but Johnston's, Brookhaven's and Dacresa's properties and, through mixing the water with the gas and oil, devalue the production and reserves.

Well D-83 is presently a commercial producer in the Dakota formation and should continue as such. In looking at the Schlumberger of the Tocito formation in this well, it appears that it would make a commercial producer in the Tocito sand. To plug back this well from the Dakota formation and open up the Tocito formation for water injection would be a dissipation of valuable resources. This well, in accordance with Lowry's contour map on top of the Tocito formation, is approximately 10 feet higher than the east producing offset T-85, and approximately 20 feet higher than the oil production in well T-109 SW/4 Section 3. Additionally, if water were injected into the Tocito formation in this well, it would damage the oil reserves in the NW/4 Section 5 owned by the undersigned companies. In other words, it would drive oil from the NW/4 of Section 5 or co-mingle the water with the oil so as to devalue the production and reserve.

Although Lowry et al Operating Account has given the Commission the impression that Johnston Oil & Gas Company may cooperate in a water flooding or pressure maintenance project, I have the personal assurance of Johnston Oil & Gas Company, owner of the lease rights under Section 6, that they will in no way agree to or countenance such a project. Without Johnston flooding or repressuring the area, the oil under Lowry's properties would eventually in part be driven across the borders to Johnston's properties. This we suspect is the reason Lowry wishes to inject water into wells T-123 and D-83.

Summary

The water flooding pressure maintenance project should be stopped until such time as

1. The pool has been defined by additional drilling on uniform spacing.
2. The area unitized or agreements had to control project for all the pool.
3. Correlative rights have been protected for all parties.
4. Waste gas has been utilized (through compressor station now being constructed.)
5. Further efforts made through production methods to reduce oil gas ratios - casing and tubing settings, more wells, lesser production per well, regular production.

6. Gas injection on top of structure.
7. Water drive on north edge on down dip in only non-commercial wells.

TESTIMONY AND EXHIBITS PRESENTED AT HEARING OF COMMISSION MAY 19, 1954,
BY A. F. HOLLAND, ENGINEER OF LOWRY ET AL OPERATING ACCOUNT.

The exhibit records show behavior of the pool through bottom hole pressures (Exhibit 3) from August 1953, and gas oil ratios (Exhibit 2) since July 1953. The first production was marketed from the pool in September 1951. The first wells had bottom hole pressures of 2200 to 2250#. In other words, there was a drop of 200 to 400# from beginning to earliest date on the exhibits. I have not learned what the original gas oil ratios were.

Exhibit I - Map South Blanco Pool - unduly limits the pool area - present and potential. Please refer to our Exhibit A which shows Johnston's new oil well #10 SE/4 Section 26-27N-7W, also the three wells (green) drilled unproductive through the Tocito, these being to date the only limiting factors to the pool's extensions.

Exhibit - Contour Map - Top Tocito Sandstone - unduly limits the pool area - present and potential.

Please refer to our Exhibit B which shows our contour map on top of the Tocito sandstone - over a larger area. This map clearly shows the unlimited prospective extent of the pool along the strike and enlarged area prospective up and down dip.

Exhibit #4 (7th General Survey Jan. 11-13/54) and #5 (8th General Survey April 1-3/54) - average reservoir pressures - gives the impression of a limited pool area particularly on the east end which remains unexplored, and highly prospective (see our Exhibit B). General Survey #1 through 6 are not included in either the testimony or the exhibits.

REFER TO TRANSCRIPT OF DIRECT TESTIMONY

- Page 3 - We do not understand why it is necessary or not necessary to use well T-109 presently a commercial oil producer as a water injection well.
- Page 4 - There is no Johnston agreement. There is no agreement with Brookhaven Oil Company and Dacresa Corporation. Therefore, Lowry without such agreements and the protection of correlative rights may not inject water into wells T-123 and D-83. As mentioned above, without doing this or injecting gas into T-123, the present program of water injection will drive Lowry's oil onto Johnston's properties.
- Page 5 - The use of commercial oil producing wells for water injection wells is, to our mind, the destruction and devaluation of oil production and oil reserves. Injection of water in a well will, of course, reduce the oil gas ratios. The question is will injection of water into a formation decrease or increase oil recoveries in the best manner.

Page 9. - Lowry's program will not protect correlative rights as indicated above.

Page 10 - A central tank battery for the metering of oil (and gas and water) is impractical and jeopardizes ownership. The ownership of all the leases will not remain the same forever. Unless the area is communitized, the central tank battery should not be installed.

