CASE 1637: Atlantic Rfg. Co. application to combine Allison-Penn & North Allison-Penn Pools & establish 80-acre proration units in said combined pool.

CASE 1637: Atlantic Rfg. Co. application to combine Allison-Penn & North Allison-Penn Pools & establish 80-acre proration units in said combined pool.

Case No.

1637

Application, Transcript,
Small Exhibits, Etc.

The Atlantic Refining Company
P. O. Box 1610
Midland, Texas

Re: NMOCC Case No. 1637
80-Acre Proration Units
For Allison and North
Allison Pools

Gentlemen:

We have examined the attached plat, Exhibit A, "Development Plan For The Allison Pool Area." Development of our property will be in accordance with this plan except where subsequent information shows that such will cause waste or be uneconomical. We understand that this is to be presented at the forthcoming rehearing for 80-acre proration units in the Allison and North Allison Pools, provided that all operators in those pools are agreeable to the plan.

Yours very truly,

The Ohio Oil Co.
COMPANY

By: C. J. L. Smith
for Coe S. Mills

Date: 7-10-59

RECEIVED
JUL 13 1959
MIDLAND OPERATIONS

ALLISON AND NORTH ALLISON POOL OPERATORS
ADDRESSES LIST

Abe Oil Company (2)
P. O. Box 814
Houston, Texas
Attn: Mr. H. C. Murray

Cactus Drilling Co.
P. O. Box 1326
Hobbs, New Mexico
Attn: Mr. George Baker

Cosden Petroleum Corporation
P. O. Box 1311
Big Springs, Texas
Attn: Mr. H. P. Bretches

Gulf Oil Corporation
P. O. Box 1290
Fort Worth, Texas
Attn: Mr. H. P. Reardon

Gulf Oil Corporation
P. O. Box 669
Roswell, New Mexico
Attn: Mr. O. K. Gilbreth, Jr.

Magnolia Petroleum Co. (3)
P. O. Box 2406
Hobbs, New Mexico
Attn: Mr. G. S. Young, Jr.

Ohio Oil Co.
P. O. Box 552
Midland, Texas
Attn: Mr. Coe S. Mills

Skelly Oil Company (2)
P. O. Box 38
Hobbs, New Mexico
Attn: Mr. J. N. Dunlavey

Sun Oil Co.
P. O. Box 1861
Midland, Texas
Attn: Mr. D. C. Brown

Trice Prod. Co.
P. O. Box 167
Midland, Texas

ATTENDANCE LIST
[illegible] 25, 1959, MEETING

NAME	COMPANY	LOCATION
W. P. [illegible]	[illegible]mble	Roswell
J. R. Rutherford	[illegible]mble	Midland
C. E. Hare	Cities	Roswell
G. A. Hard	Ohio	Midland
Tom Steele	Ohio	Midland
L. B. Webb	Magnolia	Midland

K. S. ADAMS, JR.
PRESIDENT

ADA OIL COMPANY

HOUSTON 1, TEXAS

6910 FANNIN, P. O. BOX 844
JACKSON 6-1911

JULY 8, 1959

MR. P. E. FLETCHER
THE ATLANTIC REFINING CO.
P. O. BOX 1610
MIDLAND, TEXAS

DEAR MR. FLETCHER:

RE: NMOCC CASE NO. 1637
80-ACRE PRORATION UNITS
FOR ALLISON AND NORTH
ALLISON POOLS, LEA AND
ROOSEVELT COUNTIES,
NEW MEXICO

WE ARE RETURNING A SIGNED COPY OF THE LETTER AND ATTACHED PLAT TRANSMITTED FOR OUR EXAMINATION ON JUNE 29, 1959, TO SIGNIFY OUR AGREEMENT WITH THE ARRANGEMENT OF PRORATION UNITS AS SHOWN ON THE PLAT MARKED "EXHIBIT A".

VERY TRULY YOURS,

ADA OIL COMPANY

Miriam Harrison
MIRIAM HARRISON
SECRETARY TO WM. G. HARVEY

MH:S

ENCLOSURE

THE ATLANTIC REFINING COMPANY
Incorporated - 1870
Petroleum Products

Domestic Producing Department
West Texas-New Mexico Region

Post Office Box 1610
Midland, Texas

June 29, 1959

ALLISON AND NORTH ALLISON POOL OPERATORS
(ADDRESSEE LIST ATTACHED)

Re: June 25, 1959, Meeting
Midland, Texas

Gentlemen:

Representatives of Allison and North Allison Pool operators met at 10:00 A.M. CST, on June 25, 1959, in Atlantic's Conference Room, Midland, Texas. An attendance list is attached. The purpose of the meeting was to discuss a development plan for the Allison and North Allison Pools which would be presented to the NMOCC at the forthcoming rehearing for 80-acre spacing. Those present agreed on arrangement of proration units as shown in our letter to you of June 10, 1959, with modifications as shown in the NE/4 SE/4 of Section 10 and S/2 of Section 11, T-9S, R-36E. Operators of those tracts were not present but had previously indicated a preference for rearrangement of their proration units.

We have attached two copies of a letter by which you may signify agreement with the arrangement of proration units as shown on the plats attached, Exhibit A. We would appreciate execution of one of the letters and the return of it and one of the plats to us. The other letter and plat are for your files.

Yours very truly,

THE ATLANTIC REFINING COMPANY

P. E. Fletcher

P. E. Fletcher,
Regional Operations Manager

Enclosures - 6

The Atlantic Refining Company
P. O. Box 1610
Midland, Texas

Re: NMOCC Case No. 1637:
80-Acre Proration Units
For Allison and North
Allison Pools

Gentlemen:

We have examined the attached plat, Exhibit A, "Development Plan For The Allison Pool Area." Development of our property will be in accordance with this plan except where subsequent information shows that such will cause waste or be uneconomical. We understand that this is to be presented at the forthcoming rehearing for 80-acre proration units in the Allison and North Allison Pools, provided that all operators in those pools are agreeable to the plan.

Yours very truly,

Adams Oil Co
COMPANY

By: [signature]

Date: July 7, 1959

WILSON AND NORTH ALLISON POOL OPERATORS
ADDRESSES LIST

Ada Oil Company (2)
P. O. Box 816
Houston, Texas
Attn: Mr. W. G. Harvey

Cactus Drilling Co.
P. O. Box 1326
Hobbs, New Mexico
Attn: Mr. George Baker

Cosden Petroleum Corporation
P. O. Box 1311
Big Springs, Texas
Attn: Mr. H. T. Bratcher

Gulf Oil Corporation
P. O. Box 1290
Fort Worth, Texas
Attn: Mr. H. P. Reardon

Gulf Oil Corporation
P. O. Box 669
Roswell, New Mexico
Attn: Mr. O. K. Gilbreth, Jr.

Magnolia Petroleum Co. (3)
P. O. Box 2406
Hobbs, New Mexico
Attn: Mr. G. S. Young, Jr.

Ohio Oil Co.
P. O. Box 552
Midland, Texas
Attn: Mr. Coe S. Mills

Skelly Oil Company (2)
P. O. Box 38
Hobbs, New Mexico
Attn: Mr. J. N. Dunlavey

Sun Oil Co.
P. O. Box 1861
Midland, Texas
Attn: Mr. D. C. Brown

Trice Prod. Co.
P. O. Box 167
Midland, Texas

ATTENDANCE LIST
JUNE 25, 1959, MEETING

NAME	COMPANY	LOCATION
W. P. Tomlinson	Atlantic	Roswell
J. R. Rhotenberry	Atlantic	Midland
C. E. Mace	Gulf	Roswell
G. A. Naert	Ohio	Midland
Tom Steele	Ohio	Midland
I. B. Stitt	Magnolia	Midland

Atlantic

Ada

Atlantic "AD"

Ohio

US

Adams

State

Cox

US

Magnolia

10

Gulf

Magnolia

11

Magnolia

T 9 S

12

US

Gulf

Trice

Merrill et al

Mills (U.S.)

Childers (U.S.)

Sun

Cosden

Magnolia

Santa Fe Ry

Mills

R 36 E

Cox US

Exhibit "A"

Development Plan For
Allison Pool Area

Lea & Roosevelt Counties, New Mexico

Scale: 1"=1000'

Magnolia 27	Magnolia	Atlantic 26	Skelly	Shearn 25	
Magnolia					
US	US	Beebe	Pebworth et al	US	T 8 S
Magnolia 34	Skelly	Atlantic 35	Atlantic "A"	Sunray-D.X. 36	
				Cosden J-C	
		Yates (US)			
		Gulf			
US		US		State	
Magnolia 3	Atlantic	Cactus 2	Magnolia	Anderson	Gulf 1

PETROLEUM AND ITS PRODUCTS

GULF OIL CORPORATION

P. O. DRAWER 669 — ROSWELL, NEW MEXICO

ROSWELL DISTRICT
W. A. SHELLSHEAR
District Manager
E. S. GREAR
District Exploration Manager
M. I. TAYLOR
District Production Manager
G. A. PRICE
District Services Manager

FORT WORTH
PRODUCTION DIVISION

July 7, 1959

The Atlantic Refining Company
P. O. Box 1610
Midland, Texas

Attention: Mr. P. E. Fletcher
Regional Operations Manager

Gentlemen:

As requested by your letter of June 29, 1959, concerning proposed 80-acre proration units for the Allison and North Allison Pool, attached is a copy of your letter ballot properly executed by Gulf Oil Corporation.

Yours very truly,

W. A. Shellshear

W. A. SHELLSHEAR

Attachment

The Atlantic Refining Company
P. O. Box 1610
Midland, Texas

Re: NMOCC Case No. 1637:
80-Acre Proration Units
For Allison and North
Allison Pools

Gentlemen:

We have examined the attached plat, Exhibit A, "Development Plan For The Allison Pool Area." Development of our property will be in accordance with this plan except where subsequent information shows that such will cause waste or be uneconomical. We understand that this is to be presented at the forthcoming rehearing for 80-acre proration units in the Allison and North Allison Pools, provided that all operators in those pools are agreeable to the plan.

Yours very truly,

GULF OIL CORPORATION
COMPANY

By: M A Shellshear

Date: JUL 8 1959

Magnolia 27	Magnolia	Atlantic 26	Skelly	Shearn 25
Magnolia				
US Magnolia 34	US Skelly	Beebe Atlantic 35	Pebworth et al Atlantic "AE"	US Sunray-D.X. 36
		Yates (US)		
	Gulf			
US Magnolia 3	US Atlantic	Cotton 2	State Magnolia	Anderson Gulf 1

T 8 S

Atlantic

Ada | Atlantic "AD" | Ohio

US | Adams | State | Cox | US

Magnolic | 10 | Gulf | Magnolia | 11 | Magnolia

T 9 S

12

US

Gulf

Trice

Merrill et al | Mills (U.S.) | Childers (U.S.)

Sun

Cosden

Magnolia

Santa Fe Ry

Mills

R 36 E

Cox US

Exhibit "A"

Development Plan For
Allison Pool Area

Lea & Roosevelt Counties, New Mexico

Scale: 1"=1000'

The Atlantic Refining Company
P. O. Box 1610
Midland, Texas

Re: NMOCC Case No. 1637:
80-Acre Proration Units
For Allison and North
Allison Pools

Gentlemen:

We have examined the attached plat, Exhibit A, "Development Plan For The Allison Pool Area." Development of our property will be in accordance with this plan except where subsequent information shows that such will cause waste or be uneconomical. We understand that this is to be presented at the forthcoming rehearing for 80-acre proration units in the Allison and North Allison Pools, provided that all operators in those pools are agreeable to the plan.

Yours very truly,

Shelly Oil Co.
COMPANY

By: Garry W. Selinger

Date: 7/10/59

ALLISON AND NORTH ALLISON POOL OPERATORS
ADDRESSEE LIST

Ada Oil Company (2)
P. O. Box 844
Houston, Texas
Attn: Mr. W. G. Harvey

Cactus Drilling Co.
P. O. Box 1326
Hobbs, New Mexico
Attn: Mr. George Baker

Cosden Petroleum Corporation
P. O. Box 1311
Big Springs, Texas
Attn: Mr. H. T. Bratcher

Gulf Oil Corporation
P. O. Box 1290
Fort Worth, Texas
Attn: Mr. H. P. Reardon

Gulf Oil Corporation
P. O. Box 669
Roswell, New Mexico
Attn: Mr. O. K. Gilbreth, Jr.

Magnolia Petroleum Co. (3)
P. O. Box 2406
Hobbs, New Mexico
Attn: Mr. G. S. Young, Jr.

Ohio Oil Co.
P. O. Box 552
Midland, Texas
Attn: Mr. Coe S. Mills

Skelly Oil Company (2)
P. O. Box 38
Hobbs, New Mexico
Attn: Mr. J. N. Dunlavey

Sun Oil Co.
P. O. Box 1861
Midland, Texas
Attn: Mr. D. C. Brown

Trice Prod. Co.
P. O. Box 167
Midland, Texas

ATTENDANCE LIST
JUNE 25, 1959, ARTESIA

NAME	COMPANY	LOCATION
W. P. Tomlinson	Atlantic	Roswell
J. R. Shotenberry	Atlantic	Midland
C. E. Knox	Gulf	Roswell
G. A. Nasrt	Ohio	Midland
Tom Steele	Ohio	Midland
I. B. Stitt	Magnolia	Midland

Atlantic

Ada | Atlantic "AD" | Ohio

US | Adams | State | Cox | US

Magnolia 10 | Gulf | Magnolia 11 | Magnolia

T 9 S 12

US

Gulf

Trice 1

Merrill et al | Mills (U.S.) | Childers (U.S.)

Sun

Cosden 1

Magnolia

Santa Fe Ry | Mills | R 36 E | Cox | US

Exhibit "A"

Development Plan For
Allison Pool Area

Lea & Roosevelt Counties, New Mexico

Scale: 1"=1000'

Magnolia 27	Magnolia	Atlantic 26	Skelly	Shearn 25
Magnolia				
US	US	Beebe	Pebworth et al	US
Magnolia 34	Skelly	Atlantic 35	Atlantic "A B"	Sunray-D.X. 36
				Cosden J-C
		Yates (US.)		
	Gulf			
US	US		State	
Magnolia 3	Atlantic	Cactus 2	Magnolia	Anderson Gulf 1

T 8 S

The Atlantic Refining Company
P. O. Box 1610
Midland, Texas

Re: NMOCC Case No. 1637:
80-Acre Proration Units
For Allison and North
Allison Pools

Gentlemen:

We have examined the attached plat, Exhibit A, "Development Plan For The Allison Pool Area." Development of our property will be in accordance with this plan except where subsequent information shows that such will cause waste or be uneconomical. We understand that this is to be presented at the forthcoming rehearing for 80-acre proration units in the Allison and North Allison Pools, provided that all operators in those pools are agreeable to the plan.

Yours very truly,

COMPANY Cactus Drilling Co

By: George Baker

Date: 7-7-59

ALLISON AND NORTH ALLISON POOL OPERATORS
ADDRESSEE LIST

Ada Oil Company (2)
P. O. Box 814
Houston, Texas
Attn: Mr. W. O. Harvey

Cactus Drilling Co.
P. O. Box 1826
Hobbs, New Mexico
Attn: Mr. George Baker

Cosden Petroleum Corporation
P. O. Box 1311
Big Springs, Texas
Attn: Mr. H. T. Bratcher

Gulf Oil Corporation
P. O. Box 1290
Fort Worth, Texas
Attn: Mr. H. P. Reardon

Gulf Oil Corporation
P. O. Box 669
Roswell, New Mexico
Attn: Mr. O. K. Gilbreth, Jr.

Magnolia Petroleum Co. (3)
P. O. Box 2406
Hobbs, New Mexico
Attn: Mr. G. S. Young, Jr.

Ohio Oil Co.
P. O. Box 552
Midland, Texas
Attn: Mr. Coe S. Mills

Skelly Oil Company (2)
P. O. Box 38
Hobbs, New Mexico
Attn: Mr. J. N. Dunlavey

Sun Oil Co.
P. O. Box 1861
Midland, Texas
Attn: Mr. D. C. Brown

Trice Prod. Co.
P. O. Box 167
Midland, Texas

ATTENDANCE LIST
JUNE 25, 1959, MEETING

NAME	COMPANY	LOCATION
W. P. Tomlinson	Atlantic	Roswell
J. R. Rhotenberry	Atlantic	Midland
C. E. Mace	Gulf	Roswell
G. A. Naeve	Ohio	Midland
Tom Steele	Ohio	Midland
I. B. Stitt	Magnolia	Midland

Magnolia 27 | Magnolia | Atlantic 26 | Skelly | Shearn 25

Magnolia

US | US | Beebe | Pebworth et al | US

Magnolic 34 | Skelly | Atlantic 35 | Atlantic "A" | Sunray-D.X. 36

T 8 S

Cosden

Yates (US)

Gulf

US | US | State

Magnolia 3 | Atlantic | Cactus 2 | Magnolia | Anderson | Gulf 1

Atlantic

Ada

Atlantic "AD"

Ohio

US

Adams

State

Cox

US

Magnolia

10

Gulf

Magnolia

11

Magnolia

T 9 S

12

US

Gulf

Trice

Merrill et al

Mills (U.S.)

Childers (U.S.)

Sun

Cosden

Magnolia

Santa Fe Ry

Mills

R 36 E

Cox

US

Exhibit "A"

Development Plan For
Allison Pool Area

Lea & Roosevelt Counties, New Mexico

Scale: 1"=1000'

Case 1637

NEW MEXICO OIL CONSERVATION COMMISSION

SANTA FE, NEW MEXICO

APPLICATION OF THE ATLANTIC REFINING COMPANY FOR AN ORDER COMBINING THE ALLISON AND NORTH ALLISON POOLS, LEA AND ROOSEVELT COUNTIES, AND DETERMINING THE LIMITS THEREOF AND ESTABLISHING 80-ACRE WELL SPACING AND PRORATION UNITS AND PROMULGATING SPECIAL RULES AND REGULATIONS THEREFOR

To the New Mexico Oil Conservation Commission
Santa Fe, New Mexico

Comes The Atlantic Refining Company and hereby makes application to the New Mexico Oil Conservation Commission for an order combining the Allison and North Allison Pools, located in Lea and Roosevelt Counties, New Mexico, and determining the limits thereof and redesignating the same as the "Allison Pool" and establishing 80-acre well spacing and proration units within said pool as redefined and promulgating special rules and regulations therefor and in support of said application respectfully shows:

1. That there is attached hereto, made a part hereof and for purposes of identification marked Exhibit "A," a plat showing the location of all wells which have been drilled in the Allison and North Allison Pools, as heretofore defined by the New Mexico Oil Conservation Commission, together with the ownership of the lands upon which said wells are located and the owners of the oil and gas leases embracing the same.

That applicant is the owner of the leasehold interests and wells indicated on said plat.

2. That all of the wells within the Allison and North Allison Pools, as shown on Exhibit "A" attached hereto, are producing from a common reservoir, all of said wells being completed in the Bough "C" zone of the Pennsylvanian formation at a depth of approximately 9700 feet.

3. That applicant has made a study of all of the well logs, electrical logs, available core data, well pressures and other information, including the production history of the wells drilled and producing within the Allison and North Allison Pools, and from such study applicant believes that one well will efficiently and economically drain more than 80 acres.

4. That all of the wells completed within the Allison and North Allison Pools have been drilled in such a manner that 80 acres can be dedicated to each well and that the adoption of 80-acre spacing and proration units will prevent the economic loss caused by the drilling of unnecessary wells and will protect correlative rights, including those of royalty owners, and will avoid risks arising from the drilling of an excessive number of wells and will tend to promote the greatest ultimate recovery of oil and gas from said Pool in the most economical manner.

5. That the 80-acre spacing and proration units should consist of a unit containing 80 acres, more or less, consisting of two adjacent governmental quarter-quarter sections or lots within a single governmental section and constituting either the North half, South half, East half or the West half of such quarter section and that all wells should be located within 100 feet of the center of either component quarter-quarter section or lot of such spacing or proration units.

6. That each 80-acre spacing and proration unit, situated within said Pool as combined, for proration purposes, should be assigned an 80-acre proportional factor for a depth range between 9,000 feet and 10,000 feet as provided by Rule 505 of the New Mexico Oil Conservation Commission. In the event a proration unit contains less than 78 acres or more than 82 acres, its allowable should be in the proportion that the acreage contained in such unit bears to 80 and in no event should any proration unit contain more than two governmental quarter-quarter sections or lots.

7. That any well heretofore drilled or being drilled as of the effective date of the order establishing 80-acre spacing and proration units, not in conformity with the foregoing, should be granted an exception to such well location requirements.

8. That the horizontal limits of the combined Allison and North Allison (Pennsylvanian) Pools should be designated as follows:

Township 8 South, Range 36 East, N.M.P.M. (Roosevelt County)

Section 35: $E\frac{1}{2}$
Section 36: $W\frac{1}{2}$

Township 9 South, Range 36 East, N.M.P.M. (Lea County)

Section 1: $W\frac{1}{2}W\frac{1}{2}$
Section 2: $E\frac{1}{2}NW\frac{1}{4}$, $SW\frac{1}{4}$, $E\frac{1}{2}$
Section 10: $NE\frac{1}{4}$
Section 11: $N\frac{1}{2}$, $N\frac{1}{2}S\frac{1}{2}$

WHEREFORE, applicant prays that the Oil Conservation Commission, after due notice and hearing as provided by law and the rules and regulations of the Oil Conservation Commission, enter an order herein combining the Allison and North Allison (Pennsylvanian) Pools and designating the same as the Allison Pool and providing for 80-acre well spacing and proration units and promulgating special rules and regulations therefor.

Respectfully submitted,

THE ATLANTIC REFINING COMPANY

By W. P. Tomlinson

HERVEY, DOW & HINKLE

By

Roswell, New Mexico
Attorneys for
The Atlantic Refining Company

Magnolia 3 | Atlantic | Sunray-Mid Cont. 2 | Magnolia | Anderson | Warren 1

Coctus 1-A

Atlantic

Ada | Atlantic "AD" | Ohio

US | Adams | State | Cox | US | Magnolia

Magnolia 10 | Gulf | Magnolia 11 | Magnolia 12

US

Warren

Trice 1

Merrill et al | Mills (U.S.) | Childers (U.S.)

Sun

1 Cosden

Magnolia

Santa Fe Ry

Mills R36E

T9S

ALLISON AND NORTH ALLISON POOLS

LEA AND ROOSEVELT COUNTIES, NEW MEXICO

Cox US

Magnolia 27 | Magnolia | Atlantic 26 | Skelly | Shearn 25

Magnolia

US

Magnolia 34 | US Skelly | Beebe Atlantic 35 | Pebworth et al Atlantic "AE" | US Sunray-Mid Cont

Yates

Gulf

US | State

T 8 S

DOMESTIC SERVICE

Check the class of service desired; otherwise this message will be sent as a fast telegram

TELEGRAM	
DAY LETTER	X
NIGHT LETTER	

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S
E

WESTERN UNION
TELEGRAM

W. P. MARSHALL, PRESIDENT

1206 (4-55)

INTERNATIONAL SERVICE

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FULL RATE	
LETTER TELEGRAM	
SHORE-SHIP	

NO. WDS.-CL. OF SVC.	PD. OR COLL.	CASH NO.	CHARGE TO THE ACCOUNT OF	TIME FILED
	COLLECT			

Send the following message, subject to the terms on back hereof, which are hereby agreed to

5-28-59

HOWARD BRATTON
HERVEY, DOW & HINKLE
ROSWELL, NEW MEXICO

REHEARING GRANTED IN ALLISON CASE. REHEARING GRANTED IN SOUTH-VACUUM CASE ONLY ON ISSUE OF TRANSFER OF ALLOWABLE. BOTH REHEARINGS SET FOR JULY 15.

NEW MEXICO OIL CONSERVATION COMMISSION
A. L. PORTER, Jr.
SECRETARY-DIRECTOR

Case 1637

J. M. HERVEY 1874-1953
HIRAM M. DOW
CLARENCE E. HINKLE
W. E. BONDURANT, JR.
GEORGE H. HUNKER, JR.
HOWARD C. BRATTON
S. B. CHRISTY IV
LEWIS C. COX, JR.
PAUL W. EATON, JR.
ROBERT C. BLEDSOE

LAW OFFICES
HERVEY, DOW & HINKLE
HINKLE BUILDING
ROSWELL, NEW MEXICO

TELEPHONE MAIN 2-6510
POST OFFICE BOX 547

March 24, 1959

Mr. A. L. Porter, Jr., Secretary-Director
New Mexico Oil Conservation Commission
Mabry Hall, State Capitol
Santa Fe, New Mexico

Re: Allison and North Allison Pools,
Roosevelt and Lea Counties,
80-acre spacing

Dear Mr. Porter:

We have heretofore filed with the Oil Conservation Commission application of The Atlantic Refining Company for an order combining the Allison and North Allison Pools and for the establishment of special field rules, including 80-acre spacing.

We desire to amend the application by making a slight change in the wording of paragraph 3 on page 2 and enclose original and two copies of page 2 to be substituted for these pages in the application which we have heretofore filed with you.

The change simply deletes the words, "more than," in the last line of paragraph 3.

Yours sincerely,

HERVEY, DOW & HINKLE

By Clarence E. Hinkle

CEH/bp
Encl.

cc: Mr. A. B. Tanco
Mr. F. W. Turner
Mr. P. E. Fletcher
Mr. V. E. Stepp
Mr. V. M. Hollrah
Mr. Phil Tomlinson

Docket Mailed
4-3-59
BP

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DEARNLEY-MEIER REPORTING SERVICE, Inc.

605 SIMMS BUILDING
ALBUQUERQUE, NEW MEXICO
P. O. BOX 1092 PHONE CH 3-6691

ADA DEARNLEY, PRESIDENT
MARIANNA MEIER, SEC.-TREAS

FIELD MANAGER
JERRY MARTINEZ
OFFICE MANAGER
STELLA MONTOYA
REPORTERS STAFF
J A TRUJILLO
PAUL R. DENNY
J CALVIN BEVELL
SOVEIDA GONZALES

Specializing In:
DEPOSITIONS
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STATEMENTS
EXPERT TESTIMONY
DAILY COPY
CONVENTIONS

May 8, 1959

Ida Rodriquez
Oil Conservation Commission
P. O. Box 878
Santa Fe, New Mexico

Dear Mrs. Rodriquez:

Please send us a copy of the transcript in Case # 1637.

Thank you.

Very truly yours,

DEARNLEY-MEIER REPORTING SERVICE, INC.

BY M. Ortiz.

Sent transcript H 1637
5-11-59
H

Our Experience Assures Superior Service

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

COPY

June 1, 1959

Mr. Clarence Hinkle
Hervey, Dow & Hinkle
Box 547
Roswell, New Mexico

Dear Mr. Hinkle:

On behalf of your client, Atlantic Refining Company, we enclose two copies of Order R-1339-A issued May 28, 1959, by the Oil Conservation Commission in Case No. 1637.

Very truly yours,

A. L. PORTER, Jr.
Secretary-Director

ir

Enclosures

(Gulf Oil Corporation)

1657 From the information that we have both our own and that made available to us, we believe that one well can efficiently drain in excess of 80 acres in this area. The Gulf also believes that the Allison and North Allison Pools are producing from the same reservoir and therefore concurs with Atlantic in this application in this case.

William W[illegible]

1636. Gulf stream with Atlantic
on the opposite sides the coast.

The Atlantic Refining Company
P. O. Box 1610
Midland, Texas

Gentlemen:

We have reviewed the field rules application filed with the NMOCC by The Atlantic Refining Company for the Allison and North Allison Pools. Our company is in accord with your plan for 80-acre spacing, proration units, and allocation as outlined in the application.

Yours very truly,

Cactus Drilling Company
Company

George Boston
Representative
Vice-President

4-1-59

The Atlantic Refining Company
P. O. Box 1610
Midland, Texas

Gentlemen:

We have reviewed the field rules application filed with the NMOCC by The Atlantic Refining Company for the Allison and North Allison Pools. Our company is in accord with your plan for 80-acre spacing, proration units, and allocation as outlined in the application.

Yours very truly,

The Ohio Oil Co
Company

Wm A Wills
Representative

RE Hawson

The Atlantic Refining Company
P. O. Box 1610
Midland, Texas

Gentlemen:

We have reviewed the field rules application filed with the NMOCC by The Atlantic Refining Company for the Allison and North Allison Pools. Our company is in accord with your plan for 80-acre spacing, proration units, and allocation as outlined in the application.

Yours very truly,

Ada Oil Company
Company

Lloyd E Suder, Jr
Representative

4-3-59

The Atlantic Refining Company
P. O. Box 1610
Midland, Texas

Gentlemen:

We have reviewed the field rules application filed with the NMOCC by The Atlantic Refining Company for the Allison and North Allison Pools. Our company is in accord with your plan for 80-acre spacing, proration units, and allocation as outlined in the application.

Yours very truly,

COSDEN PETROLEUM CORPORATION
Company

L. M. Thompson
Representative
Manager, Producing Division

RECEIVED
APR 1 1959
MIDLAND OPERATIONS

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1665

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

COPY

June 1, 1959

Mr. Clarence Hinkle
Hervey, Dow & Hinkle
Box 547
Roswell, New Mexico

Dear Mr. Hinkle:

On behalf of your client, Atlantic Refining Company, we enclose two copies of Order R-1389-A issued May 28, 1959, by the Oil Conservation Commission in Case No. 1637.

Very truly yours,

A. L. PORTER, Jr.
Secretary-Director

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Enclosures

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

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

CASE NO. 1637
Order No. R-1389

APPLICATION OF THE ATLANTIC REFINING COMPANY FOR AN ORDER COMBINING THE ALLISON-PENNSYLVANIAN AND NORTH ALLISON-PENNSYLVANIAN POOLS, LEA AND ROOSEVELT COUNTIES, NEW MEXICO, AND FOR THE PROMULGATION OF SPECIAL RULES AND REGULATIONS THEREFOR TO PROVIDE FOR 80-ACRE PRORATION UNITS.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on April 15, 1959, at Hobbs, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission."

NOW, on this 7th day of May, 1959, the Commission, a quorum being present, having considered the application and the evidence adduced and being fully advised in the premises,

FINDS:

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

(2) That the applicant, The Atlantic Refining Company, seeks an order combining the Allison-Pennsylvanian Pool and the North Allison-Pennsylvanian Pool, Lea and Roosevelt Counties, New Mexico.

(3) That the applicant further seeks the promulgation of special rules and regulations for said pool to provide for 80-acre proration units.

(4) That at this stage of development an order combining the said Allison-Pennsylvanian Pool with the said North Allison-Pennsylvanian Pool would be premature.

(5) That the applicant has failed to prove that the Allison-Pennsylvanian Pool and the North Allison-Pennsylvanian Pool can be efficiently drained and developed on an 80-acre spacing pattern.

(6) That the said Allison-Pennsylvanian Pool has thus far been developed on a 40-acre spacing pattern.

(7) That continued development of said pools on 40-acre proration units will not cause the drilling of unnecessary wells.

(8) That the drilling and spacing of wells in the Allison-Pennsylvanian Pool and in the North Allison-Pennsylvanian Pool should continue to be governed by Rule 104 of the Commission Rules and Regulations.

(9) That the application should be denied.

IT IS THEREFORE ORDERED:

(1) That the application of The Atlantic Refining Company for an order combining the Allison-Pennsylvanian Pool and the North Allison Pennsylvanian Pool, Lea and Roosevelt Counties, New Mexico, be and the same is hereby denied.

(2) That the application of The Atlantic Refining Company for the promulgation of special rules and regulations for said pools, be and the same is hereby denied.

(3) That the drilling and spacing of wells in the said pools shall continue to be governed by Rule 104 of the Commission Rules and Regulations.

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

JOHN BURROUGHS, Chairman

MURRAY E. MORGAN, Member

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

ir/

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

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

CASE NO. 1637
Order No. R-1389-A

APPLICATION OF THE ATLANTIC
REFINING COMPANY FOR AN ORDER
COMBINING THE ALLISON-PENNSYLVANIAN
AND NORTH ALLISON-PENNSYLVANIAN
POOLS, LEA AND ROOSEVELT COUNTIES,
NEW MEXICO, AND FOR THE PROMULGATION
OF SPECIAL RULES AND REGULATIONS
THEREFOR TO PROVIDE FOR 80-ACRE
PRORATION UNITS

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for reconsideration upon the petition of The Atlantic Refining Company for a rehearing in Case No. 1637, Order No. R-1389, heretofore entered by the Commission on May 7, 1959.

NOW, on this 28th day of May, 1959, the Commission, a quorum being present, having considered the petition for rehearing,

HEREBY ORDERS:

That the above-styled cause be reopened and a rehearing be held at 9 o'clock a.m. on July 15, 1959, at Mabry Hall, State Capitol, Santa Fe, New Mexico.

IT IS FURTHER ORDERED:

That the testimony on rehearing shall be limited to new evidence upon the issues raised in the petition for rehearing.

IT IS FURTHER ORDERED:

That Order No. R-1389 shall remain in full force and effect pending the issuance of any further order by the Commission in the above-styled cause.

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

JOHN BURROUGHS, Chairman

MURRAY E. MORGAN, Member

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

vem/

ECONOMICS OF DRILLING ONE WELL PER 40 ACRES IN ALLISON AND NORTH ALLISON POOLS

REVENUE	
Oil	
(70,000) (1.0 - .125) ($2.95) =	$180,688
Less Severance Taxes At $0.1369/BO.	8,385
Gross Oil Revenue Less Severance Taxes.	172,303
Gas	
(70,000) (1.0 - .125) (1.517) ($0.08)	7,433
Less Severance Taxes At 0.0264 Of Value	196
Gross Gas Revenue Less Severance Taxes.	7,237
Total Gross Revenue Less Severance Taxes.	179,540
COST	
Drilling.	175,000
Pumping Equipment	30,000
Flow Lines.	1,600
Total Cost.	206,600
Loss - 40 Acre Well	27,060

CONDITIONS		
Oil In Place Per 40 Acres	70,000	barrels
Gas-Oil, Ratio.	1517	cubic feet per barrel
Oil Price	$2.95	per barrel
Casinghead Gas Price.	$0.08	per MCF

Recovery factor has been used as 1.0. In practice, recovery factor will range between 0.2 and 0.5. Oil and gas recovery and revenue will be reduced proportionately. Operating expenses, which were neglected, will increase total costs.

1 x 0

3. That applicant has made a study of all of the well logs, electrical logs, available core data, well pressures and other information, including the production history of the wells drilled and producing within the Allison and North Allison Pools, and from such study applicant believes that one well will efficiently and economically drain 80 acres.

4. That all of the wells completed within the Allison and North Allison Pools have been drilled in such a manner that 80 acres can be dedicated to each well and that the adoption of 80-acre spacing and proration units will prevent the economic loss caused by the drilling of unnecessary wells and will protect correlative rights, including those of royalty owners, and will avoid risks arising from the drilling of an excessive number of wells and will tend to promote the greatest ultimate recovery of oil and gas from said Pool in the most economical manner.

5. That the 80-acre spacing and proration units should consist of a unit containing 80 acres, more or less, consisting of two adjacent governmental quarter-quarter sections or lots within a single governmental section and constituting either the North half, South half, East half or the West half of such quarter section and that all wells should be located within 100 feet of the center of either component quarter-quarter section or lot of such spacing or proration units.

6. That each 80-acre spacing and proration unit, situated within said Pool as combined, for proration purposes, should be assigned an 80-acre proportional factor for a depth range between 9,000 feet and 10,000 feet as provided by Rule 505 of the New Mexico Oil Conservation Commission. In the event a proration unit contains less than 78 acres or more than 82 acres, its allowable should be in the proportion that the acreage contained in such unit bears to 80 and in no event should any proration unit contain more than two governmental quarter-quarter sections or lots.

Magnolia Petroleum Company

A Socony Mobil Company

Producing Division

P. O. BOX 900 • DALLAS 21, TEXAS

A. E. CHESTER
VICE PRESIDENT AND MANAGER
M. V. C. BRADLEY
ASSISTANT MANAGER
D. V. CARTER
CHIEF PETROLEUM ENGINEER
C. H. HUDSON
ASSISTANT CHIEF PETROLEUM ENGINEER

April 10, 1959

File: H-220

Atlantic Refining Company
P. O. Box 1610
Midland, Texas

Attention: Mr. Jim Rhotenberry

Subject: Combination of Fields and Adoption of Rules for the Allison and North Allison (Pennsylvanian) Fields, Lea and Roosevelt Counties, New Mexico

Gentlemen:

Magnolia Petroleum Company has reviewed the provisions of Atlantic's application to the Oil Conservation Commission (Case No. 1637), and supports the Atlantic Refining Company in its proposals, which we understand briefly consist of the following:

1. Combining the Allison-Pennsylvanian and the North Allison-Pennsylvanian into one field to be known as the Allison Pennsylvanian Field.

2. The adoption of 80-acre proration units with a well to be located in either quarter-quarter section within 100' of the center of said quarter-quarter section.

3. A per-well allowable in accordance with the statewide 80-acre proportional factor for a depth range of 9000 to 10,000' as provided for in statewide Rule 505.

4. Any completed or drilling well as of the effective date of the Commission Order shall be granted exception to the proposed rules as pertains to location of wells.

Yours very truly,

MAGNOLIA PETROLEUM COMPANY

D. V. Carter

OJF:BW

R E Howard

SUN OIL COMPANY

S. M. GLADNEY
MANAGER
T. E. HILL
ASSISTANT MANAGER

SOUTHWEST DIVISION
RIO GRANDE NATIONAL BUILDING
DALLAS 2, TEXAS

A. S. RHEA
SUPT. OPERATING DEPT.

March 31, 1959

Atlantic Refining Company
Box 1610
Midland, Texas

In Re: Allison and North Allison Pools

Gentlemen:

Sun Oil Company has reviewed the field rules application which has been filed with the New Mexico Oil Conservation Commission by the Atlantic Refining Company for the Allison and North Allison pools. Sun Oil Company is in accord with the plan for 80 acre spacing proration units and allocation as outlined in your application with the Commission.

Yours very truly,

SUN OIL COMPANY

A. R. Ballou

By
A. R. Ballou

ARB:mi

CASE 1637: (REHEARING JULY 15, 1959)
Atlantic Rfg. Co. to combine Allison Penn & N. Allison-Penn Pools & establish 80-acre proration units.

Case No.

1637

Application, Transcript,
Small Exhibits, Etc.

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

IN THE MATTER OF:

CASE 1637

TRANSCRIPT OF HEARING

JULY 16, 1959

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
JULY 16, 1959

IN THE MATTER OF:

CASE 1637 (Rehearing) In the matter of the rehearing requested by The Atlantic Refining Company for reconsideration by the Commission of Case 1637 which was an application for an order combining the Allison-Pennsylvanian and the North Allison-Pennsylvanian Pools in Lea and Roosevelt Counties, New Mexico, and for the promulgation of special rules and regulations in connection therewith to provide for 80-acre proration units.

BEFORE:

Gov. John Burroughs
Murrary Morgan
A. L. Porter

T R A N S C R I P T O F P R O C E E D I N G S

MR. PORTER: Take up next Case 1637.

MR. PAYNE: Case 1637. In the matter of the rehearing requested by The Atlantic Refining Company for reconsideration by the Commission of Case 1637 which was an application for an order combining the Allison-Pennsylvanian and the North Allison-Pennsylvanian Pools in Lea and Roosevelt Counties, New Mexico, and for the promulgation of special rules and regulations in connection therewith to provide for 80-acre proration units.

MR. PORTER: Mr. Bratton, how many witnesses do you

have?

MR. BRATTON: One, Mr. Commissioner.

(Witness sworn)

MR. BRATTON: Howard Bratton, Hervey, Dow & Hinkle, Roswell, appearing on behalf of the applicant, The Atlantic Refining Company. This case comes on for rehearing on the application of The Atlantic Refining Company for an order combining the Allison-Pennsylvanian and North Allison-Pennsylvanian Pools, and for the promulgation of special rules and regulations therewith to provide for 80-acre proration units.

