CASE 3158 & 3159 - 11/24/64

Appli. of PURE OIL for creation of new gas pool and special rules.

CASE NO.
3158

Application,
Transcripts,
Small Exhibits
ETC.

GOVERNOR
JACK M. CAMPBELL
CHAIRMAN

State of New Mexico
Oil Conservation Commission

LAND COMMISSIONER
E. S. JOHNNY WALKER
MEMBER

P. O. BOX 871
SANTA FE

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

December 7, 1964

Mr. Richard S. Morris
Seth, Montgomery, Federici & Andrews
Attorneys at Law
Post Office Box 2307
Santa Fe, New Mexico

Re: Case No. 3158 and 3159
Order No. R-2826 & R-2827
Applicant:
THE PURE OIL COMPANY

DOCKET MAILED
Date 12-24-64

Dear Sir:

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

Very truly yours,

A. L. Porter, Jr.

A. L. PORTER, Jr.
Secretary-Director

ir/

Carbon copy of order also sent to:

Hobbs OCC x
Artesia OCC
Aztec OCC
OTHER Mr. George Hunker, Mr. John Russell, Mr. Donald Pray.

DOCKET MAILED
Date 12-24-64

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. 3158
Order No. R-2826

NOMENCLATURE

APPLICATION OF THE PURE OIL COMPANY
FOR THE CREATION OF A NEW GAS POOL
AND FOR SPECIAL POOL RULES, LEA COUNTY,
NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on November 24, 1964, at Santa Fe, New Mexico, before Examiner Daniel S. Nutter.

NOW, on this 7th day of December, 1964, the Commission, a quorum being present, having considered the testimony, the record, and the recommendations of the Examiner, 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 Pure Oil Company, seeks the creation of a new Wolfcamp gas pool for its Red Hills Unit Well No. 1, located 330 feet from the South line and 2310 feet from the East line of Section 32, Township 25 South, Range 33 East, NMPM, Lea County, New Mexico, and the promulgation of special rules and regulations governing said pool, including a provision for 640-acre spacing.

(3) That the portion of this case concerning the promulgation of special pool rules was continued at the above hearing by the examiner to the examiner hearing to be held on January 6, 1965, and that a subsequent order or orders should be issued concerning this portion of the case.

(4) That the Red Hills Unit Well No. 1, located 330 feet from the South line and 2310 feet from the East line of Section 32, Township 25 South, Range 33 East, NMPM, Lea County, New Mexico, has discovered a separate common source of supply which should be designated the Red Hills-Wolfcamp Gas Pool; that the vertical limits of said pool should be the Wolfcamp formation, and that the horizontal limits of said pool should include all of Sections 31, 32, and 33, Township 25 South, Range 33 East, and all of Sections 4, 5, and 6, Township 26 South, Range 33 East, NMPM, Lea County, New Mexico.

IT IS THEREFORE ORDERED:

(1) That a new pool in Lea County, New Mexico, classified as a gas pool for Wolfcamp production, is hereby created and designated the Red Hills-Wolfcamp Gas Pool, with vertical limits comprising the Wolfcamp formation, and horizontal limits comprising all of Sections 31, 32, and 33, Township 25 South, Range 33 East, and all of Sections 4, 5, and 6, Township 26 South, Range 33 East, NMPM, Lea County, New Mexico.

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

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

Jack M Campbell

JACK M. CAMPBELL, Chairman

E. S. Walker

E. S. WALKER, Member

A. L. Porter, Jr.

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

esr/

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

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

CASE No. 3158
Order No. R-2826-A

APPLICATION OF THE PURE OIL COMPANY
FOR THE CREATION OF A NEW GAS POOL
AND FOR SPECIAL POOL RULES, LEA
COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on March 17, 1965, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission."

NOW, on this 8th day of April, 1965, the Commission, a quorum being present, having considered the testimony presented and the exhibits received at said hearing, and being fully advised in the premises,

FINDS:

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

(2) That by Order No. R-2826, the Commission granted The Pure Oil Company's request for the creation of a new gas pool in Lea County, New Mexico, designated the Red Hills-Wolfcamp Gas Pool, and established vertical and horizontal limits for said pool.

(3) That the applicant, The Pure Oil Company, also seeks the promulgation of temporary special rules and regulations governing said pool, including a provision for 640-acre spacing and a provision requiring wells subsequently completed in said pool to be located no nearer than 1650 feet to the outer boundary of a section.

(4) That The Pure Oil Company Red Hills Unit Well No. 1 is the only well presently completed in the subject pool and is located 330 feet from the South line and 2310 feet from the East line of Section 32, Township 25 South, Range 33 East, NMPM, Lea County, New Mexico.

(5) That the applicant has not established that the proposed special rules and regulations would afford to the owner of each property in the pool the opportunity to produce his just and equitable share of the gas in the pool.

(6) That the applicant's request for special rules and regulations governing the Red Hills-Wolfcamp Gas Pool should be denied.

IT IS THEREFORE ORDERED:

(1) That the applicant's request for special rules and regulations governing the Red Hills-Wolfcamp Gas Pool is hereby denied.

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

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

JACK M. CAMPBELL, Chairman

GUYTON B. HAYS, Member

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

esr/

DRAFT

JMD/esr
2-5-65

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. 3158
and
CASE No. 3159

APPLICATION OF THE PURE OIL COMPANY
FOR THE ESTABLISHMENT OF SPECIAL RULES
AND REGULATIONS GOVERNING THE RED HILLS-
WOLFCAMP AND RED HILLS-PENNSYLVANIAN GAS
POOLS, LEA COUNTY, NEW MEXICO.

RULING ON MOTION TO QUASH SUBPOENA DUCES TECUM

BY THE COMMISSION:

This matter came on for hearing at 9 o'clock a.m. on January 13, 1965, at Santa Fe, New Mexico, upon Motion to Quash Subpoena Duces Tecum filed by John R. Murphey, Jr., George Fish, Fred Tyner, and The Pure Oil Company.

NOW, on this_____day of February, 1965, the Commission, a quorum being present, having read the motion and having considered the arguments of counsel, and being otherwise fully advised in the premises,

FINDS:

(1) That the documents described in the Subpoena Duces Tecum issued December 22, 1964, to Mr. John R. Murphey, Jr., Mr. George Fish, and Mr. Fred Tyner may be material and pertinent to a proper determination of the issues in these cases.

(2) That the Subpoena Duces Tecum should be modified to require production of the documents described therein at the hearing of these cases on the merits subject to objections as to the admissibility of said documents.

IT IS THEREFORE ORDERED:

(1) That the Subpoena Duces Tecum issued in the above cases on December 22, 1964, is hereby modified to require production of the documents described therein at the hearing of these cases on the merits subject to objections as to the admissibility of said documents.

(2) That, except as provided herein, the Motion to Quash Subpoena Duces Tecum is hereby overruled.

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

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

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. 3158 (Reopened)
Order No. R-3073

APPLICATION OF UNION OIL COMPANY
OF CALIFORNIA FOR SPECIAL POOL RULES,
LEA COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 a.m. on May 18, 1966, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission."

NOW, on this 2nd day of June, 1966, the Commission, a quorum being present, having considered the testimony presented and the exhibits received at said hearing, and being fully advised in the premises,

FINDS:

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

(2) That Case No. 3158 is reopened on the application of Union Oil Company of California as successor in interest to The Pure Oil Company, the original applicant in said case.

(3) That the applicant, Union Oil Company of California, seeks the promulgation of special rules and regulations for the Red Hills-Wolfcamp Gas Pool, Lea County, New Mexico, including a provision for 640-acre spacing units and specified well locations.

(4) That the applicant has established that one well in the Red Hills-Wolfcamp Gas Pool can efficiently and economically drain and develop 640 acres.

(5) That in order to prevent the economic loss caused by the drilling of unnecessary wells, to avoid the augmentation of risk arising from the drilling of an excessive number of wells, to prevent reduced recovery which might result from the drilling of too few wells, and to otherwise prevent waste and protect correlative rights, special rules and regulations providing for 640-acre spacing units should be promulgated for the Red Hills-Wolfcamp Gas Pool.

(6) That the special rules and regulations should provide for limited well locations with certain exceptions in order to assure orderly development of the pool and protect correlative rights.

(7) That an exception to the proposed well location requirements of the special pool rules for the Red Hills-Wolfcamp Gas Pool should be granted the Red Hills Unit Well No. 1, located 330 feet from the South line and 2310 feet from the East line of Section 32, Township 25 South, Range 33 East, NMPM, Lea County, New Mexico. Further, that an exception to said well location requirements should also be granted to a well to be drilled 990 feet from the North line and 1650 feet from the East line of Section 5, Township 26 South, Range 33 East, NMPM, Lea County, New Mexico.

IT IS THEREFORE ORDERED:

That Special Rules and Regulations for the Red Hills-Wolfcamp Gas Pool are hereby promulgated as follows:

SPECIAL RULES AND REGULATIONS
FOR THE
RED HILLS-WOLFCAMP GAS POOL

RULE 1. Each well completed or recompleted in the Red Hills-Wolfcamp Gas Pool or in the Wolfcamp formation within one mile thereof, and not nearer to or within the limits of another designated Wolfcamp gas pool, shall be spaced, drilled, operated, and produced in accordance with the Special Rules and Regulations hereinafter set forth.

RULE 2. Each well shall be located on a standard unit containing 640 acres, more or less, consisting of a governmental section.

RULE 3. The Secretary-Director of the Commission may grant an exception to the requirements of Rule 2 without notice and hearing when an application has been filed for a non-standard unit and the unorthodox size or shape of the unit is necessitated by a variation in the legal subdivision of the United States Public Land Surveys, and the following provisions are complied with:

(a) The non-standard unit consists of quarter-quarter sections or lots that are contiguous by a common bordering side.

(b) The applicant presents written consent in the form of waivers from all offset operators to the non-standard unit.

(c) In lieu of paragraph (b) of this rule, the applicant may furnish proof of the fact that all of the aforesaid operators were notified by registered or certified mail of his intent to form such non-standard unit. The Secretary-Director may approve the application if no such operator has entered an objection to the formation of such non-standard unit within 30 days after the Secretary-Director has received the application.

RULE 4. Each well shall be located no nearer than 1650 feet to the outer boundary of the section and no nearer than 330 feet to any governmental quarter-quarter section line.

IT IS FURTHER ORDERED:

(1) That the Red Hills Unit Well No. 1, located 330 feet from the South line and 2310 feet from the East line of Section 32, Township 25 South, Range 33 East, NMPM, Lea County, New Mexico, is hereby granted an exception to the well location requirements contained herein.

(2) That an exception to the well location requirements contained herein is hereby granted to a well to be drilled 990 feet from the North line and 1650 feet from the East line of Section 5, Township 26 South, Range 33 East, NMPM, Lea County, New Mexico.

(3) That the operator of the aforesaid Red Hills Unit Well No. 1 shall file a new Form C-102 outlining thereon the acreage dedicated to said well within 10 days after receipt of this order.

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

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

Jack M Campbell
JACK M. CAMPBELL, Chairman

Guyton B. Hays
GUYTON B. HAYS, Member

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

esr/

GOVERNOR
JACK M. CAMPBELL
CHAIRMAN

State of New Mexico
Oil Conservation Commission

LAND COMMISSIONER
GUYTON B. HAYS
MEMBER

P. O. BOX 2088
SANTA FE

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

June 2, 1966

Mr. Clarence Hinkle
Mr. S. B. Christy
Hinkle, Bondurant & Christy
Attorneys at Law
Post Office Box 10
Roswell, New Mexico

Re: Case No. 3158
Order No. R-3073
Applicant:

UNION OIL COMPANY OF CALIFORNIA

Dear Sir:

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

Very truly yours,

A. L. Porter, Jr.

A. L. PORTER, Jr.
Secretary-Director

ALP/ir

Carbon copy of order also sent to:

Hobbs OCC x
Artesia OCC
Aztec OCC

Other All personal appearances entered in this case.

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

WESTERN UNION
TELEGRAM

W. P. MARSHALL, PRESIDENT

1201 (4-60)

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

The filing time shown in the date line on domestic telegrams is LOCAL TIME at point of origin. Time of receipt is LOCAL TIME at point of destination

1966 MAY 17 AM 8 46

MAIN OFFICE 016

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:NEW MEXICO OIL CONSERATION COMM=

SANTA FE NMEX=

'66 MAY 17 AM 9 27

:RE CASES (Cases 3158 3401 3402) REGULAR HEARING MAY 18 1966

q GEORGE T ABELL, WORKING INTEREST OWNER IN THE RED HILLS WOLFCAMP GAS POOL, LEA COUNTY, NEW MEXICO, SUPPORTS UNION OIL COMPANY OF CALIFORNIA I IN ITS APPLICATION TO ESTABLISH 640 ACRE SPACING FOR THE ABOVE MENTIONED POOL. GEORGE T ABELL OBJECTS TO THE APPLICATIONS OF JERALD M SCHUMAN, ET AL, FOR THE NON-STANDARD DRILLING UNITS CONTEMPLATED BY CASES

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

CLASS OF SERVICE

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

WESTERN UNION

TELEGRAM

W. P. MARSHALL, PRESIDENT

1201 (4-60)

SYMBOLS

DL=Day Letter

NL=Night Letter

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The filing time shown in the date line on domestic telegrams is LOCAL TIME at point of origin. Time of receipt is LOCAL TIME at destination

(59).

3401 AND 2402=

GEORGE T ABELL MIDLAND TEX=

==640 3401 3402=

:ALSO 3158 3401 3402 18 1966=.

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

HERMAN H. KAVELER
PETROLEUM ENGINEERING AND MANAGEMENT CONSULTANT
NATIONAL BANK OF TULSA BUILDING
TULSA, OKLAHOMA 74103
GEORGE D. DALY, ASSOCIATE
TELEPHONE LUTHER 4-5812

May 16, 1966

The Honorable Jack M. Campbell, Chairman
The Honorable A. L. Porter, Jr., Secretary & Director
The Honorable Guyton Hays, Member
New Mexico Oil and Gas Commission
State Land Office Building
Santa Fe, New Mexico

Re: Application of Union Oil Company
for Wolfcamp Pool Spacing

Dear Sirs:

I wish to advise the Commission that my health and loss of voice prevents me from appearing at the subject hearing on May 18th as a witness for Kermit Oil Company, Jerald Schuman and Saul Yager. I appeared for the latter at the previous hearings on Red Hills Field pool spacing in January and April 1965.

I have, however, studied and evaluated all data and information regarding the Red Hills No. 1 well made available to my clients by Union Oil Company, applicant for 640-acre Wolfcamp pool spacing.

Were I able to appear as a witness, I would call attention to the fact that there is nothing new and nothing discovered since the Commission considered the same question of spacing at the previous hearings. For example, the well pressure build-up data, as interpreted and presented by Union Oil, presents the same conclusions that could have been drawn from the drill stem test of August 1964 and well test of January 1965 as did the pressure tests subsequently made in February 1966. Nothing new is revealed by recent well pressure measurements.

Further, if I were to testify, I would call attention to the fact that further exploration drilling must be done before a decision can be made as to whether the pressure data as presented by Union Oil shows the Wolfcamp pool to be small, or the drainage area of a well to be limited because of low permeability or other factors. Until the further exploration drilling provides more direct information as to the size of the three pools in the field, the drainage efficiency of the wells over the area, and the proportion of recoverable gas under each property, there is no reasonable basis for protection of correlative rights of the owners.

I covered these two points by testimony in the prior hearings. I also called attention to the fact that spacing in the Red Hills Field cannot be based upon reserves of one pool since all wells drilled are prospective dual completions which, in my opinion, makes it unreasonable to request the Commission to space one pool without regard to the two other proven pools.

Very truly yours,

Herman H. Kaveler

Herman H. Kaveler

TEXACO
INC.

PETROLEUM PRODUCTS

DOMESTIC PRODUCING DEPARTMENT
MIDLAND DIVISION

P. O. BOX 3109
MIDLAND, TEXAS 79701

'66 MAY 17 AM 8 12

May 16, 1966

CASES 3158, 3401 & 3402
RED HILLS GAS POOL
LEA COUNTY, NEW MEXICO

New Mexico Oil
Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico

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

Gentlemen:

Texaco Inc. is an interest owner in the Red Hills Unit operated by Union Oil Company of California and holds additional leases adjacent to the unit area. We note that in the above cases Union Oil Company of California will seek approval of pool rules adopting 640 acre units for wells completed in the Red Hills (Wolfcamp) Gas Pool in Case 3158. In the other two cases Schuman, Yager and Kermit Oil Company will request approval of a non-standard 280 acre unit for a proposed Penn well, 120 acre unit for a proposed Wolfcamp well and a 160 acre unit for a second proposed Wolfcamp completion.

In view of the performance of Union Oil Company of California's Red Hills Unit Well No. 1 and the depth of completion, Texaco Inc. strongly urges the Oil Conservation Commission of New Mexico to approve the application for rules that will provide for 640 acre units. Texaco therefore concurs with the recommendations that will be made under Case 3158. With regard to Cases 3401 and 3102, Texaco Inc. does not approve of non-standard units consisting of less than 640 acres and is therefore opposed to the applications contained in these two cases. Reservoir performance indicates that one well in the Wolfcamp reservoir will drain in excess of 640 acres. The non-standard locations requested would result in three wells completed in this reservoir within an area of approximately 640 acres, two of which would be unnecessary from a reservoir and producing standpoint. It is recognized

that the obvious problem is the protection of correlative rights. It is understood that Union Oil Company of California desires to drill a unit well in Section 5, the section in which the three non-standard drilling units are being requested. Correlative rights should be protected by the various interest owners in Section 5 joining in the drilling of one well in Section 5 drilled at a standard location.

Yours very truly,

J. H. Markley

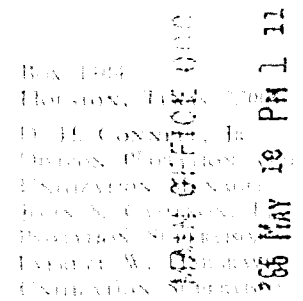
J. H. Markley
Division Manager

CLW:jl

cc: Union Oil Company of California
Attn: D. A. Dunn
Box 671
Midland, Texas

Tidewater Oil Company





May 16, 1966

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico

ATTENTION: Mr. A. L. Porter, Jr. - Secretary-Director

Re: Re-Opened Case No. 3158
Red Hills Wolfcamp Gas Pool
Lea County, New Mexico

Gentlemen:

This is regarding the subject application of Union Oil Company of California now set for hearing on May 18, 1966. Tidewater is a working interest owner in the Red Hills Unit in this field operated by Union Oil Company of California. Please be advised that Tidewater concurs with and fully supports Union's request for 640 acre spacing for this gas pool.

Very truly yours,

TIDEWATER OIL COMPANY

John S. Cameron Jr.

JOHN S. CAMERON, JR.

JSC:mfs
cc: Union Oil Company of California
P. O. Box 671
Midland, Texas
Attn: Mr. E. B. White, District Landman

FORM 446 8-63

OIL CONSERVATION COMMISSION
'66 MAY 15 PM 1 35

PAN AMERICAN PETROLEUM CORPORATION

OIL AND GAS BUILDING P. O. BOX 1410
FORT WORTH, TEXAS—76101

WILLIAM V. GRISHAM
DIVISION ENGINEER

May 13, 1966

File: GHF-174-986.510.1

Subject: Red Hills-Wolfcamp Gas Pool
Lea County, New Mexico

Mr. A. L. Porter, Jr.
Secretary-Director
New Mexico Oil Conservation Commission
State Land Office Building
Santa Fe, New Mexico

Dear Sir:

The Commission has docketed Case 3158 for hearing on May 18, 1966, concerning rules and regulations for development and production of the Red Hills-Wolfcamp Gas Pool.

Pan American Petroleum Corporation is an interest owner in the Red Hills Unit operated by Union Oil Company of California. We believe that their recommendations will permit the orderly development of this deep gas pool. Therefore, we urge adoption of the rules proposed by Union Oil Company.

Yours very truly,

W. V. Grisham

PAT:df

CC - Mr. E. B. White, Union Oil Company

TENNECO OIL COMPANY · P. O. BOX 1031 · 1800 WILCO BUILDING · MIDLAND, TEXAS 79701

MAIN OFFICE OCC
'66 MAY 13 PM 1 12

May 11, 1966

New Mexico Oil
Conservation
Commission
P. O. Box 2088
Santa Fe, New Mexico

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

Re: Case No. 3158
Red Hills (Wolfcamp) Field
Lea County, New Mexico

Gentlemen:

Tenneco Oil Company as a working interest owner in the Red Hills Unit supports Union Oil Company of California's position requesting that the Commission grant 640 acre spacing for the Red Hills (Wolfcamp) Field.

Very truly yours,

TENNECO OIL COMPANY

A. W. Lang
District Production
Superintendent

JJL/jr

cc: Union Oil Co. of California
Post Office Box 671
Midland, Texas
Attention: Mr. H. E. Keegan

SCHUMAN, PRAY & DOYLE
ATTORNEYS AND COUNSELORS AT LAW
SUITE 1109 PETROLEUM CLUB BUILDING
TULSA, OKLAHOMA 74119

TELEPHONE 918 LUTHER 7-3324

JEROLD M. SCHUMAN
DONALD E. PRAY
STANLEY P. DOYLE

GEORGE H. BOWEN
OF COUNSEL

Cas 315-B

May 10, 1966

Mr. David A. Dunn
Union Oil Company of California
Union Oil Building
619 West Texas Avenue
Midland, Texas

MAIN OFFICE OCC

'66 MAY 16 AM 8 28

Dear Mr. Dunn:

I have received your letter of May 5, 1966 in which you explained that the reason for the delay in transmitting the information I requested was because the pressure plots were not in presentable form. I still have not received these pressure plots and in order for our engineers to determine the accuracy of your computed static bottom hole pressure, it would be necessary to examine these plots which your engineers have made. I again request that these be furnished to us without further delay as the date of the hearing is rapidly approaching.

At our meeting in Dallas on April 28, 1966, you will remember that I requested that the flow rates on the Red Hills No. 1 be furnished to us for each pressure survey and that the period which these flow rates should cover should be at least equal to twice the shut-in period on each pressure survey. I have not received this information nor has there been any comment by you explaining why this information has not been submitted. All that has been submitted was the "stabilized flow rate". As I explained to you at the meeting in Dallas, this "stabilized flow rate" is a conclusion and it is necessary that our engineers be furnished with the flow information in order that they may satisfy themselves that a stabilized rate had, in fact, been established.

In ourmeeting in Dallas, I asked why the August, 1965 bottom hole pressure survey had been omitted from the data which was used in constructing your curves. This August test experienced the longest shut-in period and should be the most accurate point which you have in all of your pressure surveys. Representatives of Union appeared surprised that there was such a test and that it had been omitted. I

then requested that you furnish me an explanation as to why this test was not used or in the alternative to include it in the computations which your company has made. The cover letter accompanying the information which you have submitted merely explained that this pressure point was not used in your computations. There was no explanation contained as to why this point was omitted and I again request that you advise us why this particular point was omitted or to include it in your computations and submit the revised computations to us as soon as possible.

Very truly yours,

SCHUMAN, PRAY & DOYLE

Donald E. Pray

DEP/pds
cc: Mr. S. B. Christy
cc: Mr. George Hunker
cc: New Mexico Oil Conservation Commission
(Case No. 3158)
cc: Mr. Bill Stapler

FORM 402 11-60 500M
PRINTED IN U.S.A.

Union Oil Company of California

IN REPLY GIVE NO.

Union Oil Building 619 West Texas Avenue

MAIN OFFICE 000
'66 MAY 9 PM 8 24

May 5, 1966

Mr. Donald Pray
c/o George H. Bowen
Suite 1109
Petroleum Club Building
Tulsa, Oklahoma

Dear Mr. Pray:

In reference to your letter of May 3rd to Mr. Christy, we have mailed you the information you requested at the meeting in Dallas on April 28, 1966. In trying to secure all of the information you requested, we searched the District files trying to resurrect the pressure plots you desired only to find they were not in presentable form. This created a delay in transmitting the information to you.

Your letter of May 3rd also requested the bottom hole pressure data on the survey beginning April 17, 1965, and running to May 2, 1965. The bottom hole pressure build-up was not obtained as the bombs recording the pressure were not recovered. The pressure data you have covering this period is the surface pressure taken with a dead weight tester. The pressure gradient and final bottom hole pressure was obtained by an instrument after the failure to recover the long time measuring bombs.

Very truly yours,

David A. Dunn

DAD:bfp

cc: Mr. S. B. Christy, IV
New Mexico Oil Conservation Commission (Case No. 3158)

FORM 402 11-60 500M
PRINTED IN U.S.A.

Union Oil Company of California

Union Oil Building 619 West Texas Avenue

IN REPLY GIVE NO.

'66 MAY 9 PM 8:23

May 6, 1966

Kermit Oil Company
Box 1665
Midland, Texas

Gentlemen:

Union Oil Company representatives met with Mr. Hunker, Mr. Pray, Mr. Schuman and Mr. Yeager, April 28, 1966, in Dallas, Texas, to discuss Union's Red Hills Unit in Lea County, New Mexico, and the applications that have been filed with the Oil Conservation Commission of New Mexico pertaining to spacing for the Wolfcamp and Pennsylvanian formations. It is regreted that your representative was unable to attend this meeting.

The reserve information that was submitted to you through Mr. Hunker was discussed at the meeting. Some additional information was requested and is being furnished to Mr. Pray. Copies of this additional information are being made available for you.

Union again stated that the gas reserve in the Wolfcamp indicated by the well at Red Hills was widely distributed and cannot be economically developed on less than 640 acre spacing. Since the Schumans and Yeager have not committed their acreage in Section 5 to the Red Hills Unit and are not participating at the present time in the recovery of the Wolfcamp reserves, Union recognizes the need of a Wolfcamp well in Section 5. From the standpoint of draining the Wolfcamp reserves, Union feels that a standard 640 acre location in Section 5 would be desirable. The information developed by Union indicates that there would be very little risk at a standard location in this section; however, Union also recognizes that in the past the Schumans have considered that their rights could be protected only by a well in close proximity to Union's #1 Red Hills Unit.

The Red Hills Unit with Union as operator controls 395 acres in Section 5, and it is understood that Kermit Oil has a commitment on the remaining 245 acres. At the meeting Union proposed that a joint well, based on 640 acre spacing, be drilled to test the Pennsylvanian in Section 5. Union proposes that the location be made in the SW of the NE/4 of the section. Union would have no objection to a location of your choice, provided that such a location is approved by the U.S.G.S., the Commissioner of Public Lands for the State of New Mexico, and by the New Mexico Oil Conservation Commission.

Since the New Mexico Oil Conservation Commission may feel that an unorthodox location in Section 5 is necessary to protect correlative rights, it is possible that permission will be granted for such a location. Since you were not at the meeting previously discussed, Union would like to restate the proposal to you to drill this test as a 640 acre venture under a satisfactory operating agreement.

Yours very truly,

David A. Dunn
Assistant Manager of Exploration

DAD:bfp

cc: Mr. George H. Hunker, Jr.
4th Floor Hinkle Building
Roswell, New Mexico

Mr. S. B. Christy IV
521 Midland Tower
Midland, Texas

New Mexico Oil Conservation Commission (Case No. 3158)
State & Land Office Building
Santa Fe, New Mexico

FORM 402 11-60 500M
PRINTED IN U.S.A.

Union Oil Company of California

IN REPLY GIVE NO.

Union Oil Building 619 West Texas Avenue

May 6, 1966

Mr. Donald Pray
c/o George H. Bowen
Suite 1109
Petroleum Club Building
Tulsa, Oklahoma

Dear Mr. Pray:

At our meeting in Dallas April 28, 1966, you requested additional information to supplement that furnished by Mr. Christy's letter of April 22, 1966, to Mr. Hunker.

You stated that you would like to have details of the surface pressure buildup run in August, 1965, to verify the plot of the data which Union had previously furnished. These pressure readings are enclosed. This survey was not utilized in the reserves determination that has been given to you.

You also stated that you would require the time of stabilization of flow for the pressures furnished you in the previously mentioned letter. We have revised the "reserve data" sheet that was presented to you which shows the information you have requested.

You also stated that you would like to have the plots from which the static reservoir pressures were obtained. We have furnished you with the information required to develop these plots and the formula utilized in their construction. The plots utilized by Union's engineer were prepared by him and interpreted by him in his normal function with the Union Oil Company. They were not prepared for presentation and since the basic information for their construction has been furnished and the answer obtained from the plot given, we will be unable to honor your request for a copy of his plots.

You requested information relative to Union's contract with El Paso Natural for the sale of gas from Union's #1 Red Hills Unit well. We have verified the statement that El Paso has not as yet furnished Union their determination of the reserves; therefore, the terms of the contract requiring El Paso to take or pay for gas at the minimum rate of 1 million cubic feet per day for each 8 billion cubic feet of original reserves is not in effect.

Hoping that this takes care of the information you have requested, I remain,

Very truly yours,

David A. Dumm

DAD:bfp
Enclosures

CC: Mr. Sims Christy; Mr. Hunker; Kermit Oil Company; Mr. H. E. Keegan

RESERVE DATA
RED HILLS (WOLFCAMP) FIELD
RED HILLS UNIT WELL NO. 1
LEA COUNTY, NEW MEXICO

SURVEY DATE	STATIC RES. PRESS.-psia*	Z-FACTOR	CUMULATIVE RES.** VAPOR PROD.-MMCF	STABILIZED RATE** PRIOR TO S.I.-MMCFD	TIME OF STABILIZATION DAYS
8-23-64(DST#4)	11,306	1.617	(107.3)***	-----	-------
1-15-65	10,944	1.577	193.4	11.24	6.0
5- 2-65	9,908	1.462	1,099.8	8.94	10.0
8-31-65	9,532	1.417	1,935.0	7.53	6.3
2- 2-66	8,392	1.297	2,845.0	6.29	15.0

* Static Reservoir Pressure is obtained by analysis of buildup data. It is the pressure read from a plot of P-psia versus Log $\frac{t+Dt}{Dt}$ at infinite shut-in time.

** Reservoir Vapor Volume which is the sum of metered gas to sales, intermediate separator flared flash gas, stock tank flared gas, and stock tank oil vapor equivalent.

*** Calculated reservoir vapor volume loss prior to initiation of measured production.

SURFACE PRESSURE BUILDUP
RED HILLS (WOLFCAMP) FIELD
RED HILLS UNIT, WELL NO. 1

DATE	TIME	WELL STATUS	DEAD WEIGHT TESTER SURFACE PRESS.-psig
8-7-65	8:45 AM	Flowing	2185
	8:50 AM	Well Shut-in	----
	9:00 AM	Shut-in	3198
	9:10 AM	Shut-in	3490
	9:20 AM	Shut-in	3690
	9:30 AM	Shut-in	3845
	9:40 AM	Shut-in	3980
	9:50 AM	Shut-in	4115
	10:00 AM	Shut-in	4230
	10:10 AM	Shut-in	4303
	10:20 AM	Shut-in	4359
	10:30 AM	Shut-in	4420
	10:40 AM	Shut-in	4470
	10:50 AM	Shut-in	4530
	11:00 AM	Shut-in	4566
	11:45 AM	Shut-in	4730
	12:00 AM	Shut-in	4778
	12:30 PM	Shut-in	4860
	1:00 PM	Shut-in	4936
	1:30 PM	Shut-in	4985
	2:00 PM	Shut-in	5035
	2:30 PM	Shut-in	5081
	3:00 PM	Shut-in	5124
	3:30 PM	Shut-in	5150
	4:00 PM	Shut-in	5190
	4:30 PM	Shut-in	5215
	5:00 PM	Shut-in	5234
8-8-65	6:00 AM	Shut-in	5525
	6:00 PM	Shut-in	5610
8-9-65	6:00 AM	Shut-in	5707
	6:00 PM	Shut-in	5765
8-10-65	6:00 AM	Shut-in	5820
	5:15 PM	Shut-in	5853
8-11-65	6:00 AM	Shut-in	5901
	6:30 PM	Shut-in	5945

SURFACE PRESSURE BUILDUP
RED HILLS (WOLFCAMP) FIELD
RED HILLS UNIT, WELL NO. 1
(continued)

DATE	TIME	WELL STAIUS	DEAD WEIGHT TESTER SURFACE PRESS.-psig
8-12-65	6:30 AM	Shut-in	5982
	5:45 PM	Shut-in	6018
8-13-65	7:00 AM	Shut-in	6055
	3:15 PM	Shut-in	6076
8-14-65	7:00 AM	Shut-in	6116
8-15-65	7:00 AM	Shut-in	6173
8-16-65	7:00 AM	Shut-in	6232
8-17-65	7:00 AM	Shut-in	6281
8-18-65	7:00 AM	Shut-in	6328
8-19-65	7:00 AM	Shut-in	6367
8-20-65	7:00 AM	Shut-in	6407
8-21-65	7:00 AM	Shut-in	6438
8-22-65	7:00 AM	Shut-in	6470
8-23-65	7:00 AM	Shut-in	6500
8-24-65	7:00 AM	Shut-in	6530
8-25-65	7:00 AM	Shut-in	6560
8-26-65	7:00 AM	Shut-in	6589
8-27-65	7:00 AM	Shut-in	6616
8-28-65	7:00 AM	Shut-in	6638
8-30-65	7:00 AM	Shut-in	6680
8-31-65	7:00 AM	Shut-in	6689

CLASS OF SERVICE

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

WESTERN UNION
TELEGRAM

W. P. MARSHALL, PRESIDENT

1201 (4-60)

SYMBOLS

DL = Day Letter

NL = Night Letter

LT = International Letter Telegram

The filing time shown in the date line on domestic telegrams is LOCAL TIME at point of origin; Time of receipt is LOCAL TIME at point of destination

(02)

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1966 MAR 23 PM 12 40

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Case 3158
5/18/66

:OIL CONSERVATION COMM=

CAPITOL BLDG SANTA FE NMEX=

:UNION OIL COMPANY OF CALIFORNIA HEREBY MAKES APPLICATION TO THE COMMISSION TO REOPEN CASE NO 3158 AND TO ESTABLISH SPECIAL RULES FOR THE RED HILLS WOLFCAMP GAS POOL IN LEA COUNTY, NEW MEXICO, INCLUDING 640 ACRE SPACING AND PRORATION UNITS. REQUEST SETTING AT NEXT AVAILABLE COMMISSION HEARING=

HINKLE, BONDURANT & CHRISTY=

=3158 640=

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

MAR 13 AM 7 51

BEFORE THE NEW MEXICO OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

5-18-66

IN THE MATTER OF THE APPLICATION OF UNION OIL COMPANY OF CALIFORNIA TO REOPEN CASE 3158, AND TO ESTABLISH SPECIAL RULES FOR THE RED HILLS WOLFCAMP GAS POOL IN LEA COUNTY, NEW MEXICO, INCLUDING 640 ACRE SPACING AND PRORATION UNITS.	)	Case 3158

APPLICATION

COMES NOW Union Oil Company of California, and respectfully requests the Commission to reopen Case 3158, and to consider the establishment of special pool rules for the Red Hills Wolfcamp Gas Pool in Lea County, New Mexico, and states:

1. That heretofore on or about April 8, 1965, under Order R-2826-A in Case 3158, application of Pure Oil Company for the establishment of special pool rules in the Red Hills Wolfcamp Gas Pool in Lea County, New Mexico was denied by the Commission. Union Oil Company of California is successor in interest to Pure Oil Company.

2. That since the date of Order R-2826-A, new and independent evidence has been obtained which, in the judgment of applicant, justifies and necessitates the establishment of special pool rules in the Red Hills Wolfcamp Gas Pool, including the establishment of 640 acre spacing and proration units in order to orderly develop the Pool, protect correlative rights, and avoid

DOCKET MAILED

Date 3-15-66

waste, including economic waste. A proposal of special pool rules will be presented to the Commission at the hearing of this application.

3. That in order to protect correlative rights and avoid waste, such special pool rules should provide an exception to spacing requirements of such special pool rules for the Red Hills Unit Well No. 1 located in the SW¼SE¼ Section 32, Township 25 South, Range 33 East, N.M.P.M. Further, in order to protect the correlative rights of other interested parties, an exception to the spacing requirements of the proposed special pool rules should be granted to the owners of mineral interest in Section 5, Township 26 South, Range 33 East, N.M.P.M.

WHEREFORE, Applicant respectfully requests the Commission to reopen Case 3158, and to establish special rules for the Red Hills Wolfcamp Gas Pool in Lea County, New Mexico, setting hearing thereon at the next available Commission hearing. New Mexico counsel for certain protestants in prior hearings in Case 3158 are advised of this application by carbon copy hereof.