REFER TO TRANSCRIPT OF CROSS EXAMINATION

Page 12 - It is impractical and a waste of natural resources and devalues production and reserves to plug present Dakota producing well D-83 to the Tocito formation which will probably also produce oil, use the Tocito formation for a water injection well in that formation, then recomplete in the Dakota for oil production. In addition, such an operation would devalue the oil and gas reserves in the Tocito formation through water flooding the NW/4 of Section 5 belonging to the undersigned.

Page 13 and 14 - Lowry et al proposes to put water in the gas cap so that the oil driven up dip will not enter the gas cap. This is contrary to orthodox concepts that it needs no further comments.

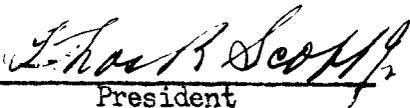
Page 14 - Lowry proposes to disperse water throughout the field. Water is one of the principal things that should not be produced with the oil. Additionally, it will devalue the production due to the expense of segregating gas, water and oil before marketing.

Page 15 - We agree with Mr. Cogin's thoughts on the matter of a common tank battery.

Finally, it is requested that Lowry's application Case 697 be denied, either with or without continuance of the Case for further testimony and cross examination.

It is requested that Order R-349 be rescinded.

BROOKHAVEN OIL COMPANY
DACRESA CORPORATION



President

6/1/54.

SUMMARY STATEMENT TO NEW MEXICO OIL AND GAS CONSERVATION COMMISSION
BY THOS. B. SCOTT, JR., PRESIDENT
OF BROOKHAVEN OIL COMPANY AND DACRESA CORPORATION
JUNE 1, 1954.

IN CASE NO. 697 - TO EXTEND THE PILOT PRESSURE MAINTENANCE PROGRAM IN THE SOUTH BLANCO TOCITO OIL POOL AND PERMISSION TO GAUGE OIL AT COMMON TANK BATTERY. Brookhaven Oil Company and Daeresa Corporation are overriding royalty owners in all of the Lowry Tecito oil production and are the lease owners below the Pictured Cliffs formation of NW/4 Section 5, Township 26 North, Range 6 West, offsetting one of the proposed water injection wells (D-83).

REFERENCE:

- CASE NO. 537 - Re Spacing Wells Tocito Sandstone South Blanco Tocite Pool, Rio Arriba County.
- CASE NO. 555 WITH RESULTING ORDER R-349 - Re Pilot Pressure Maintenance Program South Blanco Tocito Pool, Rio Arriba County.
- CASE NO. 607 - Re Oil Proration San Juan Basin.
- CASE NO. 697 - Re Extension Pilot Pressure Maintenance Program and Permission to Gauge Oil at Common Tank Battery, South Blanco Tocito Pool, Rio Arriba County, together with Transcript of Proceedings before the Oil Conservation Commission May 19, 1954.

REQUEST:

Because of the scope and the seriousness of Case No. 697, as it affects conservation of oil and gas, and correlative rights, it is requested that this statement be included in the proceedings of the Case, and the Case be continued for further testimony and cross examination at the Oil Conservation Commission hearing the middle of June, 1954.

STATEMENT:

The undersigned, Thos. B. Scott, Jr., has testified previously before the Oil and Gas Conservation Commission. The undersigned is a graduate of Harvard College, Class of 1918, with concentration in mathematics and studies in engineering and geology. The undersigned has been in the oil and gas producing and pipeline business continuously since 1919, both in the field and in executive positions; i.e. two years with the Empire Gas & Fuel Co. in Oklahoma and Kansas, seventeen years with the Standard Oil Company (New Jersey) and its subsidiaries in Oklahoma, Kansas, Argentina,

Bolivia, and executive offices in New York, and thereafter to the present (15 years) as head or manager of independent oil and gas producing companies and operations.

CASE 555 AND RESULTS

Lowry et al Operating Account, in Case 555, petitioned and was granted by the Commission under date of July 16, 1953, by Order R-349, permission to establish a pilot pressure maintenance program by injecting water into the Tociito sand in one or both of two wells, namely, T-109 located in the SW/4 SW/4 of Section 3-26N-6W and T-134 located in the NE/4 NW/4 of Section 10-26N-6W, South Blanco Tociito Pool, Rio Arriba County, New Mexico.