In the application for rehearing, the applicant stated that additional information had been obtained by the drilling of additional wells in the area; that applic ant further had made calculations, material balance calculations, and volumetric calculations, and would present that evidence to this Commission upon rehearing.

Applicant is prepared now to present the evidence which it has obtained and the additional calculations and additional evidence which was not offered to the Commission at the first hearing. We are now prepared to offer that evidence at this time, to show that the two pools should be combined, and that 80-acre spacing and proration units should be established.

We have one witness, Mr. W. P. Tomlinson, who has already been sworn.

WILLIAM P. TOMLINSON,

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

DIRECT EXAMINATION

BY MR. BRATTON:

Q Will you state your name, by whom employed, occupation and address, Mr. Tomlinson?

A My name is William P. Tomlinson, employed by The Atlantic Refining Company as reservoir engineer in Rowell, New Mexico.

Q You are the same William P. Tomlinson who testified in the original hearing in this case?

A That's correct.

(Thereupon, Atlantic's Exhibit No. 1 was marked for identification.)

Q Mr. Tomlinson, referring to Exhibit No. 1, is that a new pool map showing the proposed boundaries of the pool?

A Exhibit No. 1 is a new pool map showing the boundaries that we suggested the Commission establish for the Allison Pool when it was combined with the North Allison. We presented maps similar to this at the original hearing. Since that time, operators in the southern portion of the field have asked that we extend the map to include some additional acreage. We've done so because we see no objection to bringing in that additional acreage. I would like to point out to you that the map has been brought up to date with additional wells drilled and completed since the first hearing. There are four of those. One is on the northeast flank of

the field located in the SW/4 NE/4 of Section 36. It's a dry hole, Cosden State No. 1 "C." It fell outside of our original proposed boundaries. Another well has been drilled and completed as an oil well in the area between the Allison and North Allison Pools. That well is located in the SE/4 of the SE/4 of Section 35. It is The Atlantic Refining Company's Federal Gulf No. 1, recently completed with an initial completion of 110 barrels per day with a small amount of water. Then, in the Allison Pool area, Cactus has completed the Sunray State "A" No. 2 in the SE of the NE/4 of Section 2. That well is an oil dual. The Cosden Petroleum Company has completed their Mills No. 1 in the NW/4 of the SE/4 of Section 11; it is an oil producer. At the present time, one well is drilling in the field that -- it is the Magnolia Petroleum Company's Cox Federal No. 3 located in the SE/4 of the NW/4 of Section 1. This development between the two pools definitely indicates to us that the pools should be combined.

(Thereupon, Atlantic's Exhibit No. 2 was marked for identification.)

Q Based on the new wells which have been drilled, have you prepared a new structure map, Mr. Tomlinson?

A Yes, we have.

Q That is Exhibit No. 2?

A Exhibit 2.

Q All right, sir. Will you refer to that Exhibit and explain what it shows?

A Exhibit No. 2 is a structure map contoured on ten-foot interval on the top of Bough "C" zone in the Pennsylvanian formation. That map is up to date with structure points from all of the additional wells that I have described. Principle changes in this map is that the structure is a little broader on the North end of the Field from what we showed it to be at the original hearing. Now, we completed The Atlantic Federal Gulf in the area between Allison and North Allison, and it confirmed our original structural interpretation in that area, in that there was no saddle shown that could be separating the Field. We think that is further confirmation that the two areas are a common reservoir.

Q Shown on Exhibit No. 2 is a red line,AA Prime,which illustrates your cross section?

A Yes, sir. The red line on Exhibit No. 2 AA Prime is a trace in the cross section from North to South in the Field. At the original hearing we had two cross sections, but we didn't think it was necessary to include an east-west cross section because no changes have occurred in development that affect it.

Now, Exhibit 3 is a cross section referred to on Exhibit 2. This has been brought up to date by the addition of one well, The Atlantic Federal Gulf No. 1, previously located on our maps. From the log of that well we have drawn connecting lines connecting the top and the bottom of the Bough "C" zone, and on the log of the well itself we have indicated the perforations that we made. The perforations can be seen to occur in an interval that correlates

with perforated intervals in wells to the North and South. This further leads us to conclude that the reservoir is continuous between the two pools, and that, in fact, in all places within the pool there appears to be continuity in pay.

Q That cross section runs from the North end of the North Allison Pool to the South end of the Allison Pool?

A That is correct. The first well on it is the Atlantic State "AD" No. 1, located in the North Allison Pool as a northernmost well. The Sun Mills No. 1 is the southernmost well in the Allison Pool.

Q And it shows continuity throughout that entire area?

A It certainly does.

Q Including the Gulf Well which has just been completed in the interval between the Allison and North Allison Pool?

A Yes, sir. The same Bough "C" zone appears in all the wells on this cross section and throughout the field. It is a common reservoir.

Q Mr. Tomlinson, as presently defined, where is the northern boundary of the Allison Pool and the southern boundary of the North Allison?

A Would you like me to define it on the cross section or the map?

Q Show it on the map as to how --

A The northern boundary -- on Exhibit 1, the northern boundary is indicated by a heavy blue dashed line. That is the

northern boundary of the Allison Pool; it occurs along the Township line. I believe it's between Township 8 South and Township 9 South. There is no pool designation for the area included in the next half mile north of that. Then, after proceeding one half a mile North, we come to the -- there is the southern boundary of the North Allison Pool. It is shown on Exhibit 1 as a heavy blue line.

Q So it is presently defined there as a half mile gap between the two pools, and the Gulf Well is located in that half mile gap?

A Yes, sir.

Q And it shows continuity from the North Allison through the Allison?

A Yes, sir.

Q Do you have anything further to say with regard to those three Exhibits, Mr. Tomlinson?

A I believe not, except that they do confirm our interpretation of the structure and continuity.

Q In your opinion, it is conclusive that the two pools should be combined, that they are continuous?

A It is conclusive that they should be combined.

(Thereupon, Atlantic's Exhibit No. 4 was marked for identification.)

Q Turning now to Exhibit No. 4, Mr. Tomlinson, will you explain what that Exhibit is?

A Exhibit 4 is a graph showing reservoir performance of the Allison and North Allison Pools versus time. It is similar to the graph that we presented at the original hearing. It has been brought up to date through additional production information that we have. At the top of the graph is a curve drawn in a light blue line, which is the gas-oil ratio for both the combined production for both pools. That shows that the ratios are generally continuing on about the same trend that was observed at the time of the original hearing. The heavy blue line in the middle of the page shows oil production as a combined figure for both pools. It shows an increase since last year, due principally to the completion of some additional wells.

The second line from the bottom of the graph shows the number of wells in the Field, shows that some additional wells have been completed. The percent of water is shown on the bottom of the graph, and it shows that the water production is continuing on about the same trend that it had at the time of the first hearing. There is no significant change there. I might say that the conclusions that you can draw from examining this production data here is that this is not a water drive reservoir. Had it been a water drive reservoir, the normal course of the water percentage curve would have been upward, particularly since this pool is several years old. I believe that's about all I have to say on that one.

(Thereupon, Atlantic's Exhibit No. 5 was marked for identification.)

Q All right, sir. Referring to Exhibit No. 5, your bottom hole pressure graph, what additional information do you have there, Mr. Tomlinson?

A We have additional pressures on The Atlantic wells. We've also got an initial pressure for the Cactus State "A" No. 2 that I referred to as being one of the new wells recently completed. Both the Atlantic Federal Gulf No. 1 and the Cactus Sunray State No. 1 had initial pressures substantially less than the 3518 pounds that was the original reservoir pressure. The Atlantic Federal Gulf had an initial pressure of 2956 pounds at the field datum. Now, that, in my opinion, could have been caused only by removal of oil from the vicinity of that well prior to its drilling. There is no way to account for that pressure.

Q Now, refer back to Exhibit No. 2 and locate those two wells that have come in.

A All right, sir. Exhibit 2 -- on Exhibit 2 The Atlantic Federal Gulf No. 1 is located in the gap between the Allison and North Allison Pools in the SE, SE/4 of Section 35. It's diagonally offset -- it is a diagonal offset from the nearest production in the Allison Pool area and directly south of the nearest production in the North Allison area. The conclusion there would be that development or production of oil from the Allison area and possibly from the North Allison area has affected the pressure that we've observed.

Q Now, where is your Cactus Well, Mr. Tomlinson?

A The Cactus Sunray State is in the defined limits of the Allison Pool in the SE of the NE/4 of Section 2. It is directly north of the Ohio State "A" 2, and diagonally SE of the Cactus Sunray State "A" No. 1. Now, that well is in one direction at leasthalf a mile from any other, and in the other direction it is on an 80-acre spacing pattern substantially better than a quarter of a mile away.

Q Both your Atlantic and Gulf Wells are on 80-acre spacing pattern from any other well, aren't they?

A Yes.

Q And your Gulf Well is a little further north from the majority of productions?

A Yes, sir.

Q And its bottom hole pressure came in a little higher than the Cactus Well, but both of them are substantially lower than the initial reservoir pressure?

A I would like to give the pressure on the Cactus Well. Let's see, 2408 pounds. We received that pressure a day or so ago. That is, oh, very much lower than the original reservoir pressure of 3518 pounds. It does fall near -- you were asking me then -- it does fall near to the principle production out of the reservoir, and consequently it does have a lower pressure at this time than it would have had it been located in a less drained area. I would like to show the Commission our original bottom hole pressure map so that they might get an idea of how these pressures fall in

with our original pressures that we had. Of course, they are not on the same survey. The first pressure map that we included in the first hearing was for a fieldwide survey that was taken in January and February. These were taken quite a bit later, and as a consequence we didn't feel we should contour these new pressures on this map, but they do have a similarity. They fit in our pattern of pressure distribution for the field and confirm our original interpretation.

Q This is referring back to what Exhibit introduced in the original hearing?

A I'm sorry, I don't know the number of that Exhibit. It is entitled "Allison North Allison Pools, December '58 and January, 1959, bottom hole pressures."

Now, first observe The Atlantic Federal No. 1. If it were shown on the original bottom hole pressure map that we presented at the first hearing, it would have been in the SE of the SE of Section 35, and it would have fallen between the 2900 and the 3000 pound contours on the bottom of the pressure map. In this case the pressure was 2956 pounds, so in that respect our ideas as to pressure distribution are pretty well confirmed.

Now, in the area of the Cactus Sunray State "A" No. 2, we found that the pressures have been drawn down a little more than we expected at the location of the Sunray State "A" No. 2. On the Cactus Sunray "A" No. 2 we showed a 2800 pound contour. Now, that well was completed, as I say, with an initial pressure of 2808

pounds at datum, it does confirm our idea that pressures had been drawn down in this area, but they had been drawn down more than we thought they would be. I'd say that all of those facts do confirm our original ideas that drainage is occurring in the Field and that there is continuity over wide distances.

Q As a matter of fact, your Cactus pressure shows that there has been more drainage from that area than you suspected?

A Oh, yes. There is even more than we thought there would be.

Q That's on 80-acre spacing pattern from any well?

A Yes, sir. I might add that on Exhibits 1 and 2 for this hearing, there is a Magnolia well drilling to the East of us, but it has not been completed.

Q Do you have anything further you want to state in regard to your pressure graph?

A Well, the only thing I could think of that I would like to point out here is that we don't have a fieldwide survey at this time. We did take pressures on all of Atlantic's wells, but we felt that nothing would be gained by asking all the other operators to go in the field and conduct a fieldwide survey, so it -- just by way of explanation, why, we have prepared a bottom hole pressure map again. All presures shown here are Atlantic's wells with the exception of Cactus initial pressure.

Q The two initial bottom hole pressures?

A Yes, sir.

MR. PORTER: Let's have a ten-minute recess.

(Short recess)

MR. PORTER: The meeting will come to order, please. Mr. Bratton, will you proceed with your witness?

Q (By Mr. Bratton) Have you compiled additional basic data based on the additional wells drilled, Mr. Tomlinson?

A Yes, we have Exhibit 6 shown in our bound copies of the Exhibit. It is a tabulation of basic data which has become available to us -- additional data which has become available to us since the time of the last hearing. Much of this information was presented verbally at the time of the original hearing. However, we have expanded this tabulation to include some facts that we didn't present at that time. Other things here have been revised to reflect more complete information available from the field or other operators. This covers physical properties of reservoir rock, structural features, fluid characteristics, pressures and temperaturs, statistical data, well completion methods, area within recommended boundaries of the pool, what the operators are doing with the gas that they produce. The principle changes in basic information that we had at the time of the last hearing and presented are as follows: The porosity has been changed from one and a half percent to 5.15 percent. The change in porosity is the result of the inclusion of one additional core on the east flank of the field. I would like to show you where that core is. The Magnolia Cox Federal No. 2. Now, shortly before the last hearing,

Magnolia recompleted that well. It was originally a dry hole, and it had a core on it at the time. We didn't present it and include it in our average because we thought that it was a dry hole, and wouldn't justify including it in any average of any other cores for the reservoir. It has little porosity and permeability, so both factors have been revised downward.

Permeability is shown as 107.2 milladarcies; it was a little higher at the previous hearing. The factor of average net pay thickness shown under structural features on this tabulation has been added. It is8.94 feet. Now, at the original hearing, I testified that I thought the average would be no more than ten feet; in this case we have included an arithmetic average for all of the wells.

Q That's picked off of the five cores and all of the logs in the field?

A Yes, sir, we used that -- all of that information to get this average. The statistical data has been revised in respect to oil production rate, the latest available that we have, cumulative oil production and the well count. There are eighteen producing at the present time, one drilling and two dry holes.

Q Now, your basic data is based upon further calculations, and will be presented further in your testimony, is that correct?

A That is correct. We have performed various calculations following this,and much of this information is used in it. Exhibit 7 shown in your bound copy of the Exhibits is a summary of

core analysis for the five wells on which we have cores. Now, they are the Gulf Federal Mills No. 2 located in the NW of the NW of Section 11; the Gulf Federal Mills No. 1, located in the NE of the NW of Section 11; the Magnolia Childers Federal No. 1, located in the NW of the NE of Section 11; Magnolia Childers Federal No. 2, located in the NE of the NE of Section 11, and the previously mentioned Magnolia Cox Federal No. 2, located in the NW of the NW of Section 12. All of those cores are in a straight line. Now, I'm pointing to Exhibit No. 2. You can see that they are located in the heart of the Allison Pool in an east to west direction. We do not have any cores for the North Allison area. The reason for that is that we made two attempts to obtain cores in the pay. The first was in the Atlantic No. 1; it turned out to be a dry hole. In the North Allison Pool, or on the edge of the North Allison Pool we felt that core was unusable in any kind of average. The other well that we attempted in the North Allison was The Atlantic Federal Yates No. 1, and the reason we didn't get a core there was because the pay was so thin we missed it when we tried to core. So we felt like that core shouldn't be included in the Bough "C" average.

Now, the changes in rock characteristics that we obtained from those five cores from the previous hearing is that average porosity, 5.1 percent instead of five and a half, and the weighted average permeability of 107.2 milladarcies is a little lower than we previously had submitted.

I note here on this summary of core analysis that the weighted average permeability for the Magnolia Childers No. 1 and the Childers No. 2 are both fairly low. They are -- one is .7 milladarcy and the other is 6 milladarcies. Now, they are in the heart of the Allison Pool. That might lead a person to think that those wells would be pretty poor wells, but they are both top allowable and have made large quantities of oil. The Magnolia Federal Childers No. 1 has made over 234,000 barrels of oil. Magnolia Childers Federal No. 2 has made over 155,000 barrels of oil. At the present time they are top allowable.

Q So that even with those low permeabilities, there must be effective permeability in order to produce that much oil?

A That is correct. It must be considerably more effective permeability to the well than has been measured on those two cores. As a matter of fact, the 6 milladarcies is a pretty good permeability for most limestone reservoirs.

Q How about your net pay? I notice it is 7.7 feet.

A Yes. That net pay is lower than we found the average to be for the field for this reason: when coring, oftentimes small portions of the pay are missed, particularly in the thin pay, you may not get started to coring right away, and then if someone samples a rock to look at it, some portion of the core may be lost, and, of course, you can see that you don't have ten feet or less to start with; it doesn't take much to throw you off. We felt that logs, in general, were more accurate as to determining the quantity

of the net pay we had. However, this .7 feet is the average of what we had in these cores.

Q Exhibit No. 3 is nothing more than the actual core analyses of which this data in Exhibit 7-R was tabulated, is that correct?

A That is correct. I couldn't make any conclusion from examination of this that I haven't already made from the summary.

Q And those core analyses are not in the brochures which were distributed, but they offer substantially the information which is in the brochure?

A That is correct. We have one copy here that we would include in our Exhibits.

(Thereupon, Atlantic's Exhibit No. 9-R was marked for identification.)

Q Refer now to Exhibit No. 9-R in the brochure, which is the net pay by wells of all of the wells in the pool?

A Yes, sir. Exhibit 9-R in the bound copies of your Exhibits is net pay by wells in the Allison and North Allison wells. We have listed the wells, the operators, and the leases. And the net pay is shown on the column on the right for each, opposite each of the individual wells. The arithmetic average thickness of all of those net pays is 8.94 feet. Now, those were obtained, of course, for the most part, from logs. We used this information in preparing our calculations that we are going to present to you later. The reason that we didn't include an isopach

map is that there is not enough variation in thickness to offer the developed portion of the field to contour a map. Since we do not know the boundaries of the field, we felt like an isopach map would be meaningless, and, in fact, an arithmetic average thickness is much more accurate.

Q Now, correlating your net pay, you have an Exhibit 10-R which is a core graph for one well?

A Yes, sir.

Q I believe this Exhibit is not in the bound volume, is that correct?

A That is correct. Exhibit 10-R is a reproduction of a microlog of the Warren Company's Federal Leo No. 1. Or course, that is now Gulf's Federal Mills No. 1. We shortened the logs somewhat and had them photostat, only the bottom portion, which is an expanded scale, and we included the top of the log. On the right side of the log is shown the Schlumberberger and microlog deflections to the left, which indicates porosity and it occurs generally in the interval between 9673 and 9679 feet. And there are some small streaks of pay below that in the vicinity of 9690 and 9694. We have core analysis over the interval -- have it plotted on this log over the interval from about 9671 to 9680, and from 9690 to about 9693. Now, those intervals are shifted slightly because of variation of measurement in the core and log, but we found that they measured up very well with the indicated porosity on the log. Now, the porosity on our core analysis opposite the

indicated porosity on the log varies between, about one, a little over three percent up to about eleven percent, and then back down to about one percent. That's the major zone of porosity in that well, and shows good correlation on our -- on that particular well, and leads us to conclude that logs generally in the field do give pretty good indication of porosity. And permeability is also plotted on this core. However, we make no claim that the microlog reflects permeability.

Q Based on the data which you have presented, have you made a new volumetric calculation for oil-in-place under a 40-acre tract under this pool?

A Yes,sir, we have.

(Thereupon, Atlantic's Exhibit No. 11-R was marked for identification.)

Q Referring to Exhibit 11-R, --

A Exhibit 11-R is contained in the bound copies of your report. On this Exhibit we have shown the basic formula for volumetric calculation and the factors that we put into it. We have explained where we got our porosity, and the net pay thickness, and we have made a calculation to cover an area of 40 acres. The interstatical water saturation used is 25 percent in this case. The calculated oil-in-place here is 58,841 barrels, and after applying a recovery factor of 30 percent, we found that recoverable oil will be 17,652 barrels. This is based on average thickness in the reservoir, and it is assuming that no drainage has occurred, that

that was the oil that was originally there. The wells in the field, of course, have produced considerably more than that, and we think that that is conclusive evidence that they are getting additional oil from areas a long ways from where the well is much more -- it would have to cover an area much more than 40 acres or even 80 acres.

Q To go along with Exhibit 11-R, refer to Exhibit 12-R and explain how that ties in to your volumetric calculation.

(Thereupon, Atlantic's Exhibit No. 12-R was marked for identification.)

A As I explained when I was talking about Exhibit 11-R, a lot of the wells have made much more oil than should have been in place under their 40-acre tract. Now, we thought that we'd better test the validity of the factors that we put into that calculation, so what we did was look at a well in the field that had made a lot of oil and might raise some questions as to where its oil would be coming from, and whether it could be coming from the 40 acres assigned to the well. So we made an additional volumetric calculation for the Gulf Mills No. 1 Well. What we wanted to find out is how much the various factors would have to vary, how much error we would have in them if -- to account for the oil that that well has made. So, doing that, we made several calculations, each one holding all factors in the calculations, but one constant, and solving to see what that particular factor would have to be to account for the oil-in-place of the net pay. We used 11 feet for the Gulf Mills No. 1. Now, that is the amount that we found on the

log for the well. Now, the required values, holding all of the values constant to account for the oil that it has made, you would have to have 106.4 feet. In porosity, we measured an average of 6.7 percent in core for that well. To account for the oil that the well has made, you would have to have 64.8 percent.

Now, the recovery factor was used as 30 percent, and we would have to have a recovery factor to have 290.3 percent. Of course, I'm not -- I don't want to convince anyone that you can get a recovery factor that high; that's an impossible number, of course. The water saturation was 25 percent. Now, we would have to have a factor of less than zero to account for it, and, of course, we could not have less than zero water saturation. The formation volume factors 1.821 taken from a fluid analysis, the formation volume factor would have to be 0.188. To allow that well to have as much oil as it has produced, all of those factors that we applied are measured except the water saturation and recovery factor. The water saturation usually occurs between 15 and 16 percent, but couldn't be less than zero, as I pointed out, and recovery factor normally occurs between 15 and 50 percent. So those two were estimated, but it is found that the range in which we could estimate wouldn't account for the oil that the well has produced. The well actually has produced 273,437 barrels as of May the 1st. And volumetric calculation would show that if the well were completely depleted at this time, it would have produced 28,258 barrels of stock tank oil from this 40 acres. Our conclus-

ion is that there is an area much wider than 40 acres contributing to the production of this well, and also this, the fact that we would have to vary these factors so much validates our calculation that we have shown on Exhibit 11-R.

Q Your conclusion, therefore, is that the earlier wells in the pool have drained from extremely wide areas?

A That is correct.

(Thereupon, Atlantic's Exhibit 13-R was marked for identification.)

Q Referring now to Exhibit 13 as to the economics of drilling one well per forty acres in the pool, will you explain what that shows?

A It is a -- it is shown in tabular form. It shows the revenue that we would get from oil and gas, after paying severance taxes, shows the cost of development and operating, and shows a loss of 160,302 dollars per 40-acre well, if all of the wells in the field were drilled at the same time. In other words, what we have done, we have taken the 17,652 barrels of recovery oil from each 40 acres and said that if the field were fully developed and other wells got a start on the others, those wells would all suffer a loss of about this magnitude. Of course, all the wells have not been drilled. At the same time, a lot of them got a head start, and it accounts for the fact that some of them are profitable. I must emphasize, however, that this -- it is a basic assumption that you would fully develop the field on 40 acres at the

same time.

(Thereupon, Atlantic's Exhibit No. 14-R was marked for identification.)

Q Turn to Exhibit 14-R, Mr. Tomlinson, and tell us what is in there, the material balance calculation which you made?

A Yes, this is a material balance calculation. The results are shown in tabular form. It is not an actual tabulation in 14-R. What we did is take three wells in the Allison and North Allison Pools. One is the Atlantic Federal Yates No. 1 in the north -- northernmost well in the North Allison. Another is the Ohio State "A" No. 2 in the middle of the Allison Pool, and -- no, beg your pardon -- it is in the Allison Pool to the south. And the third one is the Cactus Sunray State "A" No. 1, which is near the northern boundary of the Allison Pool.

Now, what we wanted to do there was to find out what would be the minimum area that these wells could be draining if -- to have all factors agree with the measured physical data that we have, that is the pressure and production. First, we calculated the oil-in-place for an 80-acre tract by volumetric method, and that is shown on the first line. The next line we show the results of a material balance calculation to determine how much oil would have been forced into the well bore by expansion of reservoir fluids and rock above the bubble point. That is from 3518 pounds to 3150 pounds. And, of course, you can see the range of figures there. They range from about 1414 barrels down to 1588 barrels -- up to

about 1,800 barrels. The next line shows the calculated production into the well bore by expansion of the reservoir fluids below the bubble point, and the results of that range from 1815 pounds up to 12,204 and -- change that pounds to barrels on it, 1815 barrels up to 12,204 barrels. And in each case we took the, as a pressure increment, from 3150 pounds down to whatever the reservoir pressure was at the time of the fieldwide survey. Now, the total calculated production from expansion from an 80-acre tract then would have ranged between 3,229 barrels up to 13,792 barrels. Actual measured production, of course, in all cases for all three wells was much more than that. The minumim was 14,653 barrels. Now, we concluded from our, results of our calculations that a lot of the production had to be coming from other areas, so we subtracted the production from expansion from the actual production and show that difference on the second line from the bottom of the tabulation. Now, that is the amount that was drained from other areas. Now, it's a very easy calculation to make, to compute the drainage area that each well is apparently draining there; that is shown on the bottom line. However, I would like to point out that that is the minimum area for each well which could contain the oil that resulted in the production from these wells. In reality, their drainage area could extend over a much wider area than that. That is because first, the reservoir is continuous in all parts, and second, all of the wells in the field are competing with one another for the oil that is in the reservoir. There is one other

fallacy here; it represents a cautious approach to this problem, and that is that some of these wells didn't start out, or none of them started out at 3513 pounds above the bubble point. All of them were -- had initial pressures less than that.

Q So that actually, even though those areas shown on the bottom line are exceeding wide areas, this study is still a very cautious approach, and actually the oil that has been produced must have come from even wider areas than that?

A It certainly did come from wider areas than that. That represents the minimum drainage area that they could have.

Q And these three wells, if the production had to date were coming from the 40 acres under these wells or even a limited area around there, the pressures would have had to drop extremely more than they have dropped?

A Well, yes, sir, they would. It would be much much lower and, as a matter of fact, you can see in Case 2 that the Ohio State "A" 2 has produced 112,000 -- has produced 110,607 barrels, and we calculated that that well only had in place a hundred and twelve thousand nine hundred and fifty-nine barrels originally, so that the pressure would be zero in that case.

Q Mr. Tomlinson, without going into them in detail in support of the result shown on Exhibit 14-R, you've attached Exhibits 15-R and 16-R, a sample calculation to substantiate your Exhibit 14-R, and the nomenclature which you have used in that calculation, is that correct?

A That is correct. The sample calculation simply applies to The Atlantic Federal Yates No. 1 and it's two types of material balance, one for the pressure increment above the bubble point to determine production during that period, and the other is for production below the bubble point. It is two types of balance used. They are conventional balance, and the nomenclature used in these is AIME standard nomenclature, I believe.

(Thereupon, Atlantic's Exhibit 17-R was marked for identification.)

Q Turn to Exhibit 17, Mr. Tomlinson, and explain what that is.

Q Exhibit 17-R shows the results of calculations made to determine what the recovery factor would be in this field under the various well spacing program. Two, of course, that we are interested in is 40-acre spacing and 80-acre spacing. Now, what we wanted to show here was how much the recovery factor changes with well spacing, and it is shown on the left side of the graph as a scale recovery factor percent original oil-in-place. The well spacing and acres per well shown across the bottom runs 1 acre and 160 acres, so the field extends something further. The logical use of this graph is to find how much additional oil you can get if you had an 80-acre tract and drilled it with one well, and recovered all of the oil that well could get, and then could redrill it under the same conditions with two wells, and produce it to determine how much oil you could get. Now, the original oil-in-

place for that 30-acre tract, for an average 30-acre tract in the pool, 117,632 barrels. Now, the recovery factor under 40-acre spacing is estimated to be 26 percent. The calculation that we use is 26 percent here, and on 30-acre spacing it is 25.97 percent, a difference of only three-hundredths of 1 percent. Now, that will change the recoverable oil from that 30-acre tract from 30, 700 and -- beg pardon, start over on that -- 30,597 stock tank barrels under 40-acre spacing to 30,562 barrels. Under 30-acre spacing the difference is 35 stock tank barrels. This, in my opinion, shows that practically no additional oil would be recovered under 40-acre spacing in the Allison and North Allison Pools.

Q You've called this a hypothetical reservoir, but actually you have used in your calculations all of the available data from the Allison and North Allison Pools, have you not?

A We've used all of it, and we did have to pick up some information from one or two other reservoirs. I think there was only two curves we used in our calculation from other reservoirs. That is a common procedure used in engineering work. When you don't have all of the information you need, you look around for a similar reservoir to obtain what you do need.

Q Now, Mr. Tomlinson, you denominated it as an estimated recoverable factor. Actually, it is a calculated recovery factor, is it not?

A Yes, sir.

Q And the method of how you have arrived at that cal-

culated recovery factor is set forth in Exhibit 17-R, is it?

A That is correct. I believe that there is an Exhibit in each of your bound Exhibits. It hasn't been up. It is loose -- wait a minute. Is that it?

Q Yes.

A It is a discussion of how we made the calculations to arrive at this curve. They are very lengthy calculations, in general. What we started out to do was to find out how much the saturation would change in the reservoir under various well spacing. So, first we ran a material balance to find the saturation versus pressure in the reservoir at various pressures, and then, secondly, we made a solution of the radial flow equation to obtain pressure versus radius of drainage, and cross plotted those results from those calculations to obtain the information placed on Exhibit No. 17-R.

Q Now, your actual method is set forth in Exhibit 18-R, and attached to the original Exhibit 17-R, which you will introduce, are the actual calculations that went in --

A Yes, sir, that is correct.

Q -- to get the result?

A Shown are material balance forms and graphs and other physical calculations involved in this work.

Q Those are too voluminous to include in each bound volume, but they are attached as a part of the original Exhibit 18-R?

A That is correct.

(Thereupon, Atlantic's Exhibit No. 19-R was marked for identification.)

Q Turning now to Exhibit 19-R, Mr. Tomlinson, and explain what that is.

A Exhibit 19-R is a logical extension of the results of Exhibits 17-R and 18-R. It shows that the additional cost to develop Allison and North Allison Pools on 40 acres, 29 additional wells would be required, if the pool were fully developed, and would cost $5,991,400, based on recent drilling cost figures. The additional recovery we would get would be 1,015 stock tank barrels, based on the results from Exhibit 17-R.

(Thereupon, Atlantic's Exhibit No. 20-R was marked for identification.)

Q Refer on the wall to Exhibit 20-R, Mr. Tomlinson, and explain what that plat shows.

A Exhibit 20-R is a development plan for the Allison Pool area. The plan covers the area included on our proposed boundaries for the Allison and North Allison Pools. The plan shows that 80 acres can be assigned to each well in the pool, and that there is substantial room for additional development on 80 as well as 40. In this case we ran the extended proration units, for the most part, in the north-south direction. However, under our rules, they could be extended in either direction.

Q Have you discussed this plan of development with the

other operators in the pool?

A Yes, sir, we have. We have discussed it with all of the operators. None of them have expressed opposition, to my knowledge, of the idea of assigning each well 80 acres.

Q Do you have available some letters, Mr. Tomlinson, in that regard?

A Yes, sir. Some of the operators have written us expressing approval of that plan. And I have letters here.

Q Let's not bother with them at this time. If you will explain who they are from --

A I'll name the companies that sent them to us. Skelly Oil Company, who owns an interest in each of the areas included in the North Allison Pool. Ada Oil Company, who operates a well in the Allison Pool. Ohio Oil Company, who operates two wells in the Allison Pool, and Gulf, who operates two in the Allison Pool and has an interest in the North Allison Pool. Cactus Drilling Company also agreed to the idea of assigning 80 acres to each well, and they operate a well -- two wells in the Allison Pool. Now, we have contacted all of the other operators, and all of them have been favorable to the idea of assigning each well 80 acres.

Q Mr. Tomlinson, in summation, what does the evidence which you've presented here today prove, in your opinion?

A It proves conclusively that wells in the Allison Pool have the ability to drain wide areas, and, in fact, have already drained wide areas. It shows that no waste or practically negligible

waste will result if the field is developed on 80 acres. It shows continuity between the two reservoirs as well as continuity between various wells in the area.

Q In your opinion, is the evidence conclusive proof that one well will efficiently drain 80 acres?

A Yes, sir, it does.

Q At this point in the development of the pool, can a well be economically drained on 40 acres in that pool?

A You mean economically drilled?

Q Drilled -- excuse me.

A No, sir, I do not believe it can. I assume by that -- you say economically drilled, you mean if it were drilled to recover only that oil occurring under its 40 acres?

Q That is correct. And, in your opinion, would the granting of the application of Atlantic in this case prevent waste and protect correlative rights?

A Yes, sir.

Q In your opinion, would the drilling of this pool on 40-acre spacing result in the drilling of unnecessary wells?

A Yes, sir.

Q Were Exhibits 1-R through 20-R prepared by you or under your supervision?

A Yes, sir.

MR. BRATTON: We would like to offer Exhibits 1-R through 20-R in evidence, and also the letters from the other opera-

tors to which Mr. Tomlinson referred.

MR. PORTER: Without objection, the Exhibits will be admitted.

(Thereupon, Atlantic's Exhibits Nos. 1-R through 20-R were received in evidence.)

MR. PORTER: Anyone have a question of Mr. Tomlinson?

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Tomlinson, you have used, in making your estimates of reserves in this pool, an average net pay thickness of 8.94 feet, is that correct?

A Yes, sir.

Q Is that what your idea of the average thickness for the entire proven area is at this time?

A In the observable area that is the average.

Q There is quite a variation, though, isn't there, for net pay thickness from one well to another?

A Quite a bit of variation percentagewise from one well to another. However, the magnitude of the pay itself is small, the amount of the pay zone is small for most of the wells. The best well that we have seen to date is the last one completed, the Atlantic Federal Gulf No. 1. It seems to be a little thicker in that area.

Q Now, your 8.94 feet is based on logs or on cores?

A For the most part, on logs. We didn't have enough

cores to cover the entire field, and in addition, I suspect that some of the core analyses did not reflect all of the pay.

Q You think that's the case there in that Magnolia Childers No. 1? It seems to be offset by a well to the west with 11 feet, and a well to the east with 0.2 feet, --

A Yes, sir.

Q -- but it only has --

Q That was measured in the core, the 4.5 feet. However, the log appears to have -- the log indicates that the well has about 7 feet of pay.

Q So this may be a case where the core didn't reflect, the coring tool couldn't catch all the core?

A That's right. We would think that the error introduced -- when you compare cores and logs -- the error introduced by the logs, if any, is a little bit on the side of, including more pay.

Q I think even in your direct testimony, Mr. Tomlinson, didn't you mention that when you have a thin pay like this, it is very difficult to catch the core for the entire interval?

A It certainly is. We missed one entirely in one of our wells. We thought we were at a correct place to put a core barrel and tried to catch a core, and found we missed it entirely.

Q So, these cores that we have on five wells may not be representative of the reservoir, actually, is that correct?

A I think they are pretty representative of the reservoir.

They are the best information that we have.

Q They are representative of the part of the reservoir that was cored?

A That's correct.

Q Now, have you used the cores that you had in determining how much thickness you had on the electric logs, have you correlated the logs with the electric logs?

A Oh, yes, we correlated to see if the logs would reflect porosity, and found that they do. As I explained before, the logs, in our opinion, would tend to reflect more pay than the core; that's why we relied, for the most part, on the logs for net pay figures.

Q But you used a questionable source of information, being the cores, to attempt to determine how much pay you have on the electric logs, is that correct?

A I don't think it is questionable. We have certainly measured -- and the results from the core analyses are measured results, they are positive figures that cannot be discounted, in my opinion.

Q I see. Well now, on your Exhibit 11-R, you've calculated that the reserves under a 40-acre tract would be 58,841 barrels?

A Yes, sir.

Q And you used the recovery factor of 30 percent, and came up with 17,652 barrels?

A Yes, sir.

Q Now, would two times that 47,732 barrels represent the amount of recoverable oil under an 80-acre tract, if you had the same recovery factor?

A Yes, sir, on an average 80-acre tract.

Q Well, would two times that amount pay for a well?

A Well, I think we can turn over to Exhibit 13-B and see if it would. The total gross revenue after paying severance taxes for one well on 40 acres would be $47,710, and if we used the same amount of recovery for, or double that amount of recovery, and double that amount of gross revenue, you would see that you'd have, oh, about $94,000, $95,000 in gross revenue. Now, the cost for drilling is $206,600, so it wouldn't pay for that.

Q So an 80-acre well is not going to pay out?

A It wouldn't.If all the wells on the field were drilled at the same time on 80-acre spacing, you couldn't make money.

Q But these calculations back here on Exhibit 11 were based on the original amount of oil-in-place before any drainage occurred, correct?

A Correct.

Q Then you contend that up in this north end there has been substantial drainage from that area?

A That is correct; I'm sure there is.

Q So right now there is less than the original amount of oil in the north area, and even under the original conditions,

an 80-acre well shouldn't pay out?

A That is correct.

Q But you are continuing to drill on 80-acres up in the north end?

A We are continuing to drill there, or I should say, in the north end, because we feel that the reservoir, as a whole, has enough oil in it to pay for the well now, pay for these wells which we are drilling, when it is divided up among the wells now existing and the ones we plan on drilling. We have not --

Q Do you think this will be drilled on 80 acres?

A I doubt very much that the reservoir will be drilled on 80 acres. I don't believe the operators can make any money doing that. Now, it may seem confusing that we are asking for 80-acre spacing here when it looks like we ought to be asking for something much wider in order to make money, in the order of 160 acres. Had we had an opportunity to plan our development in this reservoir and asked for the spacing we would like to have when the well was first -- when the field was first discovered, we would ask for 160-acre spacing or something wider. Now, the way development has taken place in the reservoir, at this time, you can't assign more than 80 acres to some of the wells. If we could assign more than 80, we'd be asking for wider spacing.

Q I see.

A It's the best compromise.

Q Is this, the Sun ~~Cosmic~~ Conden Well down here in Section 1,

a completed well, Mr. Tomlinson?

A Well, yes, sir, that's the Cosmic Mills No. 1. They got that acreage on farmout from Sun.

Q Now, has that well been drilled since the last hearing?

A Yes, sir.

Q What was its potential?

A It pumped 124 barrels of oil and 173 barrels of water, and it was completed on June the 19th.

Q Now, back to that 11-R. You used a recovery factor of 30 percent, but in your calculations of recovery factor, you came up with 26.00 percent for 40 acres, and 25.97 percent for 80 acres?

A Yes, sir. That is due to the timing that we had in preparing these Exhibits. We felt that 30 percent would include all of the recoverable oil. When we had time to run through a calculation to determine exactly what the recovery factor would be, it came out two and a sixth percent, a little less.

Q Mr. Tomlinson, as a practical engineer and notwithstanding the supposed validity of these calculations that indicate there is a difference of thirty-one hundredths of one percent difference in recovery factors for the area, as a practical man, do you think that there is going to be 35 barrels difference of recovery on 80-acre spacing versus 40-acre spacing?

A I think that we may have left out some things that could cause it to be even more favorable for 80-acre spacing. For example, you go out to operate two wells to get the recovery factor down that low, and the chances are pretty good that you might operate one well a little more economically than you could two. So, from the practical standpoint, I think that that figure is in the magnitude of the difference -- 35 barrels, in the magnitude of the difference you would have under 80 and 40-acre spacing.

Q But you have enough confidence in the calculations there -- the recovery factors there, to believe that the difference would be in the range of 35 barrels?

A Yes, sir, I have that confidence.

MR. NUTTER: Thank you.

QUESTIONS BY MR. PORTER:

Q Mr. Tomlinson, pursuing this matter of reserves a little farther, I believe you testified that there were 17,652 barrels of recoverable oil-in-place under the average 40-acre unit?

A Yes, sir I believe that was it.