Respectfully submitted,

UNION OIL COMPANY OF CALIFORNIA

By _____
S. B. Christy IV, as a member
of the firm of Hinkle, Bondurant
& Christy, P. O. Box 10,
Roswell, New Mexico,
Attorneys for the Applicant

cc: Mr. John F. Russell

cc: Mr. George H. Hunker, Jr.

COPY

HINKLE, BONDURANT & CHRISTY

April 22, 1966

5-1966

3158

Mr. George H. Hunker, Jr.
Attorney at Law
4th Floor Hinkle Building
Roswell, New Mexico

Re: Red Hills Unit Area

Dear Mr. Hunker:

This letter is written to you as attorney for Saul A. Yager, Jerald M. Schuman and Kermit Oil Company, who have filed certain applications before the New Mexico Oil Conservation Commission relating to non-standard well spacing and proration units in the vicinity of the captioned. As you are aware, our client, Union Oil Company of California, has filed an application for rehearing in N.M.O.C.C. Case 3158, requesting the establishment of special pool rules for the Red Hills Wolfcamp Gas Pool in Lea County, New Mexico, including 640 acre spacing and proration units. It is our understanding that your clients' applications and the application of Union will be heard before the Commission at Santa Fe, New Mexico on May 18, 1966.

At such Hearing, Union will review the data previously presented to the Commission in Case 3158 and will give additional testimony as to the character and quality of the Wolfcamp producing zone. This testimony will represent the expert opinion of qualified people who have examined the logs (electrical and sample), tests and other data that have been previously presented. Union also will present, through a qualified expert, reserve figures for the Wolfcamp gas pool. These calculations will be based upon a material balance, utilizing production and pressure information not available at earlier hearings. It is the opinion of Union that new and independent evidence has been obtained which, in its judgment, justifies and necessitates the establishment of special pool rules for the Red Hills Wolfcamp Gas Pool including the establishment of 640 acre spacing and proration units in order to orderly develop the pool, protect correlative rights and avoid waste, including economic waste.

COPY

Union will present economic evaluations which we believe will show that any spacing less than 640 acres is unnecessary for the prevention of waste and the protection of correlative rights. Evidence will be presented to show that the normal 160 acre spacing for Wolfcamp gas production will create economic waste and make the protection of correlative rights impossible for a prudent operator with present knowledge of the area.

We recognize that your clients espouse to the present 160 acre spacing for the Wolfcamp gas pool, and have previously opposed 640 acre spacing. In an effort to adjust the divergent views of our respective clients and in an effort to reach an amicable settlement of differences, Union has authorized us to release to you for the benefit of your clients the data used in the reserve calculations prior to the above Hearing so that you may cause a timely examination of this information to be made and present your views with respect thereto.

As previously mentioned, Union would like to meet with your clients in an effort to amicably work out the current differences, and Union has furnished previously to your clients a large amount of data in connection with the Red Hills Unit Area. You have suggested a meeting in Dallas, Texas on April 28, and this will be satisfactory to our clients; however, we would suggest to you that the meeting might be more appropriate in Midland, Texas since all of Union's books and records with reference to the Red Hills Unit are located at their Midland office. However, if you still prefer the meeting to be held in Dallas, this will be satisfactory, and kindly notify us of the time and location most convenient to you.

Union possesses certain information as to structure in the Red Hills area which is a result of seismic operations, and this information has not been previously furnished to you since it did not involve either the Wolfcamp or the Pennsylvanian formations. However, Union does feel that a certain amount of this information may be relative to inquiries previously made by your clients, and may be helpful to them to make an honest evaluation of their property. For this reason, we are enclosing a plat showing Union's evaluation of the Devonian structure in the vicinity of the Red Hills Unit Area. At the above meeting, Union will allow your clients to examine the seismic sections shown in red on this geophysical map, and Union has no objection to your having a

COPY

geophysical consultant present to examine these sections. However, in view of the fact that these seismic sections are confidential in nature, and represent a property right of value to Union, we have advised Union not to permit the same to be reproduced or removed from the meeting place.

Finally, as to the Pennsylvanian formation in the Red Hills Area, Union has no information with respect thereto. However, we realize that you may wish to discuss the Pennsylvanian formation with Union at the meeting, and we will be happy to do so to any reasonable extent.

Duplicate copies of the above are enclosed for your possible use and distribution, and we would appreciate your earliest advice with respect to the time and place of the meeting.

Respectfully submitted,

HINKLE, BONDURANT & CHRISTY

By _____
S. B. Christy IV

SBC:bb
Encls.

cc: New Mexico Oil Conservation Commission
cc: Union Oil Company of California (Midland Office)

5-18-66
Case 3158

R. S. Cooke

MAR 1 - M 60

Midland, Texas
February 24, 1960

Reserve Determination
Red Hills (Wolfcamp) Field
Red Hills Unit, Well No. 1
Lea County, New Mexico

Dear Sir:

Pressure data from a drill-stem test taken at [illegible] completion, [illegible] build-up test, and from a reservoir fluid study, etc., are now available for use in determining the above captioned reserve. A plot of reservoir pressure divided by the gas compressibility factor versus cumulative [illegible] is attached. On the plot contain of the data is tabulated.

A straight line data fit using the [illegible] of least squares gives an in-place reserve of 30.6 MMMCF of original reservoir vapor. [illegible] deviation would indicate a minimum reserve of 30.[illegible] MMMCF and a maximum reserve of 33.4 MMMCF or -3.28% and +2.61% of the best fit respectively. Included in this original reservoir vapor volume is 1,717,000 BBL of condensate-in-place, which has a vapor equivalent of 1.6 MMMCF.

An abandonment pressure of 1,000 psig for this reservoir is indicated by calculation. The fluid analysis determined that at this [illegible] condition 82.02% of the original reservoir vapor or 32.3 MMMCF will be produced as separator off gas, while 48.29% of the condensate-in-place or 829,[illegible] BBL will be recovered.

For take-or-pay, 83.92%, or 33.1 [illegible], of the original reservoir vapor will have been produced at depletion. Based [illegible] MCF rate for each 8 MMMCF of recoverable reserve a take-or-pay quantity of 4,[illegible] MMMCF is calculated.

You will recall that previous reserve determinations have calculated a reserve no greater than 24.0 MMMCF original reservoir vapor; however, for those calculations laboratory PVT data were not available. Comparison of the lab data with that used previously accounts for the larger reserve.

If this office can be of further assistance in this matter please advise.

Yours very truly,

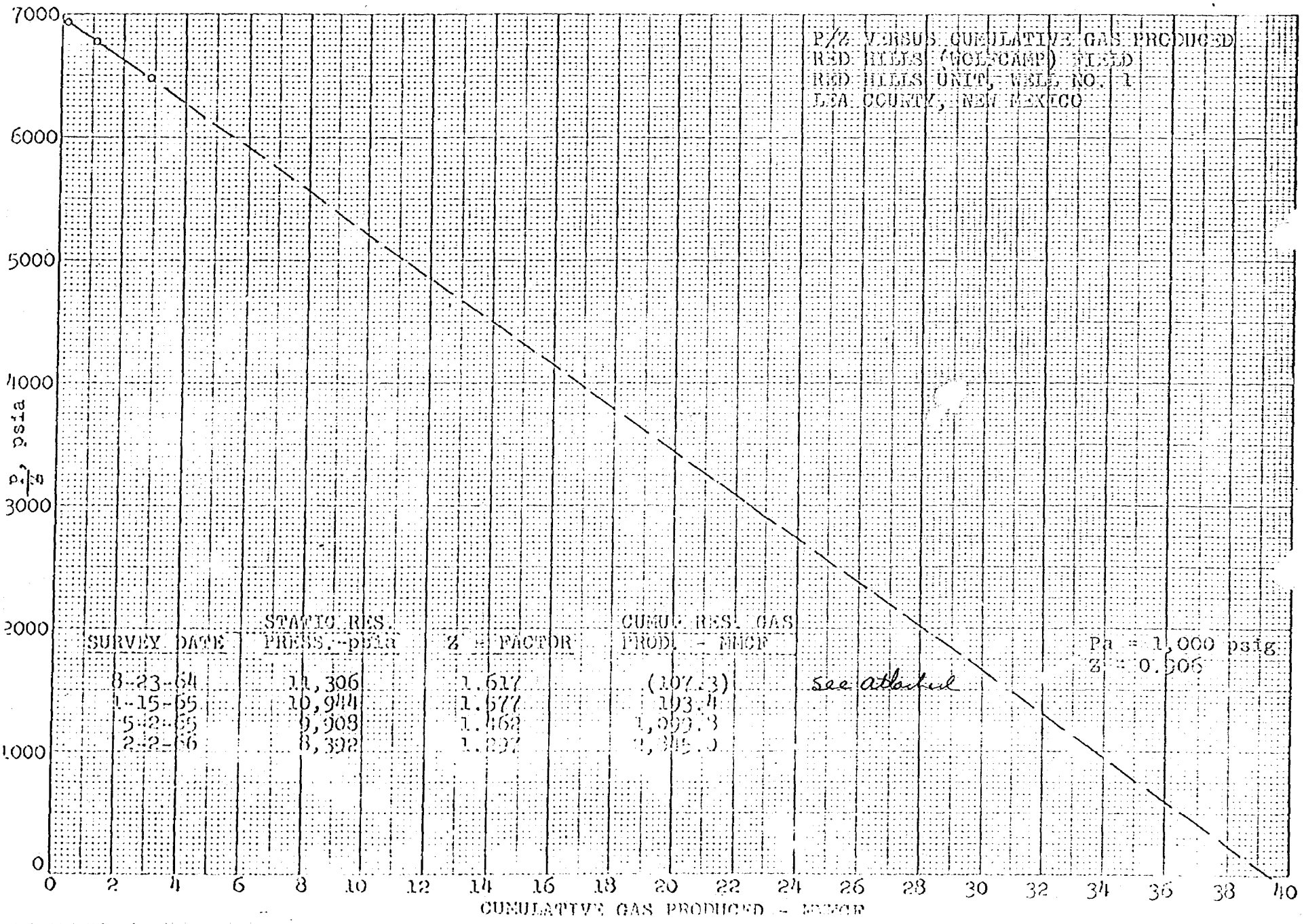
Charles W. Browning
District Engineer

CWB:CJD:mb

W. A. COOKE
1960

NO. 340R-20 DIETZGEN GRAPH PAPER
20 X 20 PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.



SURVEY DATE	STATIC RES. PRESS.-psia	Z = FACTOR	CUMUL. RES. GAS PRODN. - MMCF	
8-23-64	11,306	1.617	(107.3)	See attached
1-15-65	10,944	1.577	193.4	
5-2-65	9,908	1.462	1,099.3	
2-2-66	8,392	1.297	2,345.0	

RESERVE DATA
RED HILLS (WOLFCAMP) FIELD
RED HILLS UNIT WELL NO. 1
LEA COUNTY, NEW MEXICO

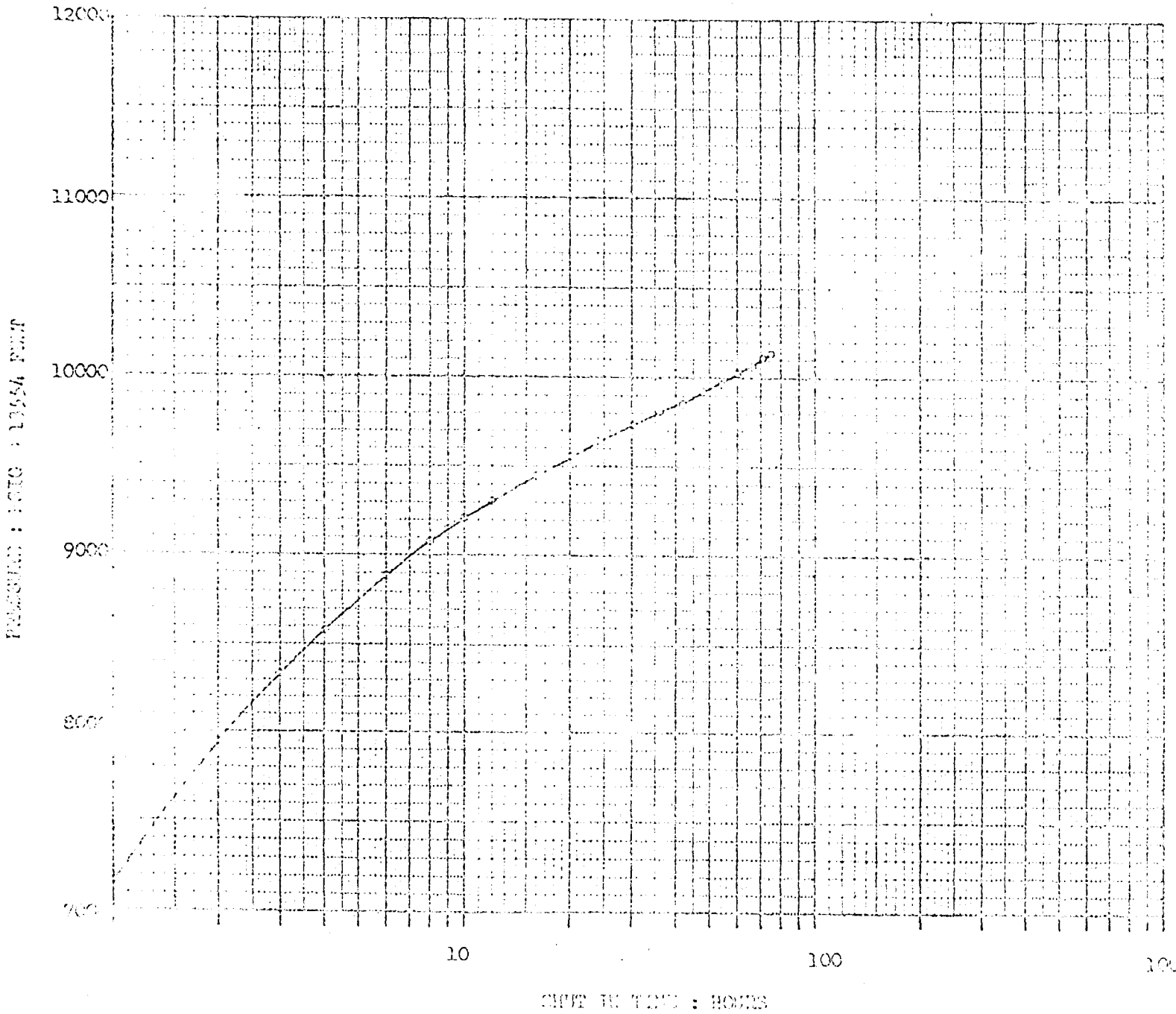
SURVEY DATE	STATIC RES. PRESS.-psia*	Z-FACTOR	CUMULATIVE RES.** VAPOR PROD.-MMCF	STABILIZED RATE** PRIOR TO S.I.-MMCFD
8-23-64 (DST #4)	11,306	1.617	(107.3)***	---
1-15-65	10,944	1.577	193.4	11.24
5- 2-65	9,908	1.462	1,099.8	8.94
2- 2-65	8,392	1.297	2,845.0	6.29

*Static Reservoir Pressure is obtained by analysis of build-up data. It is the pressure read from a plot of P-psia versus Log $\frac{t+Dt}{Dt}$ at infinite shut-in time.

**Reservoir Vapor Volume which is the sum of metered gas to sales, intermediate separator flared flash gas, stock tank flared gas, and stock tank oil vapor equivalent.

***Calculated reservoir vapor volume loss prior to initiation of measured production.

BUILD-UP CURVE



TOMPKINS, INC.
RESERVOIR ENGINEERING DATA
Midland, Texas

Well : RED HILLS UNIT NO. 1

Field : UNDESIGNATED

File 3-2414-MM

CHRONOLOGICAL PRESSURE AND PRODUCTION DATA

1965 Date	Status of Well	Time	Elapsed Time Hrs.	Min.	BHP @ 12090' Psig	BHP @ 12150' Psig
1-15	On location	07:00				
"	Shut in	09:35				
"	Inst. at 12090'	10:15		40		
"	"	10:35	1	00	6957	7174
"	"	11:35	2	00	7735	7952
"	"	12:35	3	00	8113	8330
"	"	13:35	4	00	8362	8579
"	"	15:35	6	00	8672	8889
"	"	17:35	8	00	8861	9078
"	"	19:35	10	00	8989	9206
"	"	21:35	12	00	9087	9304
"	"	01:35	16	00	9231	9448
1-16	"	05:35	20	00	9337	9554
"	"	09:35	24	00	9420	9637
"	"	15:35	30	00	9510	9727
"	"	21:35	36	00	9594	9811
"	"	03:35	42	00	9654	9871
1-17	"	09:35	48	00	9707	9924
"	"	15:35	54	00	9760	9977
"	"	21:35	60	00	9805	10022
"	"	03:35	66	00	9850	10067
1-18	"	08:35	71	00	9888	10105
"	"	13:05	74	30	9918	10135
"	"					

SEFFELLER, INC.

Company [illegible] Lease [illegible] Well No. [illegible]

Field [illegible] County [illegible] State [illegible]

Formation [illegible] Test Date JANUARY 19, 1965

Status of Well Shut in 24.5 hrs

DEPTH Feet	PRESSURE Psig	GRADIENT Psi/Ft.
0	8022	
8000	9291	0.159
11000	9754	0.154
11500	9831	0.154
12000	9905	0.148
12090	9918	0.143
13554	10135	0.148

Datum Pressure Psig

PRESSURE POUNDS PER SQUARE INCH GAUGE

11000
10500
10000
9500
9000
8500
8000
7500
7000

0 2000 4000 6000 8000 10000 12000

DEPTH IN FEET

Elev. 3413 KB Datum M.

Total Depth 14869 PB Perf. 13440-660 Ft.

Tubing 2 7/8 in. [illegible] Ft.

Casing 5 5/8 in. to 6952 Ft.

Casing Press. 7811 Tubing Press. 8022

Oil Level Water Level

Temperature 132 [illegible]

[illegible]

Pressure Test Last Run

B.H.P. Change

TEXTELLER, INC.
RESERVOIR ENGINEERING DATA
Midland, Texas

Well : RED HILLS UNIT NO. 1

Page 4 of 5

Field : UNDESIGNATED

File 3-1414-E"

CHRONOLOGICAL PRESSURE AND PRODUCTION DATA

1965 Date	Status of Well	Time	Elapsed Time Hrs.	Min.	Wellhead Pressure Tubing	BHP @ 10020' Isi	BHP @ 13504' Isi
1-18		17:15			8050	9919	10159
"	Open Well	17:30					
"	"	18:30	1	00		9421	9651
"	"	19:30	2	00		9323	9553
"	"	20:30	3	00		9263	9492
"	"	21:30	4	00		9232	9462
"	"	22:30	5	00		9209	9432
"	"	23:30	6	00		9179	9409
"	"	00:30	7	00		9172	9402
1-19	Open 2nd rate	00:45	7	15	7382	9168	9398
"	"	01:45	1	00		8703	8930
"	"	02:45	2	00		8605	8832
"	"	03:45	3	00		8529	8756
"	"	04:45	4	00		8499	8726
"	"	05:45	5	00		8469	8696
"	"	06:45	6	00		8439	8666
"	"	07:45	7	00		8431	8658
"	"	08:45	8	00	6676	8439	8666
"	Open 3rd rate	08:45					
"	"	09:45	1	00		7812	8043
"	"	10:45	2	00		7661	7892
"	"	11:45	3	00		7630	7861
"	"	12:45	4	00		7487	7718
"	"	13:45	5	00		7441	7672
"	"	14:45	6	00		7396	7627
"	"	15:45	7	00		7366	7597
"	"	16:45	8	00		7336	7567
"	"	17:45	9	00		7313	7544
"	"	18:00	9	15	5512		
"	Open well 4th rate	18:00	00	00			
"	"	19:00	00	00		6746	6986
"	"	20:00	2	00		6595	6835
"	"	21:00	3	00		6490	6730
"	"	22:00	4	00		6429	6669
"	"	23:00	5	00		6406	6645
"	"	24:00	6	00		6376	6615
1-20	"	01:00	7	00		6346	6585
"	"	02:00	8	00		6331	6571

TEXTELLER, INC.
RESERVOIR ENGINEERING DATA
Midland, Texas

Well : RED HILLS UNIT NO. 1 Page 5 of 5

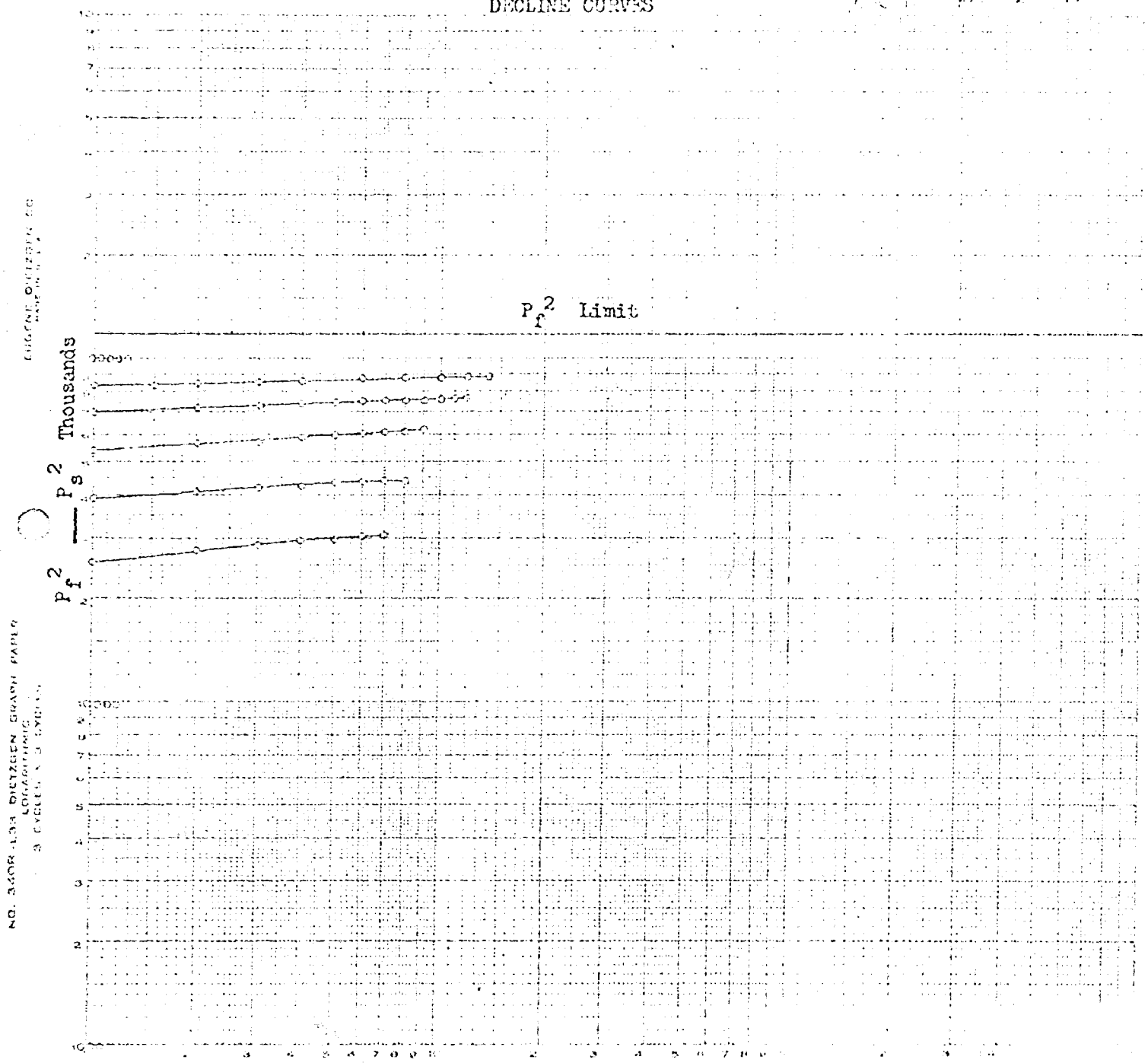
Field : UNDESIGNATED File 3-1414-EM

CHRONOLOGICAL PRESSURE AND PRODUCTION DATA

1965 Date	Status of Well	Time	Elapsed Time Hrs.	Min.	Wellhead Pressure Tubing	MP @ -2020' Psia	MP @ 13564' Psia
1-20	Open well 4th rate	03:00	9	00		6316	6556
"	"	04:00	10	00		6308	6548
"	"	05:00	11	00		6301	6541
"	"	06:00	12	00		6286	6526
"	"	06:30	12	30	4407	6278	6518
"	Open well 5th rate	06:30	00	00			
"	"	07:30	1	00		5779	6039
"	Choke change	08:00	1	30		5742	6002
"	"	08:30	2	00		5613	5873
"	"	09:30	3	00		5560	5820
"	Choke change	10:00	3	30		5545	5805
"	"	10:30	4	00		5432	5692
"	"	11:30	5	00		5356	5616
"	"	12:30	6	00		5334	5594
"	"	13:30	7	00		5326	5586
"	"	14:30	8	00		5311	5571
"	"	15:30	9	00		5296	5556
"	"	16:30	10	00		5288	5548
"	"	17:30	11	00		5273	5533
"	"	18:30	12	00	3217	5266	5526
"	"	19:30	13	00		5258	5514
"	"	20:30	14	00		5251	5507
"	"	21:30	15	00		5251	5507
"	Choke plug	22:15	15	45		5251	5507
"	"	22:30	16	00		5273	5529
"	"	23:30	17	00		5288	5544
1-21	"	00:30	18	00		5288	5544
"	"	01:30	19	00		5288	5544
"	"	02:30	20	00		5296	5552
"	"	03:30	21	00		5288	5544
"	"	04:30	22	00		5273	5529
"	"	05:30	23	00		5266	5522
"	"	06:30	24	00	3233	5243	5499
"	"	07:30	25	00		5266	5522
"	"	08:30	26	00		5273	5529
"	"	09:30	27	00		5273	5529
"	"	10:30	28	00		5258	5514
"	"	11:30	29	00		5258	5514
"	"	12:30	30	00		5266	5522
"	"	13:30	31	00		5251	5507
"	"	14:30	32	00		5251	5507
"	Shut in	15:30	33	00	3243	5251	5507

Company : The Pure[illegible] Company
Well : Red Hills Unit No. 1
Field : Undesignated
County : Lea
State : New Mexico

DECLINE CURVES



FLOW TIME : HOURS

Ten 3158
5/18/66

8

Company [illegible]
Field [illegible] County [illegible] State [illegible]
Formation [illegible] Test Date MAY 2, 1966

Status of Well Shut In 342 Hrs

DEPTH Feet	PRESSURE Psig	GRADIENT Psi/Ft.
0	7199	
2000	7510	0.156
4000	7827	0.159
6000	8134	0.159
8000	8436	0.151
9000	8598	0.152
10000	8749	0.151
11000	8900	0.151
11500	8975	0.150
12000	9051	0.152
13554 Mid-Perf	9287	0.152

Datum Pressure Psig
9287 @ 13554 Feet

PRESSURE POUNDS PER SQUARE INCH GAUGE

10000
9500
9000
8500
8000
7500
7000
6500
6000

0 2000 4000 6000 8000 10000 12000 14000

DEPTH: FEET

Elev. 3425 KB Datum Ft.
Total Depth 14,369 Perf. [illegible] Ft.
Tubing [illegible] to [illegible] Ft.
Casing [illegible] to [illegible] Ft.
Casing Press. Shut Tubing Press. [illegible]
Oil Level Water Level
Temperature [illegible] F [illegible]
Horizon No. [illegible] Range [illegible]
Last Test Date [illegible]
Pressure Last Test Date 10139 @ 13554 Psig
B.H.P. Change 243 Psi Loss

SURFACE PRESSURE BUILDUP
RED HILLS UNIT, WELL NO.1

DATE	TIME	WELL STATUS	DEAD WEIGHT TESTER SURFACE PRESS.-psig
4-17-65	6:30 AM	Flowing	2190
	7:30 AM	Flowing	2193
	8:00 AM	Flowing	2195
	8:45 AM	Flowing	2195
	9:00 AM	Well Shut-in	-
	10:20 AM	Press.Element Seated	-
	11:00 AM	Shut-in	4852
	11:15 AM	Shut-in	4957
	11:30 AM	Shut-in	5015
	11:45 AM	Shut-in	5079
	12:00 PM	Shut-in	5140
	12:15 PM	Shut-in	5184
	12:30 PM	Shut-in	5230
	12:45 PM	Shut-in	5270
	1:00 PM	Shut-in	5305
	1:30 PM	Shut-in	5384
	2:00 PM	Shut-in	5435
	2:30 PM	Shut-in	5490
	3:00 PM	Shut-in	5534
	3:30 PM	Shut-in	5580
	4:00 PM	Shut-in	5616
4-18-65	2:45 PM	Shut-in	6163
	3:00 PM	Shut-in	6164
	3:15 PM	Shut-in	6168
	3:30 PM	Shut-in	6170
	3:45 PM	Shut-in	6175
4-19-65	3:15 PM	Shut-in	6352
	3:30 PM	Shut-in	6354
	3:45 PM	Shut-in	6356
	4:00 PM	Shut-in	6357
	4:15 PM	Shut-in	6358
4-20-65	9:15 AM	Shut-in	6458
	9:45 AM	Shut-in	6461
	10:15 AM	Shut-in	6464
4-21-65	8:45 AM	Shut-in	6574
	9:15 AM	Shut-in	6578
	9:55 AM	Shut-in	6581
4-23-65	8:30 AM	Shut-in	6762
	9:20 AM	Shut-in	6768
4-27-65	8:50 AM	Shut-in	7033
4-30-65	7:00 AM	Shut-in	7165
5- 2-65	7:00 AM	Shut-in	7199

THE PURE OIL COMPANY
RESEARCH CENTER

Report 65-469
Project RS-86s

September 14, 1965

Case 3158
5-18-66

ANALYSIS OF RESERVOIR FLUID FROM
RED HILLS UNIT (WOLFCAMP) WELL NO. 1
LEA COUNTY, NEW MEXICO

REFERENCES: Letter to L. W. Holm from S. J. Black dated 2-5-65;
Problem Analysis 65-95 dated 2-19-65.

OBJECT

The purpose of this study was to determine (1) the properties of the Red Hills (Wolfcamp) reservoir fluid at reservoir conditions and (2) its behavior during pressure depletion. The experiments were designed to provide data which can be used by reservoir engineers to evaluate the future performance of the reservoir.

INTRODUCTION

The Red Hills Unit Well No. 1, located in Lea County, New Mexico, was sampled on January 26, 1965, while producing from the Wolfcamp zone at a depth of 13,440 to 13,667 feet. The separator liquid and gas samples were taken from the first stage separator operating at a pressure of 740 psig and an estimated temperature of 64°F. However, bubble point data determined in the laboratory on a sample of the separator liquid indicated that the actual temperature of the first stage separator more likely had been 72°F. At the time of sampling, the well was flowing at a stabilized rate of 346.3 barrels of stock tank liquid per day and the gas flow rate from the first stage separator was 7,365,000 standard cubic feet per day. On this basis the average produced gas-oil ratio during the sampling period was 21,269 SCF/STB. Prior to sampling, the original static bottom hole pressure was determined to be 11,100 psig at a depth of 13,554 feet. During the sampling period, the tubing flowing pressure was 5,100 psig at the well-head.

The separator liquid and gas samples were recombined in a laboratory PVT cell in the proportions established by the producing gas-oil ratio in order to provide a sample representative of the reservoir fluid. The temperature and pressure of the recombined reservoir fluid were adjusted to reservoir conditions and the behavior of the fluid was observed as a function of pressure. This report presents the results of the laboratory study.

SUMMARY

The compositions of the separator liquid and gas were determined by gas chromatography. A laboratory simulation of the field separator operation was employed to establish a shrinkage factor of 0.627 for the separator liquid from first stage separator conditions to stock tank conditions. The total gas evolved from the second stage separator and the stock tank during the simulated flash separation was 802 SCF/STB. On the basis of the separator liquid and gas compositions, the producing gas-oil ratio and

the separator liquid shrinkage factor, the composition of the recombined reservoir fluid was calculated. The composition of the reservoir fluid also was determined by chromatographic analysis of the recombined fluid, indicating a methane content of 82.3 mol percent and a specific gravity of 0.793.

The recombined reservoir fluid had a dew point of 5200 psig at 185°F. Since the well-head tubing flowing pressure was 5100 psig during sampling, some liquid condensation may have occurred in the tubing. At the high production rate of the well stream fluid, however, this liquid condensate undoubtedly was carried to the first stage separator as entrained liquid; consequently, the laboratory recombined sample should be representative of the Wolfcamp reservoir fluid.

The formation volume factor at the original reservoir pressure of 11,100 psig was 10.93 barrels of reservoir fluid per barrel of stock tank liquid and the reservoir fluid had a specific volume of 0.0416 cubic feet per pound.

The formation volume factor and the specific volume at the dew point were 14.50 barrels of reservoir fluid per barrel of stock tank liquid and 0.0551 cubic feet per pound, respectively.

During constant volume pressure depletion the recombined reservoir fluid exhibited retrograde condensation. The maximum retrograde liquid formation, amounting to 7.9 percent of the dew point volume, occurred at 1750 psig.

The results obtained from the simulated production of the recombined reservoir fluid indicated that 24.6 volume percent of the initial reservoir vapor was produced by pressure depletion from the original reservoir pressure to the dew point pressure; the total vapor production from the original reservoir pressure to 500 psig was 92.2 volume percent of the initial reservoir vapor. In terms of stock tank liquid production, 10.72 STB/MMSCF of reservoir vapor, or 24.6 volume percent of the stock tank liquid initially present, was produced from the original reservoir pressure to the dew point pressure. From the dew point pressure to 500 psig an additional 11.67 STB/MMSCF of reservoir vapor or 26.8 volume percent of the initial stock tank liquid was produced. The total production of stock tank liquid was 22.39 STB/MMSCF of reservoir vapor or 51.4 volume percent of the stock tank liquid initially present in the reservoir fluid.

CONCLUSIONS

The well stream fluid from the Red Hills Unit (Wolfcamp) Well No. 1 is a gas at the reservoir temperature of 185°F. and at reservoir pressures above the dew point pressure of 5200 psig. Below the dew point pressure, this fluid exhibits retrograde condensation with maximum retrograde condensate formation of 7.9 percent of the dew point volume occurring at 1750 psig.

ACKNOWLEDGMENT

The PVT experiments were carried out by D. H. Ferr, R. S. Holm and R. L. Jorgenson. G. Spirrison provided assistance with various computer programs which were used for some of the calculations required in this study. The gas chromatographic analyses were performed by the Gas Laboratory of the Analytical Research and Service Division of the Research Center.

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Figure I - Relative Volume vs. Pressure (Flash Liberation)
Figure II - Retrograde Liquid Formation vs. Pressure (Flash Liberation)
Figure III - Liquid Condensation vs. Pressure
Figure IV - Gas Deviation Factor and Gas Volume Factor vs. Pressure
Figure V - Recoverable Hydrocarbon Liquid Produced During Constant Volume Production
Figure VI - Distribution of Stock Tank Liquid During Constant Volume Production

DISCUSSION

Separator Fluid Samples

Separator liquid and gas samples were taken from the Red Hills Unit Well No. 1 on January 26, 1965 while the well was producing from the Wolfcamp formation. The static bottom hole pressure was 11,100 psig prior to sampling. The tubing flowing pressure was 5100 psig at the well-head during the sampling period. The well was producing at a stabilized rate of 346.3 barrels of stock tank liquid per day and the first stage separator gas flow rate was 7,365,000 SCF/day. The average producing gas-oil ratio was 21,269 SCF/STB during the sampling period.

The separator liquid and gas samples were obtained from the first stage separator operating at 740 psig and about 64°F. There was some question about the reliability of the observed operating temperature of the first stage separator; consequently, bubble-point data were obtained for the separator liquid sample at three different temperatures in order to establish the equilibrium operating temperature. At each temperature mercury was injected into the separator liquid sample container and the pressure of the sample was plotted as a function of the volume of mercury injected. The resulting plot showed a definite inflection at the saturation pressure (bubble-point). At 65, 70 and 74°F., the bubble-points of the

separator liquid sample were determined to be 685, 725 and 755 psig, respectively. By interpolation of these results, the bubble-point of the separator liquid at 72°F. was 740 psig and this temperature was taken as the actual operating temperature of the first stage separator. The compositions of the separator liquid and gas samples were determined by gas chromatographic analyses and are given in Table IV.

A portion of the separator liquid sample at first stage separator conditions was subjected to flash separation through a simulated second stage separator to stock tank conditions. The shrinkage factor was determined to be 0.627 barrel of stock tank liquid at 60°F. per barrel of first stage separator liquid. The gravity of the stock tank liquid was found to be 64.0° API and this compared favorably with the field measured gravity of 63.6° API. The total gas evolved from the second stage separator and the stock tank was 802 SCF/STB. These results are shown in Table III. The composition of the stock tank liquid obtained from laboratory simulated flash separation of the first stage separator liquid is given in Table VI.