COMMENT

Since this permission was granted, water has been injected into the Tociito sand since October 1953 in only one of the two wells, namely, No. T-134. Previous to injecting water, this well produced oil and gas from the Tociito formation. The amount of water injected into this one well since November 1953 is greater than oil produced from twelve Tociito wells on the Lowry properties. At the same time, the relatively rich casinghead gas from the oil production of these twelve wells has been blown to the air, with the result that, except in the vicinity of the input well, bottom hole pressures continue to decline. (The amount of casinghead gas produced and blown to the air, according to Lowry's records for the first four months of 1954, amounts to approximately one-third of the total gas produced and marketed from approximately thirty-one Pictured Cliffs wells on the Lowry properties.) This gas, being relatively rich casinghead gas, contains liquid petroleum products and casinghead gasoline.

The pool has been producing and marketing oil since September 1951.

Up to the time of injection water (October 1953), no water, except connate, has been found in the Tociito sand formation. The oil is of high gravity, containing, in many cases, free gas and gas in solution. The field is not defined. The water injection well, T-134, is not the lowest well in the field, the same being structurally, on top of the Tociito sandstone, approximately 20 feet higher to its northwesterly offset. No offsets have been drilled to the north, northeast, east and southeast. In these directions, no Tociito drilling has been made although from the contour map it appears likely that the pool will extend a considerable distance in the general east and southeast direction. The injection well, T-134, was the original well in the field drilled to the Dakota sandstone, but due to mechanical difficulties, it was a poor producer and plugged back to the Tociito formation, where a window was cut in the casing. From this formation it produced approximately 20 barrels per day, plus gas. The Schlumberger of the Tociito

formation in this well indicates the sand to be as good, if not better, than any other well in the field. It is assumed that the well did not produce greater quantities of oil because the sand was mudded up. The injection pressure is constantly rising although the amount of water injected is not increasing.

Injected water, as shown in the Transcript of Proceedings, is first showing up dip in the southwest offset T-157. This well also shows the best reduction in gas oil ratios. These facts are evidence that the water, following the strands of the greatest porosity and permeability, is not moving from the injection well in a uniform manner. In other words, oil will be trapped behind the water table.

The South Blanco Tecito Pool is not a "pilot" pressure maintenance program. It is experimental as indicated in the Commission's Order R-349.

The South Blanco Tecito Pool remains to date undefined except for probably three dry holes (see Exhibit A and B), namely,

Johnston's well SE/4 Sec. 30-27N-6W
Lowry et al wells NE/4 Sec. 16 and NW/4 Sec. 24-26N-6W,

these wells being some distance from present production. Johnston has recently extended the pool northwest in well #10 in the SE/4 of Section 36-27N-7W. The east end and the north borders of the pool still remain undefined with excellent chances of large amounts of additional production. Spacing of the present oil wells is not uniform. The characteristics of the Tecito sand are:

Original production marketed September 1951,
Original B.H.P. 2200 to 2250# P.S.I.,
Present B.H.P. 1800 to 2050# P.S.I. depending
on the date of first production and
the amount of oil and gas produced,
Thickness 10 to 30 feet, with greater thickness
down dip,
Porosity averages approximately 15%,
Permeability averages approximately 138 millidarcys,

porosity and permeability varying throughout the thickness
of the sand in each well and from well to well

Gas oil ratios - original - unavailable
present - see transcript

CASE 697

This new case No. 697 asks extension of the "pilot" pressure maintenance program, requesting approval of injecting water into three wells, namely, T-123, NE/4 Sec. 7-26N-6W (this being a gas well presently shut-in and, structurally on the top of the Tecite sand, the highest well in the pool), well D-83, NW/4 SE/4 Section 5-26N-6W (after plugging back from the Dakota formation from which it is now producing to the Tecite formation), and Johnston's well No. 11 in the SE/4 SW/4 Section 6-26N-6W (presently shut in as a very high gas oil ratio well) with continuing permission to inject water into T-109, SW/4 Section 3-26N-6W.

COMMENT

Well T-123 should be used as a gas injection well with that gas presently being blown to the air supplemented, if practical, by gas from the Dakota and Pictured Cliffs formations. If water were injected into this well, it would eventually disperse water throughout the Tecite formation, not only on Lowry's but Johnston's, Brookhaven's and Daeresa's properties and, through mixing the water with the gas and oil, devalue the production and reserves.