Q That was under original conditions?

A No, sir, the figure I used is --

Q Recoverable oil?

A Recoverable oil, yes. 17,652.

Q Would you say that your proposed pool boundary pretty well represents the productive area?

A Mr. Porter, I don't believe it does. The productive

area could extend -- refer to Exhibit 2-1. Productive area has not been defined to the south, to the west, or not very much on the east side of the field. The southeast side is still open. Now, in our studies we found that the oil that is being produced from the field could not be contained in the area that we have outlined.

Q This is what I was getting at. According to your unit, you propose here, I believe, thirty 80-acre units which would make sisty 40-acre units?

A Yes, sir.

Q Now, in multiplying that out, I found the oil-in-place under those 60 40-acre units would be a million fifty-nine barrels, something -- a million fifty-nine thousand and a hundred and twenty barrels?

A Yes.

Q You might check those figures, 60 times 17,652.

A I imagine they are about right. I believe there is 29 units, though, instead of 30.

Q Well, it would be fairly close, the figures?

A It would be, then, 58 units times 17,652 will be roughly a million barrels.

Q Makes me wonder where this 998,553 barrels has come from, and there are still a lot of wells in the pool producing top allowable?

A We wonder too. I might point out that we've been

drilling wildcats; not real close to this field, but we think probably there is room for wildcats around here, and probably there will be more wells drilled some day. I feel that the productive area extends considerably beyond our proposed boundaries, of course.

QUESTIONS BY MR. NUTTER:

Q Mr. Tomlinson, is there a possibility that there is some oil coming from within the same area that is not included in this 8.9½ feet of net pay?

A Very little possibility of that. You are thinking some is coming from some zone above or below?

Q Is there any oil in-place except in the net pay area?

A No, sir, the Bough "B" has been examined and tested several wells by us, and we couldn't find any oil in that zone. It is barren.

Q And Bough "C" is the only productive zone?

A Yes, sir, that's the only one. I might amend that to say that the San Andres is about 5,000 feet, and had a few oil shows in it, but not enough to justify completion. However, this Bough "C" zone is around 9600 or 9700 feet deep.

MR. PORTER: Mr. Payne.

QUESTIONS BY MR. PAYNE:

Q Mr. Tomlinson, isn't most of Atlantic acreage in the north end, and that you say it is one pool there?

A We operate this acreage. However, it is an operating

unit that we operate for Gulf, Magnolia, Atlantic and Shelly.

Q Now, did you testify that you feel that there has been some drainage from the north end to the south end --

A Yes, sir.

Q -- during the life of this pool?

A Yes, sir.

Q Now, if your application here is granted, the allowable for those wells in the south end is going to be considerably higher, is it not?

A Yes, sir.

Q So that your acreage in the north end will be drained even more than it is under existing conditions?

A We are busy developing it.

QUESTIONS BY MR. HUTTER:

Q But those are non-commercial wells, Mr. Tomlinson?

A If they were non-commercial, we wouldn't be drilling on those. We feel we have got enough of a start of development in the field, as a whole, to pay these wells out. Our contention is that some development can occur profitably, but if you try to develop the entire field on 40 acres, why, we are not going to make a profit on those additional wells that we drill.

Q You wouldn't be able to make a profit if you develop on 80 either, would you?

A No, sir.

Q So what are you going to do, stop before you get to the

end of the pool?

A We are going to stop before it gets fully developed, I am pretty sure. I say "we." There is always a matter of opinion there. Some other operators might wish to drill a little longer than we do. We don't have control of development all over the pool.

Q Do you plan any well in the NE/4 of Section 35 besides the one that is there now?

A Northeast of 35?

Q Yes, sir.

A We have none scheduled to drill right now. Our management has not approved anything for that location at the present time.

Q Would you recommend that a well be drilled there?

A I probably would not.

Q You included the pool boundaries that you suggested --

A I suggested the pool boundaries because I think it is productive.

Q Does Gulf operate the S/2 of Section 35?

A No, sir, that is in the unit that we operate, and Gulf is the original leaseholder there.

Q I see. Do you think a well there would be productive?

A In -- where, now?

Q The W/2 of the SE/4 of Section 35?

A I think it would -- it would be productive.

MR. UTTER: I believe that's all.

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

QUESTIONS BY MR. MORGAN:

Q Mr. Tomlinson, is there any significance in the fact that you -- in your Exhibit 1-R, you show the E/2 of the SW/4 as the pool boundary, and then you show the proposed boundary in that same tract on Exhibit 20-R, and you didn't show it?

A 1-R, you are talking about the E/2 of the SW/4 of Section 1, I believe, --

Q Yes.

A -- being left out of our spacing? That tract is included in the present boundaries of Allison Pool, and our proposed boundary would leave that out. The hashed line cuts it off. The hashed line around the boundary of 1-R is our proposed limit. We didn't put it on here on 20-R. We would have no objection to extending that pool as far as the Commission would want to in any direction.

MR. MORGAN: That is all.

MR. PORTER: Anyone else have a question? The witness may be excused.

(Witness excused)

MR. BRATTON: After the statement, I would like to make a concluding statement, Mr. Porter.

MR. PORTER: Anyone have any statement to make in this

case?

MR. EASTLAND: I am Jim Eastland from Roswell, New Mexico, appearing on behalf of Gulf Oil Corporation. Gulf believes the evidence is clear and convincing that the Allison Pennsylvanian and the North Allison Pennsylvanian Pools should be combined in that the oil from these pools is being produced from common reservoirs. We further believe that one well can efficiently drain the 80 acres, and that if less than 80 acre proration units are set up, economic waste will result because of -- it would tend to require the drilling of unnecessary and unprofitable wells. We, therefore, concur in Atlantic's application, and we urge that the Commission adopt appropriate orders, rules and regulations to combine the Allison Pennsylvanian and the North Allison Pennsylvanian Pools, and to establish 80-acre spacing as a common pool.

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

MR. BRATTON: Mr. Examiner, I didn't participate in the original hearing on this case, so I came into it somewhat cold when the application for rehearing was filed. I know that the Commission was sincere and conscientious when it turned down our original application, and we went on the assumption that it was because we didn't present every scrap of evidence that could be obtained. So when we started out to prepare this case for rehearing, I told Atlantic to prepare every iota of evidence that could be possibly obtained pertaining to this thing. When they

came back to me with the evidence and the drainage areas, the size of the area that is necessary to contribute the oil that has already been recovered from the pool, and is still being recovered, my reaction was just like that of the Commission, as demonstrated by some of their questions. "There is something wrong here, where is the fallacy?" "There must be more pay or there must be something else," and I want the Commission to believe that we have sincerely and conscientiously tried to determine if there is any possible miscalculation on any of the factors that have gone into computing the oil that is in-place under one of those tanks, and we can't come up with any other conclusion other than that this pool -- there is oil coming into this area from tremendously wide sources. That is the only possible conclusion that can be reached. We have tried every way we know to legislate the oil-in-place under a 40-acre tract in this pool because it's just so completely out of proportion with the oil that is being recovered, but we just haven't been able to come up with any other answer. Every bit of information that we have been able to obtain, and we have tried to present it all here to the Commission today, shows absolutely that under a tract in this pool, there just isn't enough oil to pay it out on 40 acres, and that that oil is coming over a wide area. Now, if somebody were to, in my opinion, act foolishly and start a 40-acre pattern in that pool it could result in severe economic loss to these operators because as further wells are drilled in this pool, there is an economic limit to how much oil can come into this area, and somebody is going to

start losing a lot of money. As Mr. Tomlinson said, actually, from information we have points to drainage over a tremendously wide area much larger than 80 acres. But 80 acres is the best you can do in that pool at this time, and that's what we've asked for, and we sincerely and conscientiously believe that our apolication is justified, and we have tried to present every bit of information we could to the Commission to show what exists in that pool, as we know it. Thank you.

MR. PORTER: Anyone else have anything to offer in this case? Take the case under advisement and recess the hearing until one-fifteen.

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, J. A. Trujillo, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Proceedings before the New Mexico Oil Conservation Commission was reported by me in Stenotype and reduced to typewritten transcript by me, and that the same is a true and correct record to the best of my knowledge, skill and ability.

WITNESS my Hand and Seal this, the 5th day of August, 1959, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Joseph A. Trujillo
Notary Public

My Commission Expires:

October 5, 1960

DEARNLEY - MEIER & ASSOCIATES
INCORPORATED
GENERAL LAW REPORTERS
ALBUQUERQUE, NEW MEXICO
3-6691 5-9546

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

APPLICATION OF THE ATLANTIC REFINING COMPANY FOR AN ORDER COMBINING THE ALLISON-PENNSYLVANIAN AND NORTH ALLISON PENNSYLVANIAN POOLS, LEA AND ROOSEVELT COUNTIES, NEW MEXICO, AND FOR THE PROMULGATION OF SPECIAL RULES AND REGULATIONS TO PROVIDE FOR 80-ACRE PRORATION UNITS.

CASE NO. 1637
Order No. R-1389-B

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on April 15, 1959, at Hobbs, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission," and Order No. R-1389 was entered on May 7, 1959. The case was reopened and a rehearing held on July 15, 1959, at Mabry Hall, State Capitol, Santa Fe, New Mexico.

NOW, on this 26th day of August, 1959, the Commission, a quorum being present, having considered the application and the evidence adduced at the original hearing and at the rehearing and being fully advised in the premises,

FINDS:

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

(2) That the applicant, The Atlantic Refining Company, seeks an order combining the Allison-Pennsylvanian Pool and the North Allison-Pennsylvanian Pool, Lea and Roosevelt Counties, New Mexico.

(3) That the testimony presented establishes that the wells in the Allison-Pennsylvanian Pool and the North Allison-Pennsylvanian Pool, as well as certain intervening acreage, are producing from a single common source of supply and that said pools should be combined and designated as the Allison-Pennsylvanian Pool with the pool to encompass the acreage shown in Appendix "A" attached hereto and made a part hereof.

(4) That the applicant further seeks the promulgation of special rules and regulations for said Allison-Pennsylvanian Pool to provide for 80-acre proration units.

(5) That the applicant has proved by a preponderance of the evidence that the Allison-Pennsylvanian Pool, comprising the acreage shown in Appendix "A," can be efficiently and economically drained and developed on 80-acre proration units.

(6) That to require development of the Allison-Pennsylvanian Pool on 40-acre proration units might cause the drilling of unnecessary wells.

(7) That the evidence presented indicates that it is uneconomical to drill wells on 40-acre proration units in the Allison-Pennsylvanian Pool and to remain on such a spacing pattern might impede further development in said pool.

(8) That the subject application should be approved.

IT IS THEREFORE ORDERED:

(1) That Commission Order No. R-1389, dated May 7, 1959, be and the same is hereby superseded effective September 1, 1959.

(2) That special rules and regulations for the Allison-Pennsylvanian Pool in Lea and Roosevelt Counties, New Mexico, with horizontal limits as described in Appendix "A," be and the same are hereby promulgated as follows effective September 1, 1959; provided, however, that the increased allowable provisions contained herein shall not become effective until October 1, 1959.

SPECIAL RULES AND REGULATIONS FOR THE
ALLISON-PENNSYLVANIAN POOL

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

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

RULE 3. The initial well on any 80-acre unit in said pool shall be located within 150 feet of the center of either the NW/4 or the SE/4 of the quarter section on which the well is located. Any well which was drilling to or completed in the Allison-Pennsylvanian Pool prior to September 1, 1959, is granted an exception to the well location requirements of this Rule.

RULE 4. For good cause shown, the Secretary-Director may grant exception to the requirements of Rule 2 without notice and hearing when the application is for a non-standard unit comprising a single quarter-quarter section or lot or when the application is for the purpose of joining fractional lots not exceeding 20.49 acres each with a standard unit. All operators offsetting the proposed non-standard unit shall be notified of the application by registered mail, and the application shall state that such notice has been furnished. The Secretary-Director may approve the application if, after a period of 30 days, no offset operator has entered an objection to the formation of such non-standard unit.

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

RULE 6. An 80-acre proration unit (79 through 81 acres) in the Allison-Pennsylvanian Pool shall be assigned an 80-acre proportional factor of 4.77 for allowable purposes, and in the event there is more than one well on an 80-acre proration unit, the operator may produce the allowable assigned to the unit from the wells on the unit in any proportion.

IT IS FURTHER ORDERED:

That Operators who propose to dedicate 80 acres to a well in the Allison-Pennsylvanian Pool must file an amended Commission Form C-128 with the Hobbs District Office of the Commission by September 15, 1959, in order that the well may be assigned an 80-acre allowable on the October proration schedule.

APPENDIX "A"

ALLISON-PENNSYLVANIAN POOL

HORIZONTAL LIMITS

TOWNSHIP 8 SOUTH, RANGE 36 EAST, NMPM, ROOSEVELT COUNTY

Section 35: E/2
Section 36: W/2 W/2

TOWNSHIP 9 SOUTH, RANGE 36 EAST, NMPM, LEA COUNTY

Section 1: W/2 W/2
Section 2: E/2 NW/4, SW/4, E/2
Section 10: NE/4
Section 11: All
Section 12: W/2 NW/4

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

JOHN BURROUGHS, Chairman

MURRAY E. MORGAN, Member

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

lcr/

DISCUSSION OF RECOVERY CALCULATIONS

Atlantic has made the attached calculations to show that spacing of wells in an oil reservoir does not materially affect the ultimate recovery from that reservoir so long as the permeability and porosity are continuous. The final results of these calculations is a plot of recovery factor versus well spacing and is included as an exhibit. It can be seen from the exhibit that after well spacing exceeds 10 acres, the change in recovery factor is negligible.

The approach to this problem was first to determine oil-in-place at bubble point and to predict future performance of the reservoir as a function of pressure. Then by estimating the minimum bottom hole working pressure for each well, the producing rate was calculated as a function of the shut-in reservoir pressure. With these two plots versus pressure, it was possible to determine the residual oil saturation in the reservoir when the producing rate reached the economic limit of 5 BOPD per well under various spacing patterns. The residual oil saturations were used to calculate the recovery factor as a percent of original oil-in-place (not bubble point oil) as plotted in the exhibit versus well spacing. A detailed explanation of the purpose of each of the attached calculation sheets is as follows:

Page 1. Since the gas liberation process in the reservoir is of a differential type, it is necessary to convert stock tank oil production and separator gas production to a differential basis. Page 1 of the calculation sheets has been designed for this purpose. In our calculation which is over the pressure range of 3150 psi to 2734 psi, the stock tank production of oil was 1,475,000 barrels and the separator gas production was 1894 MMSCF. In terms of differential production these figures are equivalent to 1,454,000 residual differential barrels of oil and 1875 MMSCF.

Page 2. The differential production figures arrived at in Page 1 are used in calculations shown on Page 2 to determine the oil-in-place in the reservoir at the bubble point pressure. The oil-in-place at the bubble point is calculated to be 21,840,000 barrels.

Page 3. Page 3 is a calculation of future reservoir performance versus pressure. For purposes of this calculation the oil saturation at bubble point was estimated to be 75% of total pore space; i. e, 25% water saturation and no free gas. Relative permeability ratio data was not available for the Allison Pennsylvanian reservoir so an average of six West Texas dolomite reservoir relative permeability curves was used. This is a trial-and-error calculation wherein an oil saturation at the end of each pressure increment is assumed and other factors calculated to agree with the assumed oil saturation to facilitate the calculation of an oil saturation at the end of the pressure increment. This process is repeated until the calculated oil saturation agrees with the assumed oil saturation for the end of each pressure increment. Successive pressure increments are used from the bubble point pressure to a point at or below abandonment reservoir conditions and oil saturations calculated at the end of each pressure increment. A plot of these oil saturations versus mean reservoir pressure is shown as Curve 1 on Page 9 of the attachments. This form is also used to determine the oil production in terms of residual differential barrels for each pressure increment assumed.

Page 4. Page 4 is a calculation sheet for converting the residual differential barrels calculated production from Page 3 to stock tank barrels. It is also used for converting differential gas production from Page 3 to separator gas production. Curve 4 on Page 9 is a plot of stock tank production versus reservoir pressure as calculated on Page 4.

Page 5. Under flowing conditions the fluid saturations in the reservoir will vary from a minimum value at the well bore to a maximum value at the extreme radius of drainage of a proration unit. The reservoir pressure will also be a minimum at the well bore and maximum at the extreme radius of drainage. Since this is true, it is necessary to solve the radial-flow equation for oil influx in the well bore in its differential form as the permeability is a function of pressure and viscosity and volume factors are a function of pressure. The calculation on Page 5 is for the evaluation of the integral which appears in the following equation:

$$q_o = \frac{7.08 \times h}{1000 \ln(0.607 \frac{r_e}{r_w})} \int_{P_{wf}}^{P_e} \frac{k_{ro}}{\mu_o B_o} dp$$

Since it is impossible to write an equation defining relative oil permeability, oil viscosity, and oil formation volume factors as functions of pressure, it is necessary to evaluate the integral in the above equation for average conditions in small successive pressure increments from the pressure at the extreme radius of drainage to the well bore working pressure. A plot of the values of this integral as a function of mean reservoir pressure is shown as Curve 3 on Page 9. Relative oil permeability data used in evaluating this integral is shown on Page 10. A value for K_4, productivity index permeability, was calculated from a productivity index test taken on Atlantic's Federal ~~Gulf~~ No. 1 Well. This calculation is shown on Page 7.

Page 6. It will be noted from the above radial flow equation that for a given radius of drainage the oil influx rate into the well bore will be directly proportional to the value of this integral. It will further be noted that the radius of drainage does not affect the value of this integral, therefore, it is possible to solve the above equation for the required value of the integral to sustain a given production rate for a given radius of drainage. In the Allison and North Allison Pools, we estimate the abandonment producing rate of each well will be 5 BOPD. Substituting this value into the above equation, values of the integral to maintain a producing rate of 5 BOPD are calculated on Page 6. Then referring to Curve 3 on Page 9 and Curve 1 on Page 9, the residual oil saturations existing in the reservoir and abandonment conditions for various radii of drainage are determined. These residual oil saturations are tabulated on Page 6. By use of Curve 4 on Page 9 the stock tank oil production from bubble point to abandonment conditions for different radii of drainage is determined. These values of

stock tank oil production are also tabulated on Page 6. Adding to these stock tank production figures the amount of oil that was produced from the reservoir between the original reservoir pressure and bubble point pressure, a recovery factor as a percent of original oil-in-place is calculated as shown on Page 6. These calculated values of recovery factors are shown as a smooth curve versus well spacing in the exhibit.

Page 8. Page 8 is a sample calculation of the value of the above mentioned integral assuming q_o = 5 BOPD and R_e = 745 feet.

DOCKET: REGULAR HEARING JULY 15, 1959

Oil Conservation Commission - 9 a.m., Mabry Hall, State Capitol, Santa Fe, New Mexico

ALLOWABLE: (1) Consideration of the oil allowable for August, 1959.

(2) Consideration of the allowable production of gas for August, 1959, from six prorated pools in Lea County, New Mexico, also consideration of the allowable production of gas from seven prorated pools in San Juan, Rio Arriba and Sandoval Counties, New Mexico, for August, 1959.

CONTINUED CASES, REHEARINGS, AND HEARINGS DE NOVO

CASE 1600: (continued) In the matter of the application of M. A. Romero and Robert Critchfield concerning the operation of gas prorationing in the Blanco Mesaverde Gas Pool and the ratable taking of gas from said Blanco Mesaverde Gas Pool in Rio Arriba and San Juan Counties, New Mexico, as well as from the Choza Mesa-Pictured Cliffs Gas Pool in Rio Arriba County, New Mexico.

CASE 1615: (Rehearing) In the matter of the rehearing requested by Continental Oil Company and/or Continental Pipeline Company, as successor in interest to Malco Refineries, Inc., for reconsideration by the Commission of Case No. 1615, Order R-1363. Case 1615 was an application by Stanley Jones, et al, for an order requiring Malco Refineries, Inc. to purchase oil produced from wells in the Dayton-Abo Pool in Eddy County, New Mexico, under the provisions of the Common Purchaser Act. Case 1615 culminated in the entry of Order No. R-1363 which required Malco Refineries, Inc. to purchase all oil tendered to it which is produced from the Dayton Field in Eddy County, New Mexico.

CASE 1634: (Rehearing) In the matter of the rehearing requested by The Pure Oil Company for reconsideration by the Commission of Case 1634 which was an application for an order promulgating temporary special rules and regulations for the South Vacuum-Devonian Pool in Lea County, New Mexico, to provide for 80-acre proration units and for permission to shut-in one South Vacuum-Devonian well and transfer its allowable to one or more South Vacuum-Devonian wells on the same basic lease. The rehearing will be limited solely to the transfer of allowable issue.

CASE 1637: (Rehearing) In the matter of the rehearing requested by The Atlantic Refining Company for reconsideration by the Commission of Case 1637 which was an application for an order combining the Allison-Pennsylvanian and the North Allison-Pennsylvanian Pools in Lea and Roosevelt Counties, New Mexico, and for the promulgation of special rules and regulations in connection therewith to provide for 80-acre proration units.

CASE 1641: (Hearing De Novo) Application of El Paso Natural Gas Company for a hearing de novo before the Oil Conservation Commission in Case No. 1641, Order R-1410, which was an application by W. R. Weaver for the promulgation of special rules and regulations governing the drilling, spacing, and production of wells in the Angels Peak-Gallup Oil Pool, San Juan County, New Mexico.

TOWNSHIP 12 SOUTH, RANGE 34 EAST, NMPM
Section 23: SW/4
Section 26: NW/4
Section 27: E/2

(h) Extend the Robinson Pool to include,

TOWNSHIP 17 SOUTH, RANGE 31 EAST, NMPM
Section 1: S/2
Section 2: SE/4

(i) Extend the Shoe Bar-Pennsylvanian Pool to include,

TOWNSHIP 16 SOUTH, RANGE 35 EAST, NMPM
Section 26: SE/4

CASE 1724: Northwestern New Mexico nomenclature case calling for an order extending existing pools in San Juan, Sandoval, and Rio Arriba Counties, New Mexico.

(a) Extend the Aztec-Pictured Cliffs Pool to include,

TOWNSHIP 28 NORTH, RANGE 10 WEST, NMPM
Section 14: S/2
Section 15: NE/4

(b) Extend Ballard-Pictured Cliffs Pool to include,

TOWNSHIP 24 NORTH, RANGE 6 WEST, NMPM
Section 23: E/2
Section 24: W/2 and SE/4
Section 25: All
Section 26: N/2 and SE/4

TOWNSHIP 25 NORTH, RANGE 7 WEST, NMPM
Section 30: S/2

(c) Extend The Fulcher Kutz-Pictured Cliffs Pool to include,

TOWNSHIP 28 NORTH, RANGE 10 WEST, NMPM
Section 24: NW/4

(d) Extend the South Blanco-Pictured Cliffs Pool to include,

TOWNSHIP 24 NORTH, RANGE 2 WEST, NMPM
Section 18: W/2
Section 25: SW/4

TOWNSHIP 25 NORTH, RANGE 3 WEST, NMPM
Section 27: NE/4

TOWNSHIP 25 NORTH, RANGE 5 WEST, NMPM
Section 29: N/2

TOWNSHIP 25 NORTH, RANGE 6 WEST, NMPM
Section 6: E/2
Section 7: E/2

Section 10: W/2 and SE/4
Section 14: W/2
Section 15: N/2 and SW/4
Section 16: S/2 and NW/4

TOWNSHIP 27 NORTH, RANGE 9 WEST NMPM
Section 5: W/2

(e) Extend the Blanco-Mesaverde Pool to include,

TOWNSHIP 26 NORTH, RANGE 7 WEST, NMPM
Section 12: All
Section 13: N/2

TOWNSHIP 27 NORTH, RANGE 6 WEST, NMPM
Section 34: All
Section 35: All
Section 35: All

TOWNSHIP 27 NORTH, RANGE 8 WEST, NMPM
Section 18: W/2
Section 19: W/2

TOWNSHIP 27 NORTH, RANGE 9 WEST, NMPM
Section 13: E/2

(f) Extend the Bisti-Lower Gallup Oil Pool to include,

TOWNSHIP 26 NORTH, RANGE 14 WEST, NMPM
SEction 13: S/2 NE/4

(g) Extend the Chimney Rock-Gallup Oil Pool to include,

TOWNSHIP 31 NORTH, RANGE 17 WEST, NMPM
Section 9: E/2 NW/4, W/2 NE/4, SE/4 NE/4, NE/4 SE/4
Section 10: S/2 NE/4, SE/4, S/2 SW/4
Section 11: SW/4
Section 15: NE/4 NE/4

TOWNSHIP 32 NORTH, RANGE 17 WEST, NMPM
Section 33: SW/4 SW/4

(h) Extend the Horseshoe-Gallup Oil Pool to include,

TOWNSHIP 30 NORTH, RANGE 16 WEST, NMPM
Section 14: S/2 NE/4 , N/2 SE/4

TOWNSHIP 31 NORTH, RANGE 17 WEST, NMPM
Section 13: SW/4 SW/4

(i) Extend the Angel Peak-Dakota Pool to include,

TOWNSHIP 27 NORTH, RANGE 10 WEST, NMPM
Section 28: All
Section 29: E/2
Section 33: E/2

(j) Extend the Otero Gallup Oil Pool, Rio Arriba County, to include,

TOWNSHIP 25 NORTH, RANGE 5 WEST, NMPM
Section 27: S/2 SW/4
Section 28: SE/4 and SE/4 NE/4
Section 32: NE/4 NE/4
Section 33: N/2
Section 34: N/2
Section 35: SW/4 NW/4 and NW/4 SW/4

BEFORE THE OIL CONSERVATION COMMISSION

OF THE STATE OF NEW MEXICO

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

CASE NO. 1637
Order No. R-1389

APPLICATION OF THE ATLANTIC REFINING
COMPANY FOR AN ORDER COMBINING THE
ALLISON-PENNSYLVANIAN AND NORTH ALLISON-
PENNSYLVANIAN POOLS, LEA AND ROOSEVELT
COUNTIES, NEW MEXICO, AND FOR THE
PROMULGATION OF SPECIAL RULES AND
REGULATIONS THEREFOR TO PROVIDE FOR 80-
ACRE PRORATION UNITS.

APPLICATION FOR REHEARING

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

Comes now The Atlantic Refining Company, Applicant in the above case, and respectfully applies for a rehearing therein, and in support thereof states that the Commission erred in entering its Order No. R-1389 dated May 7, 1959, in the following respects:

1. This case was heard before the Commission at Hobbs, New Mexico, on April 15, 1959. On May 7, 1959, the Commission enter Order No. R-1389 denying the Application of The Atlantic Refining Company for an order combining the Allison and North Allison-Pennsylvanian Pools and providing for 80-acre well spacing and proration units.

2. With respect to the combination of the two pools, the Commission made Finding No. 4 as follows:

> "(4) That at this stage of development an order combining the said Allison-Pennsylvanian Pool with the said North Allison-Pennsylvanian Pool would be premature."

Said Finding is not supported by the evidence in the record. In addition a well is now drilling which will offer further evidence upon which an order can be entered relative to the combination of the two pools.

3. With respect to the 80-acre spacing and proration units requested by the Applicant, the Order of the Commission is based in part on Finding No. 5 as follows:

> "(5) That the applicant has failed to prove that the Allison-Pennsylvanian Pool and the North Allison-Pennsylvanian Pool can be efficiently drained and developed on an 80-acre spacing pattern."

The above Finding is without any support in the record and is contrary to the evidence in the record before the Commission, and is therefore unreasonable and unlawful.

4. The Commission's Order denying 80-acre spacing and proration units was based in part on Finding No. 6 as follows:

> "(6) That the said Allison-Pennsylvanian Pool has thus far been developed on a 40-acre spacing pattern."

The above Finding does not preclude the development of the pool on an 80-acre basis. The record shows that 80-acre spacing or proration units can be assigned to the respective wells which have been drilled in a manner which will protect all interested parties. Said Finding does not constitute any valid basis for denial of Applicant's request for 80-acre spacing and proration units.

5. The Order denying 80-acre spacing and proration units was based in part on Finding No. 7 as follows:

> "(7) That continued development of said pools on 40-acre proration units will not cause the drilling of unnecessary wells."

The above Finding is without any support in the record and is contrary to the evidence in the record before the Commission, and is therefore unreasonable and unlawful.

6. Findings Nos. 8 and 9 and Paragraphs 1, 2, and 3 of the Order are based upon the above Findings, and as the findings upon which they are based are without support in the record and are contrary to the evidence in the record, the above ultimate Findings and Order of the Commission are without any support in the evidence and are contrary to the evidence in the record and are therefore unreasonable and unlawful.

7. The Applicant would further show that it is entitled to a rehearing upon all phases involved in connection with the original application upon the following additional grounds:

(a). Since the hearing two additional wells have been completed in the pool, and one additional well is drilling, which wells will afford further information which the Commission should consider. Further pressure information is obtainable from one of the wells which has been completed, and this information should be considered by the Commission. The well which is drilling will afford further information as to the combination of the Allison and North Allison Pools.

(b). Applicant now has available material balance calculations which it desires to offer to the Commission showing that one well will drain 80 acres.

(c). The Applicant would further offer additional evidence including volumetric calculations of oil in place and all basic data upon which the calculations were made. The volumetric calculations will show that the oil in place under a 40-acre tract is such that the development of the pool on such a pattern is not economically feasible. Applying a reasonable recovery factor to the oil in place under 40-acre tracts, it will show that the development of the pool on a 40-acre pattern would result in economic loss to the operators.

(d). Applicant has contacted other operators in the pool for the purpose of developing a plan of development of the pool, and the results of these efforts will be introduced at the rehearing.

WHEREFORE, Applicant prays that this Application for Rehearing be granted for the purpose of reconsidering Order No. R-1389, and that after notice of hearing as required by law the Commission rescind Order No. R-1389 and enter an order granting the rules as requested in the Application for the original hearing in the above cause. It is requested that in considering this Application for Rehearing

and in its further consideration of this case, the Commission consider as separate requests the request for combination of the pools and the request for 80-acre spacing and proration units.

Respectfully submitted,

THE ATLANTIC REFINING COMPANY

By _____

HERVEY, DOW & HINKLE
P. O. Box 547
Roswell, New Mexico

J. M. HERVEY 1874-1953

HIRAM M. DOW
CLARENCE E. HINKLE
W. E. BONDURANT, JR.
GEORGE H. HUNKER, JR.
HOWARD C. BRATTON
S. B. CHRISTY IV
LEWIS C. COX, JR.

PAUL W. EATON, JR.
ROBERT C. BLEDSOE

LAW OFFICES
HERVEY, DOW & HINKLE
HINKLE BUILDING
ROSWELL, NEW MEXICO

TELEPHONE MAIN 2-6510
POST OFFICE BOX 547

May 26, 1959

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

Re: Case No. 1637
Order No. R-1389

Gentlemen:

On behalf of The Atlantic Refining Company, we hand you herewith in triplicate an Application for Rehearing in the above case.

Very truly yours,

HERVEY, DOW & HINKLE

By _____

HCB:db
Enclosure

BEFORE THE
OIL CONSERVATION COMMISSION
HOBBS, NEW MEXICO

IN THE MATTER OF:

Case No. 1637

TRANSCRIPT OF HEARING

APRIL 16, 1959

DEARNLEY - MEIER & ASSOCIATES
GENERAL LAW REPORTERS
ALBUQUERQUE, NEW MEXICO
Phone CHapel 3-6691

NEW MEXICO OIL CONSERVATION COMMISSION

1300 East Scharbauer

Hobbs, NEW MEXICO

REGISTER

HEARING DATE APRIL 15, 1959 TIME: 9 A.M.

NAME:	REPRESENTING:	LOCATION:
F. Norman Woodruff	El Paso Nat. Gas	El Paso
Leon K. Howell	"	"
M.T. SMITH	Shell Oil Co.	MIDLAND
J.J. Butterfield	Ohio Oil Co.	Fort Worth
D.W. Selinger	Shelly	Tulsa
H.W. Nippert	Atlantic	Dallas
John Mills	The Texas Co.	Midland
R.L. McPherson	Mc Wood Corp.	Midland
W.W. Bell	Phillips Pet. Co.	Midland
C.L. Bess	Gulf Oil	Houston
R.M. Bayer	" "	FT Worth
B. Kastler	" "	Roswell
A.M. Bell	" "	Denver
C.E. Hammond	Indiana Oil Purch Co	Midland
Jason Kellahin	Kellahin & Fox	Santa Fe, N.M.
John L. Sanders	Magnolia Pet Co	Hobbs
E.P. St. Laurent	Shell Oil Co.	Roswell N.M.
BILL SULLIVAN	EL PASO NAT. GAS PRODUCTS	FARMINGTON, N.M.
Ray Phillips	Northwest Prod	Albuquerque
R.E. Bracht	Amerada	Hobbs

NEW MEXICO OIL CONSERVATION COMMISSION

Hobbs, NEW MEXICO

REGISTER

HEARING DATE April 15, 1959 TIME: 9 A.M.

NAME:	REPRESENTING:	LOCATION:
WARREN MANKIN	AZTEC O&G Co.	Dallas
Rex (illegible)	Sinclair	Roswell
E.K. Wride	Gulf	Hobbs
GUS ATHANAS	PAN AMERICAN	LUBBOCK
GUY BUELL	"	FT. WORTH
R.S. Reynolds	Amerada	Tulsa
J R. CURRY	Shell Oil Co	Midland, Tex
R.E. Shook	Gulf Oil Corp.	Hobbs
Jack Schrunkel	Union Oil Co of California	Midland, Tex
Grant L Adkins Jr	"	"
R L Denton	Magnolia	"
B. G. Howard	The Ohio Oil Co	Hobbs, N.Mex
D. E. Morris	"	"
J.H. Woods	Stanolind Oil Corp	Roswell, N.M.
(illegible)	(illegible)	(illegible)
(illegible)	(illegible)	(illegible)
T.E. Nelson	Stanolind Oil Co	Hobbs
R.R Dunn	Schlumberger	Hobbs N.M.

NEW MEXICO OIL CONSERVATION COMMISSION

Hobbs, NEW MEXICO

REGISTER

HEARING DATE April 15, 1959 TIME: 9 A.m.

NAME:	REPRESENTING:	LOCATION:
W. G. Mead	Gen. Am. Oil Co.	Artesia
O. J. Loudermilk	OCC	Artesia
Lemuel McPhaul	John H. Kelly	Hobbs
Paul Williams	Sinclair Oil Corp	Hobbs
H. Poole	Gulf Oil Corp	Hobbs
E. C. McBryde Jr.	Amerada	Midland
Ted Walker	"	"
Ted Chandler	N.M.O.C.C.	Santa Fe
Harrell D. Chiles	The Ohio Oil Co.	Hobbs
John W. Runyan	N. M. O. C. C.	Hobbs
Charlie Graves	Self	Hobbs
John M. Kelly	Gulf Oil Corp.	Roswell
Victor T. Lyon	Conservation Com.	Santa Fe
RAYMOND A. CRIENE	Continental Oil Co.	Hobbs

NEW MEXICO OIL CONSERVATION COMMISSION

Hobbs, NEW MEXICO

REGISTER

HEARING DATE April 15, 1959 TIME: 9 A.M.

NAME:	REPRESENTING:	LOCATION:
C. M. Linder	General Petr. Inc	Hobbs.
Bill Reese	" " "	"
Walt Mayfield	Tamarisa Oil	"
Jesse Robinson	"	"
H P Bratton	[illegible]	[illegible]
J T Dunn	The Pure Oil Co	Hobbs
G F Fisk	—	"
Harry C Wall	—	"
H. E. Wesberry	Tidewater	Midland
Robert N Miller	✓	Hobbs
Ray F. Ray	J. R. Cone	Hobbs
W. P. Shackelford	Tidewater Oil Co.	Hobbs
E. J. Motter	Cities Service	Hobbs
John W. Haygood	"	"
Raymond Lee	Wilson Oil Co	Artesia
Hugh S. Whitmore	Pan-American Pet. Corp.	Lubbock
Paul S. Johnston	Gackle Oil Co.	Hobbs

NEW MEXICO OIL CONSERVATION COMMISSION

Hobbs, NEW MEXICO

REGISTER

HEARING DATE April 15, 1959 TIME: 9 A.M.

NAME:	REPRESENTING:	LOCATION:
[illegible]	[illegible] Oil Co.	Midland Texas
Frank D. [illegible]	"	Midland
[illegible]	[illegible]	
Lonnie C. Smith	Gulf Oil Corp	Hobbs
W. F. Bridges III	Gulf Oil Corp.	Hobbs
W. D. Van Denburgh	" " "	"
[illegible]	[illegible] Oil Co	"
O. J. [illegible]	P. P. Pipeline Co.	Midland
Dick Booker	CSO	
V. M. Hollrah	Atlantic	Dallas
W. P. Tomlinson	"	Roswell
A. B. Tanco	"	Dallas Texas
V. R. Cammack	"	[illegible]
J. R. Chatenkerry	"	Midland
[illegible]	[illegible]	[illegible]
R. N. Hughes	Phillips	Hobbs
[illegible]	Phillips	[illegible]
D. C. [illegible]	Gulf	"
Wm. B. King	Phillips	Bartlesville Okla
R. M. Anderson	Sinclair	Midland

NEW MEXICO OIL CONSERVATION COMMISSION

Hobbs, NEW MEXICO

REGISTER

HEARING DATE April 15, 1959 TIME: 9 A.M.

NAME:	REPRESENTING:	LOCATION:
H.W. Swaim	Continental Oil Co.	Hobbs, N.M.
R.L. Adams	" "	Roswell, N.M.
J A Queen	" "	" "
S. D. Bailey	" "	Hobbs "
L. O. Storm	Self	Hobbs
E.O. Collins	Continental Oil Co	Artesia N.M.
James C Lewis	Amerada	Tulsa
[illegible]	[illegible]	[illegible]
T. D. Wells	Southwestern Drlg	Hobbs
J O Montgomery	Amerada	Tulsa
R E Sisler	Amerada	Midland
D.C. Capps	"	Monument, N.M.
W L Brantley	OCC	Artesia
E.A. Cone	OCC	Aztec
L. L. Shoemaker	Indiana Oil Purch Co.	Midland
A R Kiker	El Paso Natural Gas Co	Jal
[illegible]	" " " "	Jal
[illegible]	" " " "	[illegible]

NEW MEXICO OIL CONSERVATION COMMISSION

Hobbs, NEW MEXICO

REGISTER

HEARING DATE April 15, 1959 TIME: 9 A.M.

NAME:	REPRESENTING:	LOCATION:
[illegible]	[illegible]	[illegible]
Kenneth N Gordon	[illegible]	Fort Worth
L. L. McDonald	The Pure Oil Co	Midland
B. L. Griffith	[illegible]	Hobbs, N. M.
Geo. Hinchfield	Texaco	Hobbs, N. M.
H. W. Adams	[illegible]	Eunice, N.M.
J. O. Felts	Texaco	[illegible]
Fowler Kay	[illegible]	AUSTIN
R. W. Byram	R. W. Byram & Co.	

IN THE MATTER OF:

Case 1636 Application of The Atlantic Refining Company for an order establishing the Allison-Pennsylvanian and the North Allison-Pennsylvanian Pools in Lea and Roosevelt Counties, New Mexico, and for the promulgation of special rules and regulations therefor. Applicant, in the above-styled cause, seeks an order combining the Allison-Pennsylvanian and the North Allison-Pennsylvanian Pools in Lea and Roosevelt Counties, New Mexico, and providing for the establishment of 80-acre proration units in said combined pool.

Hobbs Auditorium
Hobbs, New Mexico
April 16, 1959

BEFORE:

A. L. Porter, Jr.
Murray Morgan
E. S. Walker

TRANSCRIPT OF HEARING

MR. PORTER: The meeting will come to order, please. We are going to take up first this morning Case 1636. Before we begin this case, I would like for the record to show that Mr. E. S. Walker is sitting in place of Governor Darroughs this morning on the Commission.