A portion of the separator gas at reference conditions of 800 psig and 75°F. was expanded to atmospheric conditions, and the gas volume factor was determined to be 61.38 SCF/Ft^3 of gas at reference conditions. Also, the gas deviation factor was determined to be 0.857 at the reference conditions. This observed gas deviation factor was found to be in good agreement with the value determined from the composition using published gas deviation factor correlations. The gas volume factor for the separator gas was determined in order that volume measurements of the gas being recombined with the separator liquid could be made conveniently at the reference conditions.

Recombination of Separator Fluid Samples

The separator liquid and gas samples were charged to a high pressure visual PVT cell in the ratio established by the field measured produced gas-oil ratio and the laboratory determined shrinkage factor for the separator liquid. The composition of the recombined fluid was calculated from the compositions of the separator liquid and gas on the basis of the recombination ratio calculated from the producing gas-oil ratio and the shrinkage factor and is given in Table V. Also shown in Table V is the analysis of the recombined fluid determined by gas chromatographic analyses of the liquid and gas obtained by flashing a portion of the single phase fluid. The recombined Wolfcamp reservoir fluid was found to have a dew point of 5200 psig at the reservoir temperature of 185°F. Although the observed dew point pressure was about 100 psi above the well-head pressure during the sampling period, it is felt that the laboratory sample is representative of the Wolfcamp reservoir fluid. If any liquid condensation occurred in the tubing, the condensate was probably carried to the first stage separator as entrained liquid.

Pressure-Volume Relations

A flash liberation (constant composition) test on the recombined fluid was carried out by withdrawing mercury from the PVT cell in order to decrease the pressure while increasing the volume of the sample. The equilibrium volumes of condensate and gas at various pressures from the dew point to 1500 psig were determined. The maximum retrograde condensate

formation occurred at 3,000 psig and amounted to 4.6 volume percent of the total condensate and gas volume or 6.8 volume percent of the dew point volume. These results are presented in Table VII and in Figures I, II and III.

The compressibility of the recombined reservoir fluid above the dew point was determined similarly by adding mercury to the PVT cell to increase the pressure and observing the volume of the sample in the cell at 1000 psig increments up to the original reservoir pressure of 11,100 psig. At 11,100 psig the volume of the recombined reservoir fluid was 75.4 percent of its volume at the dew point. These results are shown in Table VII and Figure I.

Constant Volume Liberation

A larger sample of recombined reservoir fluid was prepared for the laboratory simulation of reservoir depletion by constant volume production of vapor. The dew point and the flash liberation data for this sample were checked prior to the constant volume liberation test and found to be in good agreement with similar data for the initial recombination of separator liquid and gas. The constant volume liberation test was carried out by starting at the dew point pressure and expanding the sample volume in the visual cell to decrease the pressure. After allowing sufficient time to attain equilibrium, vapor was displaced from the cell at constant pressure until the volume of the sample remaining in the cell was again at the dew point volume. The produced vapor was passed into an atmospheric pressure recovery system where the gas and liquid were recovered separately and their quantities determined. The specific gravity of the produced gas was determined by the Dumas bulb method. The volume of retrograde liquid formed as a result of the pressure decrease remained in the cell and its volume was determined. This procedure was repeated for a total of 7 pressure decrements until the cell pressure was reduced to 500 psig. Since there was little change in the Dumas gravities of the produced gas, only four gas samples were submitted for chromatographic analyses. The composition, of these samples showed very little change over the pressure range of 5,000 to 500 psig. All the produced liquid samples were analyzed and the composition of the produced vapor at each pressure was calculated. These results are given in Table VIII. Retrograde liquid formation during constant volume liberation is shown graphically in Figure III. The maximum liquid condensation occurred at 1750 psig and was determined to be 7.9 percent of the volume of the recombined reservoir fluid at the dew point pressure.

The vapor remaining in the visual cell at 500 psig was displaced completely at constant pressure and the residual liquid remaining in the cell was flashed to the atmospheric recovery system where the liquid and the dissolved gas were recovered separately. The composition of the residual liquid remaining in the cell at 500 psig then was calculated on the basis of the quantities of liquid and dissolved gas and their respective chromatographic analyses. This composition is shown in Table IX.

The gas deviation factors and the gas volume factors for the produced vapor at each pressure from 11,100 to 500 psig are shown in Table X and Figure IV. The gas deviation factors were calculated from the vapor composition using published gas deviation factor correlations. The calculated values were found to agree with the gas deviation factors

determined from the experimental data. The gas volume factors were employed to calculate the constant volume production of vapor above the dew point to supplement the experimental data obtained below the dew point.

A weight balance applied to the production obtained during constant volume pressure depletion is given in Table XI. According to this tabulation, 85.4 weight percent of the original reservoir vapor is produced from 11,100 to 500 psig, while 6.5 weight percent remained as vapor and 8.1 weight percent remained as liquid at 500 psig.

Table XII and Figure V show the cumulative recoverable liquid content of the produced vapor (as gallons per 1,000 SCF) during constant volume production from 11,100 to 500 psig. To the dew point pressure, 24.6 percent of the recoverable liquid had been produced and at 500 psig a total of 71.8 percent of the recoverable propanes and heavier were produced.

Data on the stock tank liquid produced during constant volume production are tabulated in Table XIII and graphically shown in Figure VI. A computer program was employed to simulate the recovery of stock tank oil from the vapor produced below the dew point. It was assumed that the operating temperature and pressure of the field separators would be the same as when the separator liquid and gas samples were taken. The results shown in Table XIII indicated that 24.6 percent of the reservoir vapor was produced from the original reservoir pressure to the dew point pressure and the stock tank liquid production was 10.72 STB/MMSCF of reservoir vapor. From the dew point pressure to 500 psig an additional 67.6 percent of the original reservoir vapor was produced and the additional stock tank liquid production was 11.67 STB/MMSCF of reservoir vapor. The total stock tank liquid production was 22.39 STB/MMSCF or 51.4 percent of the stock tank liquid initially present in the reservoir fluid at 11,100 psig.

TABLE I

PVT ANALYSIS SUMMARY

Reservoir Temperature, °F.	185
Dew Point Pressure at Reservoir Temperature, psig	5,200
Original Reservoir Pressure at Reservoir Temperature, psig	11,100
Thermal Expansion of Saturated Vapor at 6000 psig, %/°F.	0.162
Saturated Vapor at Dew Point Pressure	
Density, gm/cc	0.290
lbs/bbl	101.82
Specific Volume, ft^3/lb	0.0551
Molecular Weight	22.98
Gas Deviation Factor, Z = PV/nRT	0.993
Compressibility, Vol./Vol./psi	106×10^{-6}
Formation Volume Factor, Reservoir Barrels/Stock Tank Barrel	14.50
Reservoir Fluid at Original Reservoir Pressure	
Density, gm/cc	0.385
lbs/bbl	135.02
Specific Volume, ft^3/lb	0.0416
Gas Deviation Factor, Z = PV/nRT	1.596
Compressibility, Vol./Vol./psi	18×10^{-6}
Formation Volume Factor, Reservoir Barrels/Stock Tank Barrel	10.93

TABLE II

FIELD DATA FOR PVT STUDY

Well Record	
Field	Red Hills Field
Lease and Well No.	Red Hills Unit Well No. 1
Well Location	Section 32, T25S, R33E
County and State	Lea County, New Mexico
Well Characteristics	
Producing Zone	Wolfcamp
Total Depth	21,321 feet
Perforated Interval	13,440 to 13,667 feet
Original Reservoir Pressure	11,100 psig at 13,554 feet
Reservoir Temperature	185°F. at 13,554 feet
Sampling Conditions	
Date of Sampling	January 26, 1965
Tubing Pressure, Flowing (Wellhead)	5100 psig
High Pressure Separator Conditions	753 psia and 72°F. (a)
Low Pressure Separator Conditions	75 psia and 36°F.
Stock Tank Conditions	13.2 psia (Atmos.) and 53°F.
Gas Production Rate	7,365,000 SCF/Day at 15.025 psia and 60°F.
Stock Tank Liquid Production Rate	346.3 STB/Day at 60°F.
Producing Gas-Oil Ratio	21,269 SCF/STB
Gravity of Stock Tank Liquid, °API	63.6

(a) The observed operating temperature for the high pressure separator was corrected from 64 to 72°F. to correspond to a 753 psia bubble point for the separator liquid sample as determined in the laboratory.

TABLE III

SEPARATOR CONDITIONS

	Laboratory			Field		
	Pressure, psia	Temperature, °F.	GOR, SCF/STB	Pressure, psia	Temperature, °F.	GOR, SCF/STB
High Pressure Separator	753	72	Not Measured	753	72	21,269
Low Pressure Separator	75	36	585	75	36	Not Measured
Stock Tank	14.3	57	217	13.2	53	Not Measured

Total Gas Production = 21,269 + 802 = 22,071 SCF/STB

$$\text{Shrinkage Factor for Separator Liquid} = \frac{\text{Vol. of Stock Tank Liquid at 60°F.}}{\text{Vol. of Sep. Liquid at High Press. Sep. Conditions}} =$$

0.627 STB/Bbl Sep. Liquid

Recombination Ratio = 21,269 x 0.627 = 13,336 SCF Sep. Gas/Bbl. Sep. Liquid at High Press. Sep. Cond.

TABLE IV

CHROMATOGRAPHIC ANALYSES OF FIELD SEPARATOR SAMPLES

Component	Separator Gas		Separator Liquid	
	Mol Fraction	GPM	Mol Fraction	Vol.%
Nitrogen	0.0059		0.0000	0.00
Carbon Dioxide	0.0000		0.0007	0.04
Methane	0.8752		0.2463	12.42
Ethane	0.0728		0.1353	10.28
Propane	0.0238	0.668	0.1410	11.55
iso-Butane	0.0080	0.267	0.0402	3.91
n-Butane	0.0099	0.318	0.0699	6.56
iso-Pentane	0.0020	0.075	0.0317	3.45
n-Pentane	0.0014	0.052	0.0315	3.40
Hexanes	0.0007	0.030	0.0458	5.61
Heptane Plus	0.0003	0.017	0.2576	42.78
	1.0000	1.427	1.0000	100.00

Calculated Specific Gravity of Separator Gas (Air=1.000)=0.650

Properties of Heptanes Plus

Sp. Gr. = 0.770

°API = 52.3 at 60° F

Mol. Wt.= 136

TABLE V

COMPOSITION OF RESERVOIR FLUID

Component	Calculated from Analyses of Separator Fluids		Analysis of Recombined Reservoir Fluid	
	Mol Fraction	GPM	Mol Fraction	GPM
Nitrogen	0.0055		0.0054	
Carbon Dioxide	0.0001		0.0001	
Methane	0.8215		0.8228	
Ethane	0.0781		0.0764	
Propane	0.0338	0.949	0.0317	0.890
iso-Butane	0.0107	0.357	0.0102	0.340
n-Butane	0.0150	0.482	0.0143	0.460
iso-Pentane	0.0045	0.168	0.0044	0.164
n-Pentane	0.0040	0.148	0.0040	0.148
Hexanes	0.0046	0.193	0.0050	0.210
Heptanes Plus	0.0222	1.264	0.0257	1.463
	1.0000	3.561	1.0000	3.675
Calculated Sp. Gr. (Air = 1.000)		0.783		0.793

TABLE VI

COMPOSITION OF STOCK TANK LIQUID

Component	Mol Fraction	Vol.%
Methane	0.0006	0.02
Ethane	0.0092	0.49
Propane	0.0500	2.89
iso-Butane	0.0416	2.86
n-Butane	0.0855	5.67
iso-Pentane	0.0529	4.07
n-Pentane	0.0558	4.25
Hexanes	0.0979	8.47
Heptanes Plus	0.6065	71.28
	1.0000	100.00

Calculated API Gravity at 60° F. = 64.0

TABLE VII

PRESSURE-VOLUME RELATIONS AT 185° F.
(Flash Liberation)

Pressure, psig	Relative Volume of Condensate and Gas, V/V_s	Specific Volume of Condensate and Gas, $ft^3/lb.$	Relative Volume of Condensate V_L/V_s	Relative Volume of Condensate V_L/V
1,500	2.990	0.1649	0.0933	0.0312
2,000	2.193	0.1209	0.0904	0.0406
2,500	1.750	0.0965	0.0791	0.0452
3,000	1.466	0.0808	0.0679	0.0463
3,500	1.282	0.0707	0.0544	0.0425
4,000	1.171	0.0646	0.0395	0.0337
4,500	1.082	0.0597	0.0236	0.0218
5,000	1.020	0.0562	0.0069	0.0068
5,200	1.000	0.0551	Dew Point	
6,000	0.932	0.0514		
7,000	0.870	0.0480		
8,000	0.829	0.0457		
9,000	0.798	0.0440		
10,000	0.768	0.0423		
11,000	0.755	0.0416		
11,100	0.754	0.0416		

V = Total volume of condensate and gas.

V_s = Volume at dew point.

V_L = Volume of condensate.

TABLE VIII

COMPOSITION OF VAPOR LIBERATED DURING CONSTANT VOLUME PRODUCTION AT 185°F.

Component	Vapor Liberated at 5200 psig Mol Fraction	GPM	Vapor Liberated at 5000 psig Mol Fraction	GPM	Vapor Liberated at 4500 psig Mol Fraction	GPM	Vapor Liberated at 4000 psig Mol Fraction	GPM
Nitrogen	0.0054		0.0054		0.0056		0.0056	
Carbon Dioxide	0.0001		0.0001		0.0001		0.0001	
Methane	0.8228		0.8252		0.8338		0.8367	
Ethane	0.0764		0.0764		0.0763		0.0763	
Propane	0.0317	0.890	0.0316	0.887	0.0313	0.879	0.0312	0.876
iso-Butane	0.0102	0.340	0.0102	0.340	0.0100	0.334	0.0099	0.330
n-Butane	0.0143	0.460	0.0142	0.456	0.0140	0.450	0.0138	0.444
iso-Pentane	0.0044	0.164	0.0044	0.164	0.0042	0.157	0.0042	0.157
n-Pentane	0.0040	0.148	0.0040	0.148	0.0038	0.140	0.0038	0.140
Hexanes	0.0050	0.210	0.0049	0.206	0.0047	0.197	0.0045	0.189
Heptanes Plus	0.0257	1.463	0.0236	1.345	0.0162	0.891	0.0139	0.751
Total	1.0000	3.675	1.0000	3.546	1.0000	3.048	1.0000	2.887
Mol Wt. of C7+	136		133		125		121	
Sp. Gr. of C7+	0.770		0.753		0.733		0.725	

Component	Vapor Liberated at 3000 psig Mol Fraction	GPM	Vapor Liberated at 2000 psig Mol Fraction	GPM	Vapor Liberated at 1000 psig Mol Fraction	GPM	Vapor Liberated at 500 psig Mol Fraction	GPM
Nitrogen	0.0056		0.0056		0.0055		0.0054	
Carbon Dioxide	0.0001		0.0001		0.0001		0.0001	
Methane	0.8423		0.8460		0.8451		0.8361	
Ethane	0.0763		0.0767		0.0779		0.0796	
Propane	0.0310	0.870	0.0309	0.867	0.0316	0.887	0.0335	0.940
iso-Butane	0.0097	0.324	0.0096	0.320	0.0098	0.327	0.0107	0.357
n-Butane	0.0135	0.434	0.0133	0.427	0.0135	0.434	0.0149	0.479
iso-Pentane	0.0040	0.149	0.0038	0.142	0.0038	0.142	0.0044	0.164
n-Pentane	0.0036	0.133	0.0034	0.126	0.0034	0.126	0.0040	0.148
Hexanes	0.0041	0.172	0.0037	0.155	0.0035	0.147	0.0042	0.176
Heptanes Plus	0.0098	0.516	0.0069	0.356	0.0058	0.298	0.0071	0.364
Total	1.0000	2.598	1.0000	2.393	1.0000	2.361	1.0000	2.628
Mol Wt. of C_7+	116		113		112		112	
Sp. Gr. of C_7+	0.714		0.707		0.707		0.706	

TABLE IX

COMPOSITION OF RESIDUAL LIQUID AT 500 PSIG
FROM CONSTANT VOLUME PRODUCTION AT 185° F.

Component	Mol Fraction	Vol.%
Nitrogen	0.0002	0.01
Carbon Dioxide	0.0000	0.00
Methane	0.1073	3.76
Ethane	0.0353	1.86
Propane	0.0337	1.92
iso-Butane	0.0197	1.33
n-Butane	0.0336	2.19
iso-Pentane	0.0180	1.36
n-Pentane	0.0189	1.42
Hexanes	0.0444	3.78
Heptanes Plus	0.6889	82.37
	1.0000	100.00
Mol. Wt. of C_7+	144	
Sp. Gr. of C_7+	0.791	

TABLE X

PHYSICAL PROPERTIES OF VAPOR LIBERATED
DURING CONSTANT VOLUME PRODUCTION AT 185° F.

Pressure, psig	Molecular Weight	Specific Gravity (Air = 1.000)	Gas Deviation Factor, Z = PV/nRT	Gas Volume Factor, SCF/ Reservoir Bbl.
11,100	22.98	0.793	1.596	2098
11,000	22.98	0.793	1.584	2095
10,000	22.98	0.793	1.468	2055
9,000	22.98	0.793	1.364	1991
8,000	22.98	0.793	1.262	1913
7,000	22.98	0.793	1.165	1814
6,000	22.98	0.793	1.068	1697
5,200	22.98	0.793	0.993	1582
5,000	22.67	0.783	0.979	1543
4,500	21.61	0.746	0.941	1445
4,000	21.28	0.735	0.906	1335
3,000	20.72	0.715	0.847	1072
2,000	20.35	0.702	0.848	716
1,000	20.28	0.700	0.906	337
500	20.69	0.714	0.948	163

TABLE XI

WEIGHT BALANCE DURING CONSTANT VOLUME PRODUCTION AT 185°F.

Pressure, psig	Weight Percent of Original Reservoir Fluid			
	Cumulative Produced	Total Remaining	Remaining as Vapor	Remaining as Liquid
11,100	0.0	100.0	100.0	0.0
11,000	0.2	99.8	99.8	0.0
10,000	2.0	98.0	98.0	0.0
9,000	5.1	94.9	94.9	0.0
8,000	8.8	91.2	91.2	0.0
7,000	13.5	86.5	86.5	0.0
6,000	19.1	80.9	80.9	0.0
5,200	24.6	75.4	75.4	0.0
5,000	26.4	73.6	72.1	1.5
4,500	30.8	69.2	63.3	5.9
4,000	35.7	64.3	56.6	7.7
3,000	47.0	53.0	43.1	9.9
2,000	62.0	38.0	27.9	10.1
1,000	77.9	22.1	13.1	9.0
500	85.4	14.6	6.5	8.1

TABLE XII

CUMULATIVE GPM CONTENT OF VAPOR LIBERATED
DURING CONSTANT VOLUME PRODUCTION AT 185° F.

Pressure, psig	Propanes Plus		Butanes Plus		Pentanes Plus		Hexanes Plus	
	Gal. per MCF of Produced Vapor	% of Original Gal. in Place	Gal. per MCF of Produced Vapor	% of Original Gal. in Place	Gal. per MCF of Produced Vapor	% of Original Gal. in Place	Gal. per MCF of Produced Vapor	% of Original Gal. in Place
11,100	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00
11,000	0.006	0.15	0.004	0.15	0.003	0.15	0.002	0.15
10,000	0.075	2.05	0.057	2.05	0.041	2.05	0.034	2.05
9,000	0.188	5.11	0.142	5.11	0.101	5.11	0.085	5.11
8,000	0.324	8.82	0.246	8.82	0.175	8.82	0.148	8.82
7,000	0.498	13.54	0.377	13.54	0.269	13.54	0.226	13.54
6,000	0.703	19.13	0.533	19.13	0.380	19.13	0.320	19.13
5,200	0.904	24.60	0.685	24.60	0.488	24.60	0.412	24.60
5,000	0.970	26.40	0.735	26.38	0.523	26.35	0.440	26.32
4,500	1.112	30.26	0.836	30.01	0.588	29.60	0.491	29.35
4,000	1.264	34.39	0.941	33.80	0.652	32.87	0.540	32.31
3,000	1.589	43.24	1.158	41.57	0.774	38.99	0.627	37.46
2,000	1.996	54.31	1.417	50.88	0.906	45.66	0.714	42.65
1,000	2.422	65.89	1.683	60.43	1.035	52.14	0.794	47.44
500	2.639	71.81	1.823	65.45	1.106	55.70	0.838	50.11

TABLE XIII

STOCK TANK LIQUID PRODUCTION AND CONDENSATION IN RESERVOIR DURING CONSTANT VOLUME PRODUCTION AT 185° F.

Pressure, psig	Cumulative Vapor Produced, SCF/ MMSCF Original Reservoir Vapor	Cumulative Separator Gas Produced, SCF/ MMSCF Original Reservoir Vapor	Stock Tank Condensate, Bbl/MMSCF Original Reservoir Vapor			Incremental Producing GOR, SCF/STB	Formation Volume Factor, Bbl.Reservoir Vapor/STB	Reservoir Liquid, % of Reservoir HC* Pore Volume
			Cumulative Produced	Remaining in Vapor	Remaining in Liquid			
11,100	0	0	0.00	43.59	0.00	-	10.93	0.00
11,000	1,493	1,437	0.07	43.52	0.00	22,100	10.95	0.00
10,000	20,498	19,725	0.89	42.70	0.00	22,100	11.16	0.00
9,000	51,064	49,138	2.23	41.36	0.00	22,100	11.52	0.00
8,000	88,245	84,917	3.85	39.74	0.00	22,100	11.99	0.00
7,000	135,380	130,274	5.90	37.69	0.00	22,100	12.64	0.00
6,000	191,296	184,081	8.34	35.25	0.00	22,100	13.52	0.00
5,200	245,985	236,707	10.72	32.87	0.00	22,100	14.50	0.00
5,000	264,633	254,632	11.48	29.52	2.59	23,800	16.03	0.69
4,500	311,197	299,881	13.04	22.65	7.90	28,900	20.55	2.35
4,000	363,767	351,152	14.46	16.48	12.65	36,200	27.81	3.85
3,000	489,020	474,145	16.82	9.02	17.75	52,100	49.47	6.38
2,000	658,934	641,355	19.11	4.23	20.25	73,300	103.67	7.87
1,000	839,250	820,169	21.05	1.60	20.94	91,800	275.38	7.66
500	922,103	901,792	22.39	0.17	21.03	61,000	379.61	7.44

* Measured at dew point

FIGURE I

RELATIVE VOLUME vs PRESSURE
(FLASH LIBERATION)
RED HILLS UNIT-WOLFCAMP
LEA COUNTY, NEW MEXICO

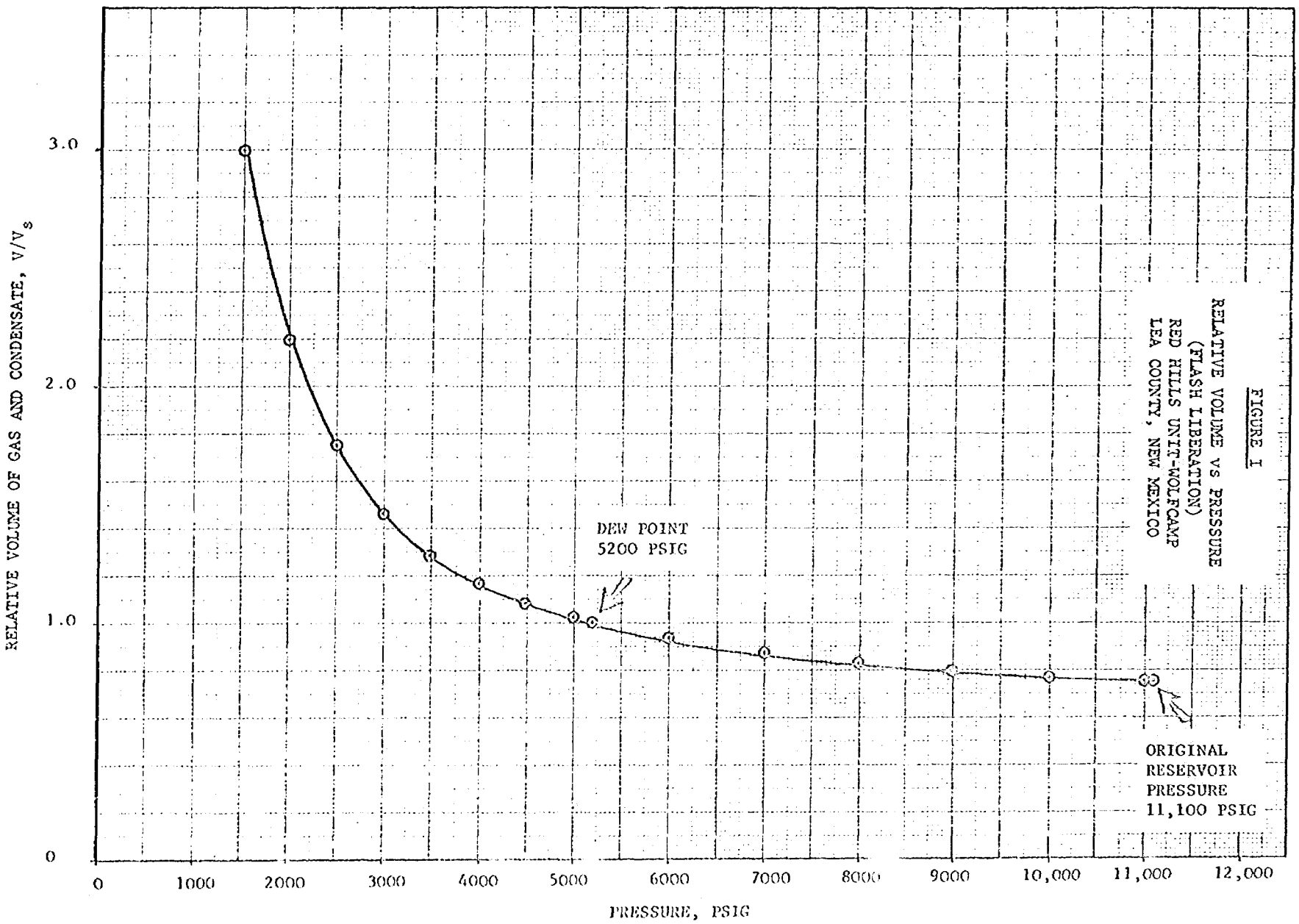


FIGURE II

RETROGRADE LIQUID FORMATION vs PRESSURE
(FLASH LIBERATION)
RED HILLS UNIT-WOLFCAMP
LEA COUNTY, NEW MEXICO

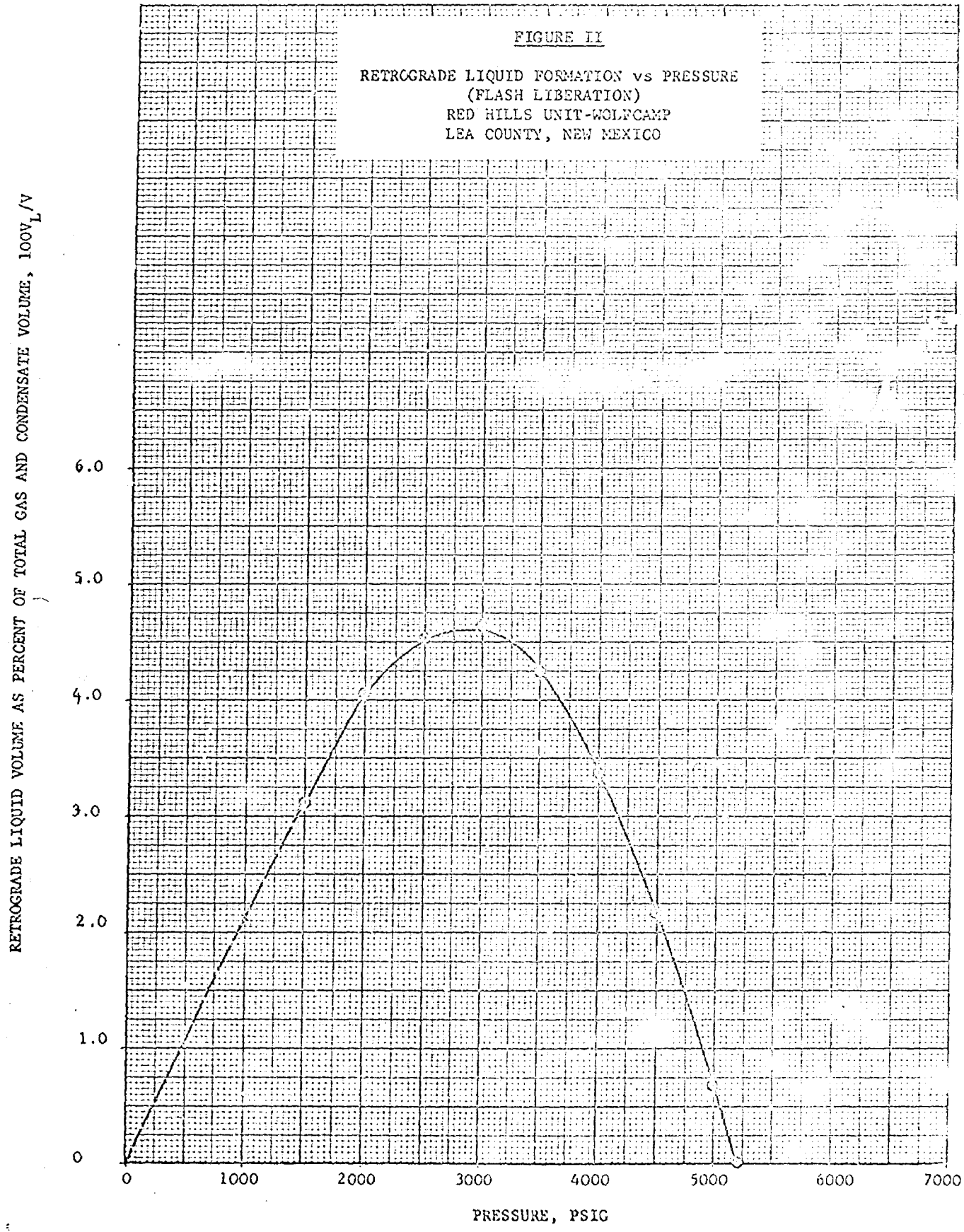


FIGURE II

RETROGRADE LIQUID FORMATION vs PRESSURE
(FLASH LIBERATION)
RED HILLS UNIT-WOLFCAMP
LEA COUNTY, NEW MEXICO

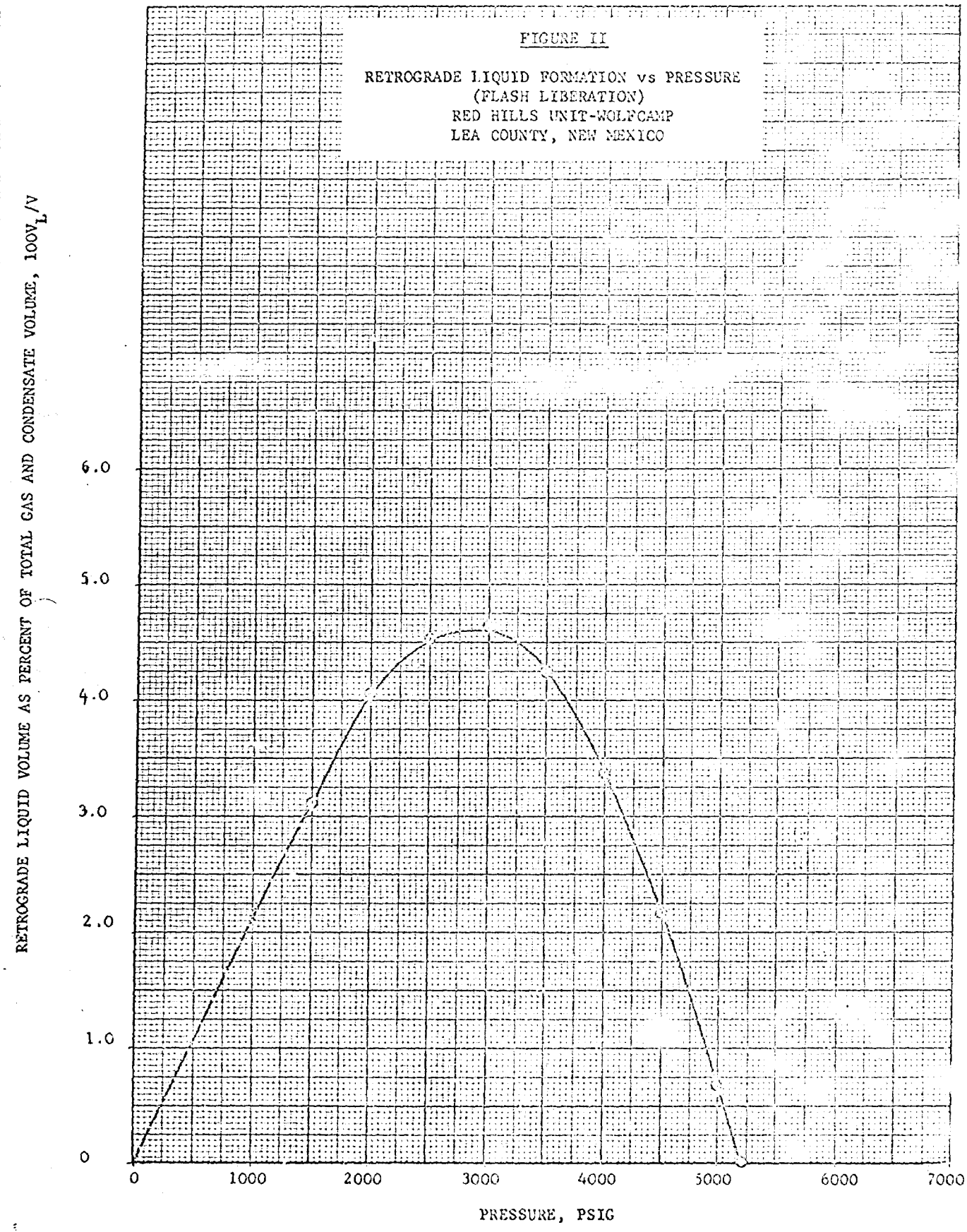


FIGURE III

LIQUID CONDENSATION vs PRESSURE
RED HILLS UNIT-WOLFCAMP
LEA COUNTY, NEW MEXICO

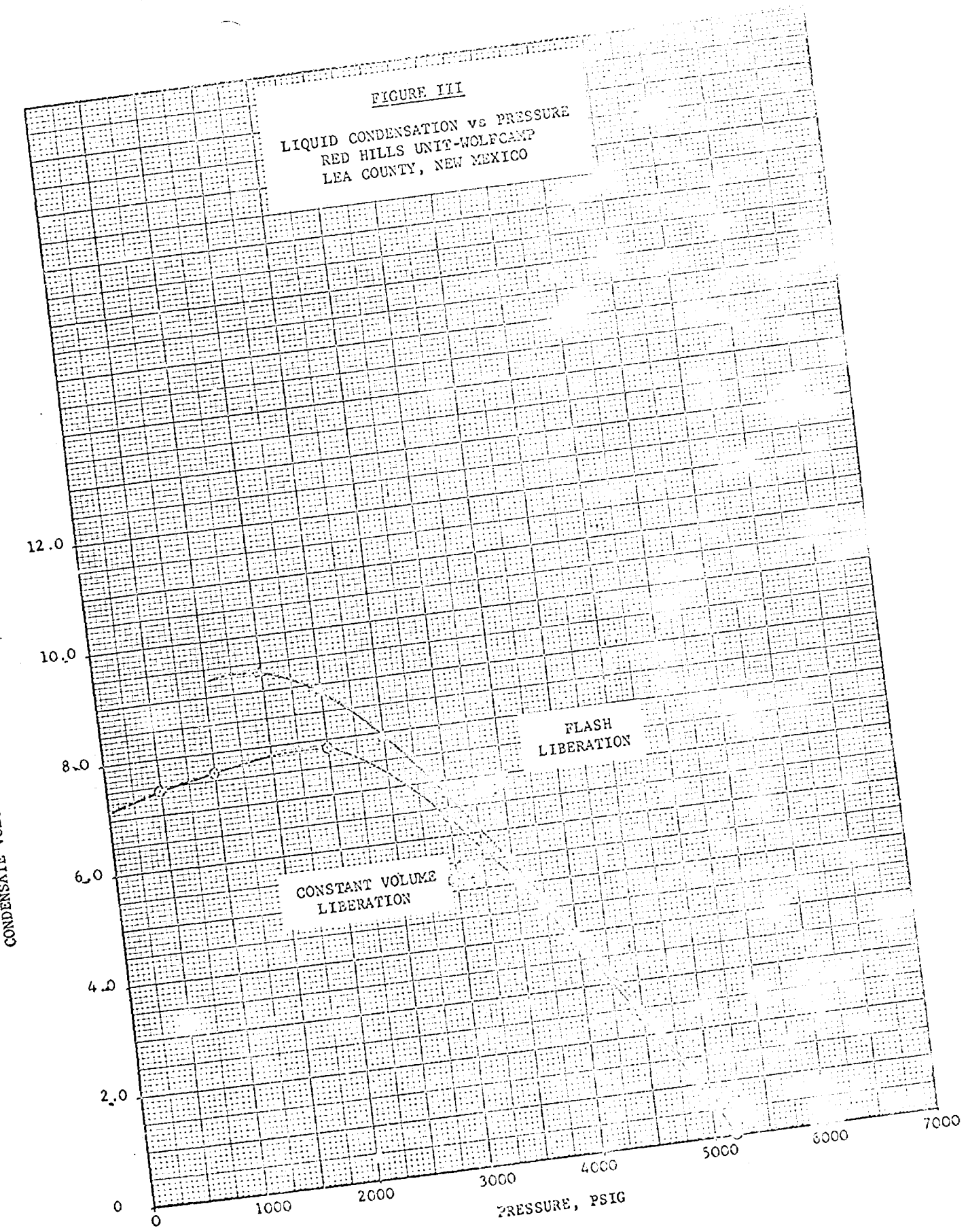


FIGURE IV

GAS DEVIATION FACTOR and GAS VOLUME FACTOR vs PRESSURE
(CONSTANT VOLUME LIBERATION)
RED HILLS UNIT-WOLFCAMP
LEA COUNTY, NEW MEXICO