Well D-83 is presently a commercial producer in the Dakota formation and should continue as such. In looking at the Schlumberger of the Tecite formation in this well, it appears that it would make a commercial producer in the Tecite sand. To plug back this well from the Dakota formation and open up the Tecite formation for water injection would be a dissipation of valuable resources. This well, in accordance with Lowry's contour map on top of the Tecite formation, is approximately 10 feet higher than the east producing offset T-85, and approximately 20 feet higher than the oil production in well T-109 SW/4 Section 3. Additionally, if water were injected into the Tecite formation in this well, it would damage the oil reserves in the NW/4 Section 5 owned by the undersigned companies. In other words, it would drive oil from the NW/4 of Section 5 or co-mingle the water with the oil so as to devalue the production and reserve.

Although Lowry et al Operating Account has given the Commission the impression that Johnston Oil & Gas Company may cooperate in a water flooding or pressure maintenance project, I have the personal assurance of Johnston Oil & Gas Company, owner of the lease rights under Section 6, that they will in no way agree to or countenance such a project. Without Johnston flooding or repressuring the area, the oil under Lowry's properties would eventually in part be driven across the borders to Johnston's properties. This we suspect is the reason Lowry wishes to inject water into wells T-123 and D-83.

Summary

The water flooding pressure maintenance project should be stopped until such time as

1. The pool has been defined by additional drilling on uniform spacing.
2. The area unitized or agreements had to control project for all the pool.
3. Correlative rights have been protected for all parties.
4. Waste gas has been utilized (through compressor station now being constructed.)
5. Further efforts made through production methods to reduce oil gas ratios - casing and tubing settings, more wells, lesser production per well, regular production.

6. Gas injection on top of structure.
7. Water drive on north edge on down dip in only non-commercial wells.

TESTIMONY AND EXHIBITS PRESENTED AT HEARING OF COMMISSION MAY 19, 1954,
BY A. F. HOLLAND, ENGINEER OF LOWRY ET AL OPERATING ACCOUNT.

The exhibit records show behavior of the pool through bottom hole pressures (Exhibit 3) from August 1953, and gas oil ratios (Exhibit 2) since July 1953. The first production was marketed from the pool in September 1951. The first wells had bottom hole pressures of 2200 to 2250#. In other words, there was a drop of 200 to 400# from beginning to earliest date on the exhibits. I have not learned what the original gas oil ratios were.

Exhibit I - Map South Blanco Pool - unduly limits the pool area - present and potential. Please refer to our Exhibit A which shows Johnston's new oil well #10 SE/4 Section 26-27N-7W, also the three wells (green) drilled unproductive through the Tecite, these being to date the only limiting factors to the pool's extensions.

Exhibit - Contour Map - Top Tecite Sandstone - unduly limits the pool area - present and potential.

Please refer to our Exhibit B which shows our contour map on top of the Tecite sandstone - over a larger area. This map clearly shows the unlimited prospective extent of the pool along the strike and enlarged area prospective up and down dip.

Exhibit #4 (7th General Survey Jan. 11-13/54) and #5 (8th General Survey April 1-3/54) - average reservoir pressures - gives the impression of a limited pool area particularly on the east end which remains unexplored, and highly prospective (see our Exhibit B). General Survey #1 through 6 are not included in either the testimony or the exhibits.

REFER TO TRANSCRIPT OF DIRECT TESTIMONY

- Page 3 - We do not understand why it is necessary or not necessary to use well T-109 presently a commercial oil producer as a water injection well.
- Page 4 - There is no Johnston agreement. There is no agreement with Brookhaven Oil Company and Dacres Corporation. Therefore, Lowry without such agreements and the protection of correlative rights may not inject water into wells T-123 and D-83. As mentioned above, without doing this or injecting gas into T-123, the present program of water injection will drive Lowry's oil onto Johnston's properties.
- Page 5 - The use of commercial oil producing wells for water injection wells is, to our mind, the destruction and devaluation of oil production and oil reserves. Injection of water in a well will, of course, reduce the oil gas ratios. The question is will injection of water into a formation decrease or increase oil recoveries in the best manner.

Page 9. - Lowry's program will not protect correlative rights as indicated above.

Page 10 - A central tank battery for the metering of oil (and gas and water) is impractical and jeopardizes ownership. The ownership of all the leases will not remain the same forever. Unless the area is communitized, the central tank battery should not be installed.

REFER TO TRANSCRIPT OF CROSS EXAMINATION

Page 12 - It is impractical and a waste of natural resources and devalues production and reserves to plug present Dakota producing well D-83 to the Tecite formation which will probably also produce oil, use the Tecite formation for a water injection well in that formation, then recomplete in the Dakota for oil production. In addition, such an operation would devalue the oil and gas reserves in the Tecite formation through water flooding the NW/4 of Section 5 belonging to the undersigned.