MR. UTZ: Case 1637, "Application of The Atlantic Refining Company for an order combining the Allison-Pennsylvanian and the North Allison-Pennsylvanian Pools in Lea and Roosevelt Counties, New Mexico, and for the promulgation of special rules and

regulations therefor."

MR. PORTER: Let me correct the record, please. I announced Case 1636, it should be case 1637.

MR. HINKLE: If the Commission please, Clarence Hinkle of Hervey, Dow and Hinkle, Roswell, appearing on behalf of the Atlantic Refining Company. We have one witness, Mr. Phil Tomlinson, that I would like to have sworn.

(Witness sworn in.)

W. P. TOMLINSON

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

DIRECT EXAMINATION

BY MR. HINKLE:

Q State your name, please?

A W. P. Tomlinson.

Q By whom are you employed, Mr. Tomlinson?

A Atlantic Refining Company.

Q In what capacity?

A As Area Reservoir Engineer.

Q How long have you been employed in that capacity?

A Since 1954.

Q Have you previously testified before the Oil Conservation Commission?

A Yes, sir.

Q Have you made a study of the Allison and North Allison

areas?

A Yes, sir.

Q Are you familiar with the application of the Atlantic Refining Company in this case?

A Yes sir, I am.

Q One of the purposes of the application is to re-designate the Allison and North Allison Pools, is it not?

A Yes, sir.

Q And to combine those pools?

A Yes, sir.

Q Have you prepared a plat which shows the present designation and also your proposed designation and combination of the pools?

A Yes sir, we have.

(Thereupon, the document was marked as Atlantic's Exhibit Number One for identification.)

Q (By Mr. Hinkle) Would you refer to Atlantic's Exhibit One and explain it to the Commission?

A This is Atlantic's Exhibit Number One. This map shows the present and proposed boundaries of the Allison and North Allison Pools. The present boundary of the Allison Pool is shown in a dark blue dotted line, which I am outlining here on the map. The North Allison Pool is shown by a heavy blue solid line somewhat to the north of the Allison Pool. The proposed boundaries that

we have are shown as a hashed line and encompass most of the area of both pools and some area between. The color coding on the map represents different types of mineral interests. The purpose --

Q Do you have three characters of land involved?

A Yes, sir.

Q What are they?

A Federal, Fee and State land involved. Purple indicates Federal land, light green indicates State and orange shows the Fee land involved. Since we turned in our application, there's been occasion for revision of that. We have not revised our application, but at the present time, it should be changed in order that the Commission might adopt to include at least the west half of the northwest quarter of Section 12, Township 9 South, Range 36 East. On that tract is a well that was once completed as a dry hole by Magnolia Petroleum Company and now they have gone in and set pipe and completed it as an oil producer in the same pay as the other wells in the field.

(Thereupon, the document was marked as Atlantic's Exhibit Number Two for identification.)

A In general, the outlines of this map are based on our structural interpretations as shown on Exhibit Two.

Q (By Mr. Hinkle) Have you prepared a structural map of the area?

A Yes, sir.

Q Refer to Atlantic's Exhibit Two and explain to the Commission what it is and what it shows?

A Atlantic's Exhibit Two is a structure map of the Bough "C" Zone in the Pennsylvanian Formation. You will notice that our interpretation shows an elongated anticlinal structure and there are no saddles in between the Allison and North Allison Field. The Allison is a little lower than the North Allison in structure, but these contour intervals are ten-foot intervals, so there's very little relief there. Now, I might add that I have not used seismic, any seismic data in contouring this map; however, the seismic data that we have does reflect about the same thing structurally. It does indicate continuity definitely between the two zones.

Q Does it show that both pools are on the same structure?

A Yes, sir.

Q What are the lines "A" and "A" Prime and "B" and "B" Prime which you have indicated on the plat?

A The lines shown in red, "A" to "A" Prime and "B" to "B" Prime, are traces of cross sections that we prepared, which are Exhibits Three and Four respectively.

Q Before you get to those exhibits, what information did you use in preparing this structural map?

A We used geological tops as picked from electrical and radioactivity logs.

Q Did you examine electrical and radioactivity logs of

practically all of the wells in the area?

A All of the wells in the field were examined.

Q They were all available to you?

A Yes, sir.

Q Any other information used in preparing the plat?

A None at all, except that I might say the completions are shown as they are producing now, and the Magnolia dry hole in the northwest of the northwest of Section 12, Township 8 South.

Q Does this also show the locations of wells that applications have been applied for to drill?

A Yes sir, there are two additional wells which are spotted on the map as locations, the Cosden Sunray Number 1 in the north half of the south half of Section 11, Township 9 South, Range 36 East, it is shown as a location, and also the Cosden Sunray State 1-C in the west half of the northwest, pardon me, let me correct that, the west half of the northeast quarter of Section 36, Township 8 South, Range 36 East, that's also shown as a location. One of those wells is now drilling to the Allison and North Allison pay.

Q That's the Cosden well?

A Yes, sir. Now, both of those wells, the locations of both of those wells were staked after we turned in our application.

Q Did you mention the Cactus well in Section 2?

A Yes sir, the Cactus--no, I didn't mention the Cactus well in Section 2. That's the one in the east half of the northeast

quarter of Section 2, Township 8 South--pardon me, Township 9 South, Range 36 East, which I believe was also staked after we turned in our application, but it's within the field limits.

(Thereupon, the document was marked as Atlantic's Exhibit Number Three for identification.)

Q (By Mr. Hinkle) Now, refer to Atlantic's Exhibit Three, which is the cross section "A" and "A" Prime, and explain to the Commission what that shows?

A This cross section, "A" and "A" Prime and "B" and "B" Prime, are the same ones that the traces were shown for on Exhibit Two. They were constructed from electrical and radioactivity logs. We have shown the top of the Pennsylvanian Formation and the interval of the Bough "C" Zone in the Pennsylvanian and we have also shown on those wells the intervals of completion. Now, the significant thing about these cross sections is that the Bough "C" Zone shows up as a clean limestone formation on these logs, no shale breaks. You can trace that zone on "A" to "A" Prime all the way across as a clean formation. It also shows porosity on the neutron curves for these wells. The Atlantic State "AD" Number 1 has porisity, this little kick right here is for porosity, and I think there's some porosity in the bottom on the Bough "C" where we completed it and it is perforated, if you will notice, it is perforated opposite the porosity, and likewise in Atlantic's Federal Yates Number 1, it is perforated

opposite one of those porous intervals. The Cactus Sunray State likewise is completed in the same interval and so on across, you can see these porous intervals occurring.

Q Does this show a continuity of the Bough "C" Zone all the way through, throughout the length of the area?

A It definitely indicates continuity.

Q Does it show a pretty uniform pay section?

A It shows a very uniform pay section for it to be that thin, very uniform.

Q And porosity throughout the section?

A Yes sir, good porosity.

(Thereupon, the document was marked as Atlantic's Exhibit Number Four for identification.)

Q (By Mr. Hinkle) Now refer to Atlantic's Exhibit Four, which is the cross section "B" and "B" Prime, and explain it to the Commission?

A Atlantic's Exhibit Four is cross section "B" to "B" Prime. It cross the south end of our proposed field from west to east. It is constructed from the same information we used before on the other cross section and depicts essentially the same thing. There is good continuity laterally in the south part of the field. The one well, the Ohio State Number 1, did not have a log with the same scale that we used on these others so we had to leave it out, but the information that we obtained for that well

was from a log. It was the wrong scale; however, it was put in the cross section.

Q But the log that you did have of that well showed the same zone and the relative position you have on this cross section?

A Yes, sir.

Q And showed porosity the same as the others?

A Yes sir, both of those indicate good continuity between wells in the field, and I think they definitely indicate that the two pools, Allison and North Allison, are connected.

Q Have you accumulated any basic field data with respect to the North Allison and Allison Pools?

A We have accumulated quite a bit. There's several things that I believe are pertinent to this case that I would like to tell the Commission about. First, we have cores on four wells in the field and we obtained a weighted average porosity for those four cores; the average porosity is five and a half per cent. We also weighted the permeability that we obtained and it was a hundred and seventeen millidarcies indicated average basis. That's very good permeability, we do not ordinarily find it that good in this part of the country, and for the purposes of the work that we have done in connection with this field, we have used an estimated saturation for oil of 75 per cent. We have no laboratory data that we feel is very reliable in that respect, so that we used an estimated figure. Most of the storage space in the reservoir is contained in vugs, very large vugs, and Matrix

porosity. So far, I know of no water-oil contact that has been obtained in this field and defined as such. Now, one thing that sort of bears this out is the Trice Drilling Company well located in the east half of the northeast quarter of Section 10, which is quite low in relation to some of the other wells in the field. Now, that well does produce water, but it makes oil, too. I might say in that respect that other wells higher on the structure are also making water, so we believe that we haven't found water-oil contact.

One other thing that I failed to mention about these field limits that I think should be brought out at this time is that the field limits have not actually been defined in this pool except possibly in one direction. That's a dry hole that Atlantic drilled and known as the Pebworth Number 1 in the North Allison area. All other directions could be productive.

The gross pay thickness in the--I might say the net pay thickness in the Bough "C" Zone is from five to ten feet. For the purposes of work, for calculations, we have used, in this field, we have used a pay thickness of ten feet, some of it is less. The average oil gravity in this field is 48 degrees API.

MR. PORTER: Forty-eight?

A Yes sir, 48 degrees. The saturation pressure is 3,150 PSI, and the solution gas-oil ratio at that pressure was 1,517 cubic feet per barrel. The formation, in value factor, at the original reservoir pressure, which was somewhat higher than the

saturation pressure, is 1.821. One thing, we used all of those, several of those figures there in our calculation in regard to this reservoir. The one thing I might note here on the fluid in this field is that when we found we had a discovery in the North Allison area, we immediately, it immediately occurred to us that possibly the two pools were connected. And so with that in mind, we requested our laboratory to take some samples to determine if there was any difference, and definitely we did want to pin down a difference if there was a possibility that they had a different type of reservoir fluid in them. So I have the results of a couple of significant points. I won't go through all of our fluid data, but the two fluids are very similar.

Now, just for example, the fluid in the North Allison has a formation volume factor of 2,000 pounds of 1.53. The fluid in the Allison Pool at the same pressure of 2,000 pounds has a formation volume factor of 1.52 and probably that's about as-- laboratory accuracy may not be that good. In other words, it awfully close and we wouldn't expect it to get any closer. The gas and solution at 2,000 pounds in the North Allison Pool is 900 cubic feet per barrel, the gas and solution at the same pressure in the Allison is 890 cubic feet per barrel. So you can see from that that they are, for all practical purposes, we have the same fluid in both reservoirs.

Original reservoir pressure in the pool was 3,518 pounds. This was obtained in the Gulf Federal Mills Number 1 a discovery

well for the Allison. Now, the average pressure in January of 1959 is 2,710 pounds and that includes an average of pressure in the North Allison as well as the Allison.

We obtained some productivity indeces in these two pools, it averages 5.6 barrels of oil per pound drop in the bottomhole pressure. The range on those that we have is from 2.6 to 11.9. They are pretty close, I think, especially for as thin a pay section as we have in these wells. The production rate during January for both combined pools is about 47,000 barrels; the cumulative to February the 1st is 1,860,000 barrels, and that oil came from 14 producing wells and there are two locations or drilling wells, one dry hole and one that has been worked over within the past two or three days, and I mentioned it was formerly a dry hole and is now producing.

Most of the wells were completed by setting pipe to total depth and perforating. The total area that we have outlined in our proposed field limits amounts to 2,000 acres.

Q (By Mr. Hinkle) But that would be increased by reason of the well you mentioned originally that --

A I think it should be increased to include the Magnolia, former Magnolia dry hole.

Q You mentioned that some of the other wells other than the Trice well were making water. Are any of the wells that are up on top of the structure making water?

A The wells right in here do make water.

Q Is that a pretty good indication that it is not a water-drive field?

A I think it is, Mr. Hinkle. The pressures in these wells have been falling right on down and shown a steady decline over the years and is still declining in the area of the Allison, original Allison wells. Had we had a water-drive, I believe it would begin to show up by now. That water seems to be present in the pay and it is produced out with the oil as it comes along. Some of the wells started out making more water than they are now making, which is itself kind of interesting to notice that. The Atlantic State "AD" started out making water and I think now essentially it doesn't make any, and I believe the Magnolia, one of the Magnolia Childers Federal wells here had the same characteristic. Those wells were not worked over and the water disappeared and went down continuously.

Q Would that indicate then that there might be considerable acreage not shown on your map there, that is not included in your structure, that might be productive?

A Definitely it could be productive. As I mentioned before, there's a well, a low well on the southwest flange, that's Trice Production Company, I believe it's called the Merrill Number 1, is a very low well that makes water, but is also a commercial oil well. So we do not know that structural position is a limiting factor in this reservoir. In this particular location to the north, the Atlantic Refining Company Pebworth Number 1,

a dry hole on the edge of the North Allison Pool, was higher or as high as the discovery well in the North Allison. That well failed to produce because of porosity and permeability development in the pay rather than water. It simply had no porosity or permeability. At the present, we obtained a core and in that particular one, it definitely indicated it wouldn't produce.

(Thereupon, the document was marked as Atlantic's Exhibit Number Five for identification.)

Q (By Mr. Hinkle) Well, Mr. Tomlinson, will you refer to Exhibit Five and explain to the Commission what it shows?

A Exhibit Five is a graph showing reservoir performance versus time for the Allison and North Allison Pools combined. That would be the combined production of water and oil and gas, and also the number of wells on this graph. These heavy blue lines show oil production and it has risen as the number of wells producing has increased. It has reflected some purchasers' proration and allowable increases as they have been granted by the Commission. The number of wells has grown fairly steadily through the middle of 1956 and there was a leveling off period there until discovery took place in the North Allison area and before drilling was started. Per cent of water is demonstrated at the bottom of the page and you willnotice that the per cent water was higher in the early life than it has been recently. Part of that decline occurred at a time when no additional drilling was occurring, so

it means that some water was being exhausted with the pay.

Q That's still another indication of it not being a water-drive pool, is it not?

A To me, it is. Now, we have shown in a light blue line at the top of the graph the gas-oil ratio by months from the beginning of the production, producing life in the pool. Generally, that ranges between about 1,100 and 1,500 cubic feet per barrel, 1,500 or 1,600 cubic feet and it is quite erratic, and the only way that I can account for that is that through much of the life, there has not been any market for the gas and I presume the operators didn't have their opportunity to measure their gas as often as they might had they been selling it. All of this information on this graph was obtained from the New Mexico Oil and Gas Engineering Committee Book, which reflects C-115 reports.

(Thereupon, the document was marked at Atlantic's Exhibit Number Six for identification.)

Q (By Mr. Hinkle) Now, refer to Atlantic's Exhibit Number Six and explain to the Commission what that shows?

A Atlantic Exhibit Number Six is a graph showing the bottomhole pressure history of several wells in the pool, and not all the wells are shown on here, but the ones where we had initial reservoir pressures were put on, and we have coded those wells as follows: The dots with a circle around them are the pressures for the Gulf Federal Mills Number 1--that was the discovery well,

by the way. The Ohio State "E" Number 1 pressures are shown by an "X," the pressures for the Atlantic State "AD" Number 1 are shown by a dot with a triangle around it, and the pressures for the Atlantic State "AE" Number 1, which is the discovery well in the North Allison area, is shown by a dot with a square around it, Atlantic's Federal Yates Number 1 is shown by a cross with a circle around it, and on this, I can't tell how the Sun Mills Number 1 is shown.

Q It's a square, I guess.

A A square with a circle around it.

MR. MORGAN: With a dot in the middle.

A Now, the significant thing here shown by this graph is that the original pressure in the reservoir is 3,518 pounds, and wells that were completed subsequent to that time came in with pressures less than the original pressure and that indicated to us that those locations had been drained prior to their drilling. That would seem to us to indicate continuity definitely from one well to the location of another and some of those locations are pretty far away, pretty far removed from the discovery wells or other development that might have occurred at the time the wells were drilled. These arrows on this graph indicate the first pressure obtained for each well.

Q Were those pressures all taken uniformly or --

A They all had forty-eight hour shut-in periods, each one of them did.

Q Is that a generally accepted method?

A All of those were taken by bottomhole pressure and corrected to the same datum.

Q So they are reliable?

A We think they are very reliable pressures. Now, I might point out here, looking at that, the second well in the pool is the Ohio State "E" Number 1, I believe. That well came in quite a bit lower than the original pressure, the third well was the Atlantic State "AD" Number 1, it came in at virtually the same pressure then existing in the Gulf well. Now, the locations of those two wells, I'll show you on Exhibit Two, the Gulf well is in the northeast quarter of the northwest quarter of Section 11, the Ohio well is in the southwest quarter of the southeast quarter of Section 2. Now, at that time, that was definitely 80-acre spacing between those two wells and it appears to us that the drainage influence of the Gulf well extended to the Ohio location. Now, the pressure for the Atlantic State "AD" Number 1 was very similar to that of the Gulf discovery well and it is 1,320 feet away from the Gulf well. Now, that would be the outer perimeter of drainage under an 80-acre spacing pattern, so it definitely means that the Gulf well in that direction was influencing drainage to the extent of 80 acres.

Q Does this show about as positively as can be shown that one well will drain 80 acres?

A Yes sir, it does show very positively that one well can

Q And not only with respect to the situation which you mentioned there in the southern part, but also in the northern part, isn't that right?

A Yes sir, the north part of the field--northern part of the field had pressures several hundred--that is, the North Allison area, had pressures several hundred pounds below that of the discovery well in the Allison. Now, since they are all practically the same datum, or the pressures all refer to the same datum, we would have assumed that we would have had the same pressures but apparently they had been drained. Now, there was a second well drilled in the North Allison area, the Atlantic Federal Yates Number 1, and it came, it is shown at the end of this trace on the graph, depicting the pressures for the Atlantic State "AE" Number 1 as the second dot there with the square around it, it is almost superimposed. That's just identically the same pressure as we had at that time in the State "AE" Number 1, and those two wells are on 80-acre spacing. We think that this graph is just as strongly an indication as we could get that these wells are draining a wide area.

(Thereupon, the document was marked as Atlantic's Exhibit Number Seven for identification.)

Q (By Mr. Hinkle) Now, refer to Atlantic's Exhibit Number Seven and explain that to the Commission?

A Yes sir, Exhibit Seven shows the results of bottomhole

pressure surveys conducted in the field in December and January, December, '58 and January of '59, and at that time, we managed to get most of the wells in the field tested. I think most of them were bottomhole pressure and three of them, I believe, were tested with sounding devices. Now, on this map, which is Exhibit Seven, we have put in all of the pressures at the field datum and contoured it around those bottomhole, around the pressures obtained with bottomhole pressure bombs. Now, we have also shown the pressures as indicated by sonic devices, but we were a little uncertain as to how accurate those were because we didn't know about the gradient spacing in the wells, and also sometimes a sonic device gives a false reading as to the fluid level in the well. We thought we should show them, to show the information, but we didn't believe it was reliable enough to contour.

We haven't closed these contours on this map because we don't know the field limits, but in the area where we have contoured it, we believe is an accurate representation of pressures. You will notice that the pressures are lower in the original Allison producing area grade gradually higher as you go north, and that's without exception. The Allison area generally is 24 or 2,500 pounds, the lowest point is 2343, and as you progress north, you find continually higher pressures. For example, the Cactus State "A" Number 1 is 2,803 pounds, Atlantic's Federal Yates Number 1 is 3,108 pounds and the Atlantic State "AE" Number 1 is 3,115 pounds. Now, to us that means that the closer the acreage was to the

Allison area, the more it had been drained, and that's logically what you would expect. It also indicates definitely the fluid is flowing from north to south in this pool at the present time.

Q It also indicates that the Allison and North Allison is all one pool, does it not?

A Yes sir, it does indicate that, that gradual increase of pressures.

Q And that movement from north to south would also indicate that one well will drain 80 acres, too, is that right?

A Yes, sir.

Q Have you prepared any data with respect to the economics involved in the development of the Allison-North Allison area?

A Yes sir, we have.

(Thereupon, the document was marked as Atlantic's Exhibit Number Eight for identification.)

Q (By Mr. Hinkle) Refer to your Exhibit Eight and explain it to the Commission?

A Exhibit Eight is titled, "Economics of Drilling One Well Per 40 Acres in Allison and North Allison Pools." Before we get into the discussion of these economics, I would like to point out that the data that we used has been given to you, the data for reserves has been given to you in the basic data that I gave you earlier in discussion here, that all of the oil in place under a 40-acre tract, in the Allison Pool average tract, that say

would contain ten feet of pay, would be 70,000 barrels, and that's all that we could see to be there based on the data that we have.

Q What method did you use in arriving at that figure?

A That's volumetric calculation, sir.

Q And is that a generally accepted method in the industry?

A Yes sir, it is, and probably in this case, the most reliable that we could use.

Q Because of the data available?

A Yes sir, we have pretty good data. We realize that it could vary somewhat from this, but we believe that we are within fairly good, pretty good range of accuracy here. Now, in making this calculation, we assumed that everyone would be paying one eighth royalty, and I think it is indicated here on this exhibit as to what the oil price is and what taxes we assumed, and all of the total gross value or total gross revenue after we pay severance taxes would amount to $179.540.00. Now, our latest drilling estimates, cost estimate for cost of drilling wells is $175,000.00, and our production engineers say that pumping equipment for one well will cost $30,000.00, and that flow lines will average out about $1,600.00 a piece. All of this total is up to $206,600.00. That then would be a difference of $27,060.00 provided that you could get all of the oil and gas under that tract. Now, in practice we know we can't get, can't approach anything like all of the oil and gas under a tract, and one thing that was not

included on this cost estimate was operating cost. This calculation assumes that we would, after we get the well drilled, it wouldn't cost us anything to operate it, but in reality, there would be considerable cost for that.

Q Does it take into consideration taxes, you have severance, but there are other taxes involved, are there not?

A There are taxes which I didn't have any information on, but it would increase the amount of tax payments for the property.

Q So that shows a loss when you drill on 40 acres of $27,060, and that's not taking into consideration all of your taxes, all of your operating costs, and it is taking into consideration a hundred per cent recovery of the oil in place, is that right?

A That's right, sir. In reality, I believe the loss would be quite a bit more.

Q Do you have any further comments with respect to Exhibit Eight?

A It certainly shows that operators don't want to drill on 40 acres, shouldn't be drilling on 40 acres in that pool.

Q Now, has the field, or the Allison-North Allison areas, been developed so far so that 80 acres can be assigned to each well that has been drilled?

A Yes sir, we have.

(Thereupon, the document was marked as Atlantic's Exhibit Number Nine for identification.)

A [illegible] this is one possible arrangement. I think

[illegible] might want their options on how they will

[illegible] their votes.

Q But under this suggested arrangement, it would not be necessary to communitize any acreage?

A No sir, not any.

Q That's the reason you have selected this particular pattern?

A Yes, sir. Well, there's quite a --

Q --as distinguished from others?

A There's a number of other combinations where you wouldn't have to unitize.

Q Do you have any opinion to express to the Commission as to whether or not the same amount or substantially the same amount of oil will be recovered if developed on 80 acres or if developed on 40 acres?

A I think that very substantially the same amount will be recovered.

Q Would the development on 40 acres, in your opinion, result in an economic loss to the operators?

A Yes sir, it would.

Q Do you have any recommendations to make to the Commission as to special field rules to be applied in this case?

A Well, yes, I do. First, I propose that these, that the Allison and North Allison Pools be combined and that their limits be extended between the two pools and also that it expand the pool from time to time as necessary; that I think, second, that the Commission adopt 80-acre proration units, and those proration

units should consist of two adjacent Governmental quarter quarter sections or lots within a single Governmental section and would constitute either the north half, south half, east half or west half of such quarter section, and that all wells drilled in the pool be located within one hundred feet off the center of either lot or quarter section in the proration unit. The third thing, I think we should, the Commission should do is that they should adopt the policy of granting each 80-acre proration unit situated in the pool, an 80-acre prorational factor for depth range between 9,000 and 10,000 feet as provided in the State-wide rules. I believe that's Rule 505 that takes that into account. And if any well is assigned less than 78 acres or more than 82 acres, its allowable should be in proration that that acreage bears to the 80 acres, and of course, in no event should any proration unit contain more than two lots or quarter quarter sections. And further, that if there are any wells--there are some already--that do not fall within these spacing requirements, if they have been drilled or started to drill before the effective date in the order that might be adopted, that they be granted an exception to the spacing requirements.

Q Is it your opinion that 80-acre spacing in this particular case and the special field rules you have recommended protect the correlative rights of all parties concerned?

A Yes, sir.

Q Including royalty owners?

A Yes, sir.

MR. HINKLE: That's all we have now.

MR. PORTER: Did you want to offer your exhibits at this time, Mr. Hinkle?

MR. HINKLE: Yes, we would like to offer Exhibits One through Nine inclusive, I believe it is.

MR. PORTER: Is there objection to the admission of Atlantic's Exhibits One through Nine?

They will be admitted.

Anyone have a question of Mr. Tomlinson?

MR. FISCHER: Mr. Tomlinson, that Pebworth et al Well Number 1 above your Atlantic "AE" Number 1, did it go to the Bough "C" Zone?

A Yes sir, that well is drilled to the Devonian as an exploratory well and we cored the Bough "C" as we went through it. We thought that probably we would get a discovery or might not, and it didn't indicate any production.

MR. FISCHER: You don't have any pressures on that zone, do you?

A I don't believe we tested that half after we got a look at the core.

MR. FISCHER: You have no pressures on it?

A No, sir.

MR. FISCHER: Thank you.

MR. PORTER: Mr. Utz?

CROSS EXAMINATION

BY MR. UTZ:

Q Mr. Tomlinson, am I correct in there being thirteen wells in this pool now, on your proposed outline of this pool?

A I thought I said fourteen. Let's see if I can count them here.

Q Well, thirteen or fourteen?

A I believe there's fourteen producers, Mr. Utz.

Q Do you have any other pressures on all of those wells?

A No sir, we don't. Now, for example, the Cactus well didn't have pressures taken right away on it, we didn't put pressures in for all of them.

Q How many of them do you have the initial pressures for?

A I believe there's six of them shown here on the graph.

Q Well, do you have pressures for any more than the six?

A Yes sir, we do. For example, on this recent survey, we have pressures for I believe all but two wells in the field.

Q Initial pressure?

A Oh no, I don't believe we do.

Q You only have initial pressure for six wells?

A Yes, sir.

Q Would any of the other operators have initial pressures for their wells?

A Well, yes sir, we obtained--this includes information for Gulf, Ohio, Atlantic and Sun. Now, I might say there's

a little more information here. In 1956, Magnolia was drilling a well, I believe it was the Childers Federal Number 2, and they got a drill stem test when they were drilling it. Now, that well in pay is not corrected to datum, but since it's very little relief, the correction would be probably less than twenty-five pounds in any event. That test was taken on March 20, 1956 and the pressure in that well was 2,985 pounds. It would be located just about, a little below the trace for the Ohio State Number 1 Well. This was considerably less than the original reservoir pressure and we checked into the matter of whether that pressure was better than the bottomhole pressure and it indicated a complete buildup on that pressure, so it's probably a reliable indication of pressure at that location.

Q Did you state what the datum was for the pressures shown on Exhibit Six?

A Oh, pardon me, which one?

Q On Exhibit Six.

A It is minus 5600 feet.

Q Mr. Tomlinson, on your Exhibit Nine, you have proposed certain 80-acre proration units which might be used. Do you believe that all of those units which have wells on them are productive throughout the unit?

A You mean are all those units which have had wells drilled on them --

Q Yes, sir.

A Is all of that productive acreage? Yes sir, in my opinion, it is. As a matter of fact, there's some that we didn't have included in here that's turned out to be productive now. The Magnolia Company has recompleted their dry hole in the southeast side of the field.

Q Let's look at Exhibit Number Two. What is your lease contour there which you feel is productive?

A Well sir, in my opinion, the field is productive beyond the lease contour that we have shown.

Q On what do you base that?

A We have not found that--the last well that we know of in the field is the Trice-Merrill Number 1 and it is producing oil and it is below the lease contour that we show here. Indications are now that the limits of the field may not be associated so much with structure as they are with just failure to develop porosity or permeability, and for example, here there's a high well in the North Allison area, that dry hole called the Atlantic Pebworth Number 1 located in the southwest quarter of the north--no, southwest quarter, southwest quarter of Section 25. That well was structurally high but didn't develop porosity and permeability and that's why we couldn't make a well.

Q Do you feel then that the south half of the northwest quarter of Section 10 is entirely productive, even though the well is on the east side of that 80-acre tract?

A I suspect it is. We --

Q But you have no definite proof of that, have you?

A We have no definite proof of that, but I suspect that that is true.

Q In regard to your Pebworth et al Number 1, did you suspect that that might be productive, too, when you drilled it?

A Did we suspect that it might have been?

Q Yes.

A Before we drilled it, we certainly did.

Q This 40-acre offset, is that your Number 1?

A Yes, sir. I might say that this did occur on the north end. I guess every field has to have a limit some place, and that seems to be it right there. Certainly we haven't, people haven't been having that experience in the acreage lieing to the south.

Q How much closer would you say on your Exhibit Number Two that you have throughout this structure, would you consider the 5640 to be the lowest contour that is presently known?

A No sir, I don't believe that's the lowest; I don't know what the lowest is, to be truthful about it.

Q The highest you know now is 5570?

A 5570, and on this map, I don't have a top for the Trice Well, but it's approximately a hundred feet lower than the nearest other well there. I can get that top for you if you are interested in finding out. I know it's productive that low.

Q No sir, that won't be necessary at the moment. Generally

speaking, this is a pretty flat structure, is it not?

A Yes sir, it's very flat and not much relief in this general area. Now, these are ten-foot contours and actually, we had to put in ten-foot contours to have much of a map. Had we contoured on a hundred feet, you couldn't have seen anything.

Q Do you have gravities on the individual wells in this pool?

A I have gravities that are reported in the New Mexico Oil and Gas Engineering Book. I notice that they vary from a degree or two on either side of 48, probably due in most instances to methods of separation and things of that nature, and I think they all average out around 48 or pretty close to it.

Q They are all within two degrees, you say?

A I think they are within two degrees of it, yes sir.

MR. UTZ: That's all I have.

MR. PORTER: Mr. Nutter?

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Tomlinson, this production in this field has evidently, the oil production has gone along, the water production has in most cases gone down, is that correct?

A Not in all wells. I believe Gulf has a well that's still making water. I believe it's one of the first wells, probably the Gulf Mills Number 2. Let's see, I'll give you those water producers if you'll wait just a minute. The Gulf Mills

Number 2 makes 19 per cent water according to this report. Now, I think that well's been making water all along. Now, Mills 1 doesn't make any water and one of the Magnolia wells makes water, I think probably it's Number 2 in this report. I think they have both been making water, but I have some more recent information in gas-oil ratio reports. I thought I recalled one of them didn't make any water any more. Well, sir, on the most recent report, it looks as if the Magnolia Trice Federal 1 and 2 quit making water.

Q What is this water, is that connate water that's in place in the reservoir and moves right along with the oil?

A Yes sir, it is. Apparently, the amount of water existing in the reservoir was just a little more than capillary pressure would support on the walls or in the pore spaces, and when the oil began to move, it had to carry some of that water along with it. That would be my interpretation of how it occurs that they make water.

Q These wells that have made water and then quit making water by themselves without any workovers, it would appear that the water in place in the reservoir had been exhausted, possibly, wouldn't it?

A Yes sir, apparently in some of these wells in the area distributing oil on to these wells immediately around them, the water is being exhausted and then being replaced.

Q I won't argue that the water is exhausted, but it is still making oil, so wouldn't that mean that the relative

permeability of the water is not possibly greater than it is to the oil?

A Well, it was probably at one time, I would say, but the saturation of the water has gone down. However, in the areas near the well, probably the trend has been in the other direction, it has become more permeable to oil.

Q Isn't the relative permeability greater with respect to the water and always a possibility that these pressure decline curves reflect the withdrawal of water as well as oil?

A I am sure they reflect withdrawals of water, yes sir.

Q Do you have the production history for all of the wells in the pool, how many barrels of oil each has made?

A No sir, I don't have the cumulative for all the wells in the pool, I know that. As a matter of fact, we didn't obtain an individual tabulation, but I do know that a lot of them have made substantial amounts of oil.

Q As a matter of fact, they have made more than the 70,000 barrels of oil --

A Yes, sir.

Q --as shown on the map?

A Yes, sir.

MR. NUTTER: Thank you.

MR. PORTER: Mr. Fischer?

CROSS EXAMINATION

BY MR. FISCHER:

Q Mr. Tomlinson, does the Ada Adams Number 1 make any water, has it ever made water?

A It shows sixty barrels.

Q Sixty barrels?

A For one month, and I believe that's for the month of February. That's out of a total production of oil of 1527, which would make it, oh, less than one percent--well, no, beg your pardon, about four per cent water.

Q At four per cent water?

A I believe that's right.

Q Is that the only month that that well made water, do you know?

A I doubt it, I imagine its made some all along, but I don't have the figures here.

Q February is the last month that you have data from the Engineering Committee, is that right?

A It's all I have with me. Well, let me say this: I have the 1957 Annual Report here, that might have that.

Q I mean as far as 1959 is concerned, that's the last month that anyone would have data on?

A February is the latest month that I could get.

MR. FISCHER: Thank you.

CROSS EXAMINATION

BY MR. PORTER:

Q Mr. Tomlinson, would you say that this reservior

that you have outlined in here is more than half depleted?

A Apparently the reservoir extends over a much wider area than that, exactly in which directions, I don't know, Mr. Porter. I would say that the oil that's been produced out of here represents a good portion of what may be all, I'm not sure, of what originally existed here, but it has been replaced, in my opinion, by other oil moving in.

Q I notice you have estimated the recoverable oil in place at 70,000 barrels here on 40 acres?

A Yes, sir.

Q And you give the cumulative production from the 14 wells now existing at 1,860,000 barrels?

A Yes, sir.

Q As I calculate that, that's an average recovery per well of 132,000 barrels?

A Yes, sir.

Q And on your exhibit under your proposed proration units here, that you would drill 12 more wells, making a total of 26?

A There would be a place for that many more wells.

Q Twelve more wells?

A Whether the operators will elect to drill all of them, I wouldn't know.

Q Which, if divided into the oil which has already been recovered, would be about 71,500 barrels, so that's what leads

to my question as to whether you think the reservoir is more than half depleted?

A This area --

Q Of course, that would --

A If it would have been closed in all places, it would have been depleted, and possibly more, with the production of oil that has occurred; however, it appears that oil has been moving in, replacing that that's taken out.

Q Of course, the assumption that the reservoir is more than half depleted would also have to assume that these would be, that there would be a total of 26 wells eventually in the pool?

A Yes, sir.

MR. PORTER: Does anyone have a question?

MR. MORGAN: I would like to ask Mr. Tomlinson a question.

MR. PORTER: All right.

CROSS EXAMINATION

BY MR. MORGAN:

Q Mr. Tomlinson, you indicated in explaining one of your exhibits, possibly Exhibit Number One or Two, I don't know which one, but it was the one, anyway, showing the well locations, and you denoted there a correlated pressure drop between one well in Section 2, I think it was Atlantic's State "AD" Number 1, and another well in Section 11 to the south, I think it was possibly Gulf Mills Federal Number 1. You stated that there was a

correlated pressure drop there that interested you and showed that there was communication between those two wells, and you also stated, I believe, that that would indicate an 80-acre pattern of drainage. I don't know, I don't believe I understand, that looks like those wells indicate a 40-acre area of drainage at the present because of their present proration?

A Yes, sir. Well, I wonder if I could use an area in this Exhibit Seven to illustrate what I am referring to? Actually, a well drilled 660 feet from all lines of this proration unit would have 40 acres assigned to it and its radius of draining on 40 would be 660 feet to its nearest line and if it were extended, it would be extended, if you extended it to 80 acres, in other words, another 660 feet away, its influence of drainage would occur to that point, and likewise an additional 660 feet in other directions, and that's what I meant when I was saying I thought that was on the outer perimeter of an 80-acre drainage pattern. So then if you apply that analgy to the location of the Gulf Federal Mills Number 1 in Section 11 and the Atlantic State "AD" Number 1, you can see that that drainage pattern could have existed and probably did exist around the Gulf well at that time.

Q Well, according to your Exhibit Twelve--I mean Nine, I think it's Nine, you seem to have a flexible pattern there in mind on your spacing?

A Well, the rules that we proposed, if you are talking about a flexible pattern, the rules that we propose allow people to

drill on either end of any proration unit.

Q In other words, just like has been done already in Sections 23 and 11, in other words, just offset from each other?

A Yes, sir.

Q Just offset wells?

A Yes, sir.

Q Supposing then you go up here into Sections 35 and 36 and 1 and you run another row of wells offsetting each other across the section line there. Supposing that you decided to do that, wouldn't you have a great deal of vacant space in between the existing wells and the new wells?

A Yes sir, we would have. However, some of that has already been solved. Cactus is drilling their well in the southeast of the northeast of Section 2 in the location shown there. That well is now drilling, so under 80-acre spacing, they couldn't come north and drill on the other end of their proration unit.

Q I see.

A I might answer this, that I think the operators originally didn't realize the situation in the Allison Pool was such and some of the wells were making water, so they felt they had to get as high on structure as they knew, and consequently they moved into the best area they knew of to drill at the time.

Q Now then, if they did go to that extreme pattern and everybody decided the same end of a row of 80's there, you would almost be operating in two pools in the north?

MR. PORTER: North Allison.

Q (By Mr. Morgan) North and the Allison Pool, wouldn't you? I mean, you are just practically disconnecting them, anyway, on that kind of a pattern?

A Well, if they were drilled in the way that you are talking --

Q I mean, that's an extreme possibility?

A It's an extreme possibility that you could have two lines of wells in that manner.

Q Yes.

A And --

Q And almost cut the pool in two? I mean, you call it a common pool, then you could still cut it in two in inactivity, no drilling?

A Yes sir, you could cut it through from appearances; I don't think you could cut it through from the drainage standpoint.

Q You are not going to get any radial pattern of drainage in this style of 80-acre spacing, are you?

A No sir, you wouldn't get radial in that drainage from one area to another, you would have to have linear flow. As you approach a well, it would become more radial, but it would be linear flow at the extreme end of the --

Q Would you place the proposed 80 acres in this manner because of the structure line to the--more or less in an elongated pattern from the northeast to the southwest?

A Not so much that as unfortunately, several of these wells were drilled in such a way that they--in the older Allison area, that they had to have acreage allocated in that way, and the other, it was simply convenient to start to continue the same pattern. However, I don't believe that this necessarily represents the outer edges of the pool; we could have just as well run them the other way.

Q Do you see any possibility in 80-acre patterns alternating with 40's in order for a fixed pattern for the remaining developments?

A Yes sir, that's possible for remaining development.

Q Do you think it would be wise to provide that?

A Well, from out standpoint, it wouldn't make much difference.

Q You don't think it would make any difference in the --

A I say from Atlantic's standpoint. We have an interest in this tract here, this one here, in fact, all across here and all of this acreage in here. Now, we have been considering drilling a well at that location, you see that these two are already on a pattern, this one is, this one, and likewise this one here. We don't plan to break an 80-acre pattern at any point if we can avoid it. Now, as far as other operators go, I don't know if their plans. It might be, it is a possibility and I don't know how our company would react, but for remaining development, it is a good possibility.

MR. MORGAN: I believe that's all, thank you.

MR. PORTER: Mr. Fischer?

CROSS EXAMINATION

BY MR. FISCHER:

Q Mr. Tomlinson, could you tell me how you would recommend to your company the development of the northwest quarter of Section 2, 9, 36?