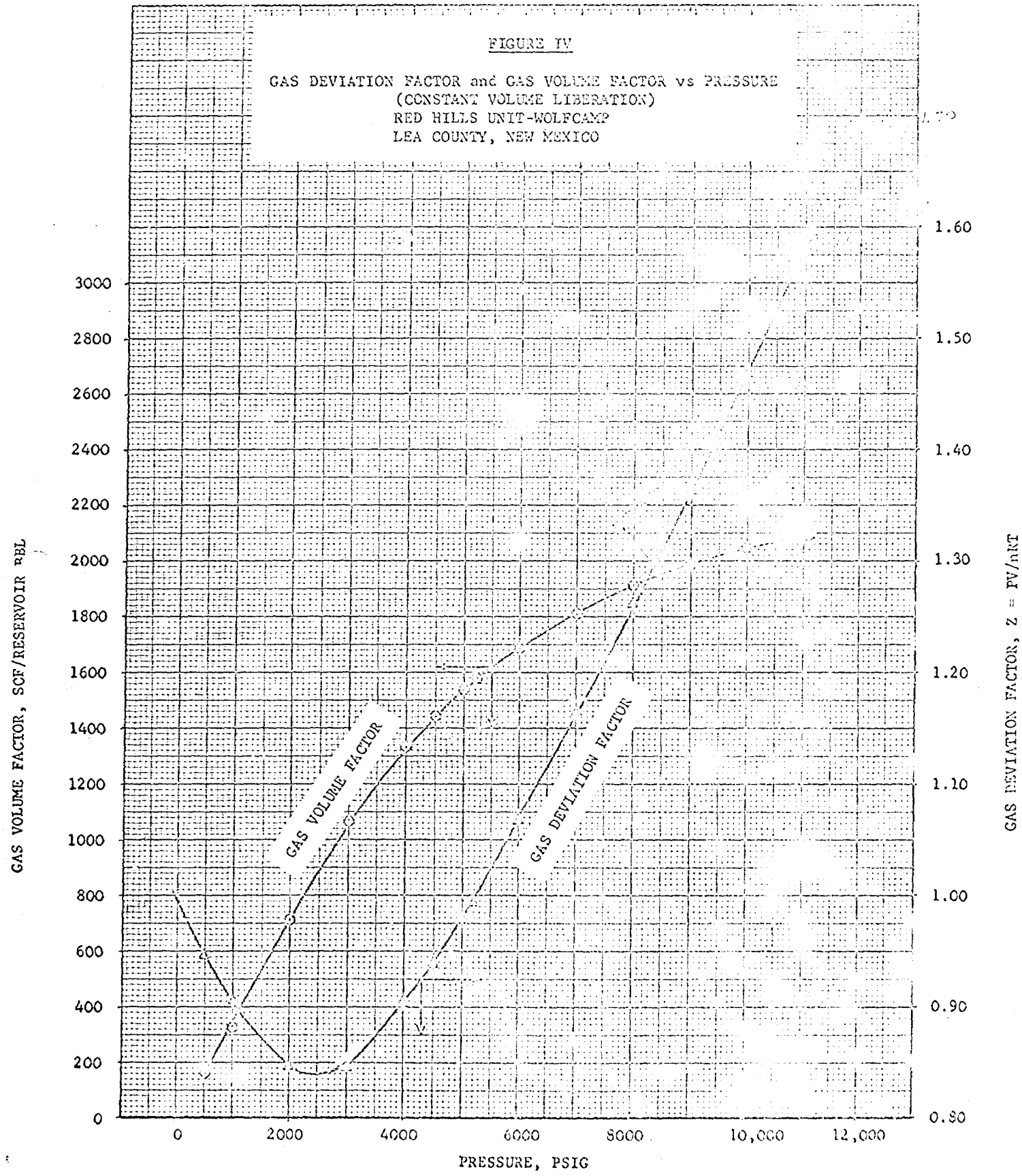
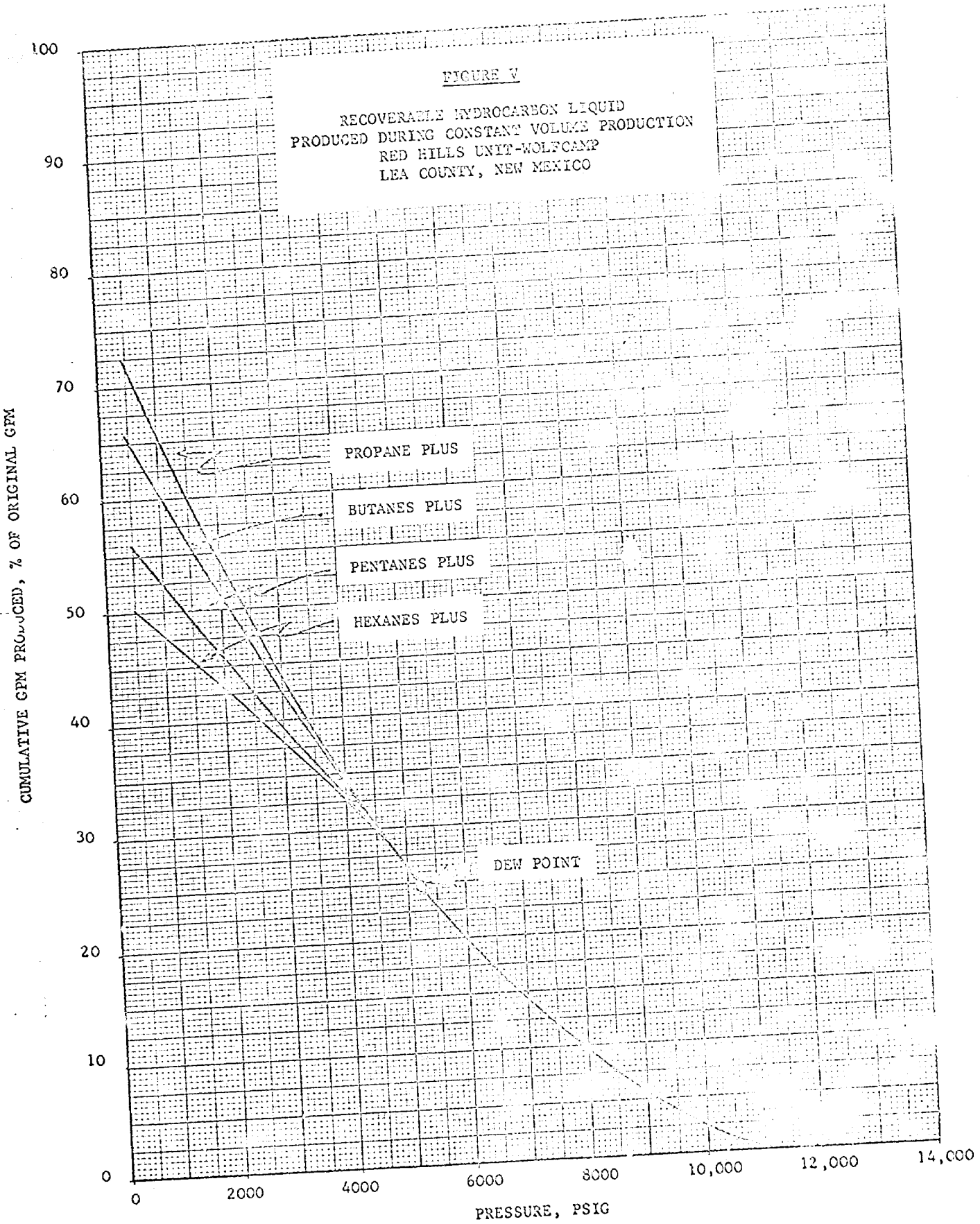


FIGURE V

RECOVERABLE HYDROCARBON LIQUID
PRODUCED DURING CONSTANT VOLUME PRODUCTION
RED HILLS UNIT-WOLFCAMP
LEA COUNTY, NEW MEXICO



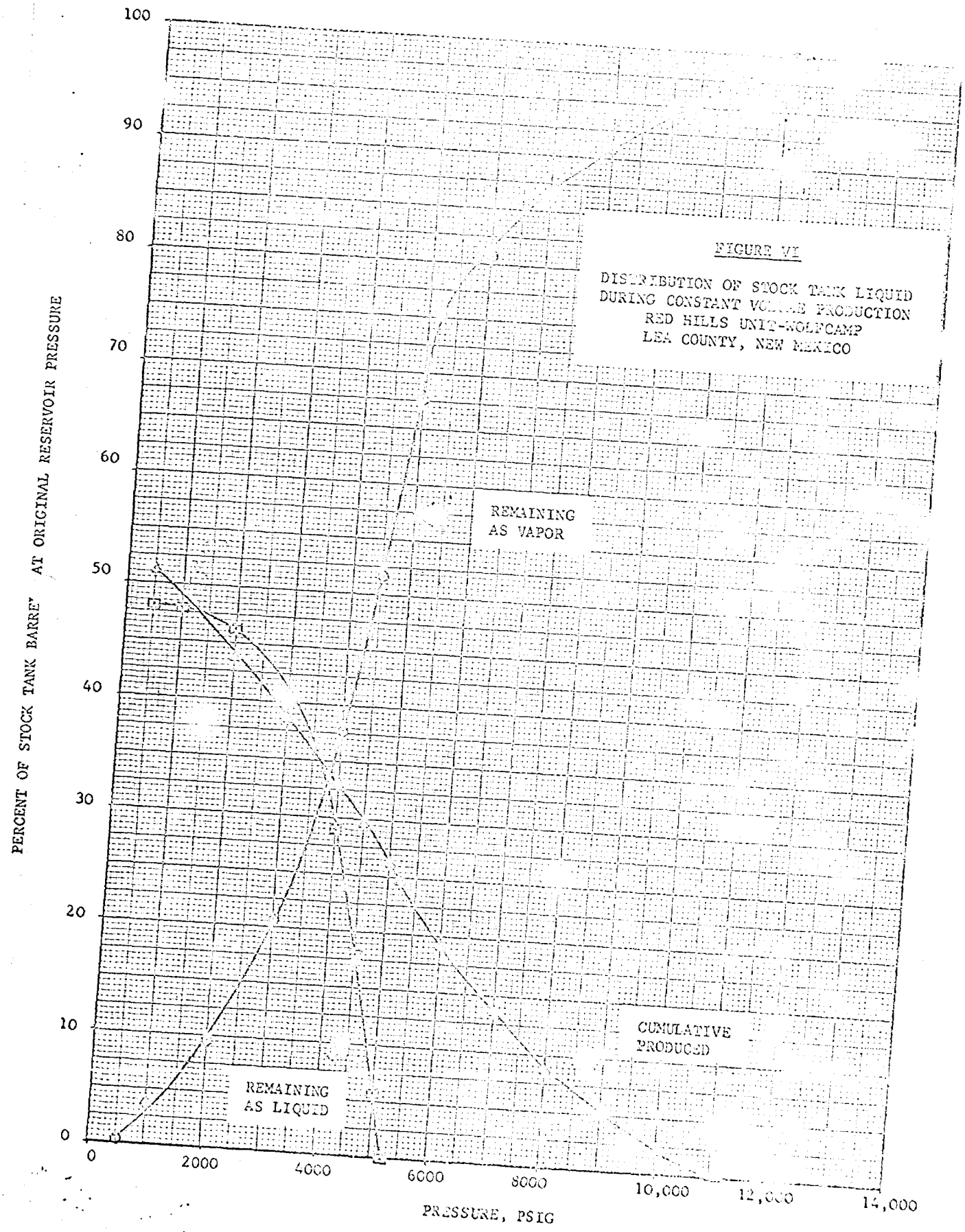


FIGURE VI

DISTRIBUTION OF STOCK TANK LIQUID
DURING CONSTANT VOLUME PRODUCTION
RED HILLS UNIT-WOLFCAMP
LEA COUNTY, NEW MEXICO

Case 3158
5/18/66

TEXTELLER, INC.
RESERVOIR ENGINEERING DATA
Midland, Texas

Well : RED HILLS UNIT NO. 1 Page 1 of 4

Field : UNDESIGNATED File 8-1927-PU

CHRONOLOGICAL PRESSURE AND PRODUCTION DATA

1966 Date	Status of Well	Time	Elapsed Time Hrs.	Min.	Wellhead Pressure DWT Tubing	BHP @ 12080' Psig	BHP @ 13554' Psig
2-2	On location	08:00					
"	Well flowing	08:30			2310		
"	Shut in well	11:30	0	00	2310		
"	"	11:45	0	15	3325		
"	"	12:00	0	30	3670		
"	"	12:15	0	45	3920		
"	"	12:30	1	00	4100		
"	"	12:45	1	15	4225		
"	"	13:00	1	30	4352		
"	"	13:15	1	45	4442		
"	"	14:00	2	30	4632		
"	"	14:15	2	45	4680		
"	"	14:30	3	00	4712		
"	Inst. @ 12080'	14:37	3	07		6261	6444
"	"	14:45	3	15	4757	6290	6473
"	"	15:00	3	30	4795	6319	6502
"	"	15:25	3	55	4828		
"	"	15:30	4	00	4842	6362	6545
"	"	15:45	4	15	4872		
"	"	16:00	4	30	4895	6420	6603
"	"	16:30	5	00	4935		
"	"	17:00	5	30	4975		
"	"	17:30	6	00	5004	6543	6726
"	"	18:00	6	30	5033		
"	"	18:30	7	00	5058	6608	6791
"	"	19:00	7	30	5078		
"	"	19:30	8	00	5098	6652	6835
"	"	20:00	8	30	5117		
"	"	20:30	9	00	5135	6695	6878
"	"	21:30	10	00	5162	6728	6911
"	"	22:30	11	00	5187		
"	"	23:30	12	00	5210	6782	6965

TEPTELLER, INC.
RESERVOIR ENGINEERING DATA
Midland, Texas

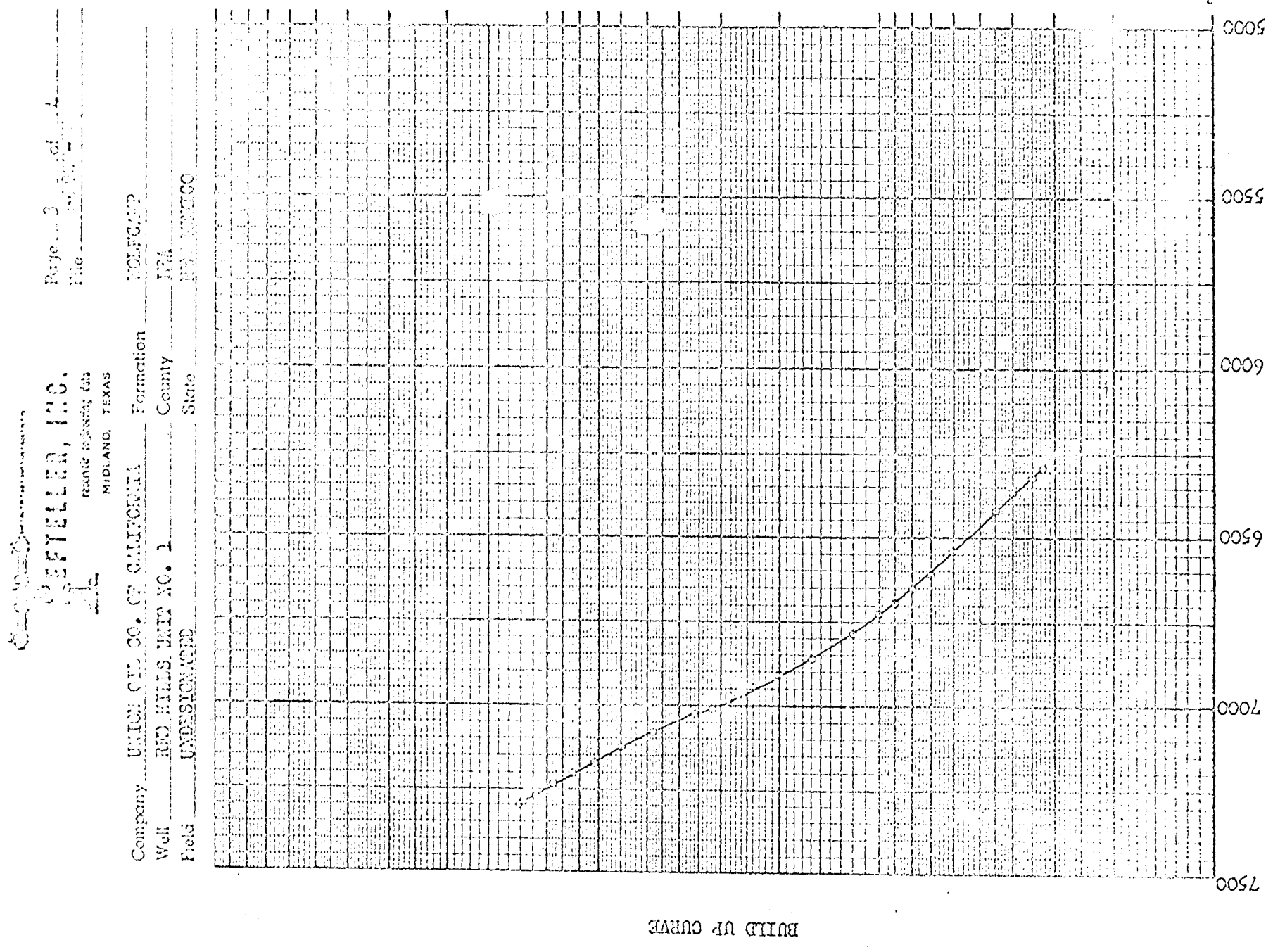
Well : RED HILLS UNIT NO. 1

Field : UNDESIGNATED

File S-1927-RU

CHRONOLOGICAL PRESSURE AND PRODUCTION DATA

1966 Date	Status of Well	Time	Elapsed Time Hrs.	Min.	Wellhead Pressure DWT Tubing	BHP @ 12080' Psig	BHP @ 13554' Psig
2-3	"	00:30	13	00	5228		
"	"	01:30	14	00	5242		
"	"	02:00	14	30	5247		
"	"	02:30	15	00	5255		
"	"	03:30	16	00	5270	6858	7041
"	"	07:30	20	00	5313	6906	7089
"	"	11:30	24	00	5340	6946	7129
"	"	15:30	28	00	5367		
"	"	19:30	32	00	5393	7007	7190
"	"	23:30	36	00		7025	7208
2-4	"	11:30	48	00	5467	7084	7267
"	"	23:30	60	00		7130	7313
2-5	"	11:30	72	00	5539	7166	7349
"	"	23:30	84	00		7203	7386
2-6	"	11:30	96	00	5596	7236	7419
"	"	23:30	108	00		7266	7449
2-7	"	08:30	117	00		7282	7465
"	"	11:15	119	45		7293	7476
"	"	14:15	122	45	5646	7301	7484


Page 3 of 4
File
Company UNION OIL CO. OF CALIFORNIA
Well RED HILLS UNIT NO. 1
Field UNDESIGNATED
Formation DELAWARE
County EDDY
State NEW MEXICO
PRESSURE : PSIG @ 12030 FEET
5000
5500
6000
6500
7000
7500
SHUT IN TIME : HOURS
1
10
100
1000
BUILD UP CURVE

PETTELLER, T.R.O.
Reservoir Engineering Data
MIDLAND, TEXAS

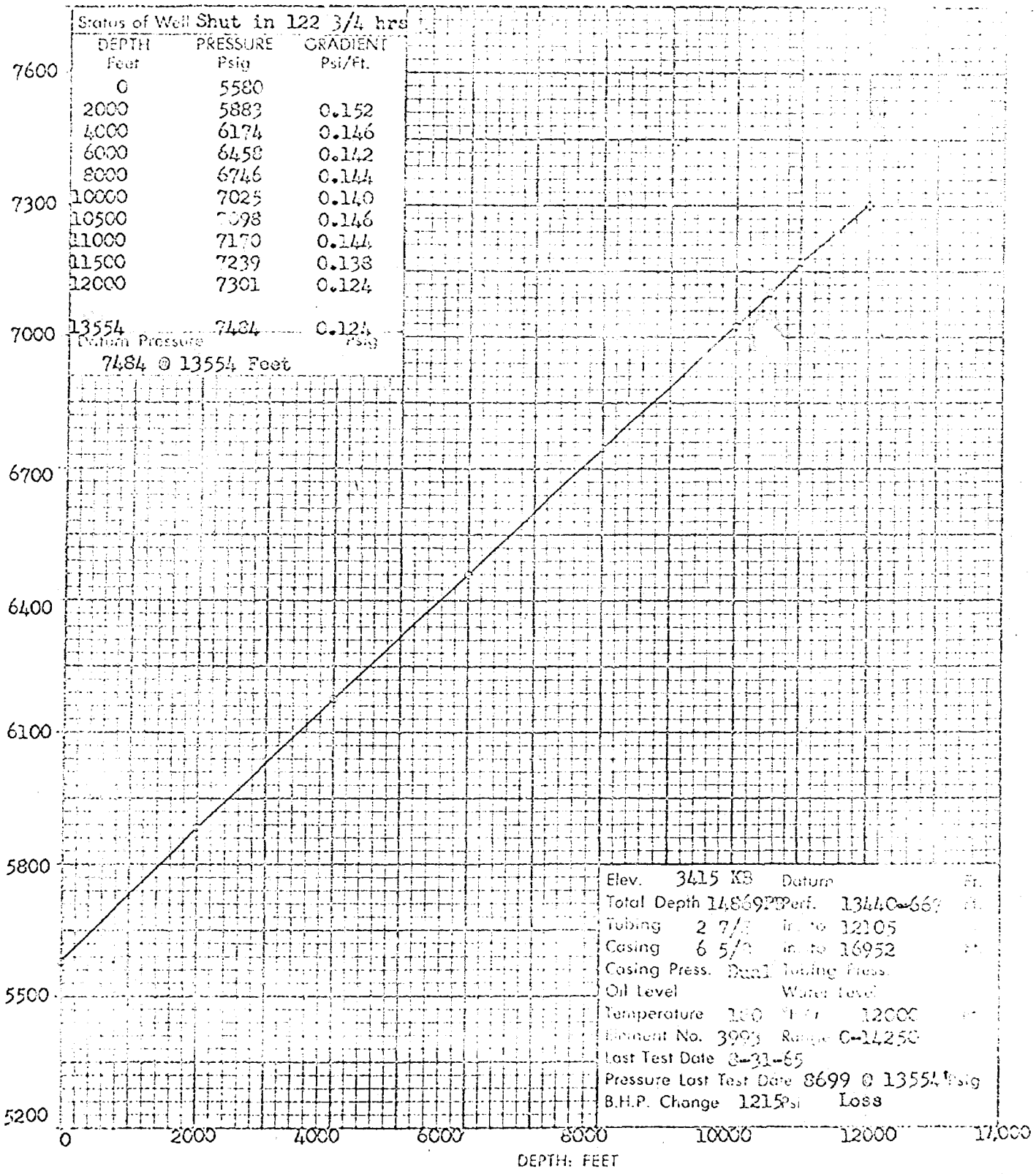
Page 4
File

Company UNION OIL CO. OF CALIFORNIA Lease RED HILLS UNIT
Field UNDESIGNATED County LEA
Formation WOLFCAMP Test Date FEBRUARY 7, 1966

Status of Well Shut in 122 3/4 hrs

DEPTH Feet	PRESSURE Psig	GRADIENT Psi/Ft.
0	5580	
2000	5883	0.152
4000	6174	0.146
6000	6458	0.142
8000	6746	0.144
10000	7025	0.140
10500	7098	0.146
11000	7170	0.144
11500	7239	0.138
12000	7301	0.124
13554	7484	0.124

Datum Pressure
7484 @ 13554 Feet Psig



Elev. 3415 KB Datum Ft.
Total Depth 14869' Perf. 13440-66' Ft.
Tubing 2 7/8 in. to 12105 Ft.
Casing 6 5/8 in. to 16952 Ft.
Casing Press. Dual Tubing Press.
Oil Level Water Level
Temperature 180 °F @ 12000 Ft.
Element No. 3995 Range 0-14250
Last Test Date 8-31-65
Pressure Last Test Date 8699 @ 13554 Psig
B.H.P. Change 1215 Psi Loss

SPECIAL RULES AND REGULATIONS
FOR THE
RED HILLS-PENNSYLVANIAN GAS POOL

the Red Hills-Pennsylvanian
lvanian formation within
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164

SPECIAL RULES AND REGULATIONS
FOR THE
RED HILLS-PENNSYLVANIAN GAS POOL

RULE 1. Each well completed in the Red Hills-Pennsylvanian Gas Pool or in the Pennsylvanian formation within one mile of the Red Hills-Pennsylvanian Gas Pool, and not nearer to or within the limits of another designated Pennsylvanian pool, shall be spaced, drilled, operated, and produced in accordance with these Special Rules and Regulations.

RULE 2. Each well completed in the Red Hills-Pennsylvanian Gas Pool shall be located on a standard unit containing 640 acres, more or less, consisting of a single governmental section.

RULE 3. Each well completed in the Red Hills-Pennsylvanian Gas Pool shall be located no nearer than 1650 feet to the outer boundary of the section and no nearer than 330 feet to any governmental quarter-quarter section line. Any well drilled to or being completed in the Red Hills-Pennsylvanian Gas Pool is granted an exception to the well location requirements of this rule.

BEFORE EXAMINER NUTTER
OIL CONSERVATION COMMISSION
EXHIBIT NO. 6
CASE NO. 3148-3149
11/20/68

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Vol I

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
May 18, 1966

REGULAR HEARING

IN THE MATTER OF:

Application of Union Oil Company of California to reopen Case No. 3158, Lea County, New Mexico.

Case No. 3158

BEFORE: Honorable Jack M. Campbell
Mr. A. L. "Pete" Porter
Mr. Guyton B. Hays

TRANSCRIPT OF HEARING

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1203 FIRST NATIONAL BANK EAST • PHONE 256-1294 • ALBUQUERQUE, NEW MEXICO

MR. PORTER: The next case on the docket is Case 3158. The Commission would like to call for appearances in Case 3158.

MR. HINKLE: If the Commission please.

MR. PORTER: Mr. Hinkle.

MR. HINKLE: Clarence Hinkle and Sim Christy of Hinkle, Bondurant and Christy, and Mr. Bob Humphrey, division counsel for Union, Midland, appearing on behalf of Union Oil Company.

MR. HUNKER: If the Commission please, George Hunker, Roswell, New Mexico. I'll be associated in this matter with Mr. Don E. Pray of the firm of Schuman, Pray and Doyle of Tulsa, Oklahoma, and I would like for the Commission to meet Mr. Hal Rucker, who is counsel for Kermit Oil Company. We are representing Kermit Oil Company and Messrs. Schuman and Yager.

MR. PORTER: How do you spell that name?

MR. HUNKER: Hal Rucker, H-a-l R-u-c-k-e-r,

MR. PORTER: Would anyone else like to make an appearance in the case? We have some correspondence from some other interested parties in the file and notice will be taken of this correspondence at the time that we take statements in the case. Mr. Hinkle.

MR. HINKLE: If the Commission please, I would like

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to make a very brief statement before putting on our testimony. This matter has been before the Commission a number of times in a number of cases, that is the Red Hills Unit and the problems which have grown out of the discovery well. Originally the Commission approved the Red Hills Unit agreement in Case No. 3157. At that time the Pure Oil Company was a proponent of the unit and was the unit operator. Since that time the Union Oil Company has acquired the interest of the Pure Oil Company and they are the unit operator at the present time.

Case 3158, which is the case we have before us today here, was for the adoption of special field rules for the Wolfcamp formation. The discovery well was discovered in the Wolfcamp, the Pennsylvanian and also in the Devonian, and it was dually completed in the Wolfcamp and the Pennsylvanian formation. The Case No. 3159, which was consolidated with 3158 at the previous hearings, was for the adoption of special field rules for the Pennsylvanian formation.

You will notice that we are not asking for the adoption of special field rules for the Pennsylvanian at this time, only for the Wolfcamp, due to the fact that the well has ceased to produce from the Pennsylvanian formation. We do not know, and the evidence we're not going into in detail, but

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it will show that we do not know whether the Pennsylvanian has been completed or whether it is due to mechanical trouble. We have, we feel, new evidence to present to the Commission. We don't want to take any more time of the Commission than we have to. We're not going into the old evidence that was introduced in the previous hearing in connection with this case, but the new evidence we have consists of a core analysis of the Wolfcamp formation.

During the previous hearing it was brought out that there was a core taken of the Wolfcamp formation, but there was no core analysis. We have recently had a core analysis made and it has afforded a new tool, so-to-speak, to evaluate the producing formation of the Wolfcamp. At the time of the original hearings here there was very little production from the discovery well. Since that time there has been considerable production and we now have considerable pressure production history which we believe will give the Commission entirely new evidence in that respect.

We think that we will be able to show that 640-acre spacing will better protect correlative rights than smaller spacing units. We also will show that the Union, as unit operator, is aware of the problems which exist with respect to the non-committed fee acreage in Section 5, 26, 33, which have not been committed to the unit agreement, and they

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will propose or submit a proposal for the protection of the correlative rights of the owners of the fee lands in Section 5.

We have altogether five witnesses and a number of exhibits and we will try to put them on as fast as we can and take as little time of the Commission as we possibly can. Our first witness is David Dunn.

MR. PORTER: Mr. Hunker.

MR. HUNKER: If the Commission please, we represent Kermit Oil Company, Jerald Schuman and Saul Yager and we object to the reopening of this case. Certainly some new and substantial evidence must be produced. Some of this information has been furnished to us; we do not believe that it is of such a substantial nature as to cause the case to be reopened.

I think it is incumbent on me to advise the Commission that this is somewhat of a precedent-setting matter. I don't think that the Commission wants a proliferation of hearings with respect to this business; we feel that the information that has been adduced by Union taking three pressure tests is not sufficient to reopen the case. We have not seen the proposed exception that they care to make with regard to the mineral owners in Section 5, although we have asked for this we have not seen one.

The information that Mr. Hinkle mentioned with regard to

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the Wolfcamp formation, the core had been taken at the time of the previous hearings and there were three or four months that went by after the core was taken that the core could have been analyzed and the Commission could have been furnished with the information that the core showed.

We feel that you may be setting a rather dangerous precedent in opening this case on the meager matters that Mr. Hinkle has mentioned, but we'll let the Commission proceed. Thank you.

MR. HINKLE: I would just like to make one or two additional remarks. This is a very important case as far as the Union Oil Company is concerned. This is in an area where the wells, even the Wolfcamp formation is a deep formation approximately 13,500 feet and costs in excess of $500,000 to drill each Wolfcamp well, so it is very important and we feel that the previous order of the Commission setting 160-acre spacing has resulted in a situation where correlative rights are not going to be protected, and that by fixing a larger spacing unit that they will be protected, and we believe we will be able to point that out clearly to the Commission that that is the case.

It's true that the core was available at the previous hearings, but there had been no core analysis and it's very important that there has been a core analysis because that

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affords a new means to evaluate the pay section of the Wolfcamp formation and gives an entirely new picture as far as the reservoir is concerned.

MR. PORTER: The Commission will hear the case as advertised.

MR. HINKLE: We can have all our witnesses sworn now or one at a time.

MR. PORTER: How many witnesses do you have?

MR. HINKLE: We have five.

MR. PORTER: Suppose we have all your witnesses, Mr. Hinkle. You have five, that's enough to enter at one time. Stand, all you witnesses stand and have the attorney swear you in at this time.

(Witnesses sworn.)

DAVID DUNN

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

DIRECT EXAMINATION

BY MR. HINKLE:

Q Your name is David Dunn?

A Yes, sir.

Q You are employed by the Union Oil Company?

A Yes, sir.

Q In what capacity?

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A I'm assistant manager of exploration for the Union Oil Company at the Central Division Office in Midland, Texas.

Q Have you previously testified before the Commission?

A I have.

Q And your qualifications as a petroleum geologist are of record with the Commission?

A That is correct.

Q Have you made a study of the Red Hills Unit area and of the initial test wells which has resulted in production?

A Yes, sir, I have. As assistant manager of exploration in the combined operation of the Union and Pure, I was called on in December of 1965 to examine Pure's proposal for additional exploration in the Red Hills Unit. Although the merger was effective in July of '65, the Exploratory Department was not combined in such a way that the operation was consolidated prior to December.

At this time I examined all of the evidence, seismic, well information, and reports that had been submitted on the Red Hills Unit and examined in detail all of the information that had gone into the recommendation to drill an exploratory well. I was also charged with making a development analysis. Now this development analysis pertained only to the Wolfcamp formation.

Q Before going into your study there, have you

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prepared, or has there been prepared under your direction a plat showing the ownership of the acreage immediately surrounding the initial test well?

A There has.

(Whereupon, Union's Exhibit No. 1 was marked for identification.)

Q Refer to Union's Exhibit 1 and explain to the Commission what this shows.

A Exhibit No. 1 shows a portion of the Red Hills Unit area and is a land ownership map. It shows the location of the Pure No. 1 Red Hills Unit well which is located 330 feet from the South Line and 2310 feet from the East Line of Section 32, Township 25 South, Range 33 East. It also shows by a block the participating area that was set up and approved by the Director of the United States Geological Survey, the Commissioner of Public Lands for the State of New Mexico.

Q That's Sections 32, 33 and Sections 4 and 5?

A That is correct. The land that is colored on this plat is all land that is within the Red Hills Unit area. It does not include all of the land within the Red Hills Unit area. The acreage within the participating area is all firmly committed, effectively committed to the unit with the exception of the North Half of the North Half of Section 5,

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the East Half of the Southeast Quarter and the Southeast Quarter of the Northeast Quarter of Section 5. Of this described acreage, this 280 acres, Union controls the working interest on one-eighth, and this one-eighth is committed to the unit operation. Mineral interests under the leases that Union control, one-sixteenth is effectively committed to the unit area and one-sixteenth is not committed.

Q Now, as a result of the investigation which you have already testified to, did you make any recommendations to your company with respect to further development of the unit area?

MR. HUNKER: If the Commission please, it sounds to me like they are reopening the entire case and I object to this line of questioning.

MR. HINKLE: This is just leading up to the information that was turned over by the Union Oil Company to independent engineers to make this survey, and we want to show that he did make an independent investigation, make recommendations to his company, and the information which he came up with was turned over to an enginee ing firm for an independent survey. Just connecting it up.

MR. HUNKER: If the Commission please --

MR. HINKLE: I'm not going into the previous evidence.

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MR. HUNKER: -- in their application, Union has said that there is new and independent evidence which has been obtained, and so far this line of testimony does not show anything new at all to the Commission. We object to the line of questioning.

MR. HINKLE: It will.

MR. DUNN: I might state, sir, that one new condition exists; at the time of the previous hearing, Union did have under lease a larger interest in the acreage than I have described and had committed it to the unit.

GOVERNOR CAMPBELL: What is the question again, what are you seeking?