Page 13 and 14 - Lowry et al proposes to put water in the gas cap so that the oil driven up dip will not enter the gas cap. This is contrary to orthodox concepts that it needs no further comments.

Page 14 - Lowry proposes to disperse water throughout the field. Water is one of the principal things that should not be produced with the oil. Additionally, it will devalue the production due to the expense of segregating gas, water and oil before marketing.

Page 15 - We agree with Mr. Cegin's thoughts on the matter of a common tank battery.

Finally, it is requested that Lowry's application Case 697 be denied, either with or without continuance of the Case for further testimony and cross examination.

It is requested that Order R-349 be rescinded.

BROOKHAVEN OIL COMPANY
DAGRESA CORPORATION


President

6/1/54.

NEW MEXICO OIL CONSERVATION COMMISSION

SANTA FE, NEW MEXICO

IN THE MATTER OF THE APPLICATION
OF LOWRY, ET AL OPERATING ACCOUNT
FOR THE APPROVAL OF AN EXTENSION
OF ITS PILOT PRESSURE MAINTENANCE
PROGRAM IN THE SOUTH BLANCO-TOCITO
POOL, RIO ARRIBA COUNTY, NEW MEX-
ICO, AND PERMISSION TO GAUGE OIL
AT A COMMON TANK BATTERY.

Case 697

PETITION

TO THE OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

Comes the undersigned, Lowry et al Operating Account, with offices at 142 Munroe NE, Albuquerque, New Mexico, and petitions the Commission for an order approving the extension of its pilot pressure maintenance program in the South Blanco-Tocito Pool, Rio Arriba County, New Mexico, by the addition of wells to be utilized for water injection purposes and authority to increase the amount of water to be injected; and for an order to permit guaging of oil at a common tank battery; and in support thereof Petitioner would show:

1. That the Commission has heretofore approved pressure maintenance in the South Blanco Tocito Pool, Rio Arriba County, New Mexico, by its order No. R-349, and that upon approval of this petition, this pressure maintenance program will be extended, and will be in the interests of conservation.

2. That geological information has heretofore been presented to the Commission in Case No. 537 and Case No. 555, which information Petitioner respectfully requests the Commission to take notice of in connection with this petition; and that further information will be offered in connection with this petition.

3. That the guaging of oil at a common tank battery will be in the interests of efficient management of the pressure maintenance program, and that the rights of all persons interested

including royalty owners, will be protected.

WHEREFORE Petitioner requests the Commission, after notice and hearing as required by law and the Rules and Regulations of the Commission, to enter its order approving extension of the pressure maintenance program heretofore approved by Commission order No. R-349, and to approve the gauging of oil at a common tank battery, together with such other provisions as in the judgment of the Commission may be deemed fit and proper.

Respectfully submitted,

LOWRY et al OPERATING ACCOUNT

By Jason W. Kellahin
Attorney for Petitioner

Jason W. Kellahin
P. O. Box 361
Santa Fe, New Mexico

NEW MEXICO OIL CONSERVATION COMMISSION

SANTA FE, NEW MEXICO

IN THE MATTER OF THE APPLICATION
OF LOWRY, ET AL OPERATING ACCOUNT
FOR THE APPROVAL OF AN EXTENSION
OF HIS PILOT PRESSURE MAINTENANCE
PROGRAM IN THE SOUTH BLANCO-TOCITO
POOL, RIO ARRIBA COUNTY, NEW MEX-
ICO, AND PERMISSION TO GAUGE OIL
AT A COMMON TANK BATTERY.

Case No. 697

AMENDED PETITION

TO THE OIL CONSERVATION
COMMISSION, SANTA FE, NEW MEXICO

Comes now the undersigned, Lowry et al Operating Account, with offices at 142 Munroe NE, Albuquerque, New Mexico, and respectfully requests this commission to accept this as an amendment to its petition in the above styled cause:

1. Petitioner requests that its well designated as T-85 be designated as a water injection well, pursuant to the petition filed in this cause.
2. That the Commission consider the testimony and exhibits heretofore offered in this case in connection with this amended petition.
3. That in the event additional testimony is required by the commission, that this case be set for special hearing at an early date, and that the Commission enter its order granting the petition in all respects as requested, except as herein amended.

Respectfully submitted,

Jason W. Kellanin
Attorney for Petitioner