A Yes sir, I know how I would like to have that well drilled, or that tract drilled. This doesn't reflect what our management wants to do, but what I would like to do is drill in the southeast of the northwest of Section 2.

Q All right, what about the next well then?

A Where? I mean, what --

Q If you developed the whole 160 acres there?

A Oh.

Q How much do you plan to develop of that 160 acres?

A Well, I don't have enough structural information to know.

Q I mean on the limits that might occur. I am not saying that your spacing --

A We don't have the control far enough to say that this is flat enough out here. It doesn't dip off, for example, any more than it does on this side for us to assume that. If it didn't, I think we probably would want to go to the northwest, but that's so hard to say right now.

Q If you drilled that well in the southeast of the northwest and it was productive, and all it showed or all it did was confirm these contours that you have shown there, where would you drill that other well, and I assume then that you would have to drill another well to develop the other 80 acres?

A Well, sir, we might not. If we went offset, you see, that is outside of the proposed limits that we had, and I think that we would have to get some indication of the reservoir extending out that far. We found, I might add we found us a dry hole on the north, and it is going to have to stop somewhere in all directions, so I think we probably would select some other locations we would rather drill.

Q If you drilled all those other locations, then you might extend it, might you not, and develop the 80 acres or 120 acres, we'll call it 80 now, remaining in this 160 acres?

A If we thought it were productive and we thought there was enough additional oil that we would recover, we would probably still be on an 80-acre pattern.

Q Where would you drill the well, however?

A Well, it would be on a 80-acre pattern, most likely, in the northwest, assuming there was enough oil and we thought it would be productive.

MR. FISCHER: Thank you.

MR. PORTER: Mr. Nutter?

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Tomlinson, I believe there are twelve wells producing in what we might call the southern end of the field, is that correct?

A Yes, sir.

Q And Atlantic has one of those twelve?

A Yes, sir.

Q Now, up in what we might call the north portion of the field, Atlantic owns the bulk of the acreage, is that correct?

A That's an operator's unit and we've got about, a little over 60 per cent of it.

Q Well now, if the Commission authorized 80-acre spacing in here and assigned these wells in the south part of the field an 80-acre allowable, they would each receive an extra 36 barrels of oil, correct?

A Yes sir, and the twelve wells would thereby receive a total of 432 barrels of oil per day.

Q I can't understand why Atlantic up in the northern part of the field would want to make an application for eleven out of twelve wells in the south part of the field to receive this additional allowable when all this drainage is coming from the north end to the south end of the field. Aren't they going to be draining your oil now?

A We plan further development up there.

Q Still they will be--they are developed down there,

aren't they?

A Yes, sir. Well, it's unfortunate that we didn't get an even start in drilling this area.

Q But you are giving them an additional headstart now, aren't you?

A Our wells will get the same advantage when they are drilled. In other words, the two that we have now will get the extra allowable and any additional wells that we might drill will get the extra allowable, and it is true that we'll be helping these folks down here, but we would rather insure that the field would produce on 80-acre development than 40. In other words, we know we can't make money on 40-acre development.

Q But you might make money by losing 432 barrels of oil per day?

A Yes, sir.

MR. NUTTER: Thank you.

MR. PORTER: Mr. Fischer?

MR. FISCHER: I have one more question. I just want to know if Atlantic has or has seen seismic information showing anything in Section 26 or 8, 36?

A We have seismic information covering that area. I didn't examine that closely, principally because it looked as if the field might be trending in a northeasterly direction. I wouldn't know what to think about it.

MR. FISCHER: Thank you.

MR. PORTER: Mr. Hinkle, did you have any other questions?

MR. HINKLE: Yes sir, I have another question or two.

REDIRECT EXAMINATION

BY MR. HINKLE:

Q Referring back to the line of testimony of Mr. Morgan's here as to the drainage area, isn't it a fact that wherever a well will be located, whatever unit it is on, whether it would be a 40-acre unit or an 80-acre unit, that the unit doesn't necessarily drain that respective unit, but that there would be counter-drainage which would average out?

A Yes, sir.

Q The drainage radius, whatever it is, remains the same whether you locate a well on 40 or 80, isn't it true?

A Yes sir, its ability definitely does, its ability to drain is the same.

Q Whether you locate these wells on 40 or 80, if they have drained 80 acres, they are going to continue to drain 80 acres, are they not?

A Yes, sir.

Q I believe Mr. Porter, in referring to your Exhibit Number Eight, spoke about the recoverable reserves as being 70,000 barrels. You didn't intend that to indicate the recoverable reserves, did you?

A No sir, I didn't understand his question in that way, I thought he meant the oil in place, but the recoverable reserves

are not calculated.

Q You have calculated that from the characteristics of the reservoir, the basic data which you have, that there was originally in place 70,000 barrels of oil under each 40-acre unit and that is what is shown in Exhibit Eight?

A Yes, sir.

Q And on that basis, one well on 40 acres, if it is limited to recover the oil in place, would not pay out?

A Yes, sir.

RECROSS EXAMINATION

BY MR. MORGAN:

Q Mr. Tomlinson, your answer indicated just now that there would be a fair exchange of oil regardless of whether the wells were located on the 80 acres, is that what you think? In other words, if there were a well on each 80 throughout the pool, the wells that you wanted on 80, then there would be a fair exchange of oil from under one, from one 80 to another?

A If I understood Mr. Hinkle's question correctly, he meant that regardless of which end, which lot of the 80 acres you put your well on, it would have the ability to drain the other end of the lot.

Q For an equal area?

A For an equal area, yes sir.

Q In other words, the permeability and the porosity is uniform throughout the pool?

A Yes, sir. There's one thing I didn't bring out that I probably should have pointed out to you, Mr. Morgan. This Sun Mills Number 1, this had an initial pressure of 3,000 pounds. This was a development well and of course there wasn't any other development in the area at all except up here, and that still wasn't there, but it was half a mile away from Gulf's well and the initial pressure on it came in a lot less than the initial pressure on the Gulf well and that definitely --

Q You pointed that out.

A Did I?

Q Yes, sir.

A Well, I--so they will, I think, drain a wide area.

MR. HINKLE: Mr. Porter, I have another question here.

REDIRECT EXAMINATION

BY MR. HINKLE:

Q Mr. Tomlinson, have you any indication from the other operators in the Allison and North Allison Pools as to their attitudes toward this application and 80-acre spacing in the area?

A Yes sir, Mr. Hinkle, we have contacted all of the operators in the pool and several of them have sent us letters saying that they were in agreement with our proposed rules, and all indications from them in one manner or another have said that they would like 80 acres.

Q They favor 80-acre spacing?

A Yes, sir.

MR. HINKLE: That's all we have.

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

The witness may be excused.

(Witness excused.)

MR. PORTER: Does that conclude your testimony, Mr. Hinkle?

MR. HINKLE: That concludes our case.

MR. PORTER: Anyone else desire to present testimony in this case?

Any statements?

MR. PAYNE: Mr. Commissioner, we received a communication from Gulf Oil Corporation concurring in Atlantic's application.

MR. PORTER: Any statements in connection with the case?

There are apparently no statements, so --

MR. HINKLE: If the Commission please, I believe that we have established conclusively in this case that one well will effectively and efficiently drain 80 acres. There's no need for me to read the statute, of course, to the Commission, which you all are familiar with. If there's any, ever has been a case where 80 acres should be allowed, 80-acre spacing, I think it is this, and I think this case points out clearly a situation where there is need for a rule, a standing rule of the Commission, State-wide rule, to permit areas and fields upon discovery, to be developed on an 80-acre pattern at least temporarily for a relatively short time until a certain number of wells have been

drilled. In this area, as the witness has shown, it looked from the beginning, because of the wells making water, that the recovery might not be too high, and outside of the offset wells, which were naturally drilled to begin with, it soon appeared that it wasn't feasible to develop it upon 40 acres, and taking into consideration the economics of it as shown by the exhibit which has been introduced here, if it is limited to oil in place, clearly one well will not pay out on 40 acres. I think the enforcement of a 40-acre rule in this particular area will result in economic waste and will cause the drilling of unnecessary wells.

MR. PORTER: Anything further, anyone else have a statement, any comments?

We will take the case under advisement.

We are going to have a ten-minute recess, but before we do, it has been a pleasure to have Mr. Walker with us, who was a member of the Commission for four years. We are glad to have him back, even temporarily.

(Short recess.)

MR. PORTER: The meeting will come to order.

Counsel for Atlantic has requested that Case 1637 be re-opened for purposes of offering letters in evidence for the record.

MR. HINKLE: If the Commission please, Atlantic would like to file in support, in connection with Case 1637, letters which have been received from the Magnolia Petroleum Company,

the Cactus Drilling Company, Ada Oil Company, the Ohio Oil Company, the Sun Oil Company and the Cosden Petroleum Corporation showing in effect that they are in accord with the application of Atlantic, and they all agree with the 80-acre spacing and proration units.

MR. PORTER: Is there objection to the admission of these letters?

The letters will be made a part of the record, Mr. Hinkle.

STATE OF NEW MEXICO)
: ss
COUNTY OF BERNALILLO)

I, JERRY MARTINEZ, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Hearing was reported by me in Stenotype and reduced to typewritten transcript by me, and that the same contains a true record to the best of my knowledge, skill and ability.

DATED this 29th day of April, 1959, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Notary Public

My Commission Expires:

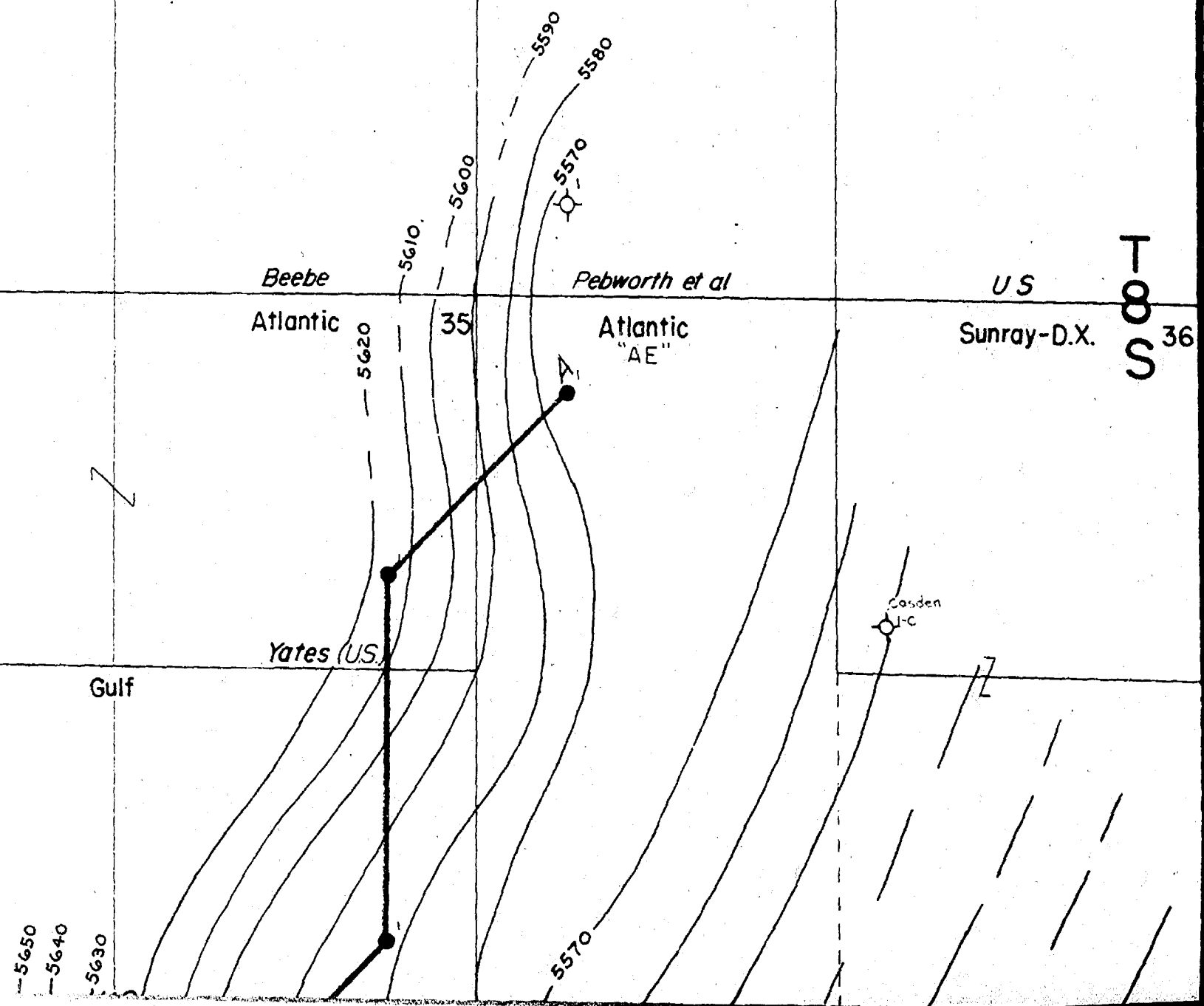
January 24, 1962

EXHIBITS FOR CASE 1637

REHEARING OF ATLANTIC'S
APPLICATION FOR 80-ACRE
SPACING IN ALLISON
AND NORTH ALLISON POOLS

July 15, 1959, Regular Statewide Hearing

Magnolia 27	Magnolia	Atlantic 26	Skelly	Shearn 25
Magnolia				
US Magnolia 34	US Skelly	Beebe Atlantic 35	Pebworth et al Atlantic "AE"	US Sunray-D.X. 36
		Yates (US.) Gulf		



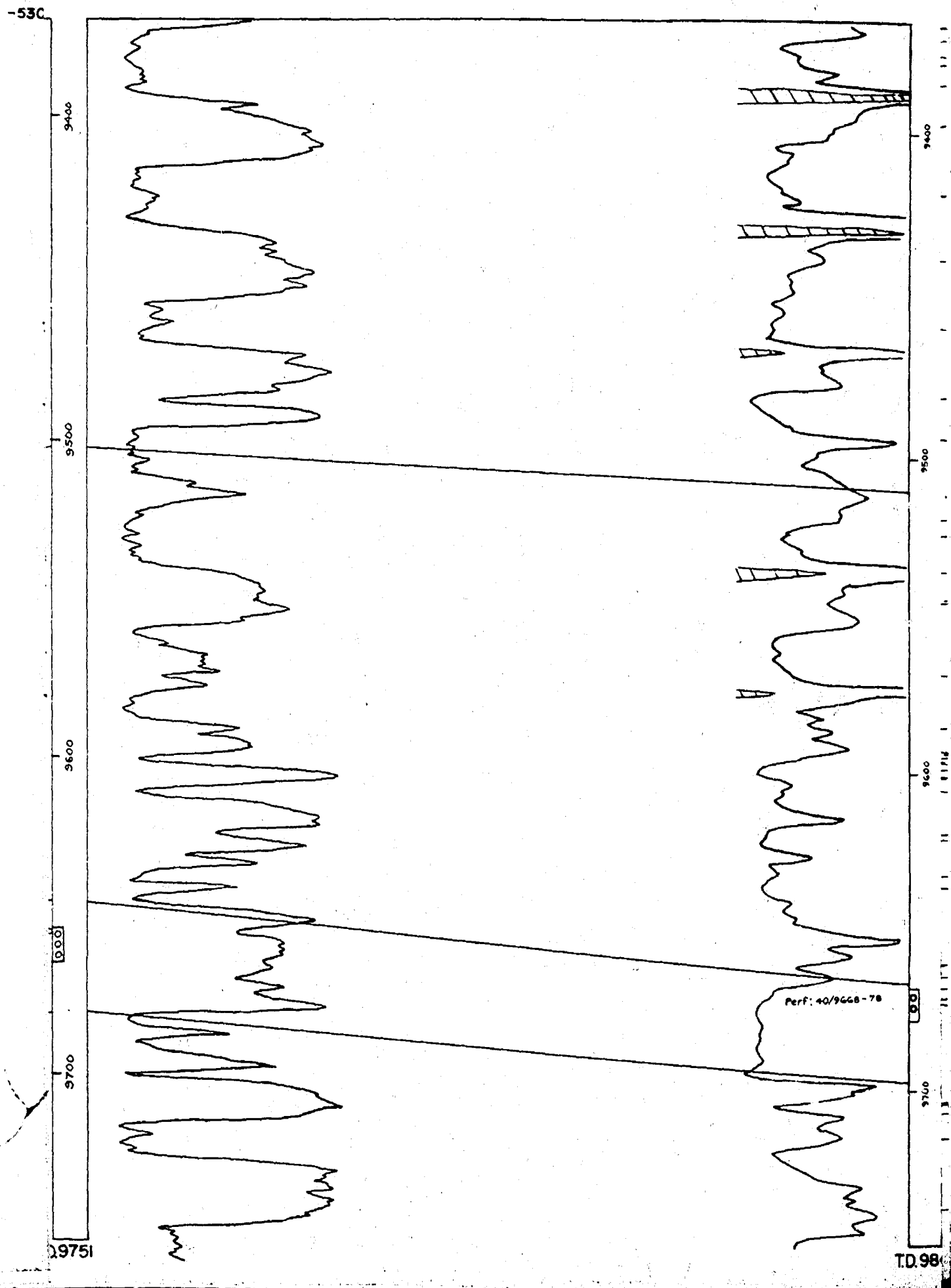
US
Magnolia
3
Atlantic
US
Cactus "A"
2
Magnolia
State
Anderson
Gulf
1
5580
5590
5600
5610
5620
5630
Atlantic
Ada
Atlantic "AD"
Ohio
Cosden
US
Magnolia
10
Adams
Gulf
State
Gulf
11
Cox
US
Magnolia
Magnolia
T 9 S
12
US
Gulf
Trice
Merrill et al
Mills (U.S.)
Childers (U.S.)
Sun
Magnolia
Santa Fe Ry
Mills
R 36 E

STRUCTURE MAP
Allison & North Allison Pools
Lea & Roosevelt Counties, New Mexico
Contoured on Top of Bough "C"
Scale: 1" = 1000'
June 24, 1959
—— Key to Cross Section

Cox US 2-R

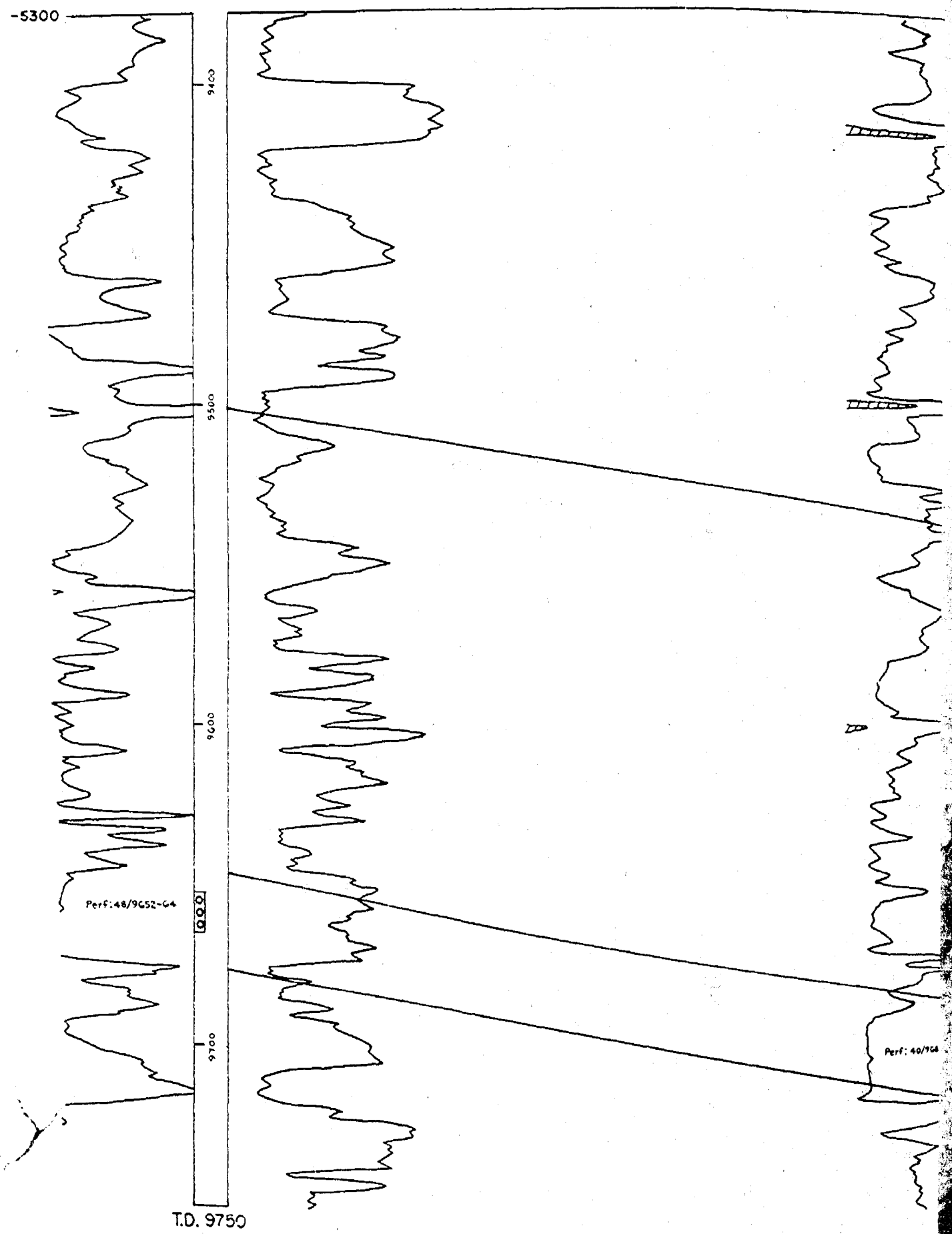
LANTIC
Gulf No.1
5-8-36
El. 4065

CACT
Sunray Stat
2-9-
El. 40

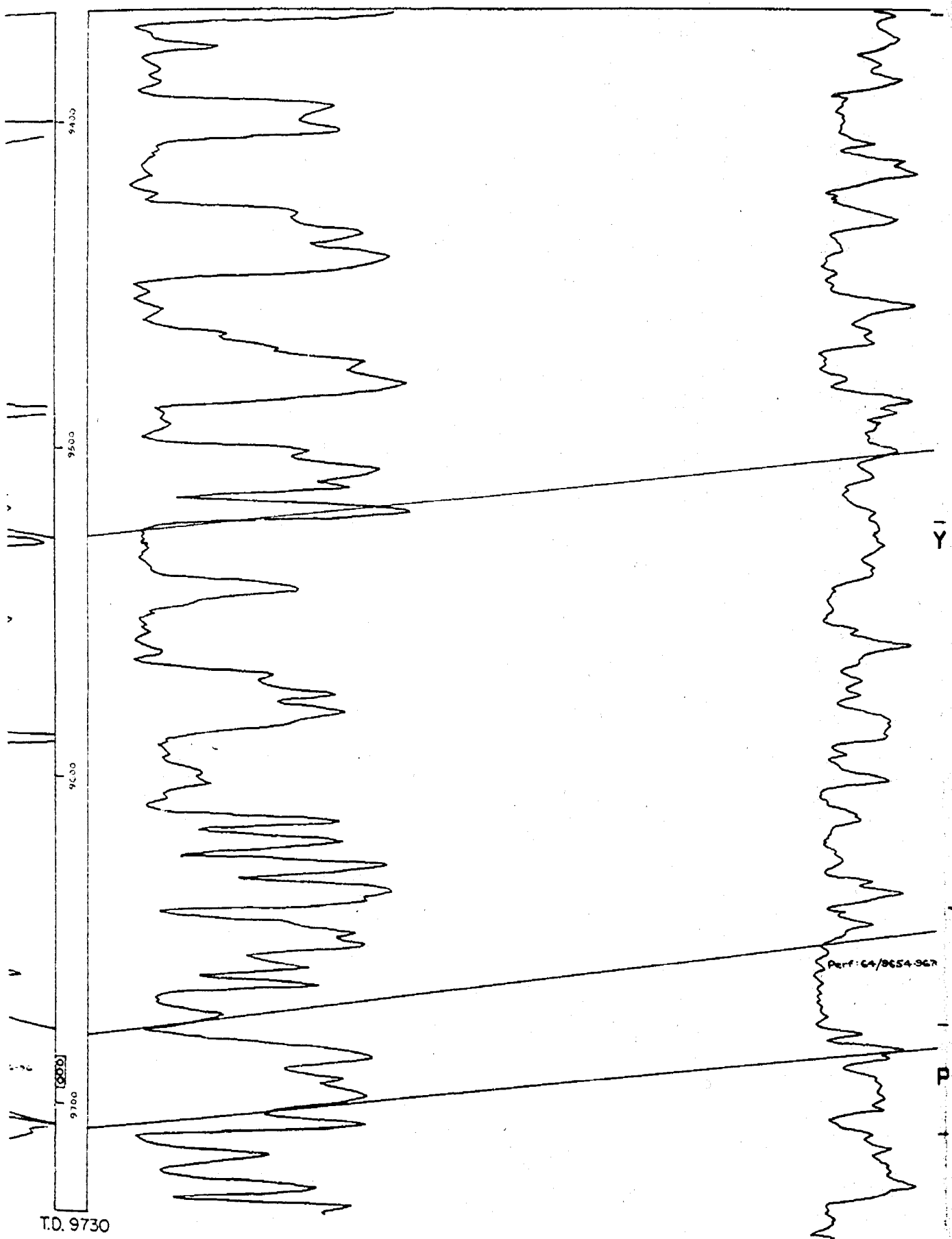


(A)

ATLANTIC
State "AE" No. 1
36-8-36
El. 4079

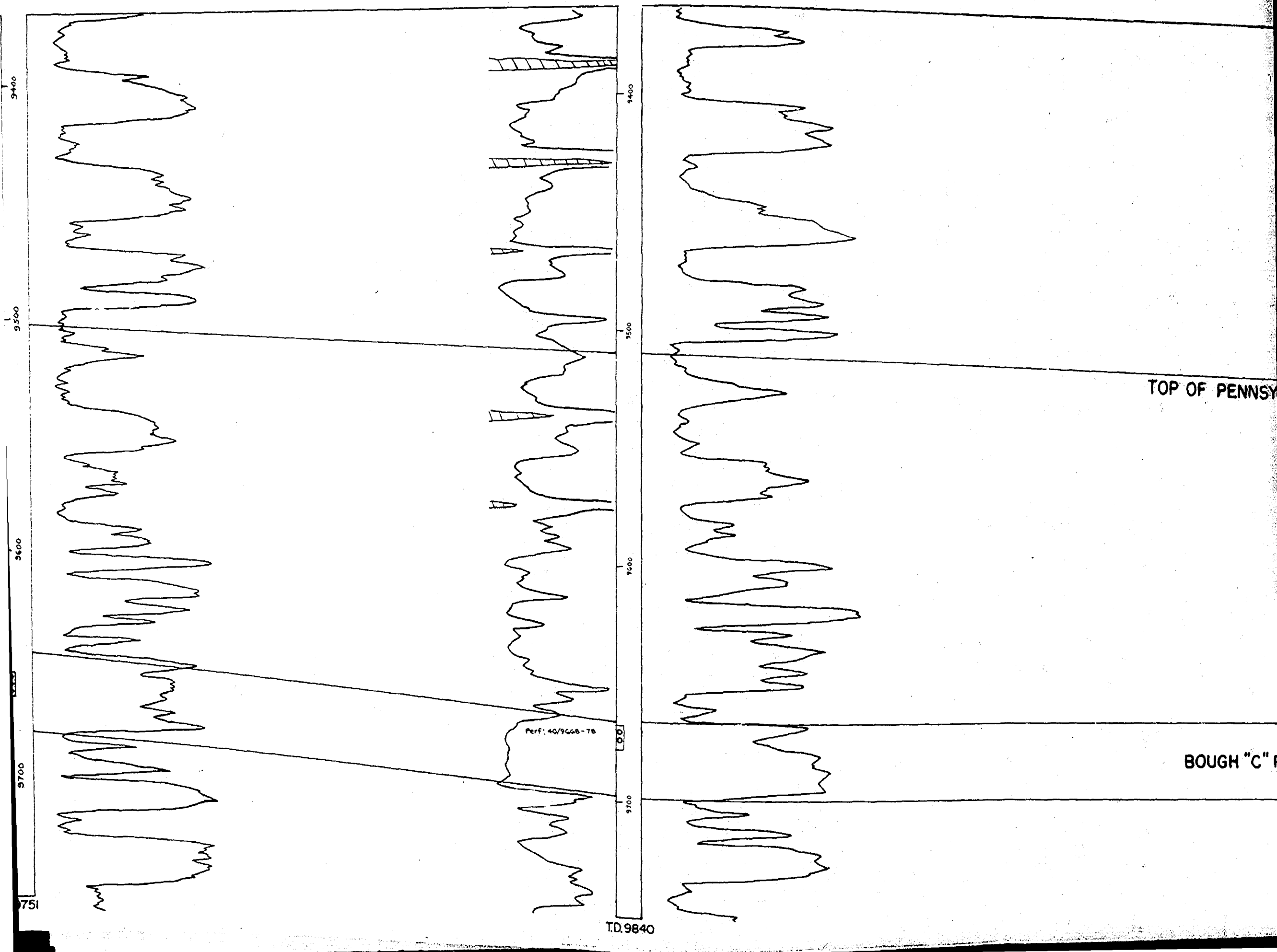


ATLANTIC
Fed. Yates No. 1
35-8-36
El. 4067



LANTIC
Gulf No.1
-8-36
El. 4065

CACTUS
Sunray State "A" No. 1
2-9-36
El. 4065



ATLANTIC
State "AD" No. 1
2-9-36
El. 4062

GULF
Fed. Mills No. 1
11-9-36
El. 4063

VIAN

9400
9500
9600
9700

Perf: 5G/9675-89

T.D. 9815

7" Csg @ 9670'

T.D. 9703

SUN
Mills No. 1
11-9-36
El. 4070

A'

-5300

9400

9500

9600

9700

Perf: 20/9726-31

TD. 9765

ALLISON & N. ALLISON POOLS

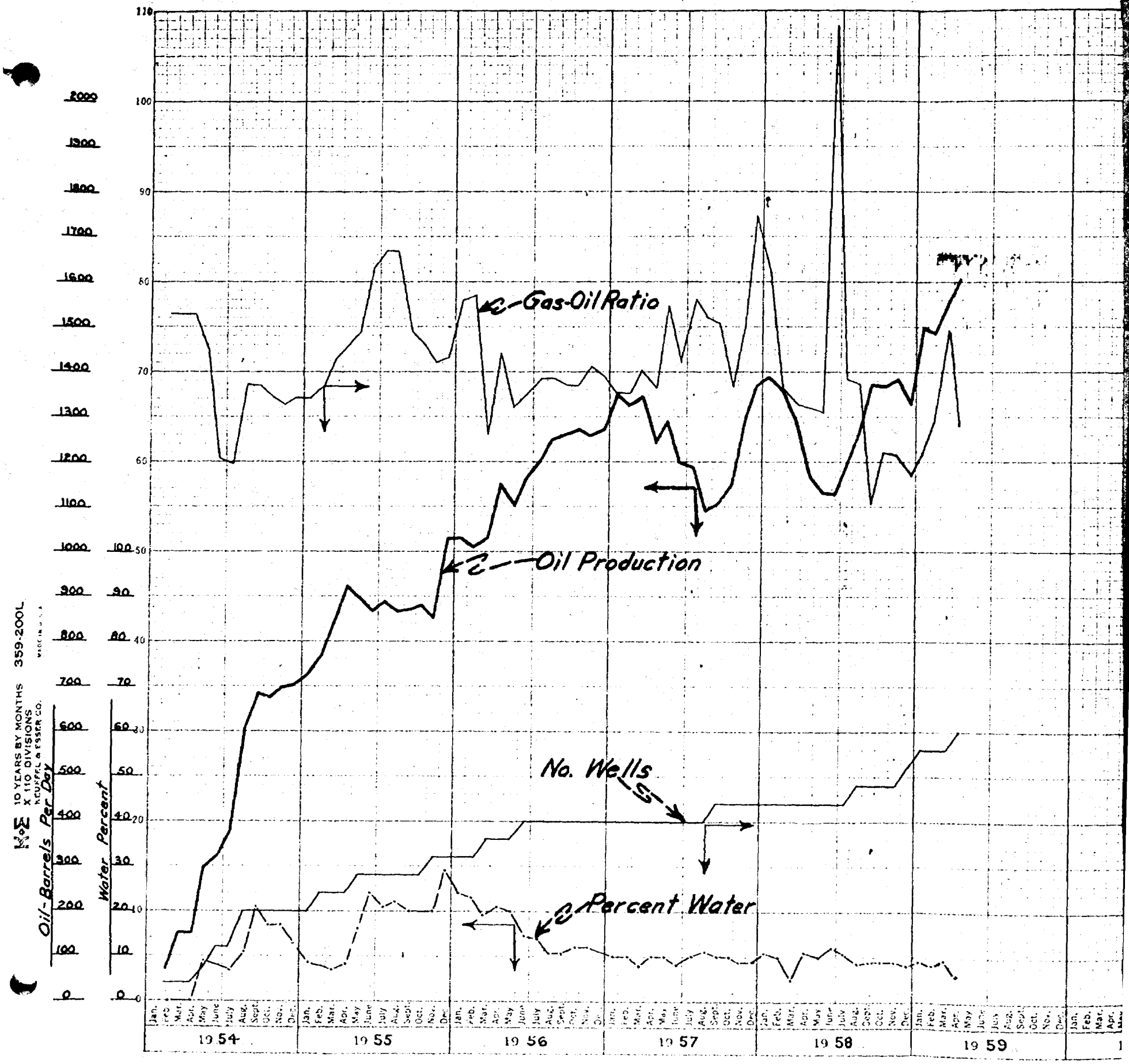
Lea & Roosevelt Co's, New Mexico

North-South Cross-Section

Horizontal Scale: 1"=300'
Vertical Scale: 1"= 40'

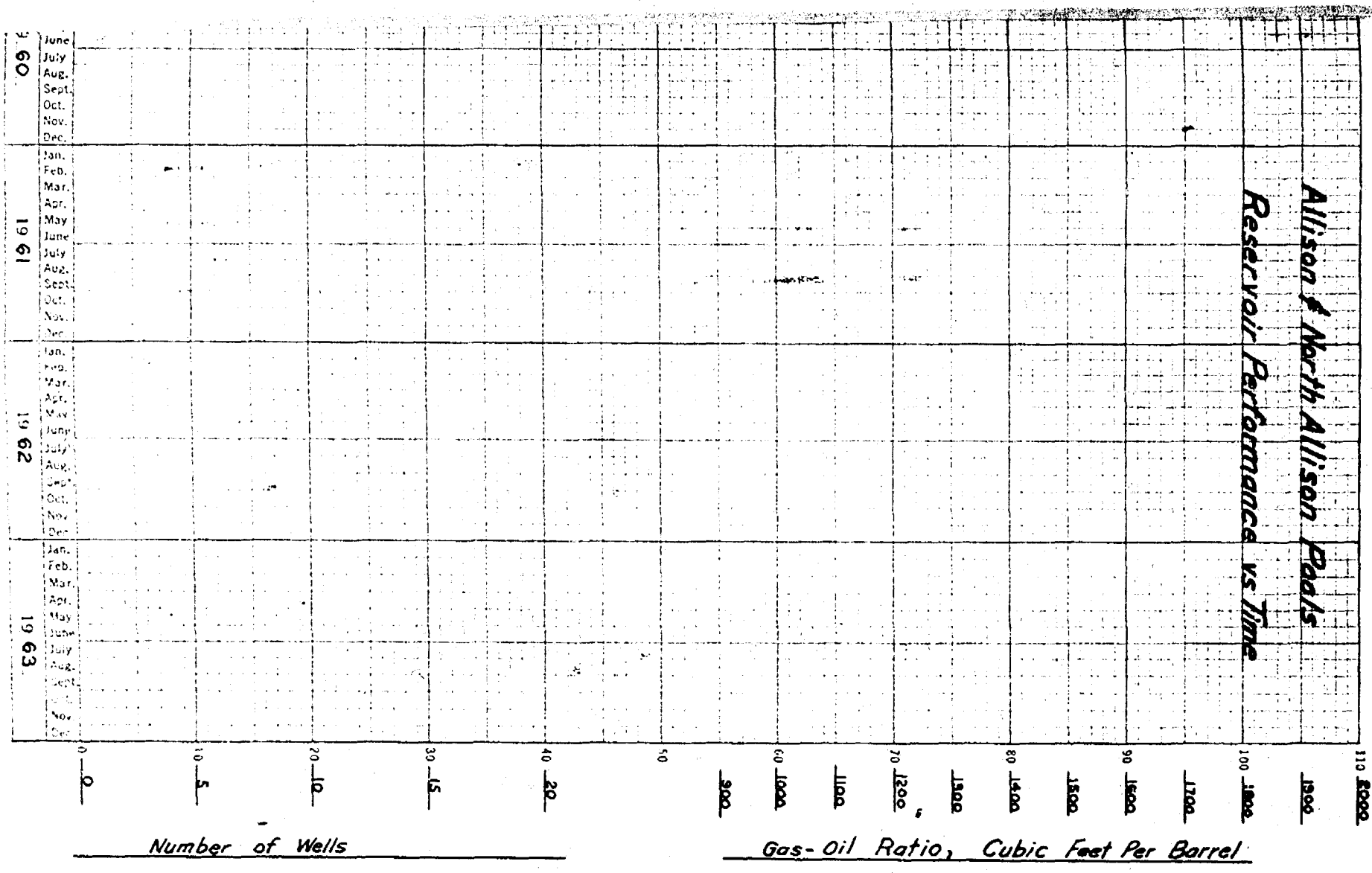
Date Prepared 3-59
Prepared By Atlantic Refining Co.
Cross Section A-A'

3-R


Gas-Oil Ratio
Oil Production
No. Wells
Percent Water
Oil-Barrels Per Day
Water Percent
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
110
100
90
80
70
60
50
40
30
20
10
0
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
1954
1955
1956
1957
1958
1959
10 YEARS BY MONTHS
X 110 DIVISIONS
KEUFFEL & ESSER CO.
359-200L

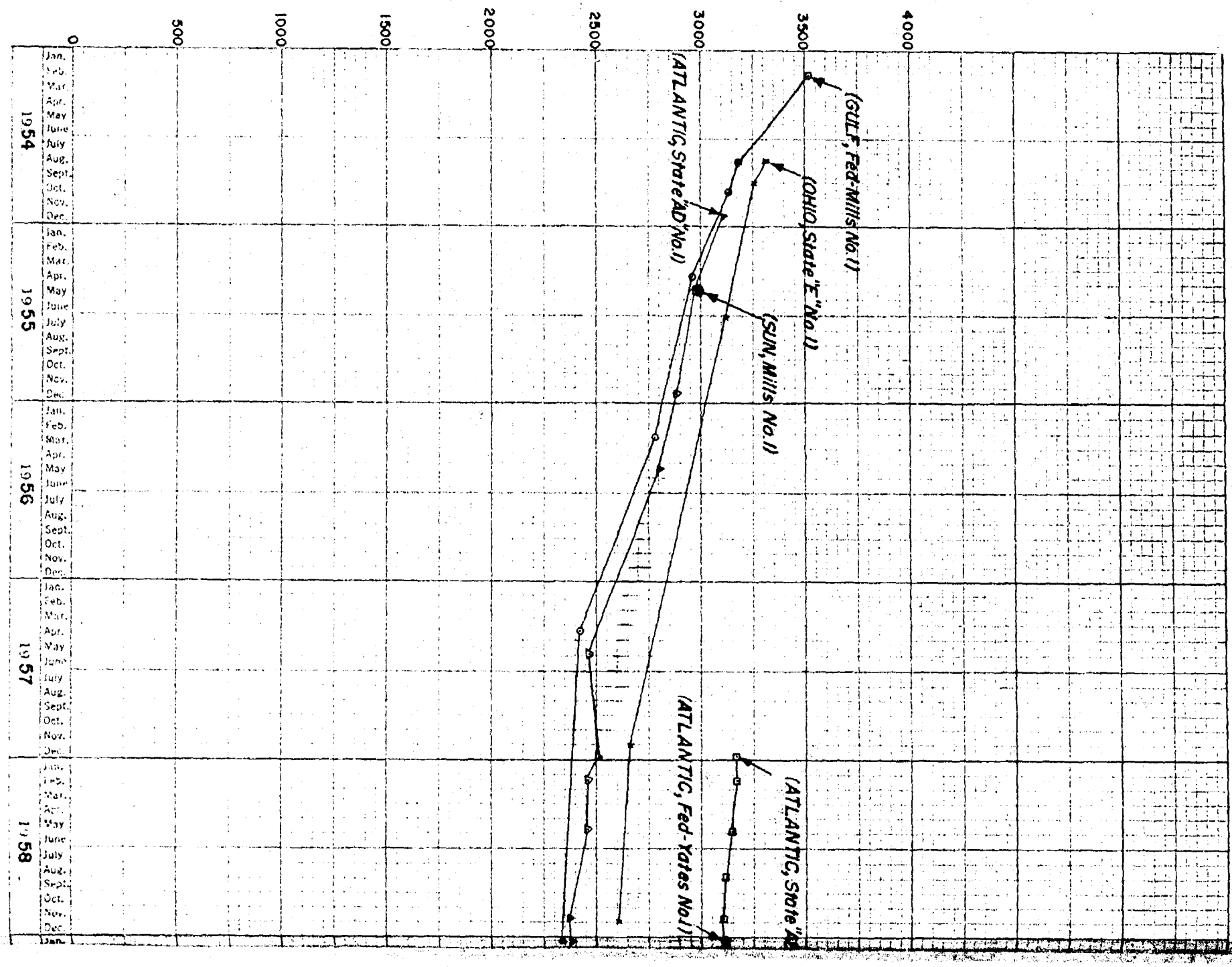
Allison & North Allison Pools

Reservoir Performance vs Time



K&E 10 YEARS BY MONTHS 359-200L
X 110 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

BOTTOM HOLE PRESSURE @ -5600', p.s.i.