Q (By Mr. Hinkle) What recommendations did you make to your company, the Union Oil Company, after you had made this investigation that they had requested you to make, with respect to further development of the unit area?

MR. HUNKER: Just a minute--

A I recommended two lines --

MR. HUNKER: -- the Commission hasn't ruled on my objection.

MR. PORTER: No.

GOVERNOR CAMPBELL: Are you asking him to express his independent, expert opinion now, in effect, by referring to his recommendations on the whole matter from the beginning

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of the original case?

MR. HINKLE: No, Governor, all I am asking him is to -- let me go back a little ways here. This was taken over from the Pure Oil Company by Union. Union employees and officials, and so forth, did not know very much about it, they wanted their own employees to investigate it and make a recommendation to them as to what they should do. All I am asking him is after he had made his investigation, what recommendations he made to Union Oil Company with respect to further development of the unit area.

GOVERNOR CAMPBELL: You mean the development --

MR. HINKLE: Whether they should go ahead and develop on one hundred --

GOVERNOR CAMPBELL: From this time forward --

MR. HINKLE: -- one hundred sixty.

GOVERNOR CAMPBELL: -- in the light of the existing circumstances?

MR. HINKLE: Yes, and in the light of the Commission on the previous order for 160-acre spacing.

GOVERNOR CAMPBELL: As I understand it, you are seeking here to present to the Commission evidence that has been made available to Union since the time of the original order?

MR. HINKLE: We're leading up to that. We're going

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to c[illegible]ect this up and show that after he made his recommendation there was a recommendation that there be an investigation by an independent engineering firm, and he turned all this information over to the engineering firm to make this independent investigation, and then the next two witnesses --

GOVERNOR CAMPBELL: He's not expressing his opinion about the investigation or the nature of it or anything else?

MR. HINKLE: He's expressing his opinion as to the conclusion he arrived at from his investigation, yes, as to whether or not under the circumstances they should be further developed. If the Commission please, this is leading up to this new evidence which I mentioned in the opening statement of how it came about that the core analysis and also the evaluation of the pressure and production history --

GOVERNOR CAMPBELL: If it is an effort simply to show how the new evidence came about, that's one thing. If it is an effort to bolster old evidence that the Commission has already ruled upon, that is entirely different. That's what we are concerned about.

MR. PRAY: We believe it's irrelevant how they got to get the new evidence.

GOVERNOR CAMPBELL: I can see where they might feel th[illegible] the Commission had been delinquent in some way in not

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getting the information. To that extent I would think the Commission might like to know, but if that's the purpose of it--

MR. HINKLE: Just laying a predicate for the other witnesses.

GOVERNOR CAMPBELL: Let's let the witness answer this question and see where we go.

Q (By Mr. Hinkle) Go ahead.

A I think I am lost on the question.

MR. PORTER: Would you restate the question?

A I believe I was asked what my recommendations were as a result of my study. As a result of that study, I recommended to my company that they do not do any additional drilling on the basis of 160-acre spacing. I recommended that they drill additional Wolfcamp development wells if we could secure voluntary pooling of 640-acre or 640-acre spacing was established. I recommended that we continue exploration, but that is not a part of this case.

Q Did you make any recommendation to your management with respect to the employment of an independent engineering firm?

A I did.

Q To study the situation?

A Yes, sir.

Q Whom did you recommend that they employ?

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A I recommended that the company employ H. J. Gruy and Associates in Dallas.

Q That's H. J. Gruy, G-r-u-y --

A G-r-u-y, that is correct.

Q -- and Associates. Did you contact Gruy and Associates yourself?

A I contacted Gruy and Associates on April 28th in Dallas, Texas.

Q Did anything grow out of that meeting with respect to the evaluation of the Wolfcamp formation?

A Yes, sir. I discussed with both their geological staff and engineering staff the information that we had on this well. I explained to them that there was considerable controversy about the commercial nature of it and the distribution of the Wolfcamp pay. I explained to them that I had independently worked the information and had selected 24 feet of pay with 6-1/2% porosity and our engineers had made a calculation based on that. I asked them if they thought they could improve on our calculations with the equipment and the experience and the personnel they had. They informed me, I should state, specifically, Mr. Martin Ford informed me that he thought --

MR. PRAY: Objection. I don't think this is proper to have him state what they informed him.

GOVERNOR CAMPBELL: Mr. Ford is here and will testify?

MR. HINKLE: He's the next witness.

GOVERNOR CAMPBELL: That should be sufficient, then, Mr. Hinkle.

MR. HINKLE: Okay.

Q (By Mr. Hinkle) Was there anything said with respect to the core that was mentioned at the previous hearing, that's the core of the Wolfcamp formation?

A Yes, sir.

MR. HUNKER: This calls for hearsay testimony too, Mr. Hinkle. Of course, the witness has already answered. Who said this, Mr. Dunn?

MR. DUNN: Mr. Ford and myself discussed it.

MR. HUNKER: It's hearsay. It's objectionable and we move it be stricken.

Q (By Mr. Hinkle) Was any determination made --

GOVERNOR CAMPBELL: Wait. Mr. Hinkle, will you withdraw the previous question?

MR. HINKLE: Yes.

GOVERNOR CAMPBELL: Strike that from the record.

Q (By Mr. Hinkle) Was any determination made as to having the core analyzed, the core of the Wolfcamp formation?

A There was.

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Q Did you take any steps toward having it analyzed?

A Yes, I did. I delivered the core to the Core Laboratories on April 29th, where they ran a core-gamma correlation and inspected the core. On May the 3rd Mr. Morton, with Gruy and Associates, and myself, selected portions of the core to be analyzed. This selection was made to give a complete analysis of the cored section with particular attention paid to each change in lithology in the cored interval.

Q When was the core analysis obtained from Core Lab?

A On May the 5th.

Q Do you have a copy of the core analysis?

A I do.

(Whereupon, Union's Exhibit No. 2 was marked for identification.)

Q Refer to Union's Exhibit No. 2 and explain to the Commission what it shows.

A This exhibit is in three parts; the first part is simply a numerical listing at the depth at which plugs were cut for analysis, the permeability measurements that were made on these plugs, the porosity measurements that were made on the plugs, the grain density measurements that were made on the plugs, and the lithologic description as furnished by Core Laboratory. The second part is a core-gamma correlation

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that was run on the slabbed core, and on this core-gamma correlation is a graphic plot of the porosity and permeability. On the third part we have the completion coregraph where the same information is repeated and the lithologic description is plotted in graphic form.

MR. HUNKER: If the Commission please, Union's application in this hearing was filed on the 23rd of March, 1966. At that time they said that they had new and substantial evidence. All of this material has been developed since the application was filed. I think that you are being less than candid with the Commission in coming in here with new evidence that you have developed in the last several days, and I object to this line of testimony.

I think they're trying to reopen the entire case and they're trying to get their foot in the door with this particular information. I object to it being considered and discussed by this witness. I think that this phase of the matter shouldn't be included.

MR. HINKLE: If the Commission please, we did have new evidence at the time that the application was filed as far as the pressure production history is concerned. That's true we did not have the core analysis at the time it was filed. We didn't even then know it was going to be made, but in this investigation we determined that it should be made and

it is now presented as new evidence.

GOVERNOR CAMPBELL: Will your subsequent testimony reflect the additional new information that you had at the time that you filed the application?

MR. HINKLE: That's right, it will.

MR. HUNKER: If the Commission please, I would like to make one further comment. If you permit further testimony with regard to this core analysis you are going to open up the amount of pay that's in this particular well in the Wolfcamp formation. You are going to open up the matter of permeability of this particular pay, you are going to open up Pandora's box to an entirely new hearing on a matter that the Commission has hashed over a year ago and made a decision about.

You denied Pure's application at that time for 640 acres; they have not shown anything substantial to show that they're entitled to reopen this case, and we object to any further testimony with regard to this core analysis. They're trying to get their foot in the door, trying to go some place where they have no right to go.

MR. HINKLE: The purpose of this new evidence is to show that there is a complete new evaluation of this reservoir which the Commission did not have at the original hearing, and which in our opinion shows that it is an entirely different

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situation than the Commission had under consideration originally, and that it is necessary that this be considered now in order to protect correlative rights and see that this area is properly developed.

MR. PORTER: Mr. Hinkle, there was no core analysis introduced at the previous hearing?

MR. HINKLE: There was not. There was no core analysis made of the Wolfcamp core at that time.

MR. PORTER: Objection overruled.

MR. HUNKER: Will you note an exception?

MR. PORTER: Let the record show that Mr. Hunker noted an exception to the ruling.

Q (By Mr. Hinkle) Mr. Dunn, do you have the last question?

A No, sir. Was that in connection with Exhibit 2?

MR. HINKLE: Would you read the question, Ada?

REPORTER: (Reading) "Refer to Union's Exhibit No. 2 and explain to the Commission what it shows."

A I believe I completed my answer in connection with Exhibit 2.

Q Do you have any other analysis made in connection with any core after the core analysis which has been referred to as Exhibit No. 2?

A Yes, I do. I had the Residue Research Laboratory

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in Midland, Texas make a residue analysis. They were requested to make an analysis opposite each of the core plugs that had been cut and analyzed by Core Laboratory. They were asked to make additional analysis so that the complete examination would illustrate in fact the complete expression of the lithology of the core involved. This analysis simply consisted of taking a selected sample of the core, grinding it into a fine mesh, dissolving it in acid to remove all of the soluble carbonate material, and then examining microscopically the reamining residue to determine the percentage of shale in each individual sample, and the percentage of chert sand and other insoluble material.

This residue analysis was furnished us in graphic form, plotted on a log stripe; there was furnished a color code to explain the material that was analyzed. Exhibit No. 3 is a photostat of the log strip and a photostat of the symbol chart that was furnished to me by Residue Research Laboratory. This information was furnished to me and copies of it were sent to Mr. Ford of Gruy.

Q Did you turn over any other information in your possession to Gruy and Associates?

A Yes, sir, I did. I turned over the entire transcript of the previous hearing, I turned over all of the well information so that they may be able to utilize it in

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their examination of all the facts. I turned over to them the chips cut from the end of the plugs taken by Core Laboratory in order that they might make further investigation of them; in other words, I furnished all of the information that would be required for a competent geologist or engineer to make a complete analysis of this situation.

Q Are you familiar with the status of the Unit No. 1 well insofar as the Pennsylvanian production is concerned?

A I am.

Q What is the status of the well with respect to Pennsylvanian production?

A The well is not producing from the Pennsylvanian section. It is, in the opinion of everyone concerned, plugged mechanically in some manner so that gas is not coming to the string of tubing. Attempts have been made to check the tubing to the Pennsylvanian perforations, and they cannot get through the tubing below a depth of approximately 12,000 feet. There is no gas coming from the Pennsylvanian side and the well is not producing from this interval.

(Whereupon, Union's Exhibit No. 3 was marked for identification.)

Q And it's only producing from the Wolfcamp formation at the present time?

A That is correct.

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MR. HINKLE: That's all the direct examination.

CROSS EXAMINATION

BY MR. PRAY:

Q Mr. Dunn, on what date did you say that you employed Gruy engineers?

A I did not say, sir, what date I employed Gruy engineers. I stated that I visited Gruy engineers on April, the afternoon of April 28th.

Q What year?

A 1966.

Q Approximately how long was this after the filing of the application for reopening of this case?

A I don't believe I have the date of the application, sir, but it must have been three weeks.

Q It could have been March 23, 1966?

MR. PRAY: Does the secretary have the date of the filing of the application? We don't have a file-stamped copy.

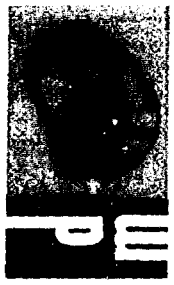
MR. PORTER: The case file should reflect the date.

A To further answer Mr. Pray's --

MR. PRAY: Excuse me.

MR. PORTER: The application for this particular hearing, Mr. Pray, was received in this office on March 25th.

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It was filed --

MR. PRAY: I believe the date it was received would be sufficient for our purposes.

MR. PORTER: I was trying to find the letter of transmittal.

Q (By Mr. Pray) The date of March 25th will be sufficient. That's approximately one month, Mr. Dunn, after your filing application that you talked with Gruy about making this study, is that correct?

A That is correct.

Q Mr. Dunn, do you have any knowledge of approximately when this well was cored in the Wolfcamp formation?

A I would like to refer to the well log, if you would like for me to obtain the exact date.

Q Would you do so?

A This core was cut on the 8-26th to 27th of 1963.

Q And what document are you reading from?

A I'm reading from the Core Laboratory mud log report on the Pure Oil Company No. 1 Red Hills Unit.

Q Approximately how long after that core was cut did you have it analyzed?

A Oh, approximately three years.

Q Could it have been analyzed prior to the date of the previous hearing?

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A It certainly could have.

Q But it was not, was it?

A No, sir.

Q How many feet of correction did you have to make in correcting this from the reported depth on the driller's log to the depths that you now show on this analysis?

A The depths that we now show on that analysis are the driller's depths.

Q Would you read me the depths that were cored from your report there, just the beginning and ending depth?

A Core No. 1, from 13,475 feet to 13,498 feet.

Q All right. The method you stated that these analyses were made were from plugs, is that correct?

A That is correct.

Q And these were not whole core analyses, is that correct?

A That is correct.

Q I direct your attention to the bottom of your Exhibit No. 2. "No permeability measurement made-plug fractured."

A That is correct.

Q Would this, then, mean that the entire core would have been fractured also?

A No, sir. It doesn't mean that the entire core

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would have been fractured also. It means that on these particular plugs which were in an extremely shaly section, in the process of cutting the plugs there were minute fractures in them and the Core Laboratory could not take permeability measurements.

Q You say it was in a very shaly section?

A That is correct.

Q In your opinion is this section representative of the entire Wolfcamp zone?

A No, sir.

Q Mr. Dunn, how was the core preserved for storage?

A The core was slabbed, placed in boxes.

Q Would you explain? I don't understand.

A It is common practice to cut a vertical cut along a core from one to two inches in thickness, to box it, in the length and in the manner in which it was originally taken from the well bore and placed in storage. We call this a slabbed core.

Q Was it sealed in any type of cans or any type of plastic container?

A It was not.

Q It was open to the atmosphere?

A That is correct.

Q Would the condition of the core at the time of the

analysis accurately represent the condition of the core when it was freshly cut?

A For the properties that have been analyzed, yes.

Q What properties were analyzed?

A The porosity, the permeability and the grain density. We did not attempt to make fluid analysis.

Q Mr. Dunn, did you furnish myself, Mr. Hunker, or any of the people with Kermit, Mr. Schuman and Mr. Yager, with copies of these core analyses?

A I did not.

Q Did you furnish us with copies of your residue study, Exhibit 3?

A I did not.

Q Did you furnish us with any copies of any studies made by Gruy?

A I did not.

Q Have you at any time made a statement to either myself or Mr. Hunker or the Kermit people that you were going to operate at this time under a procedure of full disclosure?

A This statement of operating under a full disclosure was prior to and when I had hopes that we could jointly get together and drill a 640-acre location in Section 5.

Q Has it been your unwavering position that 640 acres is the only way in which you wanted to proceed?

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A That is correct.

MR. PRAY: We respectfully request that all of the testimony shown on Exhibits 2 and 3 and all of his testimony pertaining to these exhibits be stricken from the record, for the reason that they had a full opportunity to present this same information at the time of the last hearing. For some reason they did not choose to do so. A period of almost three years has passed since this core was taken and now just a few days before this hearing they decided to have it analyzed, and one month after the application has been filed.

We submit that this does not constitute new evidence and, therefore, we ask that this be stricken. We believe that this is an attempt to rehabilitate the case they presented at the last hearing. They are trying to do now what they didn't properly do before. Apparently they're concerned about their testimony of last time, and we ask that it be stricken.

MR. HINKLE: Of course, the original case was put on by the Pure Oil Company. The Union has taken over the Pure, we have an entirely different set of attorneys, different personnel and so forth. Why they didn't have the core analyzed at the original hearing, we do not know. It was only after the engineer's suggestion that it be analyzed that it was analyzed. Now the opposition knew that the core was there because it was referred to in the previous hearing, and they

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could have had it analyzed as well as we could.

MR. PRAY: If the Commission please, I would ask Mr. Hinkle if they are now stating that Union Oil Company does not stand in the shoes of Pure.

MR. HINKLE: No, I am not saying that at all.

MR. PRAY: Then you stand in the shoes of Pure Oil Company for all purposes?

MR. HINKLE: I think we do, but I am explaining the circumstances here which we have entirely different personnel. We do not know why they did not have the core analysis made.

GOVERNOR CAMPBELL: Let's address our conversation to the Commission. It will be a little more orderly.

MR. PRAY: I would like to suggest that they do stand in the shoes of Pure Oil Company and that it's not legal grounds that there has been a change in management to reopen this case.

GOVERNOR CAMPBELL: Gentlemen, it seems to me that by the very nature of this Commission's activities and by specific language in all of their orders we retain continuing jurisdiction over matters brought before the Commission. I suppose that Union Oil Company could have filed a new application here and started from scratch without any legal objection. Here, they're simply saying that they have additional evidence they wish to offer. It seems to me the

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Commission should hear that evidence.

The reasons for it not being offered previously are pertinent here. I'm sure the Commission is interested in it. You will recall that the order in Case 3158 was based entirely upon a finding that the applicant then had not established that the proposed spacing would afford each operator the opportunity to produce his just and equitable share of the oil and gas. I think the Commission should hear what evidence there is to be offered, and if there are circumstances now that were not available then, that the Commission can, under its order, consider them.

We could spend a couple or three days arguing about each piece of testimony, as to whether it is new or old, and I think the Commission is just going to have to use its judgment and discretion in connection with how much weight we'll attach to any evidence that's offered here, just as we would do in any other case.

I would like to suggest, of course, the counsel should preserve their legal objection and right here, perhaps we can do it on a continuing basis, and then let the Commission go ahead and proceed with the case. You may have made sufficient objections up to now, but it's up to you, but we're going to have to decide somewhere along the line whether we are going to go ahead or whether we are not going to go ahead, and I feel we are obligated to go ahead.

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MR. HINKLE: We would like to offer in evidence Union's Exhibits 1, 2 and 3.

(Whereupon, Union's Exhibits 1, 2 and 3 were offered in evidence.)

MR. HUNKER: If the Commission please, we object to the admission of these exhibits, well, not to Exhibit No. 1, but we object to the admission of Exhibits 2 and 3 on the ground of the arguments here in this matter --

MR. PORTER: And for the reasons --

MR. HUNKER: -- as stated previously. I would like to make one further comment, if I may, so the Commission doesn't fall into a trap. In a case closely resembling the present one, the Supreme Court of New Mexico held that a second order of the Oil Conservation Commission which modified the original spacing order was void on the grounds that the Commission was without jurisdiction to enter the second order, Simms versus Mechem, 282 Pacific 2d, 183, a 1963 case.

The basis for the court's decision was that the Commission could not enter an order changing the existing spacing inasmuch as there was nothing in evidence tending to support a finding of waste or the prevention of waste by the forming of a spacing unit sought in the second order.

GOVERNOR CAMPBELL: I have some hazy recollection

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of that case.

MR. PORTER: If there are no further objections to the admission of the evidence, the Commission will admit the Exhibits 1, 2 and 3 into the record. Your objections are overruled.

(Whereupon, Union's Exhibits 1, 2 and 3 were admitted in evidence.)

MR. HUNKER: Will you note an exception?

GOVERNOR CAMPBELL: I might say also, if there had been any circumstances occurring with regard to the rights of the other parties since the entry of the other order, this also would be quite pertinent.

MR. HINKLE: We would like to call Mr. Ford.

MR. PORTER: At this time let's take a short recess.

(Whereupon, a recess was taken.)

MR. HUNKER: If the Commission please, in his opening statement Mr. Hinkle stated that this case was not designed to rehash the previous cases heard and determined by the Commission. We object to any testimony relating to the recent core analysis that Union has had made. Mr. Dunn has testified that the core was not representative of the Wolfcamp formation, consequently any further testimony regarding the core analysis should not be heard by the Commission at this time. It is wholly irrelevant, it is

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immaterial, and I don't believe the Commission should hear it.

GOVERNOR CAMPBELL: Will you please, I missed a sentence there, your objection to the core analysis as related to the Wolfcamp formation, I didn't get that.

MR. HUNKER: My statement was that we object to any further testimony relating to the core analysis which Union has had made since the filing of this case, for the reason that Mr. Dunn has testified that the core samples which were taken were not representative of the Wolfcamp formation; therefore, any further testimony with regard to the core analysis, since the samples were not representative, it seems to me the evidence is wholly immaterial, it is incompetent and should not be considered by the Commission as being something substantially new, at least for the reopening of the case.

We have no objection to them producing testimony with regard to the pressure surveys that have been taken, we have no objection at all to their making a suggestion to the Commission as to an exception with regard to the mineral owners in Section 5, but we would like to make a continuing objection without having to jump up every moment or two and interrupt the witness. We would like to make a continuing objection to any further testimony with regard to the core analysis, as we feel that it is wholly immaterial to the

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matter under consideration by the Commission.

MR. HINKLE: Regardless of Mr. Dunn's testimony; I don't recall that he said just what Mr. Hunker said he did, but the core analysis speaks for itself, and Mr. Ford, the next witness, will show the relevancy of the core in determining the net pay in the Wolfcamp zone.

GOVERNOR CAMPBELL: Your objection is overruled and the record will show that the objection goes to any and all testimony to the core analysis referred to in Exhibits 2 and 3.

MR. HUNKER: Will you note an exception?

MR. PORTER: Mr. Hinkle.

MARTIN E. FORD

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

DIRECT EXAMINATION

BY MR. HINKLE:

Q State your name and by whom you are employed and your residence.

A My name is Martin E. Ford. I am employed by H. J. Gruy and Associates, petroleum consultants, as a log analyst. I reside in Dallas, Texas.

MR. PORTER: Would you spell that name for us, please?

A M-a-r-t-i-n E. F-o-r-d, like the car.

MR. PORTER: Thank you, Mr. Ford.

Q (By Mr. Hinkle) Mr. Ford, have you previously testified before the New Mexico Oil Conservation Commission?

A No, sir, I have not.

Q Are you a graduate geologist?

A Yes, sir, I'm a graduate of the University of Cambridge in England, and I have an Honors Degree in geology.

Q In what year?

A I obtained the Bachelor of Arts Degree in 1948 and a Master of Arts Degree in 1954.

Q Have you practiced your profession as a geologist since your graduation?

A Yes, sir. Since my graduation I have been employed continuously as a geologist.

Q Would you give a brief history of your employment and the positions that you have held in recent years?

A From 1949 to 1951 I was employed by the Golden Base Metal Mines, Nguru, Nigeria, as an exploration geologist. From 1951 to 1955 I was employed as a subsurface water geologist by the Department of, Water and Irrigation of the Northern Rhodesia government. From 1955 to 1959 I was employed by the Ohio Oil Company, as it then was, it's now called Marathon Company, as a subsurface and as a well-site geologist, and was engaged part of my time in log analysis at

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that stage.

I left the Marathon Company and joined Kemp Petroleum Exploration, an oil company, and was employed as a well-site geologist, as a subsurface geologist, and as a log analyst. I left the Kemp Petroleum Exploration, their Dallas branch, in 1962 and joined H. J. Gruy and Associates and have been employed since that time by H. J. Gruy and Associates principally as a log analyst.

Q Have you attended any special schools with respect to teaching or studying electrical logs?

A Yes, sir, I have. I attended a Schlumberger logging school in 1957. In 1959 I attended a two-week course on formation evaluation given by Dr. Pierson and Mr. Jack Greenberg, they are both recognized experts in the field of formation evaluation, using log analysis, and have given this course in many places throughout the United States, Canada and the rest of the world.

In 1964 I attended a two-week course given by Dr. Hamilton in Tulsa. Dr. Hamilton is a very well-known and respected expert in log analysis. Late in 1964, H. J. Gruy and Associates prepared a manual of log interpretation for the instruction of some of their clients, and using this manual gave courses to clients in Bogota, Columbia, and in 1965, in Kuwait, in the Middle East, to instruct clients in the use of

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well logs, to interpret formation characteristics.

Q Was your company requested by the Union Oil Company to make a survey or study of the Red Hills Unit No. 1 Well?

A Yes, sir, they were. I was called into a meeting, if my recollection is correct, it was on April 28th of this year, at which a discussion took place regarding the characters of a log which we were shown on the Red Hills, the Pure Red Hills Unit No. 1 Well in Lea County, New Mexico; and discussion took place on this log and on pressure time information that was also presented to us at that time.

Q As a result of your study, have you prepared certain exhibits to show the results of your study?

A Yes, sir, I have.

MR. HINKLE: If the Commission please, we have placed on the wall Union's Exhibits 4, 5, 6 and 7, --

(Whereupon, Union's Exhibits 4, 5, 6 and 7 were marked for identification.)

MR. HINKLE: -- which I'll ask Mr. Martin to refer to in any order that he would like to refer to them.

GOVERNOR CAMPBELL: Mr. Ford.

MR. HINKLE: I mean Mr. Ford. I would like for him to give the Commission the result of his study.

MR. PORTER: You have a pointer there, Mr. Ford, which we would like you to please use in explaining your

exhibits.

A Thank you. After Union Oil Company had decided to employ us in this case, we requested all information that would have a bearing on the study that we were to make. In connection with this study I would like to say at this point that we have looked at the well logs that were available, that is logs recorded by the Schlumberger Log Corporation and Welex, and these were gamma ray neutron logs. We have looked at the gravity log and core-gamma logs recorded by Core Lab, we have looked at samples by Core Lab at the time the well was being drilled. We have looked at the residue after solution of the samples of the core in acid, we have looked at the slab core and at plugs cut from it, we have had thin sections made and have examined those.

Now, I would like to take a little of your time running over the characteristics of this log. I appreciate all that has been said previously about the testimony being introduced, but I do think it's relevant to what I have to say, and if you will allow me to do so, I would like to go through the characteristics of this log now.

Exhibit No. 7, which we have introduced, is a Schlumberger gamma ray neutron log on the Red Hills Pure No. 1 in Lea County, New Mexico, and this log was recorded on October 22, 1963. The principal features of this log are two

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traces or curves, one in the left-hand track is a depth track, marking the depth at which a particular response was recorded, and then in the right-hand track there is a neutron curve. The curve on the left-hand side represents the response of a detector sensitive to natural gamma radiation.

The natural gamma radiation results from the spontaneous disintegration of naturally occurring radioactive materials, and these materials, we have found from experience in this type of rock, occur principally associated with shales. The log shows excursions to the right and to the left; the excursions to the right show increasing natural gamma radiation as shown by the detector. The excursions to the left show decreasing.

The detector is on a logging string at the end of the cable and is inside whatever casing is present in the well and between it and the formation where the natural gamma radiation originates is such material as the cement which was run into the well to secure the casing.

An important point to note about this curve is that it is a record of a naturally occurring series of events, and in common with most other natural phenomena that we observe there is considerable variance, so even were we to hold the logging tool stationary opposite some point in the well bore, we would still see some variation because there is a randomness about this disintegration and we never can predict precisely

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how much disintegration will take place at any one time. We refer to this as a stick variation.

In interpreting this log we need to log at average levels of response in order to attach significance to the curve, perhaps in the amounts of shale present.

On the right-hand side is the curve that records the response of a detector, which is sensitive again to gamma radiation, but in this case it's sensitive to a much higher level of gamma radiation, which results from the bombardment of the formation with neutrons. A neutron source is carried in the logging tool, the neutrons move out from that source into the well bore environment, through everything that is associated with the environment, including the mud in the bore hole, the cement in the casing, through the formation, and the results of this bombardment is eventually the production of gamma radiation.

In order to have quite clear in our minds the significance of the extent of the excursions, it's important to consider the intermediate stage that occurs before the final capture, as it's called, which is attended by induced gamma radiation. Most of the capture, or the probability of capture, let's say, is very much greater when the level of energy of the neutrons is somewhat reduced, and this reduction depends principally on the amount of hydrogen present in the formation. So what

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we should think of is that this curve measures the amount of hydrogen in the rock. If there is no shale present in the rock, most of the hydrogen will occur in the fluids which are in the pore space. So if we could rule that there was no shale present we could argue, and if also we could rule that the bore hole environment remains substantially constant, we could argue this is a measure of porosity because it measures the amount of hydrogen which is present in the pore space; but when shales are present it's necessary to make a correction to the measured response in this curve in order to arrive at a value for the amount of hydrogen that is in the pore space and, therefore, to infer the amount of pore space.

As a means of interpreting this log, the logging companies provide interpretation charts which show the relationship between porosity and the response of the log; but because, as we've said, the response depends on the whole bore hole environment, there must be a separate chart for each bore hole condition, so if we have one size bore hole it will have a different response from the same rock in another size bore hole. So each chart has to lay out clearly what are the conditions to which it applies.

In this case here, there is no interpretation chart that closely proximates to these conditions, and consequently some other method must be devised for interpreting this

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response as porosity.

It has been found by experience and recorded by R. E. Bush of the Lane Wells Company that the response of the neutron log has a linear relationship to the log rhythm of porosity, so that if we plot the neutron log excursion against the log rhythm of porosity we can expect that there will be substantially a straight line. Whenever we have the straight line relationship it's only necessary to establish two points on the straight line to define the position of that line. So that if in this case we could establish some end points for the porosity neutron deflexion relationship, then we would be able to interpret the intermediate levels of neutron response in terms of porosity.

In terms of porosity, that is if we can make a correction for the amount of hydrogen which is present in the shale portion of the rock. Fortunately we have on the left-hand side of Exhibit No. 7 a curve which we have argued is principally dependent on the characteristics and amount of the shale. If, as is very generally the case, through a sequence of this kind the shale doesn't very materially change its character, then we can argue that this curve can be used to measure the amount of shale present, the apparent porosity due to the shale, and this can be subtracted from the total apparent porosity, which includes the effects of the shale on the right-hand side, the neutron curve in Exhibit 7, we can

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subtract the shale effect from the total effect and arrive at an estimate of the pore space. This would be the best, in most cases, method of interpretation of a log of this kind.

We would be disinclined to place any great reliance in that kind of an interpretation unless there was some supporting evidence to show that our estimates were within a correct order of magnitude. In this case, after discussion with our clients, we decided that such supporting evidence was essential and we asked what core there was for this well, we were told that there was a section of core from 13,475 to 13,499, and we requested that this be analyzed. We requested also, in order that we might evaluate the characteristics of the shale, to determine what sort of representative effect -- allow me to correct myself, what sort of representative apparent porosity would be associated with it, we asked that we should make a residue analysis on the sections of the core.

We also, in order to determine estimates of the amount and character of the other minerals in the core, made thin sections. Before we could use the core to check our measurements, to check our calibration of the neutron curve in terms of porosity, we had to determine what position on the depth scale recorded in the Schlumberger gamma ray neutron log, Exhibit No. 7, what position it should occupy. That is, we had to make a depth correlation between the core depths,

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which were driller's depths, recorded at the time the well was being cored, and the log depths which were recorded by the logging company.

One method of doing this is to make a record of this natural characteristic of the rock, the natural gamma radiation level, and this can be done by Core Laboratories, and they call their record a core-gamma correlation, and two such records are shown, Exhibits 5 and 6.

Exhibit 5 is a core-gamma which was recorded on the whole core at the time very s-ortly after it was removed from the well. The dates of this record is shown on the heading, and I cannot read it from this position, but each of you, I believe, has a copy of this record, and if you consider that relevant, would you refer to the heading on that log?

This response, this natural gamma radiation should be considered an identifying characteristic of the rock. It might almost be considered the rock's signature, it is something that is also associated with it, but the actual form of this response does depend to some extent on the recording instrument, so this you might think of as the sort of natural variance that occurs from one signature to another.

There is also, of course, the additional variance that is due to the random nature of this radioactive process. So here we have signatures, and by comparing them we might be

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able to decide whether it is very probable that these are the same pieces of rock, that is that there was no substantial rearrangement of the core between the time it was cut and the time at which we looked at the slab section of it.

Q May I interrupt you a minute? State to the Commission when the core-gamma shown by Exhibit No. 6 was made. You explained that 5 was made at the time the core was taken from the well, but when was No. 6 made?

A The date shown on the record, which is Exhibit No- 6, and is the core-gamma correlation on the slabbed core, is 5-5-66. We may then compare the characteristics of the core, of the natural gamma radiation of the core in order to decide if there has been any substantial rearrangement of this core.

We are confident on the advice of the Core Laboratories' personnel, that no such rearrangement has occurred, because the original core carried depth identification marks, and some of these were still visible on the core, but this is additional information which serves to confirm that point.

Now, I have here a replica of the core-gamma curve recorded on the slabbed core. You can see that this is a precise copy of the curve part of Exhibit No. 7, and shows the principal depth point.

If you will now allow me to lay this beside the

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core-gamma curve for the whole core, which is Exhibit No. 5, and you can see that there is good correspondence between the two, that the principal features which are a leftward excursion, the natural gamma radiation in the upper part down to the section at 13,484, that shows a leftward excursion, and the lower part shows a right one or increased level of natural gamma radiation.

GOVERNOR CAMPBELL: How do you determine -- obviously there have been changes. They are obviously not identical. How do you determine the magnitude and significance of those changes?

A The amount of the variance is a function not only of the rock but also of the measuring instrument. There is normally very little space between the recording instrument and the whole core when the response recorded in Exhibit No. 5 is made; but since the slabbed core is much smaller in cross section and can't be brought as close to the instrument, then the instrument is, in effect, less sensitive, so that we would expect to see less prominent features, less clearly-defined in the case of the slabbed core response than we would in the case of the whole core. But we would also remember that this is a natural-occurring phenomena and that there is an unpredictable variation due to this fact.

Now, taking this signature of the slabbed core and applying it to Exhibit No. 7, which is the gamma ray neutron

log --

GOVERNOR CAMPBELL: Is it your opinion that the differences reflected on those two correlations do not indicate significant changes in the composition of the core--

A No, sir.

GOVERNOR CAMPBELL: -- during the period of time involved?

A No, sir.

GOVERNOR CAMPBELL: You think you can make a fair comparison at the time the core was taken and the core in May 1966?

A Yes, sir, this is something, as I tried to describe in the analogy with the signature. This is something which stays with the rock and unless you remove from it some of that part which is principally responsible for the natural gamma radiation, then it will retain the characteristics.

GOVERNOR CAMPBELL: Forever?

A This undergoes a very gradual decline in intensity, the rate at which this occurs is described as a half life, and this may be as long as thousands of years within which the intensity of the radiation will decrease, but even when it decreases in that way there still will be the relative differences between the various parts which contain greater and lesser amounts of shale.

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MR. PORTER: You are talking about a decrease in the bombardment of your gamma ray?

A Yes, sir, this is the natural disintegration of those unstable minerals that we refer to as radioactive minerals.

GOVERNOR CAMPBELL: It doesn't make any difference if it is in a box or tin can?

A No, sir.

GOVERNOR CAMPBELL: Sealed or unsealed?

A No.

GOVERNOR CAMPBELL: Submerged or dry?

A The only thing that would make the difference would be if some of the shale contents were removed from the rock. On inspection we had no fact to believe this had taken place because it was a well-impacted, well-contained cemented rock. We also found as a result of the residue analysis that the shale was quite calcareous, the whole core has a carbonate content of the order of 30%, 20 to 30%, and this made it well-cemented type of rock which was not likely to disintegrate in the core analysis. It certainly didn't have the appearance of disintegration when we looked at it.

The core was, in fact, broken up in places, but this is almost inevitable in the process of withdrawal of the core from the core barrel, the very process of cutting the core, which

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subjects it to unusual stresses, and the process of cutting the slab. Unfortunately these boxes are likely to be dropped, so this will further break up the core.

This core will exhibit, the slab core, exhibit a number of fractures in the final stage that we were able to look at it. It is my opinion that just as one man's signature from time to time may differ, visually, and sometimes it takes an expert to determine if that signature has differed from time to time. It is my opinion there's no evidence here to suggest that the response recorded in Exhibit No. 5 is not comparable and compatible with the level of responses shown in Exhibit No. 6.

Now, taking the replica of Exhibit No. 6, the core-gamma on the slabbed core, and applying it to the curve on the left-hand side of Exhibit No. 7, which is the natural gamma radiation curve recorded by Schlumberger, in the well bore we see that this is corresponding, and whereas when comparing Exhibits 5 and 6 we saw that there were basically the same type of features, that there was the movement to the left in roughly the same place and the movement to the right, allowing for the natural variance that is the characteristic of this disintegration process. When we look at the correlation without any depth correction on Exhibit 7, we see that the features are, in fact, directly opposed, that when the gamma curve

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indicating increased level of radiation on the Schlumberger log is moving to the right, the other curve is moving, the curve representing the natural gamma radiation for the slabbed core is moving to the left.

We could move this core up a bit on the assumption which has been indicated to us by our experience as a very reasonable one, that there won't be precise correspondence between the depths recorded by the logging company and the depths recorded by the driller at the time the core was being cut.

The logging company's depths are measured by odometer, which is operated by the logging cable as it runs on to the reel, and considerable precaution is taken to insure that this very closely corresponds to controls to calibration standards that are applied by the logging company.

The depth as measured by the driller is made with the drilling string and it is measured in stands as it comes out of the well with a tape, and it is not at all surprising that with this type of measurement some small differences crop up and, in fact, are almost invariably found, so that it is not a matter of any great surprise to us on the basis of our experience that we should have to make a correction between the two depth scales.

We could move the log upwards and find that we have the

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agreement in the upper part, down to 13,484 on the core-gamma, but below that we see a fairly constant variation, so that we could draw a representative line which would be fairly straight through that section, but we couldn't draw a representative straight line through the remainder of the natural gamma radiation curve on this Schlumberger log. So we would argue from that lack of disagreement that probably that's not the correct correlation in depth.

If we move this down so 13,475 of the core-gamma on the slabbed core, Exhibit No. 6 corresponds with 13,480 on the Exhibit No. 7, the Schlumberger gamma ray neutron log, then we see that there is a fairly good agreement that the strong movement to the left, indicating decreased level of gamma radiation, is found also on the schlumberger log as well as on the slabbed core-gamma, and we find that the rather indiscriminate variation, the rather indefinite variation of the core-gamma in the lower part below 13,484 at its driller's depth corresponds to somewhat similar features on the Schlumberger natural gamma radiation curve; so that we feel that the correlation of the slabbed core to the depth as measured in the Schlumberger gamma ray neutron curve would require an addition of five feet to the depth measurements of the core.

When we make this correction and have located the position

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of the core as now being from 13,480 to 13,504, using the depth scale of the log, we can check whether our empirical interpretation of porosity from the gamma ray neutron log is a reasonable one or is not. And on the basis of this comparison we found that our interpretation was a reasonable one.

Q (By Mr. Hinkle) Mr. Ford, have you indicated the proper location of the core on Exhibit No. 7, is that the part that you have shown in blue?

A The section marked in blue on Exhibit No. 7 is the correct position of the core as referred to the depth reference on that Schlumberger gamma ray neutron log. Now we feel that this correlation is a good and reliable one, but we are fortunate in having some additional information. We recollect that the response of the gamma ray curves, both the induced curve as indicated by the neutron, the right-hand curve in the gamma ray neutron log and the natural gamma radiation, the left-hand curve, do depend on the bore hole environment, and if we find a consistent and persistent change in this environment we might look for and expect to find such a change in the level of response of these curves.



Now, if you'll look again at Exhibit No. 7 you will see that such a change in the level does occur. We would expect to find this change most noticeable in that part of the

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rock which has fairly consistent and predictable characteristics as regards this particular property, the natural gamma radiation, and so we would look at the shale and we would look at the average level towards the maximum amount of shale or the minimum excursion on the neutron curve, the maximum excursion on the natural gamma radiation curve, and try to decide whether such a change in average level does occur.

Looking down this curve we find that such a change does occur between 13,468 and 13,480, and on the gamma ray side we find that there is also a change of the average level of natural gamma radiation, and this in turn can serve as a means of determining where the core should be located, because the records show that the bore hole size was changed at the time that the core was cut.

If you will now look at Exhibit No. 4, this records this information, and Exhibit No. 4 shows that the bit size down to a driller's depth of 13,475 was 12-1/4 inches and the final size of the hole beyond that point was 9-1/2 inches. There is, therefore, a change of hole size at the driller's depth of 13,475, and we are able to locate on the gamma ray neutron curves shown in Exhibit No. 7 that such a change should occur between 13,468 and 13,480. A placement of the core at 13,480 to 13,504 is therefore confirmed by this additional

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observation. With the placement, correct placement of the core, with the agreement between the predicted levels of porosity and those found in the core, we feel that our interpretation of the neutron curve in terms of porosity is a reliable one, as reliable as this type of log will permit. This type of log in these circumstances.

We, therefore, feel justified in applying a similar method of calibration to the upper section of the log, which has a different hole size, a different environment, and therefore, can be interpreted with the same calibration as the one in the lower part below the 13,475 driller's depth.

We feel justified in applying the same system to make the calibration in the upper part. As a result of this type of investigation it is our opinion that the porosities which we have measured are the most reasonable that can be derived from this record. The gamma ray neutron curve, if it is the only record in the bore hole, cannot lead us to the determination of what is potential reservoir rock from which hydrocarbons can be recovered and what is not. There is no method by which we can determine what is the character of the pore fluids with this log combination in these circumstances.

So we must use other criteria for deciding what is the net pay and what is not. The records show that while the well

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was being drilled with a relatively light mud of the order of 9.5 pounds per gallon, which would exert a hydrostatic pressure at the depth of 13,400 to 13,500, of the order of let's say 6,700 pounds while the well was being drilled, under these conditions no very appreciable quantity of hydrocarbons was produced, that despite the fact that pressures abnormally high for this depth of the order of 11,300 pounds was subsequently measured in the formation which was found to produce.

Because of the close association of this section that I have exhibited in Exhibit No. 7 with the producing section, and because it seems to be a fairly uniform geologic environment, we feel justified in inferring that pressures of the reservoir rocks capable of producing hydrocarbons in commercial quantities are likely to be comparable.

We feel it reasonable to infer that we should expect pressures of the order of 11,300 throughout this section and, therefore, we should expect that during the drilling of the upper part of the section from 13,250 to 13,475, during which time the mud weight was of the order of 9.5 pounds, we think there should be a considerable excess pressure in any potential reservoir rocks, and that, therefore, their contents should move under this considerable excess pressure into the bore hole and that the well under these conditions would be likely to



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blow out of control. In fact, this didn't happen until a depth of 13,471, and we would, therefore, infer from this information that there are no commercial reservoir rocks above 13,471. The well was drilled on down to 13,475, at which time it very nearly went out of control, and steps were taken to regain control by increasing the mud weight, and from that time onwards a much heavier mud exerting a much greater pressure at the formation face was used; and we can't use the same criteria, that is the absence of movement of fluids from the formations into the bore hole, to infer what is effective reservoir rock and what is not.

What we have to do is to look at the general characteristics of the rock as indicated by the log response and decide whether it is similar to other types of rock which we have been able to evaluate by this other criteria. On these bases we have picked the sections which are marked in red on this exhibit as being those which are most likely potential reservoir rocks. The total thickness of that section that we have selected is 25 feet, and on the basis of our calibration of the neutron log we estimate that its porosity is of the order of 4.8%. We do not have any way of measuring the level of saturation in the pores, but our experience leads us to expect that in this type of rock it will vary from 20 to 30% water saturation, and that 25% water saturation is a

reasonable and representative figure for that parameter.

Q Mr. Ford, are your conclusions with respect to the net pay different from those which were previously made?

A Yes, sir. I have looked at some given previously and I find figures as high as 80 feet given as the net pay for this well. My figure, as I have shown, is different from that.

Q Could you find anything in your study which would substantiate any greater porosity and permeability zones than you have shown?

A No, sir, this is our best opinion of what is the net pay in this well.

MR. HINKLE: We would like to offer in evidence our Exhibits 4, 5, 6 and 7.

(Whereupon, Unions' Exhibits 4, 5, 6 and 7 were offered in evidence.)

MR. PRAY: Object to the introduction of these exhibits for the reason that they are based on information which was available at the last hearing but not adduced. We would further object to the introduction as being an attempt to rehabilitate that information, that he has used the same data, the same logs which were presented at that time and is trying, in fact, to impeach the testimony which they presented at the last hearing themselves. We would object to the

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introduction.

MR. PORTER: The objection will be overruled and the exhibits will be admitted to the record.

(Whereupon, Union's Exhibits 4, 5, 6 and 7 were admitted in evidence.)

MR. HUNKER: Will you note our exception?

MR. PORTER: Yes, your exception is noted. Mr. Hinkle.

Q (By Mr. Hinkle) Just one other question of Mr. Ford. Do you have the plugs that were cut from the core on account of which this analysis was made available for examination?

A Yes, I have.

MR. HINKLE: That's all the direct examination.

MR. PORTER: Mr. Pray, the witness will be made available for examination. At this time I think we should take a recess for lunch. We'll recess until 1:15.

(Whereupon, a recess was taken.)

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AFTERNOON SESSION

MR. PORTER: The Hearing will come to order please. Mr. Ford is now available for cross examination. Does anyone have a question?

MR. PRAY: I have a question, if it please the Commission.

CROSS EXAMINATION

BY MR. PRAY:

Q Mr. Ford, I direct your attention to your Exhibit Number 7, is it correct that you have not picked any pay opposite what core interval you show there?

A That is correct.

Q In other words, there is no pay shown opposite the core?

A Correct.

Q Is the core then representative of any of the pay section in this well? Yes or no, if you please.

A No.

Q Mr. Ford, do I understand your testimony to be that you have picked no pay above the depth of 13,468 feet?

A You refer to the logging depth?

Q I refer to the depth shown on your Exhibit 7.

A That's correct.

Q In other words, there is nothing in the upper part

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of the Wolfcamp which you have picked as pay above that depth?

A There is nothing.

Q Do you happen to know what the top of the Wolfcamp is as picked by Pure Oil Company geologists?

A No, sir.

Q Mr. Ford what, in your opinion, is the porosity of the pay zone which you have picked there as shown on your Exhibit 7 from 13,468 to 13,473? Is that the pay zone you have picked there shown in red?

A Yes, sir.

Q What is the porosity of that zone?

A It is about five to six per cent porosity.

Q Five to six per cent porosity. What is the permeability of that pay section?

A I have no way of knowing.

Q You have no way of knowing?

A I should add on the basis of the examinations I have made.

Q Would you have any estimate at all?

A No, sir, but I believe an estimate might be made.

Q How would that be made?

A I think it would have to be made on the basis of pressure studies.

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Q Are you aware that there was a drill stem test run in the Wolfcamp zone from the depth of 12,938 to 13,499?

A Yes, sir.

Q Where would that bottom depth be on your chart, would you point that out, please? 13,499?

A 13,499 would be 13,504.

Q How much pay does that include in that zone?

A Five feet as picked by me.

Q Five feet?

A Yes.

Q You haven't picked any other pay above that?

A No, sir.

Q Do you know what the rate of flow was on that drill stem test?

A I don't recollect the precise rate but I believe it was of the order of 12,000,000 cubic feet a day.

Q That's correct; and that, you say, came all from that five foot zone?

A Yes, sir.

Q In your opinion?

A Yes, sir.

Q What sort of permeability would this result in for this pay zone if you were to computo it,based on the pressures from this test and the rate of flow and the thickness of

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your pay?

A I didn't use that information. I didn't make such a calculation.

Q Could you?

A I believe I could, yes, sir.

Q How long would it take you?

A An hour or so.

Q You are familiar with the type of core analysis which was performed on this core?

A Yes, sir.

Q Did you actually perform the analysis or was it performed by another independent service?

A It was performed by Core Laboratories.

Q You didn't participate in that?

A No.

Q Isn't it correct that the type of core analysis that was performed would measure only the matrix porosity and would not measure any fracture porosity or any fracture permeability?

A In as far as the presence of major factors might result in the disintegration of the core, that's correct.

Q Isn't it just correct that the type of analysis which you made wouldn't take into account any formation fractures insofar as determining the porosity or the

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permeability from those fractures?

A It would take into account the hairline fractures in the core.

Q But the minute fractures?

A Yes.

MR. PRAY: No further questions.

MR. PORTER: Did anyone else have a question of the witness?

MR. HINKLE: I have one more question.

REDIRECT EXAMINATION

BY MR. HINKLE:

Q Based upon the evidence to which you have testified today, could the top of the core be below 13,480 feet on Exhibit Number 7?

A Below that depth, no, sir, I believe that the point at which we have it is the best position. The reason I say no is because we have this change of hole size and with it, associated with it is the change of level of natural gamma radiation associated with the shales. So, we see that change in general level between 13,468 and 13,480, so that we would have to place the top of the core somewhere in that interval.

MR. HINKLE: That's all.

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RECROSS EXAMINATION

BY MR. PRAY:

Q In connection with the existence or nonexistence of pay zones above 13,468, did you have the opportunity to examine the so-called Core Lab grapholog, or sometimes referred to as the mud log,on this well?

A Yes, sir. I did look at that.

Q Did you happen to notice whether or not there were any kicks on this log indicating the presence of gas at zones above 13,480?

A Yes.

Q Yet you still pick no pay?

A No, sir.

MR. PRAY: No further questions.

REDIRECT EXAMINATION

BY MR. HINKLE:

Q Why is that?

A Why did I not pick any?

Q Yes.

A Because the well still remained substantially under control even though we would expect a very excessive pressure in the formation.

GOVERNOR CAMPBELL: Do you base your conclusion that there was no pay, is no pay above that point entirely

upon the response of the well during the drilling process, is that correct, that it didn't blow out at a higher zone?

A Yes, sir.

MR. PORTER: Anyone else have a question?

MR. HINKLE: That's all of this witness.

MR. PORTER: The witness may be excused.

(Witness excused.)

MR. PRAY: For the purposes of the record, I would like to move that all the testimony and all his exhibits be stricken as he has testified that the core analysis is not representative of any of the pay zones and we think that all of his testimony is therefore irrelevant, immaterial and has nothing to do with pay picks.

GOVERNOR CAMPBELL: He has testified it is in the Wolfcamp?

MR. PRAY: He certainly has.

MR. PORTER: Your motion is overruled, Mr. Pray.

MR. HUNKER: We would like to note an exception.

MR. PORTER: Your exception will be noted.

MR. HINKLE: Our next witness is Forrest Garb and he is also with the Gruy Engineering Firm, and he will also deal with some new evidence in the pressure build up and the production history.

(Whereupon, Exhibits 8, 9, and 10 marked for identification.)

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F O R R E S T G A R B, a witness herein, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. HINKLE:

Q Your name is Forrest Garb?

A Yes, sir.

Q Have you previously been sworn?

A Yes, sir.

Q Where do you live, Mr. Garb?

A I live in Dallas, Texas.

MR. PORTER: Will you spell your name for us?

A Yes, sir, F-o-r-r-e-s-t G-a-r-b, Garb.

MR. PORTER: That's what I thought he said.

Q (By Mr. Hinkle) By whom are you employed, Mr. Garb?

A Union of California came to our -- Oh, you mean by whom am I employed?

A Yes.

A I work for H. J. Gruy and Associates, Incorporated, a Dallas consulting firm.

Q Are you one of the officers in that company?

A Yes, sir, I am Executive Vice-president.

Q Have you ever testified before the Oil Conservation Commission of New Mexico?

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A Not in the State of New Mexico, no, sir.

Q Are you a graduate engineer?

A Yes, I am.

Q What school, what degree?

A I graduated from Texas A and M University in 1951 with a B.S. in petroleum engineering, and I hold a professional Master's degree from Texas A and M University in 1963.

Q Have you practiced your profession since graduation?

A Yes, sir.

Q In what capacities have you served, with what company have you been associated?

A Upon graduation I spent two years in fuels and lubricant research for United States Air Force. Upon leaving the Service, I joined Socony-Mobil International and was assigned to their off-shore production in off-shore Louisiana and was eventually assigned to their Eastern Venezuelan operations. I spent some off and on eleven years in Venezuela with the Mobil. I joined Mr. Gruy in 1957 and was made an officer in the firm in 1960, and Executive Vice-president of the firm in 1961.

Q What has your work with your firm consisted of since 1957?

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A Since joining Mr. Gruy, I have principally been involved in reservoir engineering and in digital computer applications to petroleum engineering problems.

Q Have any of the properties which you have made a study of been in New Mexico?

A Yes, sir. I was in charge within our shop of the study that was prepared for the Pan American properties in New Mexico when they were sold. I was in charge of the study in our shop for all of Delhi-Taylor, New Mexico properties when they were sold, and I was in charge of the study in our shop during the study for Texas Pacific Oil Company's properties in this State.

Q Were you requested by the Union Oil Company to make a study to determine the gas initially in place in the Red Hills Pool, the Wolfcamp Pool?

A Yes, sir, we were so commissioned.

Q Did you make such a study?

A We have prepared, to the best of our ability, the study of your estimates.

Q Of what does that study consist?

A Basically, we have performed analyses of pressure production data available for this one well and have prepared on the basis of these analyses, a material balance for estimating the gas initially in place in this reservoir.

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Q As a result of your study, you have prepared a number of exhibits which are shown on the wall; eight, nine, and ten?

A Yes, sir. We have prepared these exhibits.

Q What method have you used in determining the amount of gas in place in the reservoir?

A We have assumed this to be a finite reservoir and have made an effort to analyze pressure transient tests to conclude what the average reservoir pressure in the reservoir after several production periods was, as indicated by these transient tests and then by relating these pressures to the withdrawal from the reservoir, have estimated the initial gas in place in the classic pressure divided by gas deviation factor versus cumulative production technique.

Q The method that you speak of, has it been generally accepted by the industry?

A Yes, it has. Of course, the pressure cumulative production technique is a very old accepted procedure. Build-up curve analyses have, since 1951, been more and more accepted till today they have reached general acceptance in our industry.

Q Would you explain to the Commission this pressure build-up method briefly and concisely?

A I'll try. With the Commission's permission, this

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subject of pressure transient testing, I think I can best describe it perhaps, through the use of an analogy. The data we use to make this calculation is obtained by placing a pressure recording instrument on a well, either at bottom hole or wellhead, much preferably at bottom hole, and recording the pressure profile at the wellbore during a period of production as the well is opened up, or by recording the pressure buildup in the wellbore during a shut-in period after a period of production. By analogy, changing the production in the well causes pressure transients to move outward, away from the wellbore into the reservoir, just as if when you throw a brick into the swimming pool, ripples would move away towards the boundaries of your swimming pool.

These ripples move through the formation at a speed that is determined by the permeability of the formation and the fluids contained therein, the viscosity and basic. If we know then the pressure profiles as we have observed them with these recording instruments, and we know the mathematical representation for fluid flow through a porous media, we can compute rock properties if we have a reasonable approximation for fluid properties.

Moving to a plot then, of the actual data, the normal and classic procedure is to plot for gas wells the square of the pressure observed versus the log of a time

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function and this time function is the time the well has been shut-in. These are all build up curves, there are no draw-downs here, so we'll talk about only build up and only gas.

Q Will you please refer to the Exhibits?

A Yes, sir. All of the Exhibits are plotted similarly. The time function is the time shut-in divided by a psuedo-time flowed plus the time shut-in. For this time function, then, to equal one, one would have to have the time shut-in value equal to infinite, thereby, if one takes a short period of build up in a classic example, determines the slope and extrapolates it to a value of one on any of the Exhibits, he theoretically would be shutting in the reservoir, or seeing what the reservoir would result if it were shut-in an infinite period of time.

This is particularly useful in low permeability zones where it is not economic to shut-in a well, for instance, in the San Juan Basin, over a year in order for that well to stabilize. You can then, within reasonable lengths of time, derive some data with which you can do engineering calculations. From this type of plot, then, we would expect a profile and we hope we would be able to determine from that profile certain meanings; the mathematics of this fluid flow through a porous media indicates that a straight line would be achieved with the reservoir an ideal reservoir, that is, constant thickness,

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homogeneous, radial pattern, the ideal reservoir that everyone likes to work with and we never have.

Any deviation from this straight line portion has meaning, and if we are fortunate, we can determine what this meaning is. For instance, if I may, I would like to show you what some of the meanings might be. The theories and equations tell us that the straight line would be an ideal reservoir, and the longer that the time we observed in our testing, the further out would be our ripple in the swimming pool; so therefore, the further away from our wellbore our pressure transient is investigating, if you would like to say, and if an irregularity occurs and we see this on our curve, again through the equations we can solve how far out that ripple was, and conclude with some accuracy how far away from us that irregularity or discontinuity was.

Furthermore, experience and theories have shown us how to evaluate some of the profiles to determine just what that irregularity is. If I may, I'll show you some of the classic irregularities, and then we'll try to explain the specific ones that we have observed in this well. If we will recall, if it is straight line, we had an ideal; if it continues out to one, with no straight line with no bend-over as is observed from D to E on Exhibit 8, it would represent an infinite reservoir. If, in the early stages of the well

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there is a belly downward, this is referred to as a concave upward bolly before a straight line portion as is observed from A to B on Exhibits 8, 9, and 10; one can conclude that that is the closest area to the wellbore and if it is lower than the straight line portion, having a steeper slope, this represents a poorer permeability in the vicinity of the wellbore, and is generally considered to be either damage in the vicinity of the wellbore due to completion practices, or is afterflow into the wellbore due to the fact that we are unable to close the well in most of the time at the bottom of the hole, but rather close it in at the top of the well, and the formation doesn't immediately close in, continues to bleed into the wellbore, until such time as the wellbore pressure is significantly the same as the sand face pressure at the bottom of the hole, discounting for gradient.

Therefore, one can conclude if he observes a belly downward before a straight line portion, there is damage and afterflow; if the well had exhibited a line above the straight line portion, it would have shown that the well had been acidized, or fractured, or enhanced.

Now, classicially, the equations show us that if the reservoir is bounded, and that we have depleted a portion of the energy in the reservoir instead of continuing on a straight line it gradually bends downward as is shown on B to

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E in Exhibit Number 8. This would represent a bounded reservoir, one which our ripples in the swimming pool had reached all areas, all four walls of our swimming pool, if you like. Furthermore, our theories tell us that if the ripples, we threw the brick closer to one edge of our swimming pool than the other, and the ripples hit the boundary and are reflected backwards, you've seen the ripples hit the pool and then they start going back out again, when they get to the wellbore they cause this curve to kink again. This time, the curve which reflects a transient reached on one side only, not completely surrounded will cause the curve to have an inflection upwards, if, as in the case of the swimming pool, the fault is a straight line having no curvatures, or if the boundary is a straight line in the instance of a permeability pinchout, rather than a fault, you would find that the mathematics tell us that slope should be exactly twice the slope of the curve prior to being affected by the boundary.

If we hit a second boundary, the slope again will double. Other things we can tell from this profile, if we hit an interface between two fluids, for instance, we are dealing in a gas reservoir, were we to observe on water contact or a gas-oil rim, or, in the case of oil, an oil-water contact, for that matter, against the transmissibility, the ability of this wave to go through the formation will be

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altered, and this alteration will reflect itself in the profile of this plot. The slope will change roughly in accordance with the change in viscosity of the fluids at the interface. Actually, it's the mobilities, the permeability over the viscosity, but it will be roughly in the order of, say, eight to ten times the slope change as a fault, or a boundary reflects two times the slope change.

All of this theory, gentlemen, that we have just talked over, is for a homogeneous, ideal reservoir; if we have a layered, stringered heterogeneous reservoir, as is the case, and as reflected by Mr. Ford's previous testimony, there are other considerations to take, and these considerations have been published.

There are several technical articles by Matthews, Brons, Hazebroek of Shell Development Company, by Lefkovitz, et al of Shell Development Company, by Miller, Dyes, Hutchinson of the Atlantic, by Dr. Norman Lamont, previously of the Atlantic and now with Texas Pacific Oil Company. The work that these gentlemen have published indicate that in a two-layered system, such as we have interpreted the zone, one would normally expect a profile to reflect the two-zone nature. Though I have previously mentioned that bottom-hole analyses are greatly preferred, in this instance the analysis or the transient test that we have with the longest

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duration was the test number three that is reflected in our Exhibit 8 performed 8-7-65 to 8-31-65, we have performed a calculation to transfer the wellhead pressures to the bottom-hole pressures and have plotted it, because we believe the profile that it presents describes the characteristics of the profiles that we would see were we to have bottom-hole tests of this duration. However, we have leaned more heavily on the bottom-hole calculations in forming our opinions, allowing the wellhead test to merely describe the family curve to define what we think these anomalies are. These technical articles that we have mentioned tell us that in a two-layered zone as we have evaluated the Wolfcamp in this well, one should expect either from zero to A as is reflected in Exhibit 8, the immediate vicinity of the wellbore, a period of A to B when both zones, both stringers are in unsteady state of flow. This means the rings going outward from the brick for both zones have reflected no boundaries. They are not seeing a bounded case, and you recall now, we have thrown a brick which simultaneously has gone into two swimming pools, and we have two sets of transients moving outward in what we interpret to be two separate zones, and they are going outward, possibly at different speeds because they have different permeabilities.

This is shown in our analysis both from Mr. Ford's

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previous mention and also in this pressure analysis. They support one another. We see the straight line portion from A to B, which represents this unsteady state from both zones. At point B, we detect a downward deflection which represents the point where the zone with the greatest transmissibility is feeling the boundaries. It gradually then flows less and less percentage of the total flow rate into the bottom of the hole, until such time as the tighter zone, or the zone with the lower transmissibility is generating the majority of the energy which is reflected at point C, and thereafter the pressure buildup is basically from C to D, basically attributable to the tighter zone, and it is masked for calculation purposes to a large degree by the fact that during the production, the better zone produced more of the gas, drew down further, had a lower average pressure.

When we shut the well in, now that the tighter zone is beginning to yield its energy, it not only fills back the wellbore, but it possibly begins to recharge the other zone which has been depleted to a larger extent. At point D, which was the termination of the test, we have made calculations that indicate the other zone probably would begin to feel the reflection of the boundary and it should yield a theoretical profile as we have presented from D to E on Exhibit 8.

I will support that in a moment. Using this

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information as our general family curve, we found almost an exact duplicate in literature. We have placed that duplicate that is entitled "Theoretical Buildup Pressure Curve for a Two-Layer Reservoir", and have marked it in a similar fashion. This Exhibit is taken from a paper by Lefkovitz, et al. "A Study of the Behavior of Bounded Reservoirs Composed of Stratified Layers" published in the transaction of AIME in 1961, Volume 222, Page 43.

Q The insert you referred to is in connection with Exhibit Number 8?

A Yes, sir. It is attached to Exhibit Number 8. These gentlemen are with the Shell Development Company. And the similarity between the curves we have presented and the ones in the literature are obvious. Based upon these calculations, or based upon these theories, we attempted with four separate transient tests made available to us, to evaluate the average pressure within this reservoir at the several dates of testing.

We have mentioned that we can see the anomalies but we also should mention that this procedure enables us to estimate an average pressure in the reservoir, and we attempted with two bottom hole pressure transient tests, and two wellhead transient tests to make average pressure determinations. The results of our calculations are in Exhibit 11.

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(Whereupon, Union's Exhibit 11 marked for identification.)

A Before undertaking to describe the results of our calculations, I would like to point out that Exhibits 9 and 10 are bottom-hole transient tests, Number 10 is the latest one, and because there has been the most information available to us due to chronologically it being the latest test, we have selected the test represented in Exhibit 10 for our sample calculations.

MR. PRAY: Excuse me, could I ask you to identify for me Exhibits 8 and 9? What tests are they?

A This is Test Number 3; this is Test 1, the first bottom-hole pressure test taken --

Q (By Mr. Hinkle) That's Exhibit 9?

A Exhibit 9 is Test 1. Test 2 was a wellhead pressure test of shorter duration, which we used only for average pressure determination. I do not have a large exhibit on Test 2. Test 3, due to its length of test, we felt would make a proper Exhibit Number 8, Test 3, Number 8, to describe the character of the curve, and the fourth and last test is presented as Exhibit 10.

Q What was the date of the last test shown on Exhibit 10?

A It's shown on Exhibit 10 as being from 2-2-66 to 2-7-66. With these theories in mind then, we undertook

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to analyze each of the tests.

In order to obtain average pressures as are indicated from these tests, there are two techniques available to us, one is described in the technical papers aforementioned as the fall-off curve analogy, or the fall-off curve concept whereby through trial and error the engineer assumes an average pressure in the reservoir, solves a pressure function which is the difference between his estimate and the pressure observed during the test, plots this difference versus the time of the test and looks at the profile of the resulting plot. If he has estimated a pressure that is too low, the resulting plot will be concave downward. If he has plotted or assumed a curve, an average pressure too high, it will be concave upward and the theory is that if you are in semi-steady state, we can be alternating, selecting average pressures and plotting this for the test, we can conclude with reasonable accuracy a proximation of the average pressure of the system that yielded this pressure transient profile.



The second concept available to us for average pressure determinations was developed and published by Matthews, et. al., with the Shell Development Company again. It is, "Determining the Average Pressures in Bounded Reservoirs" is the title of the paper. But, this paper presupposes that we have a knowledge of the reservoir radius. We choose not to

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base our calculations on this technique, however, we did, after we had come to some conclusions on radius, we did present one example of this for checking and comparative purposes. It should be mentioned that in addition, there is one other check available from this before we go into the individual tests, some work done by the Magnolia Field Research Laboratory when it was still the Magnolia Field Research Laboratory, now Mobil, by Aronofsky and Jenkins, furthered by Miller, Dyes, Hutchinson with the Atlantic, and furthered still further by Dr. Lamont now with Texas Pacific, indicated that if a person knew that he had a profile from a well, that profile had to have been generated by a hydrocarbon volume of a fixed volume, and that every hydrocarbon volume, every reservoir volume would yield a signature profile. This, we could run out and take a test and come in and if we had an infinite number of these graphs to lay side by each and look one over the other, we could conclude the volume of that reservoir from its pressure transient test.

Again, this theory assumes an ideal reservoir but it does serve as a valid check. Furthermore, it was concluded that no one could have an infinite number of graphs in his desk to make this comparison. So, some mathematicians borrowed some theory from heat transfer, we suspect, and they lumped all of the unknowns of these systems

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into something called dimensionless variation; and through the use of this higher mathematics have worked all curves down into two curves, one which assumes an infinite reservoir and the second of which assumes a bounded reservoir. In nature, we find some reservoirs which are not defined by use of these curves but which fall somewhere between them with the curve serving as limits. We therefore can use these curves as check points to establish minimum and maximum performance estimates.

So, we have another check to fall back on, that if we will take this curve and through the dimensional concepts solve for it, it should again yield for us an estimate of the hydrocarbons associated with that profile.

Now, gentlemen, if I may refer to our Exhibit 11; Exhibit 11-A is merely a summary of what this handout contains. Exhibit 11-B contains basic data which one would have to have in order to check our calculations. These are not in general assumptions, they are data available in all of the files, and completion records on this well. Exhibit 11-C is a plot of the gas deviation factor for the hydrocarbons in this well. It is a reproduction of a graph presented in a Pure Oil Company report number 65-469 dated September 14th, 1965. The following 11-D is a summary of the calculations that follow and is for your consideration later. Transient Test Number 1, which is represented by Example Number 9, or Exhibit 9, was performed January 15th, 1965 through January 18, 1965. It

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was a 74.5 hour build-up test taken when the well had produced 193.4 million cubic feet of wet gas and because the extrapolation to infinite time indicated that little, if any, depletion had occurred in the reservoir, the pressure at the outer boundary of 11,376 pounds absolute was assumed in our further calculations as the pressure representing the reservoir pressure at that date.

Exhibit 11-F is the raw data for that test. Exhibit 11-G is a computer printout where that raw data has been processed to the variables we have had to plot. The computer program also directs an online, or a piece of equipment, a piece of hardware called a plotter which moves that data into a graphical form. Exhibit Number 11-H, is a copy of that form and is exactly equivalent to Exhibit 9 in the large form.

Gentlemen, this is not hand plotted, this is the data as it is solved for mechanically. Exhibit 9 is a blow up of that original. It is also not hand plotted because the portions for our analysis of the curve A, B, and B to a little portion of C, the slope of those two portions are necessary in our calculations, they were least square fitted by the computer and the resulting fit is given to you as Exhibit 11-I and 11-J.

The standard deviation of the fit is also presented for those interested in how well these data do fit a straight

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line.

Transient Test 2, which was a wellhead transient test and it is not represented by a large exhibit, is a 344 hour build up test. That's 14.3 days after the well had produced 1.0998 billion cubic feet of gas.

GOVERNOR CAMPBELL: What is that figure?

A 1.0998 billion, or 1099.8 million.

GOVERNOR CAMPBELL: When was that?

A This was April 17, 1965 through May 2nd, 1965.

GOVERNOR CAMPBELL: That's the total volume it had produced up to that time?

A In wet gas, yes, sir.

Exhibit 11-L is the raw data for that test. 11-M is again the computer printout converting it to the data plotted and 11-N is a sample of the fall-off trial and error calculation we made to determine the average pressure in the reservoir, and this average pressure at this date was calculated to have been 9,500 pounds.

A presentation of test number 2 is given in Exhibit Number 11-O, a plot of the fall-off curve is presented as Exhibit Number 11-P, since this was a wellhead curve and since our theories are best applied to bottom hole curves, the data was translated from wellhead to bottom hole through the computer using a technique published and accepted, it's

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published by Cullender and Smith, entitled, "Practical Solution of Gas Flow Equations for Wells and Pipelines with Large Temperature Gradients", transactions AIME Volume 207, 1956, page 283 through 286.

This technique presented to us Exhibit 11-R. I might mention, gentlemen, that the program resulted in a last bottom-hole pressure of 9291.6 pounds. This corresponds to 9287 pounds measured at that point with an actual bottom-hole gauge. In other words, the pressure transient was taken, the profile of pressures was taken with wellhead gauges but before the test was terminated, a bomb was put into the hole to record the terminal point.

This terminal point compares with our calculated point to that degree. I might mention that this pressure range, the bombs used for bottom-hole pressures and which are reported to have only one-half of one per cent accuracy would have approximately a 45 pound tolerance or degree of accuracy, so you see our conversion is well within the accuracy of the equipment we use for bottom hole pressures, anyway.

The third transient test was run August 7th, 1965 through August 31st, 1965. This was a 574.17 hour wellhead pressure test, 23.9 days. This was after 1.935 billion cubic feet had been produced from the well. Exhibits 11-T, -U, -V, -W, -X, -Y, -Z, -AA correspond to the exhibits previously given

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for the previous transient tests. The results of our analysis on test number 3 indicated an average pressure in the reservoir at this time of approximately 9,000 pounds, and this was used in our future determinations. Transient test 4 executed from February the 2nd, 1966 to February 7th, 1966 was 122.75 hour build up, 5.1 days after a cumulative production of 2.845 billion cubic feet of wet gas. Again, we have presented for your consideration Exhibits -CC through -JJ as being similar representations as previously described but for transient test 4.

The solution of this calculation yielded an average reservoir pressure of 7,770 pounds and an interesting side piece of information based on this test, was that we concluded that approximately 48 days would be required to fully stabilize this well to that pressure at this time.

Based on the average pressures then solved from the four pressure tests and the gas deviation curve which was presented as 11-C, a classic P over Z versus wet gas cumulative curve was prepared and is Exhibit 11-KK. To eliminate the human error in casting a line through these points, again, this curve was least squares fit with a computer, the equation is presented on the graph and this graph indicated that the gas initially in place within this reservoir was approximately 26.54 billion cubic feet.

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Exhibit 11-LL is based upon Transient Test Number 4 shown in Exhibit 10, and presents some of the individual calculations for total effective permeability. This resulted in a combined two-layer effective permeability of approximately 1.56 millidarcies, and an approximation of radius of investigation for a one-way transient, that is, how far out this ripple might have been, and it's only an approximation -- due to the fact that it is a layered system, we do not present it as any more than an approximation -- showed 1,634 feet.

We do, however, find an interesting check in this dimensionless build-up theory that we were talking about earlier, looking for what hydrocarbon volume would have yielded the pressure transient build-up that we're looking at in Test Number 4. The calculations as shown in Exhibit MM, that is, 11-MM, reflect that approximately 28.099 billion cubic feet remained in the reservoir as of that test, that summed with 2.845 billion cubic feet wet gas production to that date, reflect an initial in place volume of 30.944 billion based explicitly on transient testing at Test Number 4 with no weight given to any of the other tests.

MR. PORTER: 2.8 was cumulative to what date?

A To the date on Test 4 which was February 2nd, 1966.

GOVERNOR CAMPBELL: What you are saying is that at that date, one-tenth of all the gas in this reservoir had

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already been produced.

A We're saying that approximately one-tenth of the gas in the reservoir had been produced by that date.

GOVERNOR CAMPBELL: Out of one well?

A Yes, sir. This is supported to some degree by the fact, too, that an extrapolation of the transient tests to time would not reflect lower boundary pressures, the extrapolation goes to a lower pressure successively as the tests proceed which indicates that the pressure at the boundary, at least as far as the transient tests reflect, has been depleted or reduced.