ALLISON & NORTH ALLISON POOLS

BHP's vs Time for Individual Wells

⊙ - GULF, Fed-Mills No. 1
× - OHIO, State "E" No. 1
△ - ATLANTIC, St. "AD" No. 1
⊡ - ATLANTIC, St. "AE" No. 1
⊗ - ATLANTIC, Fed-Yates No. 1
● - SUN, Mills No. 1
✱ - ATLANTIC, Fed-Gulf No. 1
◬ Cactus, Sunray State A-2
Initial Pressure

"No. 1)

(ATLANTIC, Fed-Gulf No. 1)

◬ Cactus Sunray State A-2

Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. | Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. | Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. | Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. | Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.

1959 | 1960 | 19 | 19 | 19

BASIC DATA
ALLISON AND NORTH ALLISON POOLS

1. Physical Properties of Reservoir Rock
   A. Porosity - 5.15% (Avg. of 5 cores)
   B. Permeability - 107.2 md. (Avg. of 5 cores)
   C. Saturation - estimated 75% oil, 25% water
   D. Type of porosity - matrix and vugular

2. Structural Features
   A. WOC - undetermined
   B. GOC - none observed
   C. Gross pay thickness - Bough "C" - 30-50'
   D. Arithmetic avg. net pay thickness - 8.94'
   E. Dip - gentle, 100' to 150' per mile
   F. Anticlinal structure - limits undefined

3. Fluid Characteristics
   A. Average oil gravity - 48° API
   B. Salinity of water - 107,316 ppm, NaCl
   C. Saturation pressure - 3150 psig
   D. Solution gas-oil ratio - 1517 CF/B at 3150 psia
   E. Formation volume factor - 1.821 at 3518 psi
   F. Viscosity of oil - .19 cp at 3150 psi
   G. Compressibility of saturated oil at 156°F - from 3150 psi to 5000 psi - 23.03×10^{-6} Vol/vol/psi

4. Pressures And Temperatures
   A. Original pressure - 3518 psig
   B. Reservoir temperature - 156°F
   C. January, 1959, weighted average pressure at -5600' - 2734 psig
      (Shut-in from 72 hours to 168 hours prior to test)
   D. Average productivity index - 5.01
      (Range: 2.22 - 11.88)

5. Statistical Data
   A. Oil production rate - 47,447 barrels for April, 1959
   B. Cumulative oil production to 5-1-59 - 1,998,553 barrels
   C. Average GOR - see graph
   D. Water production - see graph
   E. Well count - 16 producing, 1 drilling, 2 dry

6. Well Completion Methods - Casing Perforations Most Common

7. Area Within Recommended Boundary - 2320 Acres

8. Average Well Density - 80 Ac/Well

9. Disposition of Gas for Month of April, 1959
   A. Vent - 7810 MCF
   B. Lease - 1374 MCF
   C. Sold - 47,162 MCF (Sinclair, Magnolia, Phillips)

6-R.

ALLISON POOL
LEA COUNTY, NEW MEXICO
SUMMARY OF CORE ANALYSES

OPERATOR:	Gulf	Gulf	Magnolia	Magnolia	Magnolia	Average
LEASE AND WELL:	Fed. Mills #1	Fed. Mills #2	Fed. Childers #1	Fed. Childers #2	Fed. Cox #2	-
PAY INTERVAL FROM CORE:	9677-9698'	9694-9705.3'	9687-9704'	9692-9717'	9708-9711.2'	-
NET PAY FROM CORE:	11.0'	9.4'	4.5'	10.4'	3.2'	7.7'
WEIGHTED AVERAGE POROSITY:	6.7%	8.1%	1.8%	3.5%	1.3%	5.15%
WEIGHTED AVERAGE PERMEABILITY:	301 md.	80.6 md.	.7 md.	6.0 md.	.3 md.	107.2 md.

NET PAY BY WELLS
ALLISON AND NORTH ALLISON POOLS

OPERATOR, LEASE & WELL	NET PAY, FT.
Ada Oil Co.	
Adams St. No. 1	6
Atlantic Refining Co.	
Federal-Gulf No. 1	20
Federal-Yates No. 1	9
State "AD" No. 1	4
State "AE" No. 1	13
Cactus Drilling Co.	
Sunray State "A" No. 1	10
Sunray State "A" No. 2	4
Gulf Oil Corp.	
Mills (Fed.) No. 1	11
Mills (Fed.) No. 2	9
Magnolia Petroleum Co.	
Childers (Federal) No. 1	7
Childers (Federal) No. 2	12
Cox (Federal) No. 1	7
Cox (Federal) No. 2	3
Ohio Oil Co.	
State "A" No. 1	5
State "A" No. 2	10
Sun Oil Co.	
R. G. Mills No. 1	9
Trice Production Co.	
Merrill No. 1	13

Arithmetic Average Thickness - 8.94'

9-R

VOLUMETRIC CALCULATION
FOR OIL IN PLACE - 40 ACRE TRACT
ALLISON AND NORTH ALLISON POOLS
LEA AND ROOSEVELT COUNTIES,
NEW MEXICO

$$N_1 = \frac{7758 \times \phi \times (1 - Sw) \times h \times A}{B_o}$$

$$= \frac{7758 \times .0515 \times (1 - .25) \times 8.94 \times 40}{1.821}$$

= 58,841 barrels

A recovery factor of 30% is believed to be reasonable for the Allison and North Allison Pools. Recoverable oil per 40-acre location would therefore be:

Recoverable oil = $.30 \times N_1$

= .30 x 58,841 barrels

= 17,652 barrels

Definition of Symbols:

N_1 = Original oil in place per 40 acre tract, stock tank barrels

ϕ = Porosity as a fraction, .0515

Sw = Interstitial water saturation, fraction of pore space - .25

h = Net pay thickness, feet - 8.94

A = Area for which oil in place is being calculated - 40 acres

B_o = Original oil formation volume factor, barrels of reservoir space per barrel of stock tank oil - 1.821

7758 = Number of barrels per acre-foot

VARIATIONS REQUIRED IN APPLIED
DATA TO ACCOUNT FOR OIL PRODUCED
GULF MILLS NO. 1 WELL
ALLISON POOL

Estimated Recoverable Oil For 40 Acre Tract Assigned To Gulf's Federal Mills No. 1 is:

$$\text{Recoverable Oil} = \frac{7758 \times \phi \times A \times h \times (1-Sw) \times R.F.}{B_o}$$

$$= \frac{7758 \times .067 \times 40 \times 11 \times (1-.25) \times .30}{1.821}$$

$$= 28{,}258 \text{ STB}$$

RF is the recovery factor and is estimated to be 30%. Other symbols in the above equation are defined on the Exhibit showing volumetric calculations for oil in place.

The measured oil production from Gulf's Federal Mills No. 1 was 273,437 barrels as of May 1, 1959. The tabulation below shows what each variable in the above equation would have to be to account for the volume of oil actually produced from the tract as of May 1, 1959, if all variables but one are equal to their applied values. In reviewing this Table, it should be remembered that 28,258 STB is the estimated ultimate recovery of oil that was originally situated beneath the 40-acre tract. The 273,437 barrel figure is what the well has actually produced and of course the well is still producing. An even greater variation in the applied values and required values would exist if the required values were based on actual ultimate recovery.

	Applied Values	Required Values
Net Pay	11 feet	106.4 feet
Porosity	6.7%	64.8%
Recovery Factor	30%	290.3%
Water Saturation	25%	<0%
Formation Volume Factor	1.821	0.188

All applied values are measured except water saturation and recovery factor. Water saturation usually occurs between 15% and 60% but cannot be less than 0%. Recovery factor will occur normally between 15% and 50%.

12 K

ECONOMICS OF DRILLING ONE WELL PER 40 ACRES
IN ALLISON AND NORTH ALLISON POOLS

REVENUE		
Oil		
(17,652) (1.0 - .125) ($2.95) =		$ 45,566
Less Severance Taxes At $0.1369/BO		2,115
Gross Oil Revenue Less Severance Taxes		$ 43,451
Gas		
(17,652) (1.0 - .125) (3.540) ($0.08)		$ 4,374
Less Severance Taxes At 0.0264 Of Value		115
Gross Gas Revenue Less Severance Taxes		$ 4,259
Total Gross Revenue Less Severance Taxes		$ 47,710
COSTS		
Development		
Drilling		$ 175,000
Pumping Equipment		30,000
Flow Lines		1,600
Total Development Cost		$ 206,600
Operating		
($0.08) (17,652)		$ 1,412
Total Costs		$ 208,012
Loss Per 40-Acre Well		$ 160,302

CONDITIONS

Recoverable Oil In Place Per 40 Acres	17,652	barrels
Average Gas-Oil Ratio Throughout Life	3,540	cubic feet per bbl.
Oil Price	$ 2.95	per barrel
Casinghead Gas Price	$ 0.08	per MCF
Operating Cost	$ 0.08	per barrel
Royalty	1/8	
All Wells Completed At Same Time		

13-K

RESULTS OF INVESTIGATION OF DRAINAGE
ALLISON AND NORTH ALLISON POOLS

CASE	I	II	III
OPERATOR	Atlantic	Ohio	Cactus
WELL	Fed. Yates #1	State E-6859"A"#2	Sunray St. "A" #1
LOCATION	SE NE Sec. 35 T-8S, R-36E	SE SE Sec. 2 T-9S, R-36E	NW NE Sec. 2 T-9S, R-36E
OIL IN PLACE BY VOLUMETRIC CALCULATION FOR 80 AC., STB	118,470	112,959	112,959
CALCULATED PRODUCTION BY EXPANSION OF RESERVOIR FLUIDS & ROCK ABOVE BUBBLE POINT (3518-3150 psi), STB	1,414	1,588	1,588
CALCULATED PRODUCTION BY EXPANSION OF RESERVOIR FLUIDS BELOW BUBBLE POINT, STB	1,815	12,204	6,131
PRESSURE INCREMENT FOR CALCULATION BELOW BUBBLE POINT, psi	3150-3059	3150-2602	3150-2803
TOTAL CALCULATED PRODUCTION FROM EXPANSION FOR 80 AC. TRACT, STB	3,229	13,792	7,719
ACTUAL MEASURED PRODUCTION FROM WELL AS OF DATE OF LAST PRESSURE, STB	14,653	124,399	19,053
PRODUCTION DUE TO DRAINAGE FROM OTHER AREAS, STB	11,424	110,607	11,334
CALCULATED DRAINAGE AREA, ACRES	360	720	200

SAMPLE CALCULATION
FOR PRODUCTION DUE TO
EXPANSION OF RESERVOIR
FLUID & ROCK--80 ACRE
TRACT SITUATED ABOUT
ATLANTIC'S FEDERAL YATES NO. 1

Calculation of original oil-in-place:

$$N_1 = \frac{7758 \times \phi \times h \times (1-Sw) \times A}{B_o}$$

$$= \frac{7758 \times .0515 \times 9 \times (1-.25) \times 80}{1.821}$$

= 118,470 Stock Tank Barrels

Calculation of production due to expansion of reservoir fluids and rock above the bubble point:

Pressure increment is from 3518 psi down to 3150 psi.

$$\Delta N = \frac{N_{f1}\, Bof_1 \left[(C_{om} - C_{wm}) + \left(\frac{C_{wm} + C_f}{S_{o1}} \right) \right] \Delta P \times 10^{-6} - B_w \Delta W_p}{Bof_2}$$

$$= \frac{118,470 \times 1.821 \left[(23.03 - 3.1) + \left(\frac{3.1 + 6.5}{.75} \right) \right] 368 \times 10^{-6} - 0}{1.837}$$

= 1414 STB

Calculation of production due to reservoir fluid expansion below the bubble point:

Pressure increment is from 3150 psi down to 3059 psi. The latter pressure was measured on April 21, 1959.

Oil in place at bubble point is 118,470 bbls - 1414 bbls = 117,056 STB

Since gas liberation in the reservoir is a differential process, the barrels of stock tank oil-in-place must be changed to residual differential barrels. This is done as follows:

$$N_d = N_f \frac{B_{of}}{B_{od}}$$

$$= 117,056 \left(\frac{1.821}{1.860} \right)$$

= 115,604 Residual Differential Barrels

Differential reservoir production below the bubble point is as follows:

$$\Delta N_d = \frac{N_{d1}\left[B_{g2}(R_{sd1} - R_{sd2}) + \frac{G_{f1}}{N_{d1}}(B_{g2} - B_{g1}) - (B_{od1} - B_{od2})\right] - B_w \Delta W_p}{(B_{od2} - B_{g2}R_{sd2} + B_{g2}R_{sdm})}$$

$$= \frac{115{,}604\left[.826\ (1.525 - 1.455) + 0 - (1.860 - 1.831)\right] - 0}{(1.831 - .826 \times 1.455 + .826 \times 1.490)}$$

$$= 1790 \text{ RDB}$$

The above differential production can be converted to flash production as follows:

$$\Delta N_f = \Delta N_d \left(\frac{B_{od}}{B_{of}}\right)_m = 1790 \left(\frac{1.847}{1.821}\right) = 1815 \text{ STB}$$

Note: Flash production is considered to be equivalent to stock tank production.

Total calculated production from original reservoir pressure to 3059 psi is:

1414 STB + 1815 STB = 3229 STB

15 - 12

Nomenclature for Material Balance Calculations

a = $p_{sc}T/2.92$, (RVB)(PSIA)/(MSCF)

B_{of} = Flash PVT basis, oil formation volume factor, RVB/STB

B_{od} = Differential PVT basis, oil formation volume factor, RVB/RDB

B_g = Gas formation volume factor, RVB/MSCF

B_w = Water formation volume factor, RVB/STB

c_o = Oil compressibility, RVB per MMRVB per PSI

c_w = Water compressibility, RVB per MMRVB per PSI

c_f = Formation (rock) compressibility, RVB per MMRVB per PSI

c_t = Total (average) compressibility of fluid-rock system, RVB per MMRVB per PSI

G_{dl} = Total reservoir gas in-place (differential PVT basis) at pressure p_1, MMSCF
(In retrograde systems below the dew point this is the gas equivalent of both the gas and liquid phases in the reservoir: total mols in-place times conversion factor from mols to standard cubic feet.)
(In oil reservoirs this is the sum of the free gas and the gas in solution.)

ΔG_d = Decrease in total (differential) gas in-place over interval, MMSCF

G_{Fl} = Reservoir free gas in-place at pressure p_1, MMSCF

ΔG_F = Reservoir free gas produced over an interval, MMSCF

ΔG_{sp} = Separator gas production over interval, MMSCF
(For non-volatile oil reservoirs and gas reservoirs, this is the actual separator gas produced. For volatile oil reservoirs, this is the separator gas which would be obtained if there were no liquid condensing out from the reservoir free gas produced.)

ΔG_p = Total surface gas production over interval, MMSCF

ΔG_R = Actual separator gas produced over interval (for volatile oil systems), MMSCF

$\left(\frac{\Delta G_F}{\Delta N_C}\right)$ = Total reservoir free gas production to yield one stock tank barrel of condensate (for volatile oil systems), MSCF/STB.

$\left(\frac{\Delta G_{RF}}{\Delta G_F}\right)$ = Separator gas obtained from a unit of total reservoir free gas produced (for volatile oil systems), SCF/SCF

16

ΔG_{gl} = Reservoir gas equivalent of separator liquid (for gas reservoirs), MMSCF

$(GE)_{sl}$ = Equivalent "reservoir gas" of separator liquid per stock tank barrel of oil production (for gas reservoirs), MSCF/STB. (This is the mols of separator liquid, per STB of oil obtained, times the conversion factor from mols to standard cubic feet. This is usually for the high pressure separator liquid. If the reported gas production includes the low pressure separator gas, this is for the low pressure separator liquid.)

N_{fl} = Flash oil in-place at pressure p_1, MSTB (Reservoir oil volume in-place divided by flash formation volume factor.)

ΔN_f = Decrease in flash oil in-place over interval, MSTB

N_{dl} = Differential oil in-place at pressure p_1, MRDB (Reservoir oil volume in-place divided by differential formation volume factor.)

ΔN_d = Decrease in differential oil in-place over interval, MRDB

ΔN_p = Surface oil production over interval, MSTB
For volatile oil reservoirs this is the oil obtained from the saturated reservoir oil production only and does not include the oil condensed out from the reservoir free gas production. For non-volatile oil reservoirs and for gas reservoirs this is the total stock tank oil production.

ΔN_c = Oil which condenses out of reservoir free gas production at surface (for volatile oil systems), MSTB

ΔN_R = Actual oil production over interval for volatile oil systems, MSTB ($\Delta N_R = \Delta N_c + \Delta N_p$)

n = Lb.-mols of hydrocarbons in-place in reservoir

p = Average reservoir pressure, PSIG for oil reservoirs, PSIA for gas reservoirs

Δp = [illegible] pressure decrease during interval, PSI

p_{sc} = Standard pressure, PSIA (14.7 for most states; in Louisiana it is 15.03 PSIA)

R_{sf} = Flash PVT basis, solution gas-oil ratio, MSCF/STB

R = Gas constant (for gas reservoirs) = 10.73 (ft^3)(PSIA) per (^oR) (lb. mol)

$(R_s)_{sp}$ = Gas in solution in separator liquid, MSCF/STB

R_{sd} = Differential PVT basis, solution gas-oil ratio, MSCF/RDB

S_o = Oil saturation, fraction of total pore space

S_w = Water saturation, fraction of total pore space

T = Reservoir temperature, ^oR = (^oF plus 460)

T_{sc} = Standard temperature, ^oR (T_{sc} = 520 ^oR)

V = Volume, ft^3

V_p = Total pore space in reservoir, MRVB

V_g = Reservoir hydrocarbon volume (for gas reservoirs), MRVB

W_i = Water in place at pressure p_i, MRVB

ΔW_e = Water influx (encroachment) over interval, MRVB

ΔW_p = Water production over interval, MSTB

z = Compressibility factor in $pV = znRT$, gas equation (For retrograde systems below the dew point this is for the average hydrocarbons in place, gas plus liquid phases.)

sub m = To refer to average pressure over an interval or to value of a PVT factor at average pressure over an interval.

sub b = To refer to bubble point pressure.

sub 1 = To refer to pressure, in-place values, and PVT factors, at start of an interval.

sub 2 = To refer to pressure, in-place values, and PVT factors, at end of an interval.

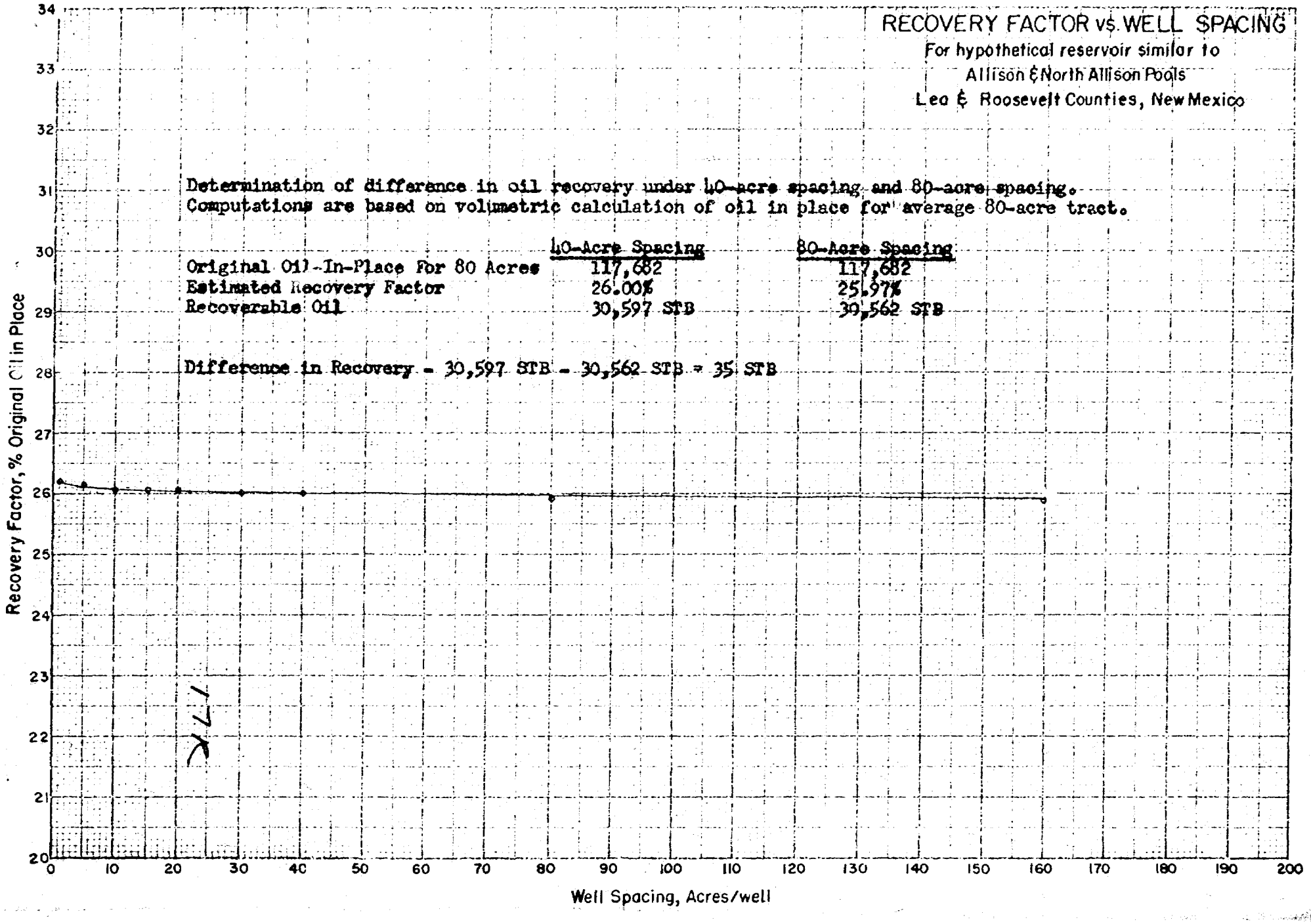
RECOVERY FACTOR vs. WELL SPACING

For hypothetical reservoir similar to
Allison & North Allison Pools
Lea & Roosevelt Counties, New Mexico

Determination of difference in oil recovery under 40-acre spacing and 80-acre spacing.
Computations are based on volumetric calculation of oil in place for average 80-acre tract.

	40-Acre Spacing	80-Acre Spacing
Original Oil-In-Place For 80 Acres	117,682	117,682
Estimated Recovery Factor	26.00%	25.97%
Recoverable Oil	30,597 STB	30,562 STB

Difference in Recovery = 30,597 STB - 30,562 STB = 35 STB



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ADDITIONAL COST TO DEVELOP ALLISON AND NORTH ALLISON POOLS ON 40 ACRES

29 Additional Wells on 40-Acre Spacing.

Each costs	$175,000 to drill
Flow lines	1,600
Pumps	30,000
	$206,600

29 x 206,600 = $5,991,400

Additional Pool Recovery on 40-Acre Spacing:

29 wells x 35 bbls/well = 1015 STB additional recovery for pool

19-R

US

US

State

Magnolia 3

Atlantic

Cactus "A" 2

Magnolia

Anderson

Gulf 1

Atlantic

Ada

Atlantic "AD"

Ohio

US

Adams

State

Cox

US

Magnolia 10

Gulf

Magnolia 11

Magnolia

US

Gulf

Trice

Merrill et al

Mills (U.S.)

Childers (U.S.)

Sun

Cosden

Magnolia

Santa Fe Ry

Mills

R36E

T 9 S

12

Exhibit "A"

Development Plan For
Allison Pool Area

Lea & Roosevelt Counties, New Mexico

Scale: 1"=1000'

Cox US

20-R

Magnolia 27	Magnolia	Atlantic 26	Skelly	Shearn 25
Magnolia				
US Magnolia 34	US Skelly	Beebe Atlantic 35	Pebworth et al Atlantic "A"	US Sunray-D.X. 36
		Yates (US) Gulf		

T 8 S

Cosden

CASE 1637: EXHIBITS (Rehearing)
July 15, 1959

Case No.

1637

Application, Transcript,
Small Exhibits, Etc.

BEFORE THE
OIL CONSERVATION COMMISSION
HOBBS, NEW MEXICO

IN THE MATTER OF:

Case No. 1637

TRANSCRIPT OF HEARING

APRIL 16, 1959

DEARNLEY - MEIER & ASSOCIATES
GENERAL LAW REPORTERS
ALBUQUERQUE, NEW MEXICO
Phone CHapel 3-6691

NEW MEXICO OIL CONSERVATION COMMISSION

1300 East Scharbauer

Hobbs, NEW MEXICO

REGISTER

HEARING DATE APRIL 15, 1959 TIME: 9 A.M.

NAME:	REPRESENTING:	LOCATION:
F. Norman Woodruff	El Paso Nat. Gas	El Paso
Ben R. Howell	"	"
M.T. Smith	Shell Oil Co.	Midland
J.F. Butterfield	Conoco	Ponca City
O.W. Delonger	Skelly	Jonas
H.W. Nippert	Atlantic	Dallas
John Mills	The Texas Co.	Midland
P.L. McKhann	McWood Corp.	Midland
E.M. Bell	Phillips Pet. Co.	Midland
C.L. Bess	Gulf Oil Co.	Houston
R.M. Bayer	" "	FT Worth
B. Kastler	" "	Roswell
A.M. Bell	" "	Denver
E. Desmond	Indiana Oil Purch. Co.	Midland
Jason Kellahin	Kellahin & Fox	Santa Fe, N.M.
John L. Sanders	Magnolia Pet. Co.	Hobbs
C.P. St. Laurent	Shell Oil Co.	Roswell N.M.
Bill Sullivan	El Paso Nat. Gas Products	Farmington, NM.
For Phillips	Northwest Pipeline	

NEW MEXICO OIL CONSERVATION COMMISSION

Hobbs, NEW MEXICO

REGISTER

HEARING DATE April 15, 1959 TIME: 9 A.M.

NAME:	REPRESENTING:	LOCATION:
Warren Mankin	Aztec O&G Co.	Dallas
Rex C Cloaninger	Shell	Roswell
E.K. Wride	Gulf	Hobbs
Gus Athanas	Pan American	Lubbock
Guy Buell	"	Ft. Worth
Roy E Curtis	A. Murdock	Tulsa
J. R. Curry	Shell Oil Co.	Midland, Tex
P.E. Shook	Gulf Oil Corp.	Hobbs
Jack Schrunkel	Union Oil Co of California	Midland, Tex
Grant L Adkins Jr	"	"
R L Denton	Magnolia	Hobbs, N. Mex
G. Howard	The Ohio Oil Co	"
E. Morris	Gulf Oil Corp	Carlsbad, N.M.
[illegible]	Shelly Oil Co.	Hobbs N.M.
Ramey	Shelly Oil Co	Hobbs N.M.
[illegible]	Schlumberger	Hobbs N.M.
Vann		

NEW MEXICO OIL CONSERVATION COMMISSION

Hobbs, NEW MEXICO

REGIS

HEARING DATE April 15, 1959 TIME: 9 A.M.

NAME:	REPRESENTING:	LOCATION:
W. A. Mead	Cont. Oil Co.	Artesia
A. J. Kendrick	OCC	Aztec
Emmett McElroy	John M. Kelly	Hobbs.
Mrs. Williams	Gulf Oil Corp	Denver.
H. Pauli	Gulf Oil Corp	Hobbs.
E. C. McBryde Jr.	Amerada	Midland
[illegible]	[illegible]	[illegible]
Ford Weber	"	"
T. J. Charbel	N M I U T	Seminole
Harold D. Chiles	The Ohio O. & G. Co.	Hobbs
John W. Runyan	N. M. O. C. C.	Hobbs
Charles Lyon	El Paso	El Paso.
John M. Kelly	Independent	Roswell
Victor T. Lyon	CONTINENTAL OIL CO	EUNICE, N.M.
RAYMOND A. BEIENE	Continental Oil Co.	EUNICE

NEW MEXICO OIL CONSERVATION COMMISSION

Hobbs, NEW MEXICO

REGISTER

HEARING DATE April 15, 1953 TIME: 9 A.M.

NAME:	REPRESENTING:	LOCATION:
W. Leeder	General Petr. Inc	Hobbs.
Tinky Reese	" " "	"
Walter Mayerick Jr.	Tamarisa Oil	"
Jesse Johnson	" "	"
J. P. Gratton	Stanolind Oil & Gas Co	Midland
J. T. Sims	The Pure Oil Co	Ft Worth, Tex
J. T. Fish	—	"
Harry Wells	—	"
L. G. Wasbeam	Tidewater	Midland
Edward N. Hunter	✓	Hobbs
Ray F. Ray	J. R. Cone	Hobbs
K. P. Shackelford	Tidewater Oil Co.	Hobbs.
E. J. Mottern	Cities Service	Hobbs
John W. Haggard	"	"
Raymond Lee	Wilson Oil Co	artesia
Fred S. Whitmore	Pan-American Petr. Corp.	Lubbock.
Ernest Johnston	Gackle Oil Co.	Hobbs

NEW MEXICO OIL CONSERVATION COMMISSION

Hobbs, NEW MEXICO

REGISTER

HEARING DATE April 15, 1959 TIME: 9 A.M.

NAME:	REPRESENTING:	LOCATION:
M. 9. Shurin	Sinclair Oil & G.	Midland
Frank D Gordon		Tulsa
[illegible]	Cactus Pet. Inc.	Midland
Lonnie C. Smith	Cavla Oil Corp	Hobbs
W. F Bridges III	Gulf Oil Corp.	Hobbs
W. D. Vandergrift	" " "	"
H. Swift	H. Swift Oil Co	"
O. Fenimith	P.B. Pipeline Co	midland
Dick Booker	& SO	
V. M. Hollrah	Atlantic	Dallas
W.P. Tomlinson	"	Roswell
A. B. Tanco	"	DALLAS Texas.
V. K. Cammack	"	Roswell N.M.
J. R. Chatenbeny	"	Midland
[illegible]	Sinclair	Texas.
R. N. Hughes	Phillips	Hobbs.
L. Tuttle	Phillips	Hobbs
D. C. Sears	Gulf	"
Wm B. King	Phillips	Bartlesville Okla
R M Anderson	Sinclair	Midland

NEW MEXICO OIL CONSERVATION COMMISSION

Hobbs, NEW MEXICO

REGISTER

HEARING DATE April 15, 1952 TIME: 9 A.M.

NAME:	REPRESENTING:	LOCATION:
H.W. Swaim	Continental Oil Co.	Hobbs, N.M.
R.L. Adams	" "	Roswell, N.M.
J A Queen	" "	" "
S. D. Dooley	" "	Hobbs "
L. O. Storm	Self	Hobbs
E.L. Cottingham	Continental Oil Co.	Artesia N. M.
James C Lewis	Amerada	Tulsa
L. E. Jackson	Amerada	Tulsa
T. D. Wallis	Southwestern Prod.	Hobbs.
J. O. [illegible]	Amerada	Tulsa
R E Sisk	Amerada	Midland
D.F. Caffey	"	Monument N.M.
W.S. Armstrong	"	Artesia
A.L. Carroll	OCC	"
G. L. Shoemaker	Indiana Oil Purch. Co.	Midland
A D Gilbert	El Paso Natural	Jal
G.L. Logan	El Paso Natural	Jal
[illegible]	El Paso Natural	Jal

NEW MEXICO OIL CONSERVATION COMMISSION

Hobbs, NEW MEXICO

REGISTER

HEARING DATE April 15, 1959 TIME: 9 A.M.

NAME:	REPRESENTING:	LOCATION:
Kenneth B. Tabb	El Paso Natural	Hobbs
Kenneth Gordon	El Paso Natural	Hobbs
L. L. McDonald	The Pure Oil Co	Ft Worth
R. L. Griffith	The Pure Oil Co	Midland
Geo. Hinchfield	Moran	Hobbs, N. M.
H. V. Adams		Hobbs, N. M.
[illegible]	Conoco	Eunice, N.M.
Travis Inkey	[illegible]	[illegible]
R. W. Byram	[illegible]	Austin

BEFORE THE
OIL CONSERVATION COMMISSION
HOBBS, NEW MEXICO

IN THE MATTER OF:

Case 1637 Application of The Atlantic Refining Company for an order combining the Allison-Pennsylvanian and the North Allison-Pennsylvanian Pools in Lea and Roosevelt Counties, New Mexico, and for the promulgation of special rules and regulations therefor. Applicant, in the above-styled cause, seeks an order combining the Allison-Pennsylvanian and the North Allison-Pennsylvanian Pools in Lea and Roosevelt Counties, New Mexico, and providing for the establishment of 80-acre proration units in said combined pool.

Hobbs Auditorium
Hobbs, New Mexico
April 16, 1959

BEFORE:

A. L. Porter, Jr.
Murray Morgan
E. S. Walker

TRANSCRIPT OF HEARING

MR. PORTER: The meeting will come to order, please. We are going to take up first this morning Case 1636. Before we begin this case, I would like for the record to show that Mr. E. S. Walker is sitting in place of Governor Burroughs this morning on the Commission.

MR. PAYNE: Case 1637, "Application of The Atlantic Refining Company for an order combining the Allison-Pennsylvanian and the North Allison-Pennsylvanian Pools in Lea and Roosevelt Counties, New Mexico, and for the promulgation of special rules and

regulations therefor."

MR. PORTER: Let me correct the record, please. I announced Case 1636, it should be case 1637.

MR. HINKLE: If the Commission please, Clarence Hinkle of Hervey, Dow and Hinkle, Roswell, appearing on behalf of the Atlantic Refining Company. We have one witness, Mr. Phil Tomlinson, that I would like to have sworn.

(Witness sworn in.)

W. P. TOMLINSON

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

DIRECT EXAMINATION

BY MR. HINKLE:

Q State your name, please?

A W. P. Tomlinson.

Q By whom are you employed, Mr. Tomlinson?

A Atlantic Refining Company.

Q In what capacity?

A As Area Reservoir Engineer.

Q How long have you been employed in that capacity?

A Since 1954.

Q Have you previously testified before the Oil Conservation Commission?

A Yes, sir.

Q Have you made a study of the Allison and North Allison

areas?

A Yes, sir.

Q Are you familiar with the application of the Atlantic Refining Company in this case?

A Yes sir, I am.

Q One of the purposes of the application is to re-designate the Allison and North Allison Pools, is it not?

A Yes, sir.

Q And to combine those pools?

A Yes, sir.

Q Have you prepared a plat which shows the present designation and also your proposed designation and combination of the pools?

A Yes sir, we have.

(Thereupon, the document was marked as Atlantic's Exhibit Number One for identification.)

Q (By Mr. Hinkle) Would you refer to Atlantic's Exhibit One and explain it to the Commission?

A This is Atlantic's Exhibit Number One. This map shows the present and proposed boundaries of the Allison and North Allison Pools. The present boundary of the Allison Pool is shown in a dark blue dotted line, which I am outlining here on the map. The North Allison Pool is shown by a heavy blue solid line somewhat to the north of the Allison Pool. The proposed boundaries that

we have are shown as a hashed line and encompass most of the area of both pools and some area between. The color coding on the map represents different types of mineral interests. The purpose --

Q Do you have three characters of land involved?

A Yes, sir.

Q What are they?

A Federal, Fee and State land involved. Purple indicates Federal land, light green indicates State and orange shows the Fee land involved. Since we turned in our application, there's been occasion for revision of that. We have not revised our application, but at the present time, it should be changed in order that the Commission might adopt to include at least the west half of the northwest quarter of Section 12, Township 9 South, Range 36 East. On that tract is a well that was once completed as a dry hole by Magnolia Petroleum Company and now they have gone in and set pipe and completed it as an oil producer in the same pay as the other wells in the field.

(Thereupon, the document was marked as Atlantic's Exhibit Number Two for identification.)

A In general, the outlines of this map are based on our structural interpretations as shown on Exhibit Two.

Q (By Mr. Hinkle) Have you prepared a structural map of the area?

A Yes, sir.

Q Refer to Atlantic's Exhibit Two and explain to the Commission what it is and what it shows?

A Atlantic's Exhibit Two is a structure map of the Bough "C" Zone in the Pennsylvanian Formation. You will notice that our interpretation shows an elongated anticlinal structure and there are no saddles in between the Allison and North Allison Field. The Allison is a little lower than the North Allison in structure, but these contour intervals are ten-foot intervals, so there's very little relief there. Now, I might add that I have not used seismic, any seismic data in contouring this map; however, the seismic data that we have does reflect about the same thing structurally. It does indicate continuity definitely between the two zones.

Q Does it show that both pools are on the same structure?

A Yes, sir.

Q What are the lines "A" and "A" Prime and "B" and "B" Prime which you have indicated on the plat?

A The lines shown in red, "A" to "A" Prime and "B" to "B" Prime, are traces of cross sections that we prepared, which are Exhibits Three and Four respectively.

Q Before you get to those exhibits, what information did you use in preparing this structural map?

A We used geological tops as picked from electrical and radioactivity logs.

Q Did you examine electrical and radioactivity logs of

practically all of the wells in the area?

A All of the wells in the field were examined.

Q They were all available to you?

A Yes, sir.

Q Any other information used in preparing the plat?

A None at all, except that I might say the completions are shown as they are producing now, and the Magnolia dry hole in the northwest of the northwest of Section 12, Township 8 South.

Q Does this also show the locations of wells that applications have been applied for to drill?

A Yes sir, there are two additional wells which are spotted on the map as locations, the Cosden Sunray Number 1 in the north half of the south half of Section 11, Township 9 South, Range 36 East, it is shown as a location, and also the Cosden Sunray State 1-C in the west half of the northwest, pardon me, let me correct that, the west half of the northeast quarter of Section 36, Township 8 South, Range 36 East, that's also shown as a location. One of those wells is now drilling to the Allison and North Allison pay.

Q That's the Cosden well?

A Yes, sir. Now, both of those wells, the locations of both of those wells were staked after we turned in our application.

Q Did you mention the Cactus well in Section 2?

A Yes sir, the Cactus--no, I didn't mention the Cactus well in Section 2. That's the one in the east half of the northeast

quarter of Section 2, Township 8 South--pardon me, Township 9 South, Range 36 East, which I believe was also staked after we turned in our application, but it's within the field limits.

(Thereupon, the document was marked as Atlantic's Exhibit Number Three for identification.)

Q (By Mr. Hinkle) Now, refer to Atlantic's Exhibit Three, which is the cross section "A" and "A" Prime, and explain to the Commission what that shows?

A This cross section, "A" and "A" Prime and "B" and "B" Prime, are the same ones that the traces were shown for on Exhibit Two. They were constructed from electrical and radioactivity logs. We have shown the top of the Pennsylvanian Formation and the interval of the Bough "C" Zone in the Pennsylvanian and we have also shown on those wells the intervals of completion. Now, the significant thing about these cross sections is that the Bough "C" Zone shows up as a clean limestone formation on these logs, no shale breaks. You can trace that zone on "A" to "A" Prime all the way across as a clean formation. It also shows porosity on the neutron curves for these wells. The Atlantic State "AD" Number 1 has porisity, this little kick right here is for porosity, and I think there's some porosity in the bottom on the Bough "C" where we completed it and it is perforated, if you will notice, it is perforated opposite the porosity, and likewise in Atlantic's Federal Yates Number 1, it is perforated

opposite one of those porous intervals. The Cactus Sunray State likewise is completed in the same interval and so on across, you can see these porous intervals occurring.

Q Does this show a continuity of the Bough "C" Zone all the way through, throughout the length of the area?

A It definitely indicates continuity.

Q Does it show a pretty uniform pay section?

A It shows a very uniform pay section for it to be that thin, very uniform.

Q And porosity throughout the section?

A Yes sir, good porosity.

(Thereupon, the document was marked as Atlantic's Exhibit Number Four for identification.)

Q (By Mr. Hinkle) Now refer to Atlantic's Exhibit Four, which is the cross section "B" and "B" Prime, and explain it to the Commission?

A Atlantic's Exhibit Four is cross section "B" to "B" Prime. It cross the south end of our proposed field from west to east. It is constructed from the same information we used before on the other cross section and depicts essentially the same thing. There is good continuity laterally in the south part of the field. The one well, the Ohio State Number 1, did not have a log with the same scale that we used on these others so we had to leave it out, but the information that we obtained for that well

was from a log. It was the wrong scale; however, it was put in the cross section.

Q But the log that you did have of that well showed the same zone and the relative position you have on this cross section?

A Yes, sir.

Q And showed porosity the same as the others?

A Yes sir, both of those indicate good continuity between wells in the field, and I think they definitely indicate that the two pools, Allison and North Allison, are connected.

Q Have you accumulated any basic field data with respect to the North Allison and Allison Pools?

A We have accumulated quite a bit. There's several things that I believe are pertinent to this case that I would like to tell the Commission about. First, we have cores on four wells in the field and we obtained a weighted average porosity for those four cores; the average porosity is five and a half per cent. We also weighted the permeability that we obtained and it was a hundred and seventeen millidarcies indicated average basis. That's very good permeability, we do not ordinarily find it that good in this part of the country, and for the purposes of the work that we have done in connection with this field, we have used an estimated saturation for oil of 75 per cent. We have no laboratory data that we feel is very reliable in that respect, so that we used an estimated figure. Most of the storage space in the reservoir is contained in vugs, very large vugs, and Matrix

porosity. So far, I know of no water-oil contact that has been obtained in this field and defined as such. Now, one thing that sort of bears this out is the Trice Drilling Company well located in the east half of the northeast quarter of Section 10, which is quite low in relation to some of the other wells in the field. Now, that well does produce water, but it makes oil, too. I might say in that respect that other wells higher on the structure are also making water, so we believe that we haven't found water-oil contact.

One other thing that I failed to mention about these field limits that I think should be brought out at this time is that the field limits have not actually been defined in this pool except possibly in one direction. That's a dry hole that Atlantic drilled and known as the Pebworth Number 1 in the North Allison area. All other directions could be productive.

The gross pay thickness in the--I might say the net pay thickness in the Bough "C" Zone is from five to ten feet. For the purposes of work, for calculations, we have used, in this field, we have used a pay thickness of ten feet, some of it is less. The average oil gravity in this field is 48 degrees API.

MR. PORTER: Forty-eight?

A Yes sir, 48 degrees. The saturation pressure is 3,150 PSI, and the solution gas-oil ratio at that pressure was 1,517 cubic feet per barrel. The formation, in value factor, at the original reservoir pressure, which was somewhat higher than the

saturation pressure, is 1.821. One thing, we used all of those, several of those figures there in our calculation in regard to this reservoir. The one thing I might note here on the fluid in this field is that when we found we had a discovery in the North Allison area, we immediately, it immediately occurred to us that possibly the two pools were connected. And so with that in mind, we requested our laboratory to take some samples to determine if there was any difference, and definitely we did want to pin down a difference if there was a possibility that they had a different type of reservoir fluid in them. So I have the results of a couple of significant points. I won't go through all of our fluid data, but the two fluids are very similar.

Now, just for example, the fluid in the North Allison has a formation volume factor of 2,000 pounds of 1.53. The fluid in the Allison Pool at the same pressure of 2,000 pounds has a formation volume factor of 1.52 and probably that's about as-- laboratory accuracy may not be that good. In other words, it awfully close and we wouldn't expect it to get any closer. The gas and solution at 2,000 pounds in the North Allison Pool is 900 cubic feet per barrel, the gas and solution at the same pressure in the Allison is 890 cubic feet per barrel. So you can see from that that they are, for all practical purposes, we have the same fluid in both reservoirs.

Original reservoir pressure in the pool was 3,518 pounds. This was obtained in the Gulf Federal Mills Number 1 a discovery

well for the Allison. Now, the average pressure in January of 1959 is 2,710 pounds and that includes an average of pressure in the North Allison as well as the Allison.

We obtained some productivity indeces in these two pools, it averages 5.6 barrels of oil per pound drop in the bottomhole pressure. The range on those that we have is from 2.6 to 11.9. They are pretty close, I think, especially for as thin a pay section as we have in these wells. The production rate during January for both combined pools is about 47,000 barrels; the cumulative to February the 1st is 1,860,000 barrels, and that oil came from 14 producing wells and there are two locations or drilling wells, one dry hole and one that has been worked over within the past two or three days, and I mentioned it was formerly a dry hole and is now producing.

Most of the wells were completed by setting pipe to total depth and perforating. The total area that we have outlined in our proposed field limits amounts to 2,000 acres.

Q (By Mr. Hinkle) But that would be increased by reason of the well you mentioned originally that --

A I think it should be increased to include the Magnolia, former Magnolia dry hole.

Q You mentioned that some of the other wells other than the Trice well were making water. Are any of the wells that are up on top of the structure making water?

A The wells right in here do make water.

Q Is that a pretty good indication that it is not a water-drive field?

A I think it is, Mr. Hinkle. The pressures in these wells have been falling right on down and shown a steady decline over the years and is still declining in the area of the Allison, original Allison wells. Had we had a water-drive, I believe it would begin to show up by now. That water seems to be present in the pay and it is produced out with the oil as it comes along. Some of the wells started out making more water than they are now making, which is itself kind of interesting to notice that. The Atlantic State "AD" started out making water and I think now essentially it doesn't make any, and I believe the Magnolia, one of the Magnolia Childers Federal wells here had the same characteristic. Those wells were not worked over and the water disappeared and went down continuously.

Q Would that indicate then that there might be considerable acreage not shown on your map there, that is not included in your structure, that might be productive?

A Definitely it could be productive. As I mentioned before, there's a well, a low well on the southwest flange, that's Trice Production Company, I believe it's called the Merrill Number 1, is a very low well that makes water, but is also a commercial oil well. So we do not know that structural position is a limiting factor in this reservoir. In this particular location to the north, the Atlantic Refining Company Pebworth Number 1,

A dry hole on the edge of the North Allison Pool, was higher or as high as the discovery well in the North Allison. That well failed to produce because of porosity and permeability development in the pay rather than water. It simply had no porosity or permeability. At the present, we obtained a core and in that particular one, it definitely indicated it wouldn't produce.

(Thereupon, the document was marked as Atlantic's Exhibit Number Five for identification.)

Q (By Mr. Hinkle) Well, Mr. Tomlinson, will you refer to Exhibit Five and explain to the Commission what it shows?

A Exhibit Five is a graph showing reservoir performance versus time for the Allison and North Allison Pools combined. That would be the combined production of water and oil and gas, and also the number of wells on this graph. These heavy blue lines show oil production and it has risen as the number of wells producing has increased. It has reflected some purchasers' proration and allowable increases as they have been granted by the Commission. The number of wells has grown fairly steadily through the middle of 1956 and there was a leveling off period there until discovery took place in the North Allison area and before drilling was started. Per cent of water is demonstrated at the bottom of the page and you will notice that the per cent water was higher in the early life than it has been recently. Part of that decline occurred at a time when no additional drilling was occurring, so

it means that some water was being exhausted with the pay.

Q That's still another indication of it not being a water-drive pool, is it not?

A To me, it is. Now, we have shown in a light blue line at the top of the graph the gas-oil ratio by months from the beginning of the production, producing life in the pool. Generally, that ranges between about 1,100 and 1,500 cubic feet per barrel, 1,500 or 1,600 cubic feet and it is quite erratic, and the only way that I can account for that is that through much of the life, there has not been any market for the gas and I presume the operators didn't have their opportunity to measure their gas as often as they might had they been selling it. All of this information on this graph was obtained from the New Mexico Oil and Gas Engineering Committee Book, which reflects C-115 reports.

(Thereupon, the document was marked at Atlantic's Exhibit Number Six for identification.)

Q (By Mr. Hinkle) Now, refer to Atlantic's Exhibit Number Six and explain to the Commission what that shows?

A Atlantic Exhibit Number Six is a graph showing the bottomhole pressure history of several wells in the pool, and not all the wells are shown on here, but the ones where we had initial reservoir pressures were put on, and we have coded those wells as follows: The dots with a circle around them are the pressures for the Gulf Federal Mills Number 1--that was the discovery well,

by the way. The Ohio State "E" Number 1 pressures are shown by an "X," the pressures for the Atlantic State "AD" Number 1 are shown by a dot with a triangle around it, and the pressures for the Atlantic State "AE" Number 1, which is the discovery well in the North Allison area, is shown by a dot with a square around it, Atlantic's Federal Yates Number 1 is shown by a cross with a circle around it, and on this, I can't tell how the Sun Mills Number 1 is shown.

Q It's a square, I guess.

A A square with a circle around it.

MR. MORGAN: With a dot in the middle.

A Now, the significant thing here shown by this graph is that the original pressure in the reservoir is 3,518 pounds, and wells that were completed subsequent to that time came in with pressures less than the original pressure and that indicated to us that those locations had been drained prior to their drilling. That would seem to us to indicate continuity definitely from one well to the location of another and some of those locations are pretty far away, pretty far removed from the discovery wells or other development that might have occurred at the time the wells were drilled. These arrows on this graph indicate the first pressure obtained for each well.

Q Were those pressures all taken uniformly or --

A They all had forty-eight hour shut-in periods, each one of them did.

Q Is that a generally accepted method?

A All of those were taken by bottomhole pressure and corrected to the same datum.

Q So they are reliable?

A We think they are very reliable pressures. Now, I might point out here, looking at that, the second well in the pool is the Ohio State "E" Number 1, I believe. That well came in quite a bit lower than the original pressure, the third well was the Atlantic State "AD" Number 1, it came in at virtually the same pressure then existing in the Gulf well. Now, the locations of those two wells, I'll show you on Exhibit Two, the Gulf well is in the northeast quarter of the northwest quarter of Section 11, the Ohio well is in the southwest quarter of the southeast quarter of Section 2. Now, at that time, that was definitely 80-acre spacing between those two wells and it appears to us that the drainage influence of the Gulf well extended to the Ohio location. Now, the pressure for the Atlantic State "AD" Number 1 was very similar to that of the Gulf discovery well and it is 1,320 feet away from the Gulf well. Now, that would be the outer perimeter of drainage under an 80-acre spacing pattern, so it definitely means that the Gulf well in that direction was influencing drainage to the extent of 80 acres.

Q Does this show about as positively as can be shown that one well will drain 80 acres?

A Yes sir, it does show very positively that one well can

Q And not only with respect to the situation which you mentioned there in the southern part, but also in the northern part, isn't that right?

A Yes sir, the north part of the field--northern part of the field had pressures several hundred--that is, the North Allison area, had pressures several hundred pounds below that of the discovery well in the Allison. Now, since they are all practically the same datum, or the pressures all refer to the same datum, we would have assumed that we would have had the same pressures but apparently they had been drained. Now, there was a second well drilled in the North Allison area, the Atlantic Federal Yates Number 1, and it came, it is shown at the end of this trace on the graph, depicting the pressures for the Atlantic State "AE" Number 1 as the second dot there with the square around it, it is almost superimposed. That's just identically the same pressure as we had at that time in the State "AE" Number 1, and those two wells are on 80-acre spacing. We think that this graph is just as strongly an indication as we could get that these wells are draining a wide area.

(Thereupon, the document was marked as Atlantic's Exhibit Number Seven for identification.)

Q (By Mr. Hinkle) Now, refer to Atlantic's Exhibit Number Seven and explain that to the Commission?

A Yes sir, Exhibit Seven shows the results of bottomhole

pressure surveys conducted in the field in December and January, December, '58 and January of '59, and at that time, we managed to get most of the wells in the field tested. I think most of them were bottomhole pressure and three of them, I believe, were tested with sounding devices. Now, on this map, which is Exhibit Seven, we have put in all of the pressures at the field datum and contoured it around those bottomhole, around the pressures obtained with bottomhole pressure bombs. Now, we have also shown the pressures as indicated by sonic devices, but we were a little uncertain as to how accurate those were because we didn't know about the gradient spacing in the wells, and also sometimes a sonic device gives a false reading as to the fluid level in the well. We thought we should show them, to show the information, but we didn't believe it was reliable enough to contour.

We haven't closed these contours on this map because we don't know the field limits, but in the area where we have contoured it, we believe is an accurate representation of pressures. You will notice that the pressures are lower in the original Allison producing area grade gradually higher as you go north, and that's without exception. The Allison area generally is 24 or 2,500 pounds, the lowest point is 2343, and as you progress north, you find continually higher pressures. For example, the Cactus State "A" Number 1 is 2,803 pounds, Atlantic's Federal Yates Number 1 is 3,108 pounds and the Atlantic State "AE" Number 1 is 3,115 pounds. Now, to us that means that the closer the acreage was to the

Allison area, the more it had been drained, and that's logically what you would expect. It also indicates definitely the fluid is flowing from north to south in this pool at the present time.

Q It also indicates that the Allison and North Allison is all one pool, does it not?

A Yes sir, it does indicate that, that gradual increase of pressures.

Q And that movement from north to south would also indicate that one well will drain 80 acres, too, is that right?

A Yes, sir.

Q Have you prepared any data with respect to the economics involved in the development of the Allison-North Allison area?

A Yes sir, we have.

(Thereupon, the document was marked as Atlantic's Exhibit Number Eight for identification.)

Q (By Mr. Hinkle) Refer to your Exhibit Eight and explain it to the Commission?

A Exhibit Eight is titled, "Economics of Drilling One Well Per 40 Acres in Allison and North Allison Pools." Before we get into the discussion of these economics, I would like to point out that the data that we used has been given to you, the data for reserves has been given to you in the basic data that I gave you earlier in discussion here, that all of the oil in place under a 40-acre tract, in the Allison Pool average tract, that say

would contain ten feet of pay, would be 70,000 barrels, and that's all that we could see to be there based on the data that we have.

Q What method did you use in arriving at that figure?

A That's volumetric calculation, sir.

Q And is that a generally accepted method in the industry?

A Yes sir, it is, and probably in this case, the most reliable that we could use.

Q Because of the data available?

A Yes sir, we have pretty good data. We realize that it could vary somewhat from this, but we believe that we are within fairly good, pretty good range of accuracy here. Now, in making this calculation, we assumed that everyone would be paying one eighth royalty, and I think it is indicated here on this exhibit as to what the oil price is and what taxes we assumed, and all of the total gross value or total gross revenue after we pay severance taxes would amount to $179.540.00. Now, our latest drilling estimates, cost estimate for cost of drilling wells is $175,000.00, and our production engineers say that pumping equipment for one well will cost $30,000.00, and that flow lines will average out about $1,600.00 a piece. All of this total is up to $206,600.00. That then would be a difference of $27,060.00 provided that you could get all of the oil and gas under that tract. Now, in practice we know we can't get, can't approach anything like all of the oil and gas under a tract, and one thing that was not

included on this cost estimate was operating cost. This calculation assumes that we would, after we get the well drilled, it wouldn't cost us anything to operate it, but in reality, there would be considerable cost for that.

Q Does it take into consideration taxes, you have severance, but there are other taxes involved, are there not?

A There are taxes which I didn't have any information on, but it would increase the amount of tax payments for the property.

Q So that shows a loss when you drill on 40 acres of $27,060, and that's not taking into consideration all of your taxes, all of your operating costs, and it is taking into consideration a hundred per cent recovery of the oil in place, is that right?

A That's right, sir. In reality, I believe the loss would be quite a bit more.

Q Do you have any further comments with respect to Exhibit Eight?

A It certainly shows that operators don't want to drill on 40 acres, shouldn't be drilling on 40 acres in that pool.

Q Now, has the field, or the Allison-North Allison areas, been developed so far so that 80 acres can be assigned to each well that has been drilled?

A Yes sir, we have.

(Thereupon, the document was marked as Atlantic's Exhibit Number Nine for identification.)

Q (By Mr. Hinkle) Will you refer to Exhibit Nine and explain to the Commission what that shows?

A Exhibit Nine is a map showing a possible arrangement of 80-acre proration units in the Allison-North Allison Pool areas. Now, all we have done on this map is go through it and show proration units for the area included in our proposed boundary. There are wells now either drilling or in existence outside of our proposed boundary, but they could also be allocated to 80 acres, and you will notice that there's, in several instances we have openings under our proposed rules as to how you could run your proration units and also be some openings, I suppose, to where you want to drill the wells. And there's a situation which may not be apparent at first, but in the northeast quarter of Section 2, Township 8 South, Range 36 East, some people might think that was indicating a need for a communitization, that is the Cactus acreage and the 40-acre Atlantic tract, that tract has already been communitized under a joint operating agreement at this time and the royalty, of course, in that quarter section is all common, it's State acreage.

Q You are not proposing to the Commission the arrangement shown on Exhibit Nine, are you, is it the definite pattern that must be followed?

A No sir, this is one possible arrangement. I think maybe the operators might want their options as to how they will arrange their units.

Q But under this suggested arrangement, it would not be necessary to communitize any acreage?

A No sir, not any.

Q That's the reason you have selected this particular pattern?

A Yes, sir. Well, there's quite a --

Q --as distinguished from others?

A There's a number of other combinations where you wouldn't have to unitize.

Q Do you have any opinion to express to the Commission as to whether or not the same amount or substantially the same amount of oil will be recovered if developed on 80 acres or if developed on 40 acres?

A I think that very substantially the same amount will be recovered.

Q Would the development on 40 acres, in your opinion, result in an economic loss to the operators?

A Yes sir, it would.

Q Do you have any recommendations to make to the Commission as to special field rules to be applied in this case?

A Well, yes, I do. First, I propose that these, that the Allison and North Allison Pools be combined and that their limits be extended between the two pools and also that it expand the pool from time to time as necessary; that I think, second, that the Commission adopt 80-acre proration units, and those proration

units should consist of two adjacent Governmental quarter quarter sections or lots within a single Governmental section and would constitute either the north half, south half, east half or west half of such quarter section, and that all wells drilled in the pool be located within one hundred feet off the center of either lot or quarter section in the proration unit. The third thing, I think we should, the Commission should do is that they should adopt the policy of granting each 80-acre proration unit situated in the pool, an 80-acre prorational factor for depth range between 9,000 and 10,000 feet as provided in the State-wide rules. I believe that's Rule 505 that takes that into account. And if any well is assigned less than 78 acres or more than 82 acres, its allowable should be in proration that that acreage bears to the 80 acres, and of course, in no event should any proration unit contain more than two lots or quarter quarter sections. And further, that if there are any wells--there are some already--that do not fall within these spacing requirements, if they have been drilled or started to drill before the effective date in the order that might be adopted, that they be granted an exception to the spacing requirements.

Q Is it your opinion that 80-acre spacing in this particular case and the special field rules you have recommended protect the correlative rights of all parties concerned?

A Yes, sir.

Q Including royalty owners?

A Yes, sir.

MR. HINKLE: That's all we have now.

MR. PORTER: Did you want to offer your exhibits at this time, Mr. Hinkle?

MR. HINKLE: Yes, we would like to offer Exhibits One through Nine inclusive, I believe it is.

MR. PORTER: Is there objection to the admission of Atlantic's Exhibits One through Nine?

They will be admitted.

Anyone have a question of Mr. Tomlinson?

MR. FISCHER: Mr. Tomlinson, that Pebworth et al Well Number 1 above your Atlantic "AE" Number 1, did it go to the Bough "C" Zone?

A Yes sir, that well is drilled to the Devonian as an exploratory well and we cored the Bough "C" as we went through it. We thought that probably we would get a discovery or might not, and it didn't indicate any production.

MR. FISCHER: You don't have any pressures on that zone, do you?

A I don't believe we tested that half after we got a look at the core.

MR. FISCHER: You have no pressures on it?

A No, sir.

MR. FISCHER: Thank you.

MR. PORTER: Mr. Utz?

CROSS EXAMINATION

BY MR. UTZ:

Q Mr. Tomlinson, am I correct in there being thirteen wells in this pool now, on your proposed outline of this pool?

A I thought I said fourteen. Let's see if I can count them here.

Q Well, thirteen or fourteen?

A I believe there's fourteen producers, Mr. Utz.

Q Do you have any other pressures on all of those wells?

A No sir, we don't. Now, for example, the Cactus well didn't have pressures taken right away on it, we didn't put pressures in for all of them.

Q How many of them do you have the initial pressures for?

A I believe there's six of them shown here on the graph.

Q Well, do you have pressures for any more than the six?

A Yes sir, we do. For example, on this recent survey, we have pressures for I believe all but two wells in the field.

Q Initial pressure?

A Oh no, I don't believe we do.

Q You only have initial pressure for six wells?

A Yes, sir.

Q Would any of the other operators have initial pressures for their wells?

A Well, yes sir, we obtained--this includes information for Gulf, Ohio, Atlantic and Sun. Now, I might say there's

a little more information here. In 1956, Magnolia was drilling a well, I believe it was the Childers Federal Number 2, and they got a drill stem test when they were drilling it. Now, that well in pay is not corrected to datum, but since it's very little relief, the correction would be probably less than twenty-five pounds in any event. That test was taken on March 20, 1956 and the pressure in that well was 2,985 pounds. It would be located just about, a little below the trace for the Ohio State Number 1 Well. This was considerably less than the original reservoir pressure and we checked into the matter of whether that pressure was better than the bottomhole pressure and it indicated a complete buildup on that pressure, so it's probably a reliable indication of pressure at that location.

Q Did you state what the datum was for the pressures shown on Exhibit Six?

A Oh, pardon me, which one?

Q On Exhibit Six.

A It is minus 5600 feet.

Q Mr. Tomlinson, on your Exhibit Nine, you have proposed certain 80-acre proration units which might be used. Do you believe that all of those units which have wells on them are productive throughout the unit?

A You mean are all those units which have had wells drilled on them --

Q Yes, sir.

A Is all of that productive acreage? Yes sir, in my opinion, it is. As a matter of fact, there's some that we didn't have included in here that's turned out to be productive now. The Magnolia Company has recompleted their dry hole in the southeast side of the field.

Q Let's look at Exhibit Number Two. What is your lease contour there which you feel is productive?

A Well sir, in my opinion, the field is productive beyond the lease contour that we have shown.

Q On what do you base that?

A We have not found that--the last well that we know of in the field is the Trice-Merrill Number 1 and it is producing oil and it is below the lease contour that we show here. Indications are now that the limits of the field may not be associated so much with structure as they are with just failure to develop porosity or permeability, and for example, here there's a high well in the North Allison area, that dry hole called the Atlantic Pebworth Number 1 located in the southwest quarter of the north--no, southwest quarter, southwest quarter of Section 25. That well was structurally high but didn't develop porosity and permeability and that's why we couldn't make a well.

Q Do you feel then that the south half of the northwest quarter of Section 10 is entirely productive, even though the well is on the east side of that 80-acre tract?

A I suspect it is. We --

Q But you have no definite proof of that, have you?

A We have no definite proof of that, but I suspect that that is true.

Q In regard to your Pebworth et al Number 1, did you suspect that that might be productive, too, when you drilled it?

A Did we suspect that it might have been?

Q Yes.

A Before we drilled it, we certainly did.

Q This 40-acre offset, is that your Number 1?

A Yes, sir. I might say that this did occur on the north end. I guess every field has to have a limit some place, and that seems to be it right there. Certainly we haven't, people haven't been having that experience in the acreage lieing to the south.

Q How much closer would you say on your Exhibit Number Two that you have throughout this structure, would you consider the 5640 to be the lowest contour that is presently known?

A No sir, I don't believe that's the lowest; I don't know what the lowest is, to be truthful about it.

Q The highest you know now is 5570?

A 5570, and on this map, I don't have a top for the Trice Well, but it's approximately a hundred feet lower than the nearest other well there. I can get that top for you if you are interested in finding out. I know it's productive that low.

Q No sir, that won't be necessary at the moment. Generally

speaking, this is a pretty flat structure, is it not?

A Yes sir, it's very flat and not much relief in this general area. Now, these are ten-foot contours and actually, we had to put in ten-foot contours to have much of a map. Had we contoured on a hundred feet, you couldn't have seen anything.

Q Do you have gravities on the individual wells in this pool?

A I have gravities that are reported in the New Mexico Oil and Gas Engineering Book. I notice that they vary from a degree or two on either side of 48, probably due in most instances to methods of separation and things of that nature, and I think they all average out around 48 or pretty close to it.

Q They are all within two degrees, you say?

A I think they are within two degrees of it, yes sir.

MR. UTZ: That's all I have.

MR. PORTER: Mr. Nutter?

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Tomlinson, this production in this field has evidently, the oil production has gone along, the water production has in most cases gone down, is that correct?

A Not in all wells. I believe Gulf has a well that's still making water. I believe it's one of the first wells, probably the Gulf Mills Number 2. Let's see, I'll give you those water producers if you'll wait just a minute. The Gulf Mills

Number 2 makes 19 per cent water according to this report. Now, I think that well's been making water all along. Now, Mills 1 doesn't make any water and one of the Magnolia wells makes water, I think probably it's Number 2 in this report. I think they have both been making water, but I have some more recent information in gas-oil ratio reports. I thought I recalled one of them didn't make any water any more. Well, sir, on the most recent report, it looks as if the Magnolia Trice Federal 1 and 2 quit making water.

Q What is this water, is that connate water that's in place in the reservoir and moves right along with the oil?

A Yes sir, it is. Apparently, the amount of water existing in the reservoir was just a little more than capillary pressure would support on the walls or in the pore spaces, and when the oil began to move, it had to carry some of that water along with it. That would be my interpretation of how it occurs that they make water.

Q These wells that have made water and then quit making water by themselves without any workovers, it would appear that the water in place in the reservoir had been exhausted, possibly, wouldn't it?

A Yes sir, apparently in some of these wells in the area distributing oil on to these wells immediately around them, the water is being exhausted and then being replaced.

Q I won't argue that the water is exhausted, but it is still making oil, so wouldn't that mean that the relative

permeability of the water is not possibly greater than it is to the oil?

A Well, it was probably at one time, I would say, but the saturation of the water has gone down. However, in the areas near the well, probably the trend has been in the other direction, it has become more permeable to oil.

Q Isn't the relative permeability greater with respect to the water and always a possibility that these pressure decline curves reflect the withdrawal of water as well as oil?

A I am sure they reflect withdrawals of water, yes sir.

Q Do you have the production history for all of the wells in the pool, how many barrels of oil each has made?

A No sir, I don't have the cumulative for all the wells in the pool, I know that. As a matter of fact, we didn't obtain an individual tabulation, but I do know that a lot of them have made substantial amounts of oil.

Q As a matter of fact, they have made more than the 70,000 barrels of oil --

A Yes, sir.

Q --as shown on the map?

A Yes, sir.

MR. NUTTER: Thank you.

MR. PORTER: Mr. Fischer?

CROSS EXAMINATION

BY MR. FISCHER:

Q Mr. Tomlinson, does the Ada Adams Number 1 make any water, has it ever made water?

A It shows sixty barrels.

Q Sixty barrels?

A For one month, and I believe that's for the month of February. That's out of a total production of oil of 1527, which would make it, oh, less than one percent--well, no, beg your pardon, about four per cent water.

Q At four per cent water?

A I believe that's right.

Q Is that the only month that that well made water, do you know?

A I doubt it, I imagine its made some all along, but I don't have the figures here.

Q February is the last month that you have data from the Engineering Committee, is that right?

A It's all I have with me. Well, let me say this: I have the 1957 Annual Report here, that might have that.

Q I mean as far as 1959 is concerned, that's the last month that anyone would have data on?

A February is the latest month that I could get.

MR. FISCHER: Thank you.

CROSS EXAMINATION

BY MR. PORTER:

Q Mr. Tomlinson, would you say that this reservior

that you have outlined in here is more than half depleted?

A Apparently the reservoir extends over a much wider area than that, exactly in which directions, I don't know, Mr. Porter. I would say that the oil that's been produced out of here represents a good portion of what may be all, I'm not sure, of what originally existed here, but it has been replaced, in my opinion, by other oil moving in.

Q I notice you have estimated the recoverable oil in place at 70,000 barrels here on 40 acres?

A Yes, sir.

Q And you give the cumulative production from the 14 wells now existing at 1,860,000 barrels?

A Yes, sir.

Q As I calculate that, that's an average recovery per well of 132,000 barrels?

A Yes, sir.

Q And on your exhibit under your proposed proration units here, that you would drill 12 more wells, making a total of 26?

A There would be a place for that many more wells.

Q Twelve more wells?

A Whether the operators will elect to drill all of them, I wouldn't know.

Q Which, if divided into the oil which has already been recovered, would be about 71,500 barrels, so that's what leads

to my question as to whether you think the reservoir is more than half depleted?

A This area --

Q Of course, that would --

A If it would have been closed in all places, it would have been depleted, and possibly more, with the production of oil that has occurred; however, it appears that oil has been moving in, replacing that that's taken out.

Q Of course, the assumption that the reservoir is more than half depleted would also have to assume that these would be, that there would be a total of 26 wells eventually in the pool?

A Yes, sir.

MR. PORTER: Does anyone have a question?

MR. MORGAN: I would like to ask Mr. Tomlinson a question.

MR. PORTER: All right.

CROSS EXAMINATION

BY MR. MORGAN:

Q Mr. Tomlinson, you indicated in explaining one of your exhibits, possibly Exhibit Number One or Two, I don't know which one, but it was the one, anyway, showing the well locations, and you denoted there a correlated pressure drop between one well in Section 2, I think it was Atlantic's State "AD" Number 1, and another well in Section 11 to the south, I think it was possibly Gulf Mills Federal Number 1. You stated that there was a

correlated pressure drop there that interested you and showed that there was communication between those two wells, and you also stated, I believe, that that would indicate an 80-acre pattern of drainage. I don't know, I don't believe I understand, that looks like those wells indicate a 40-acre area of drainage at the present because of their present proration?

A Yes, sir. Well, I wonder if I could use an area in this Exhibit Seven to illustrate what I am referring to? Actually, a well drilled 660 feet from all lines of this proration unit would have 40 acres assigned to it and its radius of draining on 40 would be 660 feet to its nearest line and if it were extended, it would be extended, if you extended it to 80 acres, in other words, another 660 feet away, its influence of drainage would occur to that point, and likewise an additional 660 feet in other directions, and that's what I meant when I was saying I thought that was on the outer perimeter of an 80-acre drainage pattern. So then if you apply that analgy to the location of the Gulf Federal Mills Number 1 in Section 11 and the Atlantic State "AD" Number 1, you can see that that drainage pattern could have existed and probably did exist around the Gulf well at that time.

Q Well, according to your Exhibit Twelve--I mean Nine, I think it's Nine, you seem to have a flexible pattern there in mind on your spacing?

A Well, the rules that we proposed, if you are talking about a flexible pattern, the rules that we propose allow people to

drill on either end of any proration unit.

Q In other words, just like has been done already in Sections 23 and 11, in other words, just offset from each other?

A Yes, sir.

Q Just offset wells?

A Yes, sir.

Q Supposing then you go up here into Sections 35 and 36 and 1 and you run another row of wells offsetting each other across the section line there. Supposing that you decided to do that, wouldn't you have a great deal of vacant space in between the existing wells and the new wells?

A Yes sir, we would have. However, some of that has already been solved. Cactus is drilling their well in the southeast of the northeast of Section 2 in the location shown there. That well is now drilling, so under 80-acre spacing, they couldn't come north and drill on the other end of their proration unit.

Q I see.

A I might answer this, that I think the operators originally didn't realize the situation in the Allison Pool was such and some of the wells were making water, so they felt they had to get as high on structure as they knew, and consequently they moved into the best area they knew of to drill at the time.

Q Now then, if they did go to that extreme pattern and everybody decided the same end of a row of 80's there, you would almost be operating in two pools in the north?

MR. PORTER: North Allison.

Q (By Mr. Morgan) North and the Allison Pool, wouldn't you? I mean, you are just practically disconnecting them, anyway, on that kind of a pattern?

A Well, if they were drilled in the way that you are talking --

Q I mean, that's an extreme possibility?

A It's an extreme possibility that you could have two lines of wells in that manner.

Q Yes.

A And --

Q And almost cut the pool in two? I mean, you call it a common pool, then you could still cut it in two in inactivity, no drilling?

A Yes sir, you could cut it through from appearances; I don't think you could cut it through from the drainage standpoint.

Q You are not going to get any radial pattern of drainage in this style of 80-acre spacing, are you?

A No sir, you wouldn't get radial in that drainage from one area to another, you would have to have linear flow. As you approach a well, it would become more radial, but it would be linear flow at the extreme end of the --

Q Would you place the proposed 80 acres in this manner because of the structure line to the--more or less in an elongated pattern from the northeast to the southwest?

A Not so much that as unfortunately, several of these wells were drilled in such a way that they--in the older Allison area, that they had to have acreage allocated in that way, and the other, it was simply convenient to start to continue the same pattern. However, I don't believe that this necessarily represents the outer edges of the pool; we could have just as well run them the other way.

Q Do you see any possibility in 80-acre patterns alternating with 40's in order for a fixed pattern for the remaining developments?

A Yes sir, that's possible for remaining development.

Q Do you think it would be wise to provide that?

A Well, from out standpoint, it wouldn't make much difference.

Q You don't think it would make any difference in the --

A I say from Atlantic's standpoint. We have an interest in this tract here, this one here, in fact, all across here and all of this acreage in here. Now, we have been considering drilling a well at that location, you see that these two are already on a pattern, this one is, this one, and likewise this one here. We don't plan to break an 80-acre pattern at any point if we can avoid it. Now, as far as other operators go, I don't know if their plans. It might be, it is a possibility and I don't know how our company would react, but for remaining development, it is a good possibility.

MR. MORGAN: I believe that's all, thank you.

MR. PORTER: Mr. Fischer?

CROSS EXAMINATION

BY MR. FISCHER:

Q Mr. Tomlinson, could you tell me how you would recommend to your company the development of the northwest quarter of Section 2, 9, 36?

A Yes sir, I know how I would like to have that well drilled, or that tract drilled. This doesn't reflect what our management wants to do, but what I would like to do is drill in the southeast of the northwest of Section 2.

Q All right, what about the next well then?

A Where? I mean, what --

Q If you developed the whole 160 acres there?

A Oh.

Q How much do you plan to develop of that 160 acres?

A Well, I don't have enough structural information to know.

Q I mean on the limits that might occur. I am not saying that your spacing --

A We don't have the control far enough to say that this is flat enough out here. It doesn't dip off, for example, any more than it does on this side for us to assume that. If it didn't, I think we probably would want to go to the northwest, but that's so hard to say right now.

Q If you drilled that well in the southeast of the northwest and it was productive, and all it showed or all it did was confirm these contours that you have shown there, where would you drill that other well, and I assume then that you would have to drill another well to develop the other 80 acres?

A Well, sir, we might not. If we went offset, you see, that is outside of the proposed limits that we had, and I think that we would have to get some indication of the reservoir extending out that far. We found, I might add we found us a dry hole on the north, and it is going to have to stop somewhere in all directions, so I think we probably would select some other locations we would rather drill.

Q If you drilled all those other locations, then you might extend it, might you not, and develop the 80 acres or 120 acres, we'll call it 80 now, remaining in this 160 acres?

A If we thought it were productive and we thought there was enough additional oil that we would recover, we would probably still be on an 80-acre pattern.

Q Where would you drill the well, however?

A Well, it would be on a 80-acre pattern, most likely, in the northwest, assuming there was enough oil and we thought it would be productive.

MR. FISCHER: Thank you.

MR. PORTER: Mr. Nutter?

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Tomlinson, I believe there are twelve wells producing in what we might call the southern end of the field, is that correct?

A Yes, sir.

Q And Atlantic has one of those twelve?

A Yes, sir.

Q Now, up in what we might call the north portion of the field, Atlantic owns the bulk of the acreage, is that correct?

A That's an operator's unit and we've got about, a little over 60 per cent of it.

Q Well now, if the Commission authorized 80-acre spacing in here and assigned these wells in the south part of the field an 80-acre allowable, they would each receive an extra 36 barrels of oil, correct?

A Yes sir, and the twelve wells would thereby receive a total of 432 barrels of oil per day.

Q I can't understand why Atlantic up in the northern part of the field would want to make an application for eleven out of twelve wells in the south part of the field to receive this additional allowable when all this drainage is coming from the north end to the south end of the field. Aren't they going to be draining your oil now?

A We plan further development up there.

Q Still they will be--they are developed down there,

aren't they?

A Yes, sir. Well, it's unfortunate that we didn't get an even start in drilling this area.

Q But you are giving them an additional headstart now, aren't you?

A Our wells will get the same advantage when they are drilled. In other words, the two that we have now will get the extra allowable and any additional wells that we might drill will get the extra allowable, and it is true that we'll be helping these folks down here, but we would rather insure that the field would produce on 80-acre development than 40. In other words, we know we can't make money on 40-acre development.

Q But you might make money by losing 432 barrels of oil per day?

A Yes, sir.

MR. NUTTER: Thank you.

MR. PORTER: Mr. Fischer?

MR. FISCHER: I have one more question. I just want to know if Atlantic has or has seen seismic information showing anything in Section 26 or 8, 36?

A We have seismic information covering that area. I didn't examine that closely, principally because it looked as if the field might be trending in a northeasterly direction. I wouldn't know what to think about it.

MR. FISCHER: Thank you.

MR. PORTER: Mr. Hinkle, did you have any other questions?

MR. HINKLE: Yes sir, I have another question or two.

REDIRECT EXAMINATION

BY MR. HINKLE:

Q Referring back to the line of testimony of Mr. Morgan's here as to the drainage area, isn't it a fact that wherever a well will be located, whatever unit it is on, whether it would be a 40-acre unit or an 80-acre unit, that the unit doesn't necessarily drain that respective unit, but that there would be counter-drainage which would average out?