Following this are some additional individual calculations showing gas initially in place per acre foot, using an initially indicated gas in place of 589.39 mcf per acre foot, and assuming the minimum volume of gas indicated that's the 26.54 billion, we computed from the least squares of all pressures, this would result in an estimated 45,030 acre feet of reservoir space based upon our interpretation of porosity and water saturation. If we assume a 25 foot average thickness as was presented by Mr. Ford in his testimony, this would result in a total area of 1801.2 acres. Again, if we were to assume an ideal radial pattern, this would yield a radius of 4998 feet.

Now, as mentioned before, there is a second way to

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check this using the Shell Development Company's average pressure concept and we undertook to do so assuming a radius then of drainage of 4998 feet. Based on this calculated theoretical radius and using the published techniques, we calculated a 7812 psia, or pounds per square inch absolute, average reservoir pressure. This corresponds to the 7770 determined through the fall-off technique. A straight line determination of gas initially in place then based on the decline in pressure over gas deviation factor between the initial pressure of 11376 and the calculated by Matthews technique of average pressure of 7812 yielded an indicated gas in place of 27.67 billion cubic feet.

Gentlemen, each of these three procedures are independent and though depending to some degree on interlacing data, are summarized in Item 7 on Exhibit 11-PP showing a range of from 26.5 to 30.9 billion cubic feet initially in place; acre feet in the vicinity of from 45,000 to 52,000 acre feet; an area of from 1800 to 2100 acres and a possible radial radius of from 5,100 to 5400 feet.

Q (By Mr. Hinkle) What was your figure on acres?

A Approximately 1800 to 2100.

Q Mr. Garb, on Exhibit 11-PP, part 7, which is the summary of gas in place, the area shown means number of acres, does it not?

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A Yes, sir.

Q What conclusion, if any, have you made from your study and calculations with respect to the drainage area of the Number 1 Red Hills Unit Well?

A Because the family curve represented by Exhibit 8 did not definitely show that we were in a bounded condition to that time, subsequent, or I should say sequential, transient testing did show the completion at the boundary. We concluded that we were in a bounded reservoir, that we were in fact with the one well lowering the average pressure in producing the entire reservoir, and that we therefore must conclude, based on the other calculations, that this well is draining in excess of 640 acres.

Q Is it your opinion, then, that this well would drain the complete pool or reservoir?

A This well, on the basis of our calculations, not considering any other factors, is indicated that it is draining the entire reservoir and given sufficient time, could drain the entire reservoir. I can not predict that it could do so economically.

Q Do you feel that your calculations are reasonable with all the information available and will actually work out in production history performance along these lines?

A Yes, I feel that this is a resonable interpretation of the data that we were able to gather.

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Q You feel that this is a conservative figure that you have shown in each instance, or a liberal?

A I feel that this is a conservative estimate for one basic reason. We have based most of our calculations on the 26.5 billion cubic feet, which is the minimum we calculated from any of the techniques; yet to derive that minimum we used the fall-off curve concept for estimating average pressures. This fall-off curve concept reflects the average pressure within the transient flushing that flow. If the production prior to that transient was -- Let me rephrase that to correct myself. If the transient from the test was not long enough to be in what is technically termed as semi-steady state, the resulting average reservoir pressure would be lower than actual, therefore, the successive points plotted on our p over z versus cumulative production graph would have a steeper slope and would yield a lesser amount of gas in place.

However, that, we could support and we have presented it as a minimum and I believe the 26.5 to be a reasonable but possibly conservative estimate.

Q If the total volume goes up, or as it goes up, the areal extent would increase accordingly, would it not?

A Would you rephrase that?

Q If you calculate a larger volume in place under

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these calculations, the areal extent, area of drainage would go up?

A Yes, since we based our area of calculation upon the amount of gas in place. If the resulting gas in place were to improve with additional data, the area we have calculated would go up.

MR. HINKLE: We would like to offer in evidence Exhibits 8, 9, 10, and 11.

(Whereupon, Union's Exhibits 8, 9, 10, and 11 were offered in evidence.)

MR. HUNKER: If the Commission please, the tests which were run, the pressure build up tests were not properly authenticated by this witness, no proper foundation has been laid for the admission of these Exhibits and we ask the Commission not to accept 8, 9, and 10.

MR. PORTER: You object to Exhibits 8, 9, 10, and 11?

MR. HUNKER: 8, 9, 10, and 11.

GOVERNOR CAMPBELL: All except one, all except Number 1 up to now?

MR. HUNKER: May I explain the basis for my motion? This man has not testified that any of the work was done under his supervision or under his authority. I don't think that the tests have been properly authenticated.

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MR. HINKLE: If the Commission please, that objection only goes to the weight of the evidence, not the admissibility of it.

GOVERNOR CAMPBELL: You want to leave the record like it is on that point?

MR. HINKLE: I think so.

MR. PORTER: The objection overruled and the Exhibits will be admitted.

MR. HUNKER: Will you note our exception?

MR. PORTER: The exception will be noted.

(Whereupon, Union's Exhibits 8, 9, 10, and 11 admitted in evidence.)

MR. PORTER: We'll take a very short recess.

(Whereupon, the Hearing was recessed.)

(Whereupon, the Hearing was resumed.)

MR. PORTER: The Hearing will come to order, please. Does anyone have a question of this witness?

MR. PRAY: I would like to ask a few questions if I might.

MR. PORTER: MR. PRAY.

CROSS EXAMINATION

BY MR. PRAY:

Q I would like to ask the witness, Mr. Garb, directing

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your attention to Exhibit Number 8, point D. At point D and prior to that time, you have for some span a relatively straight curve, do you not?

A From C to D, E?

Q Not quite from C, but from there on up, yes.

A It mathematically has a slight concave upward.

Q It has the appearances of being fairly straight?

A My red line shows it this way, (indicating). I can only advise you that in checking it on other calculations it is slightly concave up.

Q Upon what basis did you decide to bend that curve over to point E?

A To E; from the fall-off curve concept of calculating with the average pressure in the bounded area.

Q Is this fall-off curve concept?

A Yes, which is the way we computed the average pressure within the bounded area.

Q Why didn't you take a straight line?

A From here on out?

Q Yes.

A This would give you a pressure which is P star,a pressure at the boundary but not the average pressure within the entire drainage radius. In order to compute what the difference would be if allowed geologic time to stabilize

so those zones above that pressure could bleed the energy into the "S" zones below average pressure, then the resulting profile will be in actuality in this configuration and this is presented in the literature.

Q Isn't the purpose of this curve to compute static pressure?

A Static stabilized pressure.

Q Equilibrium pressure?

A Yes. That would be calculated by calculating the average pressure, not the pressure at the boundary.

Q Do I understand that you used this pressure from the literature to show this is the proper thing to do?

A No, sir, we used the fall-off curve calculation, which you have in the hand-out, in order to calculate what E would be.

Q This is a mere calculation, this is not measured?

A It is not measured.

Q It's an extrapolation based upon your opinion and judgment about the type of calculation to be used?

A No, sir. It is a trial and error calculation.

Q It's trial and error. That's sufficient.

A Whereby you calculate until you get to the straight line.

Q You state that you have the opinion that this

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is a two-layered system?

A Yes, sir, a two familied layered system, or more than one family.

Q I would like to request that you try to limit your explanation as much as possible because, as I understand, we are going to proceed until we complete this Hearing. I realize some explanation is necessary but let's do our best to limit it.

In a two-layered system, does this mean that perhaps you have two zones contributing to the build up and pressure?

A Yes, sir.

Q Could it also be due to fracturing in the formation?

A It can be resulting from fracturing and matrix, yes.

Q Let's suppose it is due to a two-layered system, and I believe you stated in your opinion that it was two-layered?

A This is collaborated by our log interpretation and other means, yes, that supports a two-layered system.

Q Is it possible that there are other separate layers in this reservoir which are not open to the bore hole?

A It is obviously possible, yes. The indications are that it fits the family of two.

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Q All right, and then would your curve show in the reservation, indicate the reservation in these unopened zones?

A Two that are not open to the wellbore?

Q That's right.

A No, sir, it would not.

Q It would not show that. Do your studies indicate the amount of gas which would be contained in any given acre foot of the reservoir?

A In a single acre foot we have calculated the gas in place.

Q Based on these curves?

A No, not based on these curves.

Q That's my question.

A Just based on the initial pressure and the fluid properties.

Q But these fluid properties are from other testimony of other witnesses, is that correct?

A Actually, no, sir. I presented to you a gas deviation factor curve in there which is one of the, which is the item that would be under consideration.



Q What do you use to compute the gas in place in any given acre foot?

A Porosity, permeability, water saturation, pressure, gas deviation factor.

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Q All right, these curves give you anything other than pressure?

A Just the pressure.

Q And in addition, you have worked up the gas deviation?

A Yes, I have, many times. I presented to you the other testimony that had not been previously given.

Q So that these curves really don't change or affect the amount of gas in place in any given acre foot of the reservoir, do they?

A No, sir, they do not.

Q Do your studies with all of your computers average --

A Pardon me, may I ask a question?

Q I would rather not, if you don't mind.

GOVERNOR CAMPBELL: If he's trying to clarify a question.

A I am not sure I understood you properly. I hope you meant an initial gas in place per acre foot?

Q (By Mr. Pray) Yes, that's right. Can you predict from your study the location of the boundary of this reservoir?

A No, sir. We did not see a bounded situation other than can be volumetrically calculated from the gas in place.

Q I would like to direct your attention to your

pressure plot on Exhibit 9, I believe it is, is that the initial one?

A Yes, sir, this is the initial one.

Q What was your pressure from that?

A May I get my material, I'm sorry, I left it.

Q Sure.

A As I recall, it was 11376.

Q This was taken after there had been production from the well?

A A very small amount.

Q Do you recall what the pressure was from the drill stem test of the Wolfcamp Zone as the initial pressure?

A It was recorded at 11400.

Q Do you have that report?

A Yes, sir, I believe I have. Yes, sir, I have it.

Q May I see it? What is this report?

A These are some data that were mailed to us during the period of our study representing the drill stem tests and the completion tests taken during the completion of the well.

Q You have not seen the drill stem test data, personally?

A I personally have not.

Q I will ask you if you have seen this letter and the information that it is attached to?

A I believe I did see this, yes, sir.

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Q I ask you what it appears to be?

A This is a letter containing some field information that was prepared for presentation to you and your staff, containing some pressures and indicated flow rates as factors, static reservoir pressures, the times of stabilization, and on the basis of this data a graph was plotted to indicate something in excess of 39,000,000,000 cubic feet of gas in place.

MR. HINKLE: If the Commission please, this letter will be offered in evidence by the next witness.

MR. PRAY: I have a purpose in asking him this.

Q (By Mr. Pray) The date of the letter?

A The date is February 22, 1966.

Q Who is it from?

A Mr. Charles W. Browning.

Q District Engineer?

A District Engineer.

Q For Union Oil Company? It doesn't say. I will ask you what the drillstem pressure is reported on the data attached to this letter.

A DST, it's listed here as 11,306.

Q Is that less than the pressure which you compute at some later date after there has been production?

A Yes, sir, it is.

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Q You stated that you computed the areal coverage of the reservoir. How did you arrive at that areal amount, what factors did you use? I believe you said 1800 acres, is that correct?

A If one assumes the 26.5 billion in place, one would compute 1,798 acres.

Q What is necessary to compute that number of acres?

A This is based upon an average thickness of 25 feet, the porosity of 4.8 per cent, water saturation of 25 per cent, as was testified to by Mr. Ford.

GOVERNOR CAMPBELL: And permeability?

A Permeability is not in the calculation.

Q (By Mr. Pray) What would be the result if this 4.8 per cent porosity were in fact 10 per cent porosity as submitted by Pure Oil Company, our Exhibit Number 5 in the last Hearing. What would be the effect, actually of doubling the porosity?

A It would reduce the area.

Q By what extent?

A It would be a linear reduction, we can compute it for you.

Q Would it be one-half, approximately?

A Approximately.

Q So that you would have only 900 acres, is that

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correct, being drained by this well?

A Counselor, this is your calculation.

Q I'm asking you if this were the prosity which was used, would the resultant be approximately 900 acres?

A Approximately.

Q Would you have any idea where this 900 acres most likely would be?

A No, sir.

Q You assumed for the purposes of your study that it was substantially circular, did you not?

A Yes, sir.

Q So if it were reduced to 900 it would still be substantially circular, would it not?

A One could make this assumption.

Q Have you had an opportunity to view any structure maps of this area?

A No, sir.

Q You have not seen anything submitted by Union Oil Company?

A I have seen one structure map on a different horizon and only casually, and I saw that since my arrival here in Santa Fe.

Q Did you compute a permeability based on your pressure surveys?

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A We computed a combined permeability for a layered system, yes.

Q What did you arrive at?

A 1.56 millidarcies.

Q Were you present in the Hearing Room when the last witness, Mr. Ford, was on the stand?

A Yes, sir.

Q And you heard him testify that there was a five foot layer of reservoir open that he called pay open to the drill stem test made in the Wolfcamp?

A Yes, sir.

Q If you use this five feet of pay, and 1.56 millidarcies, what would you come up with as a resultant flow, using your initial pressure in the reservoir?

A I have not made this calculation.

Q How long would it take you?

A As long as it takes, I don't know.

Q Five minutes?

A It would take a few minutes.

Q Well, I would like to ask you to take that time and do it and I would then like to recall you.

A All right, sir.

GOVERNOR CAMPBELL: You are sure you understand what he's asking?

A Yes, sir.

Q (By Mr. Pray) Did I understand you to say that from Exhibit 8, which is the August, 1965 pressure survey, that it didn't show a bounded reservoir?

A We can't be sure. We can't be sure because there is a layover at point D on the last point, but whether the last point or so is sufficient to make that determination or not is questionable.

Q And yet, did I understand you to say that subsequent tests show that it is bounded?

A We interpret it to be this, yes, sir, because extrapolation to the boundary pressure to the P stars show successive depreciation which is characteristic of the bounded reservoir.

Q What subsequent tests did you have after the August test?

A Each successive test has shown here -- In other words, tests subsequent to the first one; we had one test subsequent to the Test Number 3 that continues to show that same tendency.

Q It shows that it is bounded or is not?

A It shows that the pressure at the boundary is still continuing to deplete, or appears to be depleting, which continues the trend we have seen from Test 1 to 2, 2 to 3 and

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3 to 4.

Q Well, I apparently don't understand you. I thought you said that on Exhibit 8 it didn't show any tendencies of being bounded but that on subsequent tests it did show it to be bounded?

A I'll try to explain that. The configuration of Exhibit 8 alone is difficult to attribute to a bounded case unless one does so on the basis of the last pressure read. However, because from Test 1 to 2, and on successive tests, the pressures as indicated from each successive transient test showed a marked reduction in the boundary, in the calculated boundary pressure; we therefore concluded that it was a bounded reservoir.

Q Yet the subsequent test was approximately one-fourth the duration of the test shown on Exhibit 8?

A It doesn't matter.

Q It doesn't matter. The period of extrapolation doesn't enter into it, then?

A Yes, it does, of course, in the accuracy in which you can extrapolate, but the amounts in which these tests show difference would allow a great tolerance of error.

Q Would you say a test that had been shut-in 500 hours was more reliable than a test that had been shut-in 120?

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A Certainly.

Q Which point did you use in drawing the P over Z curve the longest shut-in or the last point.

A We least square fitted all of them. In turn, however, we calculated an answer from the first to just the last as well.

Q I would like to call your attention to your Exhibit KK, would you get it, please?

A Yes, sir. The first --

Q The first point that is shown as we move from the left margin at approximately 7,000, how many hours was that pressure test for?

A This would be pressure test number 1, that was a 74.5 hour test.

Q The second point?

A 344 hours.

Q The third point?

A Was 500 and -- it was 574 hours.

Q And the final point?

A 122.75 hours.

Q If you used the second and third points, which represents a shut-in time approximately three to four times as great as either of the other two, what would have been the result of your line? Would it have flattened the decline of

your line?

A It would have, sir. It would have thrown away bottom hole pressure and used only wellhead converted pressures.

Q But you would have used pressures which were substantially longer, is that correct?

A Yes, sir.

Q Did you not testify that your bottom hole pressure and your surface pressure compared very favorably within a few pounds?

A We think that we have a reasonable conversion.

Q Well, then, why wouldn't you use these two points which are favorable in conversion and yet exhibit substantially greater shut-in periods?

A We have used them but in context with the other two bottom hole pressures as well.

Q You let the other two pressures substantially affect the slope of the curve?

A We let them slope off the bottom hole.

MR. PRAY: I have no further questions. I ask that you make the calculation which I have asked you.

MR. PORTER: Does anyone else have any further questions? The witness may be excused. He may be recalled to answer the question that was asked on circulation.

Will you call your next witness?

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MR. PORTER: You may proceed.

* * *

S L O A N J. B L A C K, a witness, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. HINKLE:

Q State your name, please?

A Sloan Black, S-l-o-a-n J. B-l-a-c-k.

Q Where do you reside and by whom are you employed?

A I reside at Midland, Texas, and am employed by the Union Oil Company of California.

Q In what capacity?

A Reservoir Engineer in the District Office.

Q Have you ever testified before the Oil Conservation Commission?

A No, sir.

Q Are you a graduate engineer?

A Yes, sir, I am. I graduated from the University of Oklahoma in 1958 with a Bachelor of Science Degree in Petroleum Engineering.

Q Have you practiced your profession since graduation?

A Yes, sir.

Q What positions have you held?

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A Upon graduation in 1958 I went to work for the Humble Oil and Refining Company in Houston, Texas and worked there one year at their Research Laboratory; was transferred a year later to South Texas and worked for the Humble Oil and Refining Company in the Stratton District Office in that area. In October, 1963 I began work for Pure Oil Company and worked for Pure as a Reservoir Engineer until their merger last year, and have worked for their successor since, Union Oil of California.

Q You have been employed continuously with Union?

A Yes.

Q What has your work consisted of with Union?

A Reservoir engineering.

Q Entirely?

A Well, not entirely. I have taken on projects of a mechanical nature or --

Q Has part of your time been devoted to the valuation of properties in New Mexico --

A Yes, sir.

Q -- as a Reservoir Engineer?

A Yes, sir.

Q Have you made a study of the Red Hills Unit Area --

A Yes, sir.

Q -- and of the Number 1 Well?

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A Yes, sir.

Q Have you made a study of the production, pressure production history of the well?

A Yes, sir.

Q Have you also made an economic study --

A I have.

Q -- based upon the production history and pressure?

A I have.

Q What figures have you used in making those studies?

A Well, I've used my own reserve determinations.

Q You did make reserve determinations, yourself?

A Yes, sir, I've also used reserve determinations as testified to by Gruy and Associates. I have developed economics for both reserves.

Q Have you prepared any exhibits which reflect these studies you have made and these calculations you have made, as far as economics are concerned?

A Yes, sir.

(Whereupon, Union's Exhibit Number 12 marked for identification.)

Q Refer, first, to Union's Exhibit Number 12 and explain to the Commission what this is and what it shows.

A Exhibit Number 12 is in two parts. The first part is a letter written by myself and directed to Mr. R. S. Cooke,

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the Division Engineer. It is -- was reviewed and signed by my supervisor, Mr. Charles W. Browning, District Engineer. It was written by myself to convey to Mr. Cooke my reserve determinations. And the second part of the exhibit is a plot of P/Z versus cumulative gas produced, and illustrates my reserve determinations.

Referring back to the letter part, I mentioned the data -- in the first paragraph of the letter I mentioned the data that is available and can be used in determining a reserve.

In the second paragraph of the letter I report my original gas in-place determination of 39.4 billion cubic feet. I also say that of this reservoir vapor, 1,717,000 barrels of condensate have an equivalent vapor volume of 1.6 billion.

In the third paragraph I say that an abandonment pressure of 1,000 pounds, 82.02 percent of the original reservoir vapor in-place will be produced as separator off gas, and that 48.29 percent of the condensate in-place will be produced as stock tank liquids.



The fourth paragraph deals with pay based on the reserve.

The fifth paragraph recalls reserve determinations on my part, and the final paragraph offers me as further assistance.

The plot that is a part of this Exhibit Number 12, tabulates data used in this reserve determination and illustrates the reserve determined.

Q Is this the letter which the attorney for the opposition referred to in the preceding testimony?

A Yes, it is.

Q Can you explain the descrepancy which he referred to?

A He referred to a descrepancy between the reserve as determined by Gruy and Associates and the reserve that I have determined here. As I recall, he also brought up a pressure point different, but I don't remember the nature.

MR. HUNKER: Drill stem test pressure.

A The drill stem test pressure is -- is not plotted on this.

MR. HUNKER: But the drill stem pressure is?

THE WITNESS: Yes, sir, one of the bottoms in the hole recorded a lower pressure. Another one at another time recorded a pressure higher.

MR. HUNKER: Which one did you use? I think I probably should wait.

Q (By Mr. Hinkle) Mr. Black, referring to Union's Exhibit Number 12, what net number of feet from the pay

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section of the Wolfcamp did you use making these calculations, also your water saturation and porosity?

A Sire, in the calculations that I did here, I know the quality of the pay and relied entirely upon the pressure and reduction history. It's a volumetric balance.

(Whereupon, Union's Exhibit Number 13 marked for identification.)

Q Refer to Union's Exhibit 13 and explain what that is and what it shows?

A Union's Exhibit Number 13 is in two parts. The first part is headed, "Remaining Reserves and Economic Factors, Red Hills (Wolfcamp) Field, Lea County, New Mexico", and I have listed certain of the reserve parameters and certain of the economic parameters.

The second part is headed, "Estimated Cost for 14,200' Red Hills Wolfcamp Test, Lea County, New Mexico, Intangibles and Tangibles".

Referring back to the first part of Exhibit 13, I have entered an exhibit and testified to the fact that my reserve determination of 39.4 billion cubic foot of reserve vapor-in-place, that have this original gas-in-place, some 1,717,000 barrels of condensate would be produced. I've reduced those numbers to recoverable hydrocarbons and this is 1C on Exhibit 13, by use of a recombined fluid analysis that

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Pure Oil Company's Research Laboratory performed as a service and reported back to the District Office. And these numbers are established in that fluid analysis that have the gas-in-place. 82.02 percent of the original gas-in-place will be produced as separator off gas and 48.29 percent of the original condensate-in-place will be produced as stock tank liquids. And I have also included on the first part of Exhibit 13, a sales gas estimate that I think, based on current production, will be the cumulative gas produced at 1-1-67, that's 4.9 billion. And the condensate produced as of 1-1-67 will be 618,400 barrels.

Part two in the tabulation is Economic Factors. "A" of the Economic Factors is the gas price that the company receives. This pirce was arrived at through a discussion between myself and our Division Gas Manager, who told me that at the current time we were receiving 16-1/2 cent per MCF based on the FPC area price for new gas. That in addition to the 16-1/2 cents we were receiving a BTU adjustment for gas with BTU content in excess of 1050 BTU per MCF at 0.01190 MCF, gas price of 17.60 cents per MCF. He informed me not to use any other gas price because he couldn't predict that we would, even under the terms of the contract, receive any escalation.

On condensate we have a base price of $2.79 a barrel. We have a trucking charge that is netted off of the base price

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of the condensate before a division of the production of .13 cents a barrel, leaving a net price for the division of interest of $2.66.

State and local taxes are tabulated on the first part of Exhibit 13 under C, IIC. Included is the severance tax, emergency school tax, conservation tax, and Ad Valorem tax. State and local taxes totaled 6.54675 percent of the gross value after royalties, insofar as the working interests are concerned.

I have also estimated from our accounting records, that the annual operating cost of a Red Hills Unit Well in dollars per well per year, is approximately $7,200.00 a month -- a year.

The second part of Exhibit 13 is itemized well cost estimate for a total amount of $539,900.00.

Q That's your completion in the Wolfcamp?

A That is for a completed well.

Q In the Wolfcamp formation only?

A Yes, sir. In addition to this amount I would estimate that the surface facilities, in order to place the well on production, would cost $30,000.00, for a total cost on a development well of $569,900.00.

(Whereupon, Union's Exhibit Number 14 marked for identification.)

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Q Mr. Black, refer to Union's Exhibit Number 14 and explain what it shows.

A Exhibit Number 14 is titled, "Red Hills Unit Development Economics for 14,200-Foot Wolfcamp Well, Union Oil Company of California Reserve Estimate, Red Hills (Wolfcamp) Field, Lea County, New Mexico". Tabulated beneath that heading is my reserve of gas-in-place of 39.4 billion cubic feet; a calculated number of surface or aerial acres of 2,200 acres; a porosity upon which this aerial extent was calculated of 6.5 percent; water saturation of 30.0 percent; thickness of 24 feet in net pay, which results in a unit reserve of 624.2 MCF per acre foot. These volumetric parameters tabulated at the top of this Exhibit 14 were given to me by our Division Geological Staff and have been used to make this set of economics.

Now, the tabulation beneath that is Assumed Spacing and I have assigned to 2,200 aerial acres the entire recoverable reserve of 32.3 billion, and have developed a set of economics and economic parameters on that reserve and its associated condensate.

The gross gas revenue is $5,713,900.00; the gross condensate revenue is $2,206,200.00 for a total gas and condensate revenue from a 2,200 acre Red Hills Well, of $7,920,100.00.

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I've based my economics assuming working interests, royalty, and overriding royalty. This is the royalty and overriding burdens for the 9 section drilling unit action. The amount of those royalties expressed in a percent, is 19.51098. The royalty burden that will be born by the working interest, is $1,545,300.00.

After royalty I've applied the State and local tax percent that we developed earlier in the State and local taxes. This will amount to $417,300.00. Then I've developed an operating cost based on an MCF take of 1,000,000 per day for each 8 billion reserves, which results in a producing life of 22 years, and this is the method that I have used to arrive at 22 years for an operating life, and the operating cost is $158,400.00. Total taxes and operating costs are $575,700.00, which leaves an operating income of $5,799,100.00. And for pay-out purposes I have developed a number here which is the annual operating income, $263,600.00. Investment was testified to before, in the amount of $569,900, which leaves a net profit before net income tax and before the working interest overhead, of $5,229,200.00. Pay-out is calculated to be 2.2 years. Profit to investment ratio is 9.2:1.0. And I have developed here two other economic yardsticks used to compare investment opportunities; one is the present value profit of 10 percent,

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and that number is $1,854,100.00; and a profitability index at 10 percent, which is defined as the net cash discounted at 10 percent divided by the investment also discounted at 10 percent, and that number, that ratio is 3.2:1.0.

Q You have made similar calculations for 1100 acres, 640 acres, 320 acres and 160 acres?

A Yes, sir.

Q Explain briefly, without referring to each one like you did in the first column, what it shows; the result.

A In terms of net profit, the result of developing an aerial extent as established by this volumetric determination would show a net loss per well of $295,100.00; 320-acre development would show a net profit of $138,200.00; and 640-acre spacing would show a net profit of $1,004,800.00. The pay-out of a 160-acre spaced well is nill. There is not a pay-out since there is a profit loss. For a 320-acre well the pay-out is 17.7 years, and for 640-acre spacing it's 8.0 years. All of the economic parameters that are developed here indicate a loss until one assumes 640-acre spacing, which is just a break-even proposition, so to speak.

Q This is considering the most favorable calculations which have been made?

A It assumes that the reservoir was completed, developed, the day the first well was completed, and that each

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surface acre participates equally in the initial reserve.

Q In other words, this is considering the initial gas-in-place in the reservoir?

A Yes, sir.

Q It is not taking into consideration the gas that has been produced to date?

A No, sir.

Q And you have used the greatest volume, 39.4 billion cubic feet, which is the most favorable calculation which has been made?

A That's the largest reserve calculation that anyone has come up with so far.

(Whereupon, Union's Exhibit Number 15 marked for identification.)

Q Refer to Union's Exhibit 15 and explain what that shows.

A Union's Exhibit 15 is similar in nature to Union's Exhibit 14 in that it is a set of economics developed for a 14,200-foot Wolfcamp Well, but using the reserve estimate as developed here earlier today by H. J. Gruy and Associates. The original gas-in-place as found by Mr. Gruy's people, was 26.540 billion. This indicated an aerial extent of 1,798 acres. They testified to a porosity of 4.8, and a water saturation of 25.0 percent. The thickness used in this

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volumetric determination was 25 feet, and it had a unit reserve of 590.42 unit reserve per acre. In using the same economic parameters, and in the same sense, yardsticks were developed to illustrate the profitability of development in the same fashion that I had on the previous Exhibit 14. In taking the net profit column, again, a 160-acre spacing shows a net loss of $371,100.00. There is no pay-out. 0.6 of the investment is never recovered.

320-acre spacing shows a net loss of $13,900.00. There is no pay-out indicated, and for all practical purposes the profit to investment ratio is 0.0:1.0; that you just recover your investment.

For 640-acre spacing $700,400.00 is indicated as a net profit. There is a 9.9 year pay-out and a profit to investment ratio of 1.2:1.0.

Again, one producing from denser to wider spacing, to 640 acres before profitable economics are developed.

Q I note that there's two corrections made in ink; one in Column 3 on the 640-acre spacing, and one under the 160-acre spacing. Were those corrections made by you?

A Yes, sir, they were.

Q They are correct as indicated?

A Yes, sir.

Q Do you have anything else that you would like to

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tell the Commission with respect to these exhibits?

A It's my opinion, and is what I have advised my management, that we cannot economically develop Union's area of Red Hills-Wolfcamp Unit on spacing denser than 640 acres.

Q That's your conclusion of all the information available?

A Yes, sir.

MR. HINKLE: We would like to offer in evidence Exhibits 12, 13, 14 and 15.

(Whereupon, Union's Exhibits 12, 13, 14 and 15 offered into evidence.)

MR. HUNKER: If the Commission please, we object to the admission of these exhibits. They are a rehash of what the Commission has heard previously. They're trying to bolster their case by the same kind of testimony that has previously been heard by the Commission. Nothing new has been offered and we object to their admission.

MR. PORTER: Objection overruled.

MR. HUNKER: Note our objection.

MR. PORTER: The exhibits will be admitted.

(Whereupon, Union's Exhibits 12, 13, 14 and 15 admitted into evidence.)

MR. HINKLE: That's all the direct examination.

MR. PORTER: Are there any questions of the

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witness?

CROSS-EXAMINATION

BY MR. PRAY:

Q I would like to direct the witness's attention to Exhibit 12, which is the letter you say you wrote and Charles W. Browning signed, attached to which is a curve of P/Z versus cumulative production. Do you have other data or do you have data upon which you based the drawing of this curve; for example the static pressures?

A The data upon which the curve is drawn is tabulated on that curve.

Q Directing your attention to the static pressures which you computed, have you had an opportunity to compare those with the static pressures made by Gruy?

A Yes, sir.

Q How do they compare; take them point by point, if we might.

A I'll have to ask Mr. Gruy, or I can get that Exhibit 11 and make the comparison.

Q All right. Start with January 15, 1965. What is the pressure which you show?

A Please refer to Exhibit 11, the 4th page, which is the tabulation of results of his analysis --

Q All right. I want you to testify for me as to --

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A -- and Mr. Gruy tabulates a pressure in the tabular column which is headed Calculated Stabilized Reservoir Pressure, and the January 5th through January 18th, '65 pressure is 11,376 pounds. Mine, as tabulated on the second part of Exhibit Number 12, is 11,306 pounds.

GOVERNOR CAMPBELL: You gave the figure for August 23, '64.

A Oh, it's 10,944 pounds, excuse me, sir.

Q (By Mr. Pray) That's correct. There's approximately some three, four hundred pounds difference. Next point, May 2, 1965?

A Gruy, 9,500 pounds; mine, 9,908 pounds.

Q For the February 2, 1966 pressure, what was Gruy?

A Gruy, 7,770 pounds. Mine is 8,392 pounds.

Q Approximately six, maybe seven hundred pounds difference. Can you explain this difference of some seven, eight, nine percent?

A Yes, sir. My analysis was accomplished in the daily routine of my job and I used two or three different methods of analyzing this data, one of which Mr. Gruy said he used.

Q Did you use good engineering practices?

A Yes, sir. It's perfectly satisfactory to the other engineers that have seen it, and to my management.

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Q You omitted, did you, the August 1965 pressure curve from your curve?

A I personally did, yes, sir. It's not that I didn't analize it, I didn't show the point on this curve.

Q On a later data sheet did you compute the static pressure for August 31, 1965?

A It was an earlier data sheet.

Q Have you computed the static pressures for August?

A Yes, sir.

Q What is this?

A I'd have to look and see, I don't recall.

Q Is this paper familiar to you at all?

A Yes, sir, it is. And the August 31, 1965 pressure as I had calculated, was 9,532 pounds.

Q Do you see a "Z" factor on that?

A Yes, sir.

Q Did you compute where the point would lie on this curve, which is Page 2 of the exhibit?



A Yes, sir. And that is approximately the same point that's on my worksheets, that I placed the point at.

Q Would it be above the curve?

A Yes, sir.

Q And if you use that point would it tend to flatten

the curve and show greater reserves?

A I assume that it would. There is a mathematical possibility that it would decline the curve and show less reserves. I'd have to check it to know.

Q You say there's a mathematical possibility it could decline the curve more. What is this possibility?

A The curve being above the other three points, it would in fact increase it.

Q Increase the reserve?

A Yes.

Q Directing your attention now, to Exhibit 13. I believe you stated that the tabular information shown above there, was given to you by the Division Geological Staff, is that correct -- pardon me, Exhibit 14?

A Yes, sir, it was.

Q So you didn't compute the porosity?

A No, sir.

Q You didn't compute the water saturation?

A No, sir.

Q You didn't pick the pay thickness?

A No, sir.

Q Is there any figure on this exhibit which is yours?

A Yes, sir.

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Q Would you state for the record what that figure is?

A The original gas-in-place as abbreviated, 39.4 billion.

Q To arrive at the number of acres in this reservoir you have to use somebody else's figure to use your figure, is that correct?

A Yes, sir.

Q Is the person who supplied this information present here?

A He's testified today.

Q Who is that?

A Mr. David Dunn.

Q He's the man who supplied you the information?

A Yes, sir.

Q You don't know where he got the information?

A He analized the log.

Q From his analysis?

A Yes, sir.

Q The 6.5 percent is Mr. Dunn's figure?

A Yes, sir.

Q On your well cost, exhibit -- did you prepare this exhibit?

A No, sir.

Q Who did prepare this exhibit?

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A The District Drilling Supervisor.

Q Is he present today?

A No, sir.

MR. PRAY: If the Commission please, I request that this estimated cost from Exhibit 13 be striken from the record for failure to properly authenticate it. I have no opportunity to cross-examine as to the basis of this cost, and that goes for the entire economic value he has made, and I ask that that be stricken.

MR. HINKLE: I would like to ask Mr. Black a question here.

REDIRECT EXAMINATION

BY MR. HINKLE:

Q Was this Exhibit Number 13 prepared under your direction or at your request?

A The first part was prepared -- Page 1 of Exhibit Number 13 was prepared by myself.

Q It was prepared by you. But it's only the second page that gives the detailed estimates of the cost of a well?

A The detailed estimates of the cost of the Red Hills Well was first made in the District Office, and early last week I carried the estimates to the Drilling Supervisor so he could check them out to see if they were still

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applicable, and he said they were.

Q You actually prepared, yourself, all the information shown on this exhibit except the breakdown of the different costs in connection with the drilling of wells in the Wolfcamp?

A Yes, sir.

MR. PRAY: If the Commission please, these costs are what make the total costs; and if you have the opportunity to determine what the second part is, we have the opportunity to determine what the total is, or whether it is good.

Q (By Mr. Hinkle) In your opinion, are the study of the drilling costs and the costs shown on the exhibit reasonable and --

MR. PRAY: He hasn't shown that he has any experience in this matter.

Q (By Mr. Hinkle) What experience have you had?

A I have estimated costs of wells prior to their being drilled for my company's planning.

Q For a good many years?

A Yes, sir.

Q Have you kept up with the drilling costs?

A Not as a normal every day function.

Q But you do in a general way?

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A I have.

Q And you know what the cost of drilling in this area is?

A Yes, sir.

Q In your opinion is the cost shown reasonable and normal for a Wolfcamp Well in this area?

A Yes, sir.

RECROSS-EXAMINATION

BY MR. PRAY:

Q I would like to ask you a question. Do you have independent knowledge of any of the details of this as to whether they are correct and accurate, of your own personal knowledge? For example, the contract rated $9.50 a foot. Do you have any knowledge of whether or not that is a proper figure?

A I know that's about the going rate in Southeast New Mexico.

Q For wells of this depth?

A Yes, sir.

Q How did you arrive at this information?

A Seeing other -- making these estimates and talking to contractors.

Q How about the mud cost of $50,000.00?

A That I couldn't testify to.

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MR. PRAY: If the Commission please, I renew my objection.

MR. PORTER: Here again the objection appears over the weight of the evidence, and the document admissibility will be accepted.

MR. HUNKER: Note our objection.