A Yes, sir.

Q The drainage radius, whatever it is, remains the same whether you locate a well on 40 or 80, isn't it true?

A Yes sir, its ability definitely does, its ability to drain is the same.

Q Whether you locate these wells on 40 or 80, if they have drained 80 acres, they are going to continue to drain 80 acres, are they not?

A Yes, sir.

Q I believe Mr. Porter, in referring to your Exhibit Number Eight, spoke about the recoverable reserves as being 70,000 barrels. You didn't intend that to indicate the recoverable reserves, did you?

A No sir, I didn't understand his question in that way, I thought he meant the oil in place, but the recoverable reserves

are not calculated.

Q You have calculated that from the characteristics of the reservoir, the basic data which you have, that there was originally in place 70,000 barrels of oil under each 40-acre unit and that is what is shown in Exhibit Eight?

A Yes, sir.

Q And on that basis, one well on 40 acres, if it is limited to recover the oil in place, would not pay out?

A Yes, sir.

RECROSS EXAMINATION

BY MR. MORGAN:

Q Mr. Tomlinson, your answer indicated just now that there would be a fair exchange of oil regardless of whether the wells were located on the 80 acres, is that what you think? In other words, if there were a well on each 80 throughout the pool, the wells that you wanted on 80, then there would be a fair exchange of oil from under one, from one 80 to another?

A If I understood Mr. Hinkle's question correctly, he meant that regardless of which end, which lot of the 80 acres you put your well on, it would have the ability to drain the other end of the lot.

Q For an equal area?

A For an equal area, yes sir.

Q In other words, the permeability and the porosity is uniform throughout the pool?

A Yes, sir. There's one thing I didn't bring out that I probably should have pointed out to you, Mr. Morgan. This Sun Mills Number 1, this had an initial pressure of 3,000 pounds. This was a development well and of course there wasn't any other development in the area at all except up here, and that still wasn't there, but it was half a mile away from Gulf's well and the initial pressure on it came in a lot less than the initial pressure on the Gulf well and that definitely --

Q You pointed that out.

A Did I?

Q Yes, sir.

A Well, I--so they will, I think, drain a wide area.

MR. HINKLE: Mr. Porter, I have another question here.

REDIRECT EXAMINATION

BY MR. HINKLE:

Q Mr. Tomlinson, have you any indication from the other operators in the Allison and North Allison Pools as to their attitudes toward this application and 80-acre spacing in the area?

A Yes sir, Mr. Hinkle, we have contacted all of the operators in the pool and several of them have sent us letters saying that they were in agreement with our proposed rules, and all indications from them in one manner or another have said that they would like 80 acres.

Q They favor 80-acre spacing?

A Yes, sir.

MR. HINKLE: That's all we have.

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

The witness may be excused.

(Witness excused.)

MR. PORTER: Does that conclude your testimony, Mr. Hinkle?

MR. HINKLE: That concludes our case.

MR. PORTER: Anyone else desire to present testimony in this case?

Any statements?

MR. PAYNE: Mr. Commissioner, we received a communication from Gulf Oil Corporation concurring in Atlantic's application.

MR. PORTER: Any statements in connection with the case?

There are apparently no statements, so --

MR. HINKLE: If the Commission please, I believe that we have established conclusively in this case that one well will effectively and efficiently drain 80 acres. There's no need for me to read the statute, of course, to the Commission, which you all are familiar with. If there's any, ever has been a case where 80 acres should be allowed, 80-acre spacing, I think it is this, and I think this case points out clearly a situation where there is need for a rule, a standing rule of the Commission, State-wide rule, to permit areas and fields upon discovery, to be developed on an 80-acre pattern at least temporarily for a relatively short time until a certain number of wells have been

drilled. In this area, as the witness has shown, it looked from the beginning, because of the wells making water, that the recovery might not be too high, and outside of the offset wells, which were naturally drilled to begin with, it soon appeared that it wasn't feasible to develop it upon 40 acres, and taking into consideration the economics of it as shown by the exhibit which has been introduced here, if it is limited to oil in place, clearly one well will not pay out on 40 acres. I think the enforcement of a 40-acre rule in this particular area will result in economic waste and will cause the drilling of unnecessary wells.

MR. PORTER: Anything further, anyone else have a statement, any comments?

We will take the case under advisement.

We are going to have a ten-minute recess, but before we do, it has been a pleasure to have Mr. Walker with us, who was a member of the Commission for four years. We are glad to have him back, even temporarily.

(Short recess.)

MR. PORTER: The meeting will come to order.

Counsel for Atlantic has requested that Case 1637 be re-opened for purposes of offering letters in evidence for the record.

MR. HINKLE: If the Commission please, Atlantic would like to file in support, in connection with Case 1637, letters which have been received from the Magnolia Petroleum Company,

the Cactus Drilling Company, Ada Oil Company, the Ohio Oil Company, the Sun Oil Company and the Cosden Petroleum Corporation showing in effect that they are in accord with the application of Atlantic, and they all agree with the 80-acre spacing and proration units.

MR. PORTER: Is there objection to the admission of these letters?

The letters will be made a part of the record, Mr. Hinkle.

STATE OF NEW MEXICO)
: ss
COUNTY OF BERNALILLO)

I, JERRY MARTINEZ, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Hearing was reported by me in Stenotype and reduced to typewritten transcript by me, and that the same contains a true record to the best of my knowledge, skill and ability.

DATED this 29th day of April, 1959, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Notary Public

My Commission Expires:

January 24, 1962

DISCUSSION OF RECOVERY BY CALCULATIONS

Atlantic has made the attached calculations to show that spacing of wells in an oil reservoir does not materially affect the ultimate recovery from that reservoir so long as the permeability and porosity are continuous. The final results of these calculations is a plot of recovery factor versus well spacing and is included as an exhibit. It can be seen from the exhibit that after well spacing exceeds 10 acres, the change in recovery factor is negligible.

The approach to this problem was first to determine oil-in-place at bubble point and to predict future performance of the reservoir as a function of pressure. Then by estimating the minimum bottom hole working pressure for each well, the producing rate was calculated as a function of the shut-in reservoir pressure. With these two plots versus pressure, it was possible to determine the residual oil saturation in the reservoir when the producing rate reached the economic limit of 5 BOPD per well under various spacing patterns. The residual oil saturations were used to calculate the recovery factor as a percent of original oil-in-place (not bubble point oil) as plotted in the exhibit versus well spacing. A detailed explanation of the purpose of each of the attached calculation sheets is as follows:

Page 1. Since the gas liberation process in the reservoir is of a differential type, it is necessary to convert stock tank oil production and separator gas production to a differential basis. Page 1 of the calculation sheets has been designed for this purpose. In our calculation which is over the pressure range of 3150 psi to 2734 psi, the stock tank production of oil was 1,475,000 barrels and the separator gas production was 1894 MMSCF. In terms of differential production these figures are equivalent to 1,454,000 residual differential barrels of oil and 1875 MMSCF.

Page 2. The differential production figures arrived at in Page 1 are used in calculations shown on Page 2 to determine the oil-in-place in the reservoir at the bubble point pressure. The oil-in-place at the bubble point is calculated to be 21,840,000 barrels.

Page 3. Page 3 is a calculation of future reservoir performance versus pressure. For purposes of this calculation the oil saturation at bubble point was estimated to be 75% of total pore space; i. e, 25% water saturation and no free gas. Relative permeability ratio data was not available for the Allison Pennsylvanian reservoir so an average of six West Texas dolomite reservoir relative permeability curves was used. This is a trial-and-error calculation wherein an oil saturation at the end of each pressure increment is assumed and other factors calculated to agree with the assumed oil saturation to facilitate the calculation of an oil saturation at the end of the pressure increment. This process is repeated until the calculated oil saturation agrees with the assumed oil saturation for the end of each pressure increment. Successive pressure increments are used from the bubble point pressure to a point at or below abandonment reservoir conditions and oil saturations calculated at the end of each pressure increment. A plot of these oil saturations versus mean reservoir pressure is shown as Curve 1 on Page 9 of the attachments. This form is also used to determine the oil production in terms of residual differential barrels for each pressure increment assumed.

Page 4. Page 4 is a calculation sheet for converting the residual differential barrels calculated production from Page 3 to stock tank barrels. It is also used for converting differential gas production from Page 3 to separator gas production. Curve 4 on Page 9 is a plot of stock tank production versus reservoir pressure as calculated on Page 4.

Page 5. Under flowing conditions the fluid saturations in the reservoir will vary from a minimum value at the well bore to a maximum value at the extreme radius of drainage of a proration unit. The reservoir pressure will also be a minimum at the well bore and maximum at the extreme radius of drainage. Since this is true, it is necessary to solve the radial-flow equation for oil influx in the well bore in its differential form as the permeability is a function of pressure and viscosity and volume factors are a function of pressure. The calculation on Page 5 is for the evaluation of the integral which appears in the following equation:

$$q_o = \frac{7.08 \times \phi}{1000 \ln(0.607 \frac{r_e}{r_w})} \int_{P_w}^{P_e} \frac{k_{ro}}{\mu_o B_{of}} dP$$

Since it is impossible to write an equation defining relative oil permeability, oil viscosity, and oil formation volume factors as functions of pressure, it is necessary to evaluate the integral in the above equation for average conditions in small successive pressure increments from the pressure at the extreme radius of drainage to the well bore working pressure. A plot of the values of this integral as a function of mean reservoir pressure is shown as Curve 3 on Page 9. Relative oil permeability data used in evaluating this integral is shown on Page 10. A value for K_ϕ, productivity index permeability, was calculated from a productivity index test taken on Atlantic's Federal ~~Gulf~~ Yates No. 1 Well. This calculation is shown on Page 7.

Page 6. It will be noted from the above radial flow equation that for a given radius of drainage the oil influx rate into the well bore will be directly proportional to the value of this integral. It will further be noted that the radius of drainage does not affect the value of this integral, therefore, it is possible to solve the above equation for the required value of the integral to sustain a given production rate for a given radius of drainage. In the Allison and North Allison Pools, we estimate the abandonment producing rate of each well will be 5 BOPD. Substituting this value into the above equation, values of the integral to maintain a producing rate of 5 BOPD are calculated on Page 6. Then referring to Curve 3 on Page 9 and Curve 1 on Page 9, the residual oil saturations existing in the reservoir and abandonment conditions for various radii of drainage are determined. These residual oil saturations are tabulated on Page 6. By use of Curve 4 on Page 9 the stock tank oil production from bubble point to abandonment conditions for different radii of drainage is determined. These values of

stock tank oil production are also tabulated on Page 6. Adding to these stock tank production figures the amount of oil that was produced from the reservoir between the original reservoir pressure and bubble point pressure, a recovery factor as a percent of original oil-in-place is calculated as shown on Page 6. These calculated values of recovery factors are shown as a smooth curve versus well spacing in the exhibit.

Page 8. Page 8 is a sample calculation of the value of the above mentioned integral assuming q_o = 5 BOPD and R_e = 745 feet.

MPCO
PETR. ENGR. DEPT.
X-6762

FU DIAMETERCORE ANALYSIS REPC

IBM PROJECT NO. (0093) DIVISION WEST TEXAS DISTRICT LEA (070)
PARISH
COUNTYXX LEA STATE NEW MEXICO (095)
FIELD ALLISON PENNSYLVANIAN (01200) ZONE PENNSYLVANIAN (00)
LEASE CHILDERS FEDERAL (0326) WELL NO. 1 (001)
FORMATION PENNSYLVANIAN (0964) ELEVATION GL (4046) CORING TOOL DIAMOND (1)
CORING FLUID SALT GEL (4) DATE CORED 5-54 (54) DATE ANALYZED 4-59 (59) BY JLB 99

COMPLETE READING CODE 1009307009501200000326001096440461454599 9

SAMPLE NUMBER	DEPTH, FEET	LITHOLOGY	LITH. CODE	PERMEABILITY, md. HORIZONTAL MAX.	PERMEABILITY, md. HORIZONTAL 90° MAX.	PERMEABILITY, md. VERTICAL	EFFECTIVE POROSITY (PERCENT)	SATURATION (% PORE SPACE) RESIDUAL OIL	SATURATION (% PORE SPACE) TOTAL WATER
001	09683-84	LS	15	0000.J	0.J	0000.J	00.1	00.P	00.P
002	09683-84	"	15	0000.J	0.J	0000.J	00.1	00.P	00.P
003	09684-85	"	15	0000.J	0.J	0000.J	00.1	00.P	00.P
004	09685-86	FR LS	17	0000.1	0.1	0000.J	00.8	00.P	00.P
005	09685-86	" "	17	0000.J	0.J	0000.J	00.3	00.P	00.P
006	09686-87	LS	15	0000.J	0.J	0000.J	00.3	00.P	00.P
007	09686-87	"	15	0000.J	0.J	0000.J	00.3	00.P	00.P
008	09689-90	FR VUG LS	17	0001.1	0.1	0000.3	01.9	00.P	00.P
009	09690-91	VUG LS	16	0000.2	0.2	0000.J	01.6	00.P	00.P
010	09690-91	" "	16	0000.5	0.4	0000.1	02.0	00.P	00.P
011	09691-92	FR VUG LS	17	0000.1	0.1	0000.J	01.7	00.P	00.P
012	09691-92	" " "	17	0000.2	0.1	0000.1	02.4	00.P	00.P
013	09692-93	FR LS	17	0000.5	0.1	0000.J	00.4	00.P	00.P
014	09693-94	" "	17	0000.J	0.J	0000.J	00.3	00.P	00.P
015	09693-94	" "	17	0000.J	0.J	0000.J	00.2	00.P	00.P
016	09694-95	" "	17	0000.1	0.1	0000.J	00.2	00.P	00.P
017	09694-95	LS	15	0000.J	0.J	0000.J	00.2	00.P	00.P
018	09695-96	FR LS	17	0000.1	0.1	0000.J	00.2	00.P	00.P
019	09696-97	LS	15	0000.J	0.J	0000.J	00.1	00.P	00.P
020	09696-97	"	15	0000.J	0.J	0000.J	00.2	00.P	00.P
021	09697-98	"	15	0000.J	0.J	0000.J	00.1	00.P	00.P
022	09698-99	FR LS	17	0000.1	0.J	0000.J	00.1	00.P	00.P
023	09698-99	LS	15	0000.J	0.J	0000.J	00.2	00.P	00.P
024	09699-9700	FR LS	17	0000.4	0.3	0000.J	00.2	00.P	00.P
025	09699-9700	LS	15	0000.J	0.J	0000.J	00.1	00.P	00.P
026	09700-01	"	15	0000.J	0.J	0000.J	00.1	00.P	00.P
027	09701-02	"	15	0000.J	0.J	0000.J	00.3	00.P	00.P
028	09701-02	FR LS	17	0000.4	0.3	0000.J	01.0	00.P	00.P
029	09702-03	VUG LS	16	0000.7	0.5	0000.2	01.2	00.P	00.P
030	09703-04	" "	16	0001.7	1.4	0000.4	02.2	00.P	00.P
031	09704-05	LS	15	0000.J	0.J	0000.J	00.3	00.P	00.P
032	09705-06	FR LS	17	0000.1	0.J	0000.J	00.1	00.P	00.P

(J) PERMEABILITY < 0.1 md.
(K) INSUFFICIENT SAMPLE
(L) TOO FRIABLE
(M) MUD CONTAMINATED
(N) COMPLETELY ALTERED BY MUD

SD – SANDSTONE
LS – LIMESTONE
DOL – DOLOMITE
SH – SHALE
CONG – CONGLOMERATE

SDY – SANDY
LY – LIMEY
DLC – DOLOMITIC
SHY – SHALY
IGR – INTERGRANULAR

FR – FRACTURED
VUG – VUGULAR
OLI – OOLITIC
V – VERY
SL – SLIGHTLY

Remarks:

Date Submitted: APRIL 13, 1959 Signed:

(CONTINUED)

(4 SA)

MPCO
PETR. ENGR. DEPT
X-6743

FULL IAMETER CORE ANALYSIS REPO

IBM PROJECT NO. (0093) DIVISION WEST TEXAS DISTRICT LEA (070)
PARISH
COUNTY XX LEA STATE NEW MEXICO (095)
FIELD ALLISON PENNSYLVANIAN (01200) ZONE PENNSYLVANIAN (00)
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034	09706-07	" "	17	0000.1	0.J	0000.J	00.2	00.P	00.P
035	09707-08	" "	17	0000.J	0.J	0000.J	00.1	00.P	00.P

(I) PERMEABILITY < 0.1 md.	SD – SANDSTONE	SDY – SANDY	FR – FRACTURED
(K) INSUFFICIENT SAMPLE	LS – LIMESTONE	LY – LIMEY	VUG – VUGULAR
(L) TOO FRIABLE	DOL – DOLOMITE	DLC – DOLOMITIC	OLI – OOLITIC
(M) MUD CONTAMINATED	SH – SHALE	SHY – SHALY	V – VERY
(N) COMPLETELY ALTERED BY MUD	CONG – CONGLOMERATE	IGR – INTERGRANULAR	SL – SLIGHTLY

Remarks: (P) - FOR CODING PURPOSES ONLY

Date Submitted: APRIL 13, 1959 Signed: P. O. Weston

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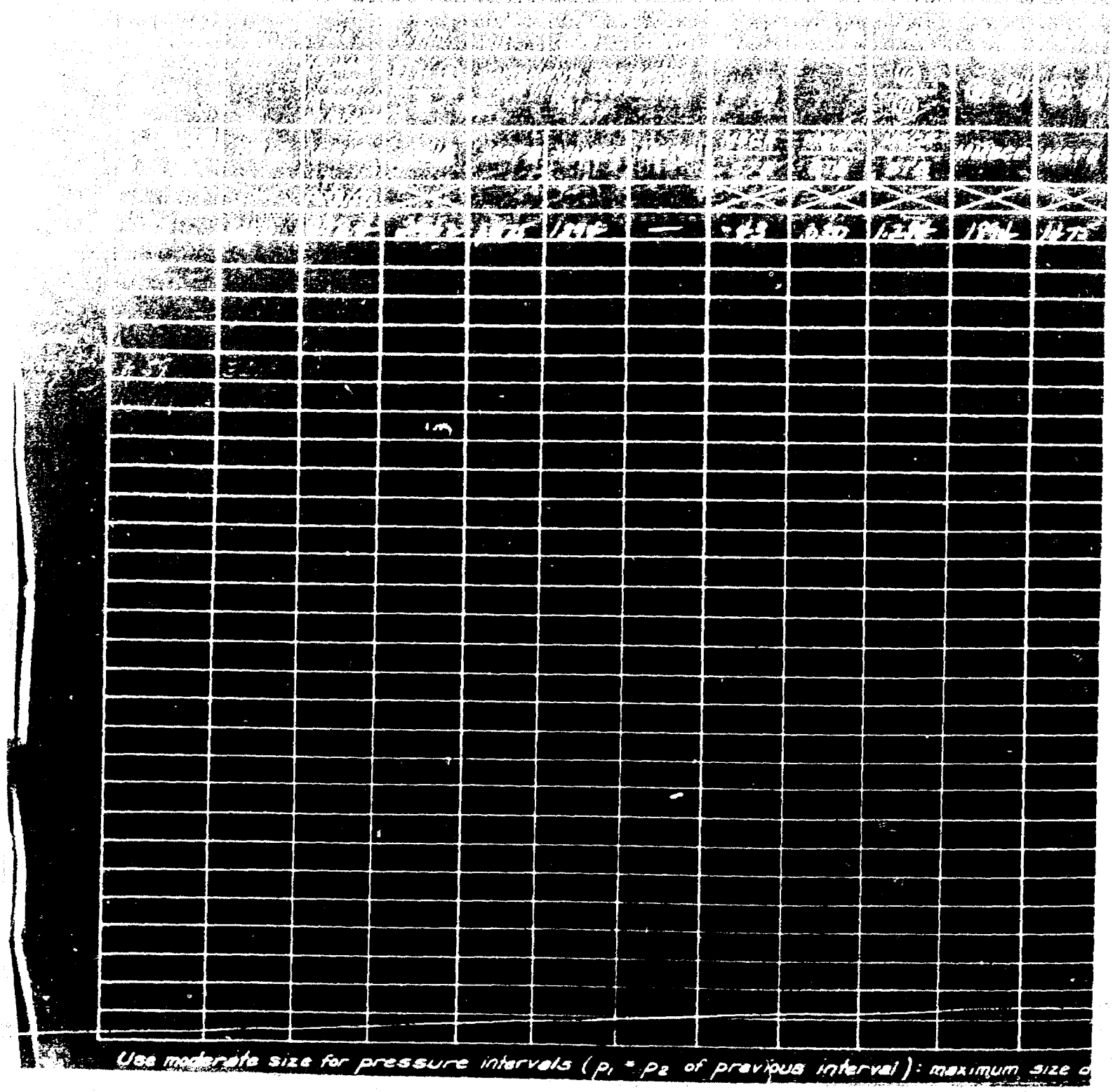
$$q_o = \frac{7.08 k h}{1000 \ln(0.607 \frac{r_e}{r_w})} \int_{P_{wf}}^{P_e} \frac{k_{ro}}{\mu_o B_o} dP$$

Since it is impossible to write an equation defining relative oil permeability, oil viscosity, and oil formation volume factors as functions of pressure, it is necessary to evaluate the integral in the above equation for average conditions in small successive pressure increments from the pressure at the extreme radius of drainage to the well bore working pressure. A plot of the values of this integral as a function of mean reservoir pressure is shown as Curve 3 on Page 9. Relative oil permeability data used in evaluating this integral is shown on Page 10. A value for K_4, productivity index permeability, was calculated from a productivity index test taken on Atlantic's Federal Gulf No. 1 Well. This calculation is shown on Page 7.

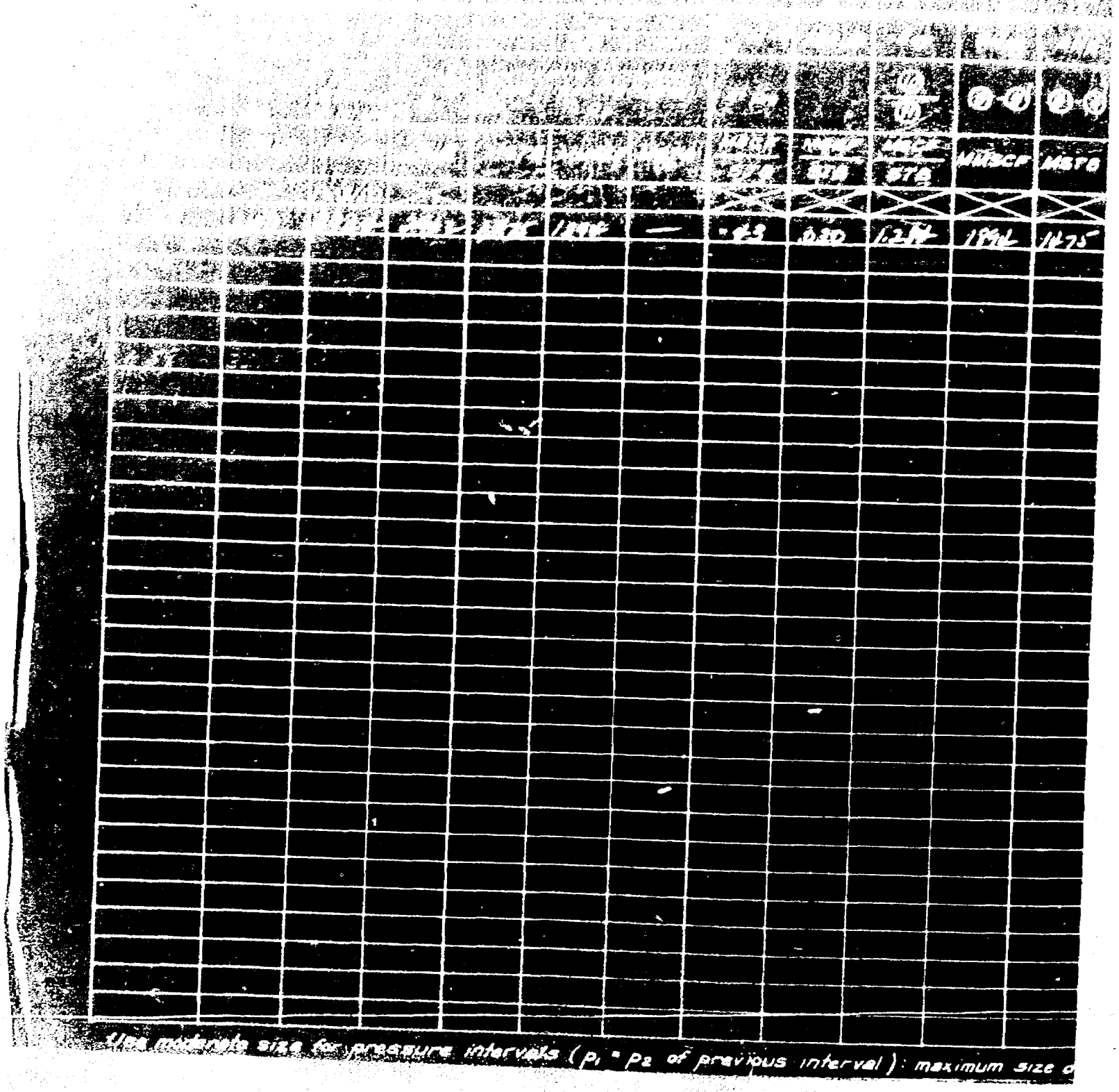
Page 6. It will be noted from the above radial flow equation that for a given radius of drainage the oil influx rate into the well bore will be directly proportional to the value of this integral. It will further be noted that the radius of drainage does not affect the value of this integral, therefore, it is possible to solve the above equation for the required value of the integral to sustain a given production rate for a given radius of drainage. In the Allison and North Allison Pools, we estimate the abandonment producing rate of each well will be 5 BOPD. Substituting this value into the above equation, values of the integral to maintain a producing rate of 5 BOPD are calculated on Page 6. Then referring to Curve 3 on Page 9 and Curve 1 on Page 9, the residual oil saturations existing in the reservoir and abandonment conditions for various radii of drainage are determined. These residual oil saturations are tabulated on Page 6. By use of Curve 4 on Page 9 the stock tank oil production from bubble point to abandonment conditions for different radii of drainage is determined. These values of

stock tank oil production are also tabulated on Page 6. Adding to these stock tank production figures the amount of oil that was produced from the reservoir between the original reservoir pressure and bubble point pressure, a recovery factor as a percent of original oil-in-place is calculated as shown on Page 6. These calculated values of recovery factors are shown as a smooth curve versus well spacing in the exhibit.

Page 8. Page 8 is a sample calculation of the value of the above mentioned integral assuming q_o = 5 BOPD and R_e = 745 feet.



Use moderate size for pressure intervals ($p_1 = p_2$ of previous interval): maximum size o



Use moderate size for pressure intervals (P_1 - P_2 of previous interval): maximum size o

12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ΔNd	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
⑪ ⑫	at Pm	[illegible]	[illegible]	[illegible]	at Pm	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MRDB	RDB/STB	MSCF/STB	MMSCF	MSTB	RVB/STB	MRVB	MRVB	MRDB	MMSCF	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
							0	0	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1454	.9855	1.271	1875	—	—	—	0	1454	1875	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

depends on variations of PVT functions with pressure

$\left[\left(\frac{}{}\right)-\left(B_{odi}-B_{oda}\right)\right]$ + Water: $\Delta W_e - \Delta N_p B_{wda} + B_w \Delta W_p$ + Free Gas: $B_{gi}\left(\Delta G_p - \Delta N_p R_{sda}\right)$ = $N_{pa} - N_{pi}$

12	13	14	15	16	17	18	19	20	21				
Production MRVB	B_{gi}				$\frac{G_{pi}}{N_{pi}}$	$B_{gi} - B_{gi}$		Total Hydrocarbons					
(11)(13)	at P_i	(13)(14)	(5')-(5)	(6')-(6)	(2)/(3)	(13)-(13')	(17)(18)	(4)+(14)	(12)-(2)	(1)(20)	(6)-(5)		
					Known				Known	(21)-(1)	(6')-(5')		
MRVB	RVB / MSCF	RVB / RDB	MSCF / RDB	RVB / RDB	MSCF / RDB	RVB / MSCF	RVB / RDB	MRVB	MRVB	MRVB	RVB / RDB		
	.1064												
52.67	.9282	.2495	.270	.132	0	.1178	0	2566	0	2566	.1178		
	✓												

PAGE 2
INITIALS W
DATE 2/23/54
6-25-54

[illegible] + No. Allison

[illegible] POINT PRESSURE

REMARKS For Oil in Place @ Bubble Point

If p_2 is above bubble point pressure then primed values are values at bubble point.

If p_1 is p_2 of previous interval then primed values are values on preceding line.

Expansion: $N_{oi}\left[B_{g2}(R_{si}-R_{sd2})+\frac{G_{fi}}{N_{oi}}(B_{g2}-B\right]$ — Evolved Gas / Free Gas

COL. NO.	1	2	3	4	5	6	7	8	9	10	11
QUANTITY	p_1	p_2	$B_g \Delta W_p$	Oil & Water Voidage	B_{od2}	$\Delta N_d B_{od2}$	ΔN_d	R_{sd2}	$\Delta N_d R_{sd2}$	ΔG_d	Free Gas F MMSCF
For N_{pi}		Bubble point pressure on first line	See form M.B.-II a	③ + ⑥	at p_2	⑤ ⑦	See form M.B. II a	at p_2	⑦ ⑧	See form M.B II a	⑩ - ⑨
For N_{oi}											
UNITS	PSIG	PSIG	MRVB	MRVB	RVB/RDB	MRVB	MRDB	MSCF/RDB	MMSCF	MMSCF	MMSCF
		p_s=3150			1.860			1.520			
	3150	2734	0	2513	1.728	2513	.1454	1.250	1818	1875	57

[illegible] on size of pressure interval.

	(14)	(7)+(15)	(15)+(16) / 2	(17) / (9)	(11)(18)	(2)(3) / (1) (14)
	CF / B	MSCF / RDB	MSCF / RDB	MSCF / RVB	MSCF / RVB	MSCF / RVB
		1.523				
		1.425	1.472	.3144	.0219	.0685
	42	1.451	1.478	.9965	.03136	.05254
	57	1.506	1.471	.3446	.02796	.01884
	34	1.533	1.520	.8696	.02876	.01774
	5	1.975	1.754	1.050	.04608	.10358
	14	4.714	3.845	(1.115)	.0728	.1988
	52	7.152	4.563	2.923	.1909	.2986
	80	3.880	2.987	1.875	.1226	.2824
	14	4.714	3.345	2.142	.1399	.2453
	3	11.083	7.898	5.395	.3350	.4198
	68	8.588	6.651	4.543	.2821	.3464
	52	8.972	6.843	4.674	.2902	.3750
	38	11.958	10.[illegible]	7.594	.4457	.5601
	0	14.220	11.596	8.415	.4940	.6094
	14	17.284	15.752	12.186	.7782	.8688
	4	12.24	14.960	12.836	1.393	1.610
	50	8.030	12.651	11.006	1.194	1.441

for first interval below bubble point [illegible]

[illegible] RESERVOIR PRODUCTION TO [illegible] CONDENSATION [illegible]

PAGE 4
INITIALS VC
DATE 2-1-57

$\Delta G_{pc} = \Delta G_{p} - \Delta N_p \left[(R_s)_{sp} + \left(\frac{B_{of}}{B_{od}} \right) R_{sd} - (R_{sf}) \right]$

6	7	8	9	10	11	12	13	14	15	16	17
[illegible]	$\Delta G_p/\Delta G_{pc}$	ΔG_{pp}	ΔG_d	ΔN_d	$\left(\frac{B_{of}}{B_{od}}\right)$	ΔN_p	Oil Rate From [illegible]	Δt	Δt	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	From Solution Gas [illegible] Calculations Form [illegible]	[illegible]	[illegible]	(10)/(11)	Other Calculations	(12)/(13)	(14)/(0.365)	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	STB/D	M Days	Years	Years	[illegible]

12																	
(10) (11)	Cumulative of (12)																
STB)(PSI)	STB)(PSI)		PSIB														
CP)(RVB)	CP)(RVB)			RVB													
		Pb	250	.240													
1.405	1.405		200	.200													
1.135	2.540		150	.165													
.750	3.290		100	.130													
.160	3.450		50	.080													
			25	.060													
					Pd:												
1.135	1.135	Pb	300	.250													
.755	1.890		250	.220													
.160	2.050		200	.200													
			150	.165													
			100	.130													
			50	.080													
.810	.810		25	.060													
.230	1.040																
					Pb:												
		Pb	400	.245													
			300	.210													
			250	.220													
			200	.200													
			150	.165													
			100	.130													
			50	.080													
			25	.060													

DATE 6-55

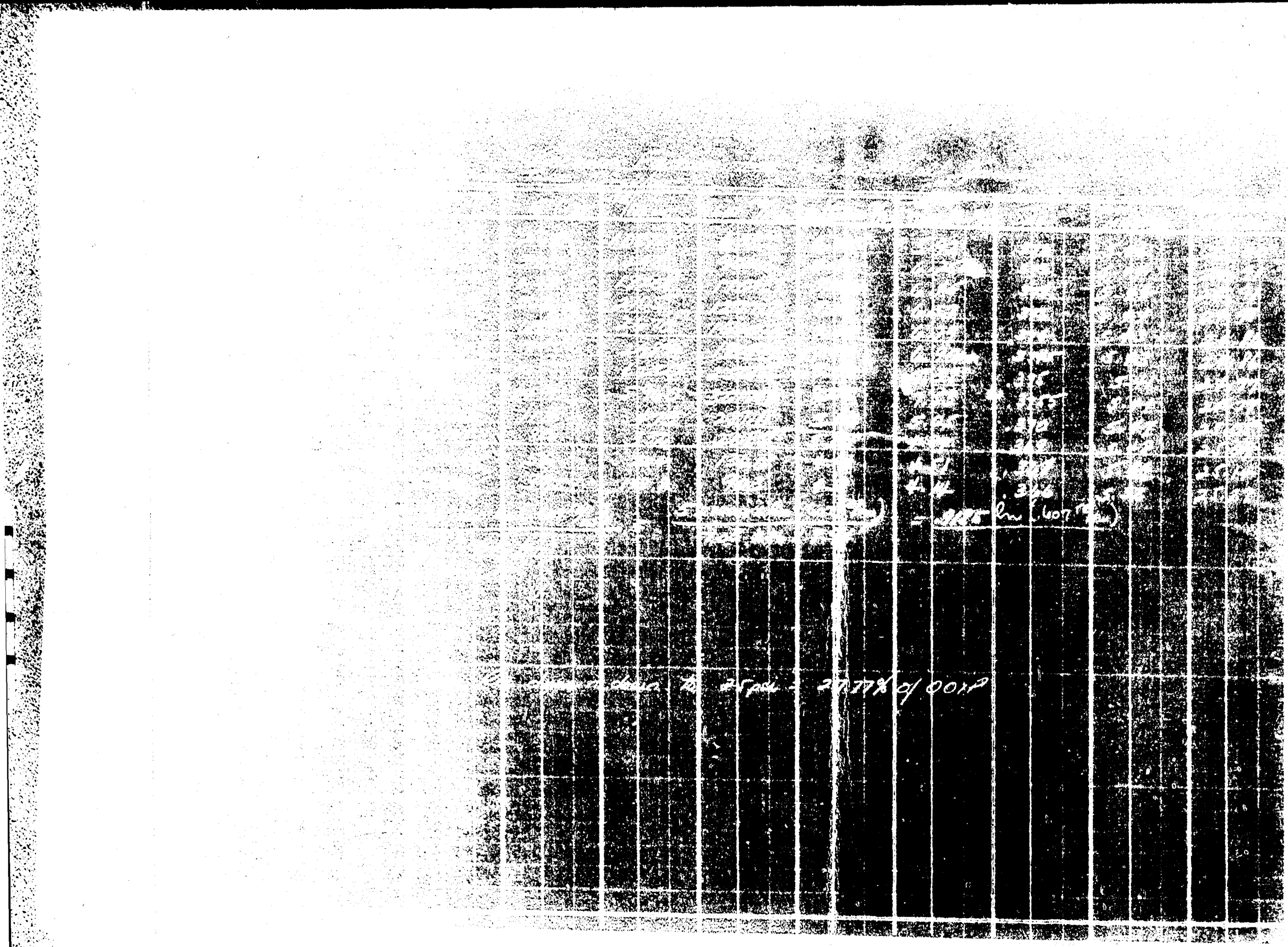
Core 9353-54 - Dickinson A-2

... and let $k_{ro} = 1.0$ ... omit (2) thru (5) and use ... calculations on Form S.G.D.-I

Gas-Oil Ratio Equation

$$\frac{k_g}{k_o} = \frac{R_d - R_{od}}{\frac{\mu_o}{\mu_g}\gamma B_{od}}$$

1	2	3	4	5	6	7	8	9	10	11
[illegible]	R_{od}	$R_d - R_{od}$	$\frac{\mu_o}{\mu_g}\gamma B_{od}$	$\frac{k_g}{k_o}$	S_o	k_{ro}	$\mu_o B_{of}$	$\frac{k_{ro}}{\mu_o B_{of}}$	$\left(\frac{k_{ro}}{\mu_o B_{of}}\right)_{avg}$	Δp
[illegible]	at (1)	R_d at P_e minus (2)	at (1)	$\frac{(3)}{(4)}$	at (5)	at (6)	at (1)	$\frac{(7)}{(8)}$	$\frac{(9)' + (9)}{2}$	(1)' - (1)
PSIG	MSCF/RDB	MSCF/RDB	MSCF/RDB	—	—	—	cp (RVB/STB)	STB/(cp)(RVB)	STB/(cp)(RVB)	PSI
		R_d = 14.0 MSCF/RDB								
200	.200	13.800	[illegible]	[illegible]	37.2	.020	.6479	.0308		
150	.165	13.835	3.413	4.053	35.7	.018	.7112	.0253	.0281	50
100	.130	13.870	2.819	4.920	34.6	.017	.847	.0201	.0227	50
50	.080	13.920	1.581	8.804	31.3	.010	.996	.0100	.0150	50
25	.060	13.940	.957	14.566	28.5	.003	1.092	.0028	.0064	25
		R_d = 13.4 MSCF/RDB								
150	.165	13.235	3.413	3.878	35.8	.018	.7112	.0253		
100	.130	13.270	2.819	4.707	34.8	.017	.847	.0201	.0227	50
50	.080	13.320	1.581	8.425	31.6	.010	.996	.01004	.0151	50
25	.060	13.340	.957	13.939	28.8	.003	1.092	.00275	[illegible]	25
			R_d = 11.6 MSCF/RDB							
100	.130	11.470	2.819	4.068	35.6	.018	.847	.0213		
50	.080	11.520	1.581	7.286	32.4	.011	.996	.0110	.0162	50
25	.060	11.540	.957	12.058	29.6	.008	1.092	.0073	.0092	25
			R_d : 8.03 MSCF/RDB							
50	.080	7.950	1.581	5.028						
25	.060	7.970	.957	8.328						



= 10 md.

Use Perc Spacing

P₂ = 1053'

= 86 md.

Use 86 md as Ky for formation

Form 1891 11-54

Sec 1.6 for Rock Spacing = .3730

Sec for 40 ac Spacing .3725

For 80 acre Tract - 1 Well

3.99 Pm: 282 $N_R = \frac{7758 \times .0515 \times .3730 \times 10 \times 80}{1.243} = 95,914$ RDB

For 80 acre tract - 2 Wells

Pm: 275 $N_R = \frac{7758 \times .0515 \times .3725 \times 10 \times 80}{1.242} = 95,860$ RDB

Last Oil - 54 RDB

Form 1891 11-54