Q (By Mr. Pray) I would like to ask you that if in making your valuation you took into consideration the possibility of a dual completion of the Wolfcamp and Pennsylvanian Zone?

A No, sir.

Q Why not?

A Because I was advised by -- not to have -- to do that.

Q You were advised by whom?

A By counsel.

Q In your opinion, if you were making an economic appraisal of the particular property, and it was known that it had a zone comparable to the Pennsylvanian in this well, would you take that zone into consideration in making the economic study?

A Not necessarily.

Q As a matter of good engineering practice would you consider all potential economic productive zones in making

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your economic valuation?

A Yes, sir.

MR. PRAY: No further questions.

MR. PORTER: Anyone else have a question?

MR. HINKLE: I would like to ask Mr. Black one other question.

REDIRECT EXAMINATION

BY MR. HINKLE:

Q Referring to Exhibit 14, are the net feet of water saturation and porosity figure shown on that exhibit, those testified to by Mr. Dunn this morning?

A Yes, sir, they are.

MR. HINKLE: That's all.

MR. PORTER: Any further questions?

MR. HINKLE: If the Commission please, I would like just a moment.

MR. PRAY: I would like to ask a question in reference to the last answer. Mr. Dunn did not testify that he had computed 6.5 percent porosity. He stated that he had -- that he made an engineering study and that when he went to Gruy he told them that he had come up with 24 feet of pay and 6.5 percent porosity; he didn't testify this was the porosity and how he arrived at it.

MR. HINKLE: If the Commission please, we're going

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to put Mr. Dunn back on anyway, as the next witness, just for a few questions here, and if it's true that he did not testify as to the porosity he will now.

GOVERNOR CAMPBELL: In view of the fact that Mr. Dunn is going to testify, did you want to pursue your objection?

MR. PRAY: No, we'll wait.

MR. PORTER: If there are no further questions this witness may be excused. You may proceed.

* * *

D A V I D D U N N, a witness, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. HINKLE:

Q Your name is David Dunn?

A That's correct, sir.

Q You have previously testified in this case this morning?

A Yes, sir.

Q Refer to Union's Exhibit Number 14 and state whether or not you calculated the porosity which is shown on that exhibit, and gave it to Mr. Black?

A I did. I calculated the porosity given on that exhibit and I furnished it to Mr. Black and asked him to make

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the type of calculation he has made here. I calculated the porosity from the Schlumberger Gamma Ray Neutron Log based on the porosity measurement curve that Schlumberger furnished me, identified the pay from 13,468 feet to 13,474 feet, a total of 6 feet of pay; I identified as pay section the interval on the Schlumberger Log from 13,600 feet to 13,618 feet, 18 feet of pay, making a total of net pay of 24 feet.

Utilizing the determinations as I stated before, the Schlumberger gave me, and arrived at a net average porosity of 6-1/2 percent. The 30 percent water saturation is a water saturation that I assumed based on comparable porosity in this type of a reservoir.

Q Mr. Dunn, were your calculations of porosity made before the core was analized?

A They were.

Q Do you have any special rules to propose to the Commission to be adopted as special field rules for the Wolfcamp formation in this case?

A I do.

Q Refer to Union's Exhibit Number 16 and state briefly what these rules consist of?

A These rules are the same rules that were previously submitted in the hearing. Rule 1 is a statement

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that "Each well completed in the Red Hills-Wolfcamp Gas Pool or in the Wolfcamp formation within one mile of the Red Hills-Wolfcamp Gas Pool, and not nearer to or within the limits of another designated Wolfcamp pool, shall be spaced, drilled, operated, and produced in accordance with these Special Rules and Regulations.

Rule 2, each well completed in the Red Hills-Wolfcamp Gas Pool shall be located on a standard unit containing 640 acres, more or less, consisting of a single governmental section.

Rule 3, each well completed in the Red Hills-Wolfcamp Gas Pool shall be located no nearer than 1650 feet to the outer boundary of the section and no nearer than 330 feet to any governmental quarter-quarter section line.

Rule 4, any well presently"--

Q This is a new rule, is it not -- go ahead.

A Rule 4 is a new rule?

Q No, it's 5.

A "Any well presently drilling, being completed or now completed in the Red Hills-Wolfcamp Gas Pool is granted an exception to the well location requirements of Rule 3".

Rule 5 is a new rule. It is very similar to Rule 104-C-2A of the State Regulations. "Any well completed in the Red Hills-Wolfcamp Gas Pool and located in Section 5,

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Township 26 South, Range 33 East, New Mexico Prime Meridian, shall be located, as an exception to Rule 3, not closer than 660 feet to any outer boundary of said Section 5 nor closer than 330 feet to any quarter-quarter section or subdivision inner boundary nor closer than 1320 feet to the nearest well drilling to or capable of producing from the Red Hills-Wolfcamp Gas Pool".

Q Mr. Dunn, based upon your study of this area, well production, well history, is it your opinion that one well will effectively and efficiently drain more than 640 acres?

A Yes, sir, it is.

Q Do you feel that because of the economics involved that Correlative Rights will be better protected by 640-acre spacing than by the statewide spacing of 160 acres?

A I certainly do.

Q What is the purpose of submitting Rule 5 that you have referred to?

A Rule 5 has been submitted because the offset mineral owners in the Red Hills unit area have consistantly and frequently stated that they felt that the only way they could protect their Correlative Rights was to drill a well close to the Number 1 Red Hills unit well. The location that they have requested in Case 3401 and in 3402,

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Paragraph 2, will fit the requirements of Rule 5.

Union Oil Company has offered to join these people in pooling of acreage in Section 5 so that their Correlative Rights may be protected and to pay our way in the drilling of a well at a location of their choice, if it meets the approval of the Commission, the Commission of the State of New Mexico, the Commissioner of Public Lands and U.S.G.S., Geological Survey.

Q Has this offer been previously made to them?

A Yes, sir, in Dallas on April 28th, and was repeated to the Kermit Oil Company, which I made to them on May the 6th, 1966.

Q Is Union Oil Company still willing to so provide for the drilling of a well in Section 5 on the basis you talked to them?

A We are, we have complete management approval.

MR. PORTER: Your agreement is for only one well to be drilled in Section 5?

THE WITNESS: That is right, sir, based on the 640-acre spacing.

MR. HINKLE: That is all the direct examination at this time.

MR. PORTER: Are there any questions of the witness?

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CROSS-EXAMINATION

BY MR. PRAY:

Q First, I would like to discuss just for a moment, Mr. Dunn, your selection of the pay picks. I believe you picked the same intervals and the same zones with the exception of one foot that was picked by Gruy, is that correct?

A That is correct.

Q Did you pick those before you gave the information or contacted Gruy, or --

A Before I contacted Gruy.

Q You didn't pick any pay above this 13,468 feet, is that correct?

A No, sir, I did not. I questioned an interval or two as potential pay, and had to reject it.

Q What basis did you reject it?

A I rejected it principally on the cleanliness of the section as separated from the gamma ray log by discussions with Schlumberger that the zones I suspected were severely enlarged and could not be considered as an indication of porosity from the neutron curve, and by the same factors that Mr. Ford testified to that the well remained under constant and consistant control of 9-1/2 pound mud.

Q Do you have a complete drilling report with you?

A I have the core laboratory mud log report which is

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complete, sir.

Q But you don't have anything else indicating, other than the core log report?

A No.

Q No tabulation of cementing jobs, for example?

A No, sir.

Q Are you familiar with the Sub Surface Library in Midland, Texas?

A Vaguely.

Q Do you use their service?

A No, sir, not personally; the company may.

Q That's what I meant. I presume you're speaking for Union Oil Company?

A I'm speaking for Union Oil Company, however it's a large concern, sir, I do not know all the services that we subscribe to.

Q What is the Sub Surface Library?

A I don't know that I can define its function; I've simply heard of it.

Q May I ask you a question? During the drilling of this well, you will have to perforate the 10-3/4" casing at approximately 12,700 feet and squeeze cement?

A I would not dispute the fact, sir, if you have the record with you, but by my memory I could not testify to that.

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Q Would you have any information whether or not this work was done?

A I can check the time interval on this core laboratory report and see.

Q Would that show cementing?

A No, it would not show cementing, not normally.

Q Well, I think it's a very important point because my information is that the well is kicking up in this zone at about 13,300 feet, and it was squeezed.

A The mud log does show gas characteristics, and the well was never reported in danger or out of control prior to the depth on the Schlumberger of 13,471 feet.

Q Is it necessary that the well be out of control or the rig be in danger before there's substantial gas, and before you term in a blow out?

A No, sir, that is not true. As a matter of fact, you can have a blow out without having substantial gas.

Q Is it possible that you can determine if the well is kicking?



A Yes, you can determine that the well is kicking. This is, in fact, something that happens to practically every well drilled in the Delaware Basin as it goes through the Wolfcamp.

Q Are you familiar with the Rhinehart Oil Reports?

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A Yes, I am.

Q Do you personally use that from time to time?

A I read that from time to time.

Q If I told you that Rhinehart reports show that at 13,304 feet the well blew out an estimated 12 million cubic feet of gas per day, would you say that this is substantially the same information obtained in the Sub Surface Library Report; do you have any way to check that information?

A Not with me, it can be checked. I have read the report carefully and that is an unverified report, and our reports do not indicate a blow out above 13,471 feet. Neither does the drilling log that I have here show any break in continuity at that stage that would indicate such an occurrence.

Q What was occurring between the dates of June 5th, 1963 and June 12th, 1963?

A What are your dates, sir?

Q June 5th and June 12th.

A On June the 5th, 1963 at 12:01 A.M., according to this log, the well was drilling at a depth of 12,980 feet; on June the 6th, 1963 at 12:01 A.M., the well was drilling at a depth of 13,068 feet. What dates were you wanting included?

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Q Through the 12th.

A On the 7th the well was drilling at 12:01 A.M., at 13,120 feet; on the 8th at 12:01 A.M. it was drilling at 13,200 feet; on the 9th at 12:01 A.M., it was drilling at 13,246 feet.

Q What happened at that time, on your report?

A I see no particular comments, sir.

Q It doesn't say, "Heavy gas cut mud up on break"?

A It says back -- it says back at 13,220 to 26, "Heavy gas cut mud up on break after 2 hour down time". And the volume of this gas is measured here, sir, and it does not represent a stronger gas reading. That was encountered up higher in the drill stem test up in the Bone Springs. No shows were indicated in the samples. And the best judgment on the well of the people at that time, was not to test this zone.

Q You did drill stem test what interval?

A We drill stem tested an interval from 12,938 feet to 13,499 feet.

Q It included the entire interval?

A It included the entire interval and the test interval was necessitated by setting the packer up in the liner so that the test would not get into trouble. The zone being tested was the zone that had blown out.

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Q What was the rate on that test?

A I'll read the report as they have it here, I do not have the chart, DDT-4, "12,938 to 13,499".

Q Give the rate.

A All right. States that "The flowing heavy gas cut mud stabilized flow on 1-1/2" choke at 1700 pounds at 12 million cubic feet of gas per day; no measurement of fluid; some distillate or condensate present".

Q That will be satisfactory, Mr. Dunn. How many feet of pay did you pick on this drill stem tested interval?

A On this interval I picked 6 feet.

Q Mr. Dunn, were you present at Midland, Texas on the occasion of April 7, 1965 at a certain meeting in which I was present and you were present, and Union Oil Company was represented by attorney Jack Snodgrass.

A Yes, sir. I don't recall the exact date but I was.

Q We did have a meeting in Midland, did we not?

A That's right.

Q Do you recall Mr. Snodgrass's opening remarks on the deposition?

A No, sir, I do not.

Q I would like to read very briefly a page from the deposition which was certified, and I would be happy to

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introduce it.

MR. PORTER: What is that?

MR. PRAY: This is a deposition made in a separate matter concerning drainage. It has to do with this case. This comment is directed to the Commission hearing which is going to be made.

MR. HINKLE: This deposition was not taken for this case, was it?

Q (By Mr. Pray) "And as a technical matter, I don't think it would be appropriate to use this deposition as a vehicle for exploring that, but the statement I want to make is that this spacing hearing which is coming up is not going to be handled like the last one, in that there is going to be a very free and open exchange of information on our part with you prior to that hearing. And before we get into the hearing, and well in advance of it so that you will have time enough to analize it, we are going to lay before you -- I say we are, the lawyers that are handling it are going to lay before you the information and you are going to be fully advised, and you are not going to be confronted with any problem of subpoenas and that sort of thing. And we are going to try to handle it on the basis of full disclosure, and the reason I'm making this statement is so you wouldn't feel like you had to use this deposition

as a means of trying to get information that you could use in your other lawsuit. That's not necessary, you're going to have it anyway". Do you recall that statement, Mr. Dunn?

A It sounds familiar.

Q Were you present when Mr. Snodgrass made that statement?

A I was.

Q I'll ask you to view this letter?

A Yes, sir.

Q Is that your letter of May 6th, addressed to me?

A That is correct.

Q Is this report of Charles Browning, whom we now find to have been prepared by the other engineer, Mr. Black?

A Mr. Black's initials are here in the corner.

Q Is that the report that accompanied this?

A That is correct.

GOVERNOR CAMPBELL: "That and this" are what?

MR. PRAY: I'm sorry.

Q (By Mr. Pray) Is this the report of Mr. Black; did that accompany your letter of May 6th?

A No, the report of Mr. Black's was sent to you through your attorney, Mr. Hunker. You had it available at the meeting in Dallas.

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Q And it was supplemented by this letter to show the pressure point?

A That's right.

Q But the pressures you submitted to us are the ones prepared by Black?

A That is correct.

Q Did you at any time ever submit any information to us from your study by Gruy?

A No, sir, I did not.

Q Did you ever submit any information to us concerning, or did you ever mention the core analysis?

A I did not.

Q Do you consider that this is full disclosure?

A No, sir, I do not consider that it's full disclosure.

MR. HINKLE: If the Commission please, I don't think we're required to turn over our complete case to the other side before we have a hearing here. Now, I think Mr. Dunn has complied with all their requests and furnished them with all the information they have called for.

After this conference took place the engineers were hired, the core analyses were made, and all of the engineering report was gotten up. I don't think there's any obligation on our part to turn that information over to them before we have a hearing here today.

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GOVERNOR CAMPBELL: Mr. Hinkle and Mr. Pray, I think it's been obvious that the Commission has felt that this was one of those matters which should be resolved between the parties involved, and was hopeful that it could be, and I'm hopeful it can be because I believe that's the way it should be handled. I think that's the reason the subject came up, Mr. Hinkle, because it was discussed to some extent in the prior hearings, and obviously which it apparently is a matter of litigation, why, that's another thing. You're not required to disclose, of course, at least at our proceedings; we had hoped you would.

MR. HINKLE: We would like to offer in evidence Exhibit 16, which is the special field rules proposed.

(Whereupon, Union's Exhibit 16 marked for identification.)

(Whereupon, Union's Exhibit 16 offered into evidence.)

MR. PORTER: Are there any objections to the admission of Exhibit 16? It will be admitted.

(Whereupon, Union's Exhibit 16 admitted into evidence.)

GOVERNOR CAMPBELL: May I ask the counsel to approach the bench here a minute? Do you have any further questions of this witness, Mr. Pray?

MR. PRAY: No, sir.

MR. PORTER: The witness may be excused.

GOVERNOR CAMPBELL: Off the record.

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(Whereupon, a discussion was held off the record.)

MR. PORTER: Call your next witness, Mr. Hinkle.

MR. HINKLE: That completes our case.

MR. PORTER: Mr. Pray, do you desire to put on testimony at this time?

MR. PRAY: Yes, we do.

MR. PORTER: Call your witnesses, please.

MR. PRAY: Mr. Bill Stapler, will you take the stand, please? Our witnesses haven't been sworn, Mr. Stapler, Mr. Keplinger and Mr. Schuman.

(Witnesses sworn.)

* * * *

B I L L S T A P L E R, a witness, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. PRAY:

Q Mr. Stapler, would you state your full name for the Commission, and your position?

A Bill Stapler, Vice President and General Manager of Kermit Oil Company.

Q What do your duties as Vice President and General Manager of Kermit entail?

A Oh, management and decisions in running the company, as to securing leases, drilling wells.

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Q What has been your experience in the oil business, Mr. Stapler?

A I have been in the oil business all my life from the time I roughnecked and roustabouted. I spent 6 years with Skelly Oil Company; 6 years with Sharp Drilling Company; 2 years in Midland; then to North Dakota, and two years figuring bids and working on wells and well bids. And for the past two and a half years I have been at Kermit Oil.

Q Mr. Stapler, have you examined all the data which, prior to this hearing, was submitted by Pure Oil Company and then Union Oil Company?

A Yes, sir, I have examined the entire case file.

Q Have you examined all of the logs and all of the testimony?

A Yes, sir.

Q Have you reached any conclusions concerning the advisability of the development on the present spacing?

A We have a contract with the mineral owners of this tract to drill a Wolfcamp Pennsylvanian test under the present spacing.

Q Do you feel this will be an economic venture?

A Yes, sir.

Q Do you believe a reasonably prudent operator would

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drill a well on that spacing?

A I believe they would.

Q Have you computed what the well costs would be for drilling a single Wolfcamp completion?

A Yes, sir, I have. I may have left that information down here. I now have that information.

Q All right. And what is the cost of drilling a well in the Wolfcamp formation as a single completion?

A We feel a single completion in the Wolfcamp formation can be accomplished for $393,782.00.

Q Do you have experience in drilling producing wells of comparable depth?

A Yes, sir. We have drilled wells to 14,000 feet. This well would be deeper but we feel the experience gained to this depth would benefit us and we can make the few extra feet of hole we're talking about.

Q Do you have a contractor for this well?

A Yes, sir.

Q Who is it?

A Sharp Gullington.

Q Has Sharp had experience in drilling wells similar to this?

A Yes, sir. They operate some 20 rigs in West Texas-New Mexico area and have drilled several holes to 20,000 feet.

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Q Did they in fact drill the Red Hills Number 1?

A In fact they drilled the Red Hills Number 1.

Q Have you computed what a dual completion in the Wolfcamp and Pennsylvanian would cost?

A It is our opinion that a dual completion of the Wolfcamp and Pennsylvanian would cost $689,980.00.

Q Is your company ready to commence drilling?

A We are prepared to commence this test when we have an appropriate order from the Commission.

MR. PRAY: No further questions.

MR. PORTER: Do you have any questions of the witness, anyone?

CROSS-EXAMINATION

BY MR. CHRISTY:

Q The contract you're speaking of, is this a contract of February 1966 between Mr. Schuman, et al., and Kermit Oil?

A That's correct.

Q You have to date been furnished Exhibits 13, 14 and [illegible], have you not?

A Yes, sir.

Q And examination of those exhibits would indicate that a well on a 160 acres would not be profitable. If you had not made the contract of February '66 would you make it

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today?

A Yes, sir.

Q You would make it today even in view of Exhibits 13, 14 and 15?

A Yes, sir.

Q You say your Wolfcamp cost $393,782.00 and Mr. Sharp is going to drill that for you?

A Yes, sir.

Q Is he getting an override or any other figure besides the $393,000?

A No, sir.

Q He doesn't get an override?

A No, sir.

Q That's the total cost for drilling the well?

A In our opinion, yes, sir.

Q What type of basis, is that a cost plus?

A Footage and day-work.

Q And that is his estimate. Now, what is your surface equipment going to cost?

A We feel that pipe and fittings for a Wolfcamp completion, $3,000; tank & stairs, $4500; separators & treators, $12,000.00; well head, $13,000.00.

Q Total up?

A I don't have a total of those, I'm sorry.

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Q Would you total them for me, please?

A $32,500.00.

Q Which, of course, should be added to the $393,000 you spoke of a minute ago?

A No, sir.

Q That includes it?

A Yes, sir.

Q I assume, then, sir, that you feel the estimated costs shown on Exhibit 13 are unreasonable costs. And I will refer you to Exhibit 13, because they show 539,000 and you show 393,000.

A I don't say they're unreasonable, there could be two basis for figuring. In my opinion $393,000.00 is the cost.

Q But in your further opinion, the Exhibit 13 well costs of 539 are not unreasonable?

A Yes, sir, I believe they are unreasonable.

Q In what respect, sir?

A I think they're a hundred and thirty-nine thousand dollars high.

Q And would you show me where the hundred and thirty-nine thousand is that's unreasonable; what items are unreasonable?

A We have a less expensive casing program.

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Q You have a less expensive casing program. Now, in what items are you less expensive; is it the 13-3/8" casing?

A It's the 9-5/8" casing.

Q Do you plan for the full 6,000 feet of it?

A No, sir.

Q Why don't you plan for 6,000 feet of it?

A In our studies we feel that we can set this string of casing at 5200 feet and that -- that's it at this time, sir. I don't have my complete casing program here and I can't compare it foot by foot, but the total difference is some $50,000.00.

Q You can't tell me where it's unreasonable?

A There are --

Q I believe that will be sufficient on that question. Let me ask you another question. In this drilling cost that you spoke of, is there any profit involved, or do you know?

A I feel there is profit.

Q You feel there is profit involved because Mr. Sharp is drilling this --



A Yes, sir.

Q -- and Kermit Oil Company is having it drilled?

A Yes, sir.

Q And does Mr. Sharp, in fact, own Kermit Oil Company?

A Yes, sir.

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MR. CHRISTY: That's all.

MR. PORTER: Any further questions of the witness?

MR. PRAY: Nothing further.

MR. PORTER: The witness may be excused. Call your next witness.

MR. PRAY: Call Jerald Schuman.

* * * *

J E R A L D S C H U M A N, a witness, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. PRAY:

Q State your full name, please?

A Jerald N. Schuman.

Q What is your occupation?

A Attorney.

Q Do you own any interest at all in Section 5, which is Township 26 South, Range 33 East?

A Yes, sir, I do.

Q And has that ownership previously been entered in the record of Case 3158?

A Yes, sir.

Q Mr. Schuman, did the Pure Oil Company, and subsequently Union Oil Company by merger, own a lease covering your mineral interest?

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A They did.

Q And have they released that lease?

A They have.

Q What was the date of that lease being released?

A I believe the date that they released it was September 1st, 1965.

Q Did they at that time or at any other time tell you why they released your lease?

A They did.

Q What was the reason given?

A There was a meeting with Mr. E. B. White, I think it was some time in July of Nineteen Hundred and Sixty-Five, the 20th or 21th, with a Mr. Sabin, along with Mr. George Bowen, an attorney in Tulsa, and at that meeting Mr. White told me that additional, or however he phrased it, that they could not justify, economically, to drill a well on Section 5.

Q Have they at any other time indicated to you that they did not believe a well in Section 5 was justified on an economic standpoint?

A They have.

Q What occasion was this?

A In about January, on the 13th or 14th, a deposition was taken by Union Oil Company, it was my deposition in my

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office, where attending that was the attorney, Mr. Jack Snodgrass, representing Union Oil Company, and Mr. Robert Humphrey who, I believe is present in this hearing.

Q Did they at that time tell you that they didn't believe that a well on Section 5 was justified?

A They told me that they didn't want any part of it and that they would be very happy to see a well drilled in Section 5 because they've got a lot of other acreage around, but they didn't want to have anything to do with it.

Q When did you conclude your agreement with Kermit for the development of Section 5?

A I believe it was either February 18th or 19th, Nineteen Hundred and Sixty-Six.

Q And approximately how long after this did Union file the present application?

A From the testimony here in the hearing, the date that I had, I thought it was some time around March 23, Nineteen Hundred and Sixty-Six, or March the 25th, one of the two, approximately, oh, a little over a month later.

Q What would be the effect of this spacing order on Union's ownership in a well drilled on 640-acre spacing?

A Their ownership then would be increased tremendously.

Q Over what it is under the present spacing?

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A Over what it is under the present spacing, that's correct.

Q Yet they told you they didn't want any part of Section 5?

A That is correct.

MR. PRAY: No further questions.

MR. PORTER: Any questions of the witness?

CROSS-EXAMINATION

BY MR. CHRISTY:

Q I believe you stated that Mr. Snodgrass in Midland, and I don't believe I got the date, stated to you that Union was not interested in drilling a well in Section 5?

A I didn't say in Midland.

Q Where was it?

A In Tulsa in my office, I think I said.

Q And when was that, approximately?

A January 13th.

Q Year?

A 1966.

Q And at that time the area spacing was 160 acres, it is in fact today?

A That is correct.

Q Did Mr. Snodgrass say anything to you about the aerial extent or was he speaking in fact, Mr. Schuman, of a

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160-acre well in Section 5 and that's what he meant, rather than a 640-acre well in Section 5?

A He said they just didn't want the lease.

Q He didn't want the lease?

A Referring to Union.

Q But he didn't say that he would not drill a well on 640 acres in Section 5, did he?

A He did not.

Q As a matter of fact, on February 28, 1966 in a meeting in Dallas, Union agreed to drill a 640-acre well in Section 5, that is correct, is it not, a Wolfcamp well?

A That is correct.

Q You say that Union's interest in Section 5 increases by virtue of the 640-acre spacing, did I understand you correctly, is that your statement, sir?

A Yes.

Q How does Union's acreage increase in Section by virtue of 640-acre spacing, how do we get more acreage, I don't understand?

A You don't understand?

Q No, sir.

Q If I understand, myself, Mr. Christy, under the existing statewide rules, which is 160 acres for standard location, if we should drill a well in the, say, Northeast

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Quarter of Section 5, the undivided mineral owners, other than a fractional interest of approximately a 1/16 owned by some other parties, which is leased to Union Oil Company, approximately 120 acres of that 160 acres is owned by myself and the other undivided mineral owners, and that Union Oil Company or their -- whoever is involved with them own approximately 40 acres.

Q All right, sir. We didn't loose or gain right there, did we, acreage?

A We're just staying with a hundred and sixty, and that's exactly what our interest would be. We would have approximately 3/4 interest in that particular well.

Q And Union would have 1/4?

A That is correct. If a 640-acre spacing were granted, we own, based upon the same type of a mineral interest, undivided, which is not owned by Union, we have approximately 280 acres out of 640 acres, thereby reducing our proportionate interest.

Q And Union would have the balance of the acreage in Section 5?

A That is correct.

Q And if you drilled another well that would be 50-50?

A I don't understand.

Q If you drilled it in the Northwest it would be a

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50-50 well, would it not?

A In the Northwest Quarter of the Northwest Quarter?

Q Northwest Quarter as a proration unit, 160 acres?

A You would own half and Union would own half.

Q I'm talking about a 160-acre well spacing in the Northwest Quarter of Section 5. You own the North half Northwest, Union owning the South half?

A If it were drilled in the Northwest Quarter, that's correct.

Q And in the Southwest Quarter Union would own it all, and in the Southeast it would be 50-50 again?

A That's correct.

Q How does Union's acreage increase in Section 5 by virtue of the 640-acre spacing; it all comes out the same, doesn't it?

A I don't see how you can determine that.

MR. CHRISTY: No more questions.

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

REDIRECT EXAMINATION

BY MR. PRAY:

Q Mr. Schuman, if a well were drilled on the present spacing and there was production from that well, let's assume as Mr. Christy was saying, it's in the Northeast Quarter on

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160 acres, how would the production be allocated?

A 3/4 on me and 1/4 on Union.

Q 160 spacing, it would be allocated entirely different?

A That is correct.

Q 280 acres or 640, I believe the ownership of Union would be about 9/16, isn't that correct?

A That ratio.

Q So a larger share they would get from any well that was drilled?

A That is correct.

MR. PRAY: No further questions.

MR. PORTER: Any further questions? The witness may be excused.

MR. PRAY: I would like to take a few minutes recess.

MR. PORTER: We will take a short recess.

(Whereupon, a recess was taken.)

* * * *

H E N R Y K E P L I N G E R, a witness, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. PRAY:

Q Would you state your name, please, sir?

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A Henry Keplinger.

Q What is your occupation, Mr. Keplinger?

A Petroleum engineer.

Q What is your experience?

A I have worked in the oil fields, started out in 1929 with Shell Oil Company.

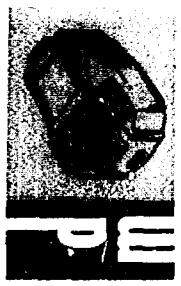
MR. CHRISTY: We would be happy to stipulate that Mr. Keplinger is a petroleum engineer.

MR. PRAY: We would prefer to have his qualifications in the record, thank you very much.

Q (By Mr. Pray) Would you continue, Mr. Keplinger?

A I graduated from the University of Tulsa in 1931; took a Masters Degree in Physics from George Washington University, 1933; started with Shell in 1933. Personally, before that I worked in the summer for Shell and others in oil fields, and worked for Shell for approximately 11 years as a petroleum engineer, appraisal of oil and gas properties, well spacing problems in the States of Kansas, Oklahoma, Illinois and Texas. In 1944 I formed a company with my partner, Mr. Wanenmacher, and since that time we've engaged in the practice of petroleum engineering, estimating oil and gas reserves, completion problems. We have a firm of petroleum engineers who have worked in every state in the Union, and most of the foreign countries. We have a staff

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of operating people who drill wells, produce wells. At the present time we operate 800 wells and have many gas wells under our supervision.

Q Mr. Keplinger, have you had an opportunity to view all of the exhibits presented at the prior hearings by Pure Oil Company?

A Yes, sir, I have looked at the exhibits.

Q Have you had an opportunity to review all of the testimony?

A I've tried to review most of the testimony that was available.

Q Have you had an opportunity to view all of the information which up until today had been submitted by Union Oil Company concerning the pressure surveys?

A I have.

Q And you have heard the testimony at this hearing?

A I have.

Q Mr. Keplinger, are you of the opinion that Union Oil Company has presented new evidence which would entitle them to a change in the spacing?

A New evidence today or since the hearing?

Q Today.

A No, I don't think that the information that has been presented today would entitle them to a new hearing on well

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spacing.

Q Let's direct our attention to the core analysis. Do you believe that this core analysis furnishes any new information upon which to change the data which was presented at the last hearing?

A No, and specifically, in reference to this core analysis, we had a complete description which was furnished at the formal hearing. It was a shale section containing limestone streaks, and although there is a little discrepancy in where the core was at that time compared to what the testimony was today, it doesn't constitute new data from this core analysis. And in addition, the information from the core, as to porosity, isn't used because none of the pay picks that were presented today, the new pay picks were in the section which was cored.

Now, formerly there was a portion of the core which was indicated to be in the pay section, there was some two or three feet of pay picked maybe at the top part, maybe at the top part of this core, so it doesn't, in my opinion, constitute additional information by having this core run.

Q In your opinion, would good engineering practice entitle them to change on the basis of this core analysis, the porosities and the pay picks which they presented today, to change the testimony from the prior hearing?

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A No, sir, and my experience at picking pays, the pay picks have to come from the gamma ray neutron log which is run many months ago, and the analysis of the core couldn't be used as a calibration as we speak of calibration in the neutron log in the oil industry or oil industries, because the pays they picked, none of it, the section which they analized, none of it was considered pay by these new picks or within these new picks.

Q In your opinion, are there additional pay zones which they did not pick today?

A Yes, sir. Mr. Cavler, in a previous hearing, picked additional pay which they have failed to pick today.

Q What is your opinion of what the pay pick should be in the Wolfcamp, based on all the information that we have?

A Well, I feel that the pay picks by Mr. Cavler are justified.

Q Do you recall what those pay picks, total pay was in the Wolfcamp?

A Total pay was about 80 feet.

Q Is there a substantial amount of pay above this first zone which was picked today at 13,468?

A Yes, sir, there is.

Q Upon what do you base this opinion?

A Based upon the characteristics of the neutron log

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and the blow out and the drill stem tests.

Q Do you use this drill stem test in arriving at your conclusion, did you?

A As part of the fact that this well, it has this small pay section, supposedly made 12 million cubic feet. And also, before the drill stem tests was made, number four test, there was this kick in the mud, indicating gas.

Q What was the porosity which was presented by the Pure Oil Company at the time of the last hearing?

A The porosity on Exhibit Number 5, average porosity was 10 percent; pay pick was 28 feet.

Q Do you see any reasonable basis, using good engineering practice, why they should be reduced to some 4.89 percent and 24 feet?

A No, sir, I do not.

Q Have you had an opportunity to study the pressure charts, the pressure data which has been submitted to us prior to the date of this hearing?

A Yes, sir, in great detail.

Q Have you presented or prepared your own pressure build up curves based on this data?

A Yes, sir.

Q Now, does it compare with the curves by Gruy?

A Mr. Gruy's curves -- they're really not Mr. Gruy's,

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they're presented by Gruy Engineering, but those curves are in general, higher. The pressures are higher at the beginning and lower at the end.

Q And what is the result of this?

A The result of this is to decrease, as pointed out, the probable gas-in-place in the Wolfcamp Reservoir.

Q Approximately how much of the computed reservoir reserves had been produced to the time that the last survey was made, do you recall?

A I know how much was produced, but how much of the reservoir is a problematical thing.

Q According to their information, I believe they stated that there was 25 billion cubic feet?

A This was, I believe, more than 10 percent, because it would produce better than 2.8 billion.

Q In your opinion, how can these pressure surveys be applied to an economic evaluation?

A They will give the range of results, the number. The August test of '65, which is their Exhibit Number 8, was the survey with the longest shut in period, some 585 hours, and in there they calculated a little higher pressure, it went above their curve. The same thing happens in our calculations. This is a very tight reservoir. We feel that on the basis of additional calculations of permeability in

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C-2, both near the well bore and away from the well bore, that the permeability is less than 1 millidarcy. We come up with a little lower figure than the figures presented today.

So this is a very tight gas reservoir, and in a tight reservoir like this where we have to reach out for the boundary, a type of curve where you plot P/Z of one well, and being very tight, there is a possibility that where we have P/Z on the left here and down below, we have accumulated gas, that with time more and more may feed in and the curve may not break off as fast because of the low permeability of this reservoir. And in my experience in the Hugerton Field where we have had low permeability in certain wells, there the curve came down fairly rapidly for awhile and then flattened off, indicating gas feeding in. So the information presented, we cannot, and I don't think anyone else can, definitely say what these reserves are at this time.

For instance, if we take the long shut in pressure period at this point here, which is August 31, 1965, that was 585 hours, you take that point and the point before, and extend that out, you can see you can reach up into several more billion cubic feet of gas by this.



Q Did you in fact compute what the maximum potential reserves would be using those points?

A Well, it depends on the width of your pencil, and

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it's very delicate, but it would surely double the 25 billion, and probably approximate 50.

Q In your opinion, do these pressure surveys show any change at all in the volumetric capacity of a particular acre foot of this reservoir?

A No, these pressure surveys include the entire reservoir which is perforated and tied in with this part where the pressure is effecting the reservoir at this time, or where the withdrawals are effecting the pressures.

In this particular reservoir to date, although Union did perforate an additional section which they haven't called pay, which I think has a pay section in, they haven't completely perforated all the pay sections in this well, so that there was additional reserves from that.

Q In other words, there are reserves in the Wolfcamp which are not reflected by this curve?

A I don't think the system is such that it would tie in there a couple hundred foot section.

Q In fact, didn't the gentleman state that there were two separate zones which he viewed on these curves?

A You would have to ask him. I think he stated they showed two different pay sections as producing in this well; I think that's what he was talking about. Our analysis of these curves definitely indicate two sections

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producing, but they also indicate that whenever you get a change in slope, going along like this, and then changing, or particularly like this, and then changing, and this little trend like that indicates fracturing in my opinion.

Q How is it possible to determine the aerial extent of this reservoir by using the pressure surveys?

A The pressure surveys have to incorporate the best estimate of the volumetric and the thickness or the recovery per acre foot times the thickness. As pointed out, if you change the porosity from 4.8 percent to approximately 9 percent or 9-1/2, the aerial extent of being effected by the well would be reduced to half, or from 1800 acres down to 900 acres. So it's very critical in determining the aerial extent to have a reliable porosity and thickness figures.

Q Have you been able to develop an opinion as to the volumetric capacity of this reservoir?

A In my case I have used the information submitted at the last hearing by Pure Oil Company and accepted their 28 percent porosity.



Q What is your basis?

A I think that is a minimum that additional pay in the well up above that gives a reasonable estimate.

Q What are the figures you have used?

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A It's their Exhibit 5 of the last hearing. That gives approximately 30, 30 million cubic feet per acre.

Q Have you then computed the recoverable gas-in-place in this reservoir, based on the testimony given by Pure Oil Company in the former hearings?

A I have.

Q What is this?

A Approximately 30 million per acre.

Q You stated you believe this is a minimum figure?

A I think it's a realistic figure based on the pay picks. Additional perforating will increase the well.

Q If you used this conservative figure and used the reservoir volume as computed by Gruy of some; I speak of Gruy, I mean Gruy Engineering; if I remember, of 25 billion, how many acres in aerial extent would this reservoir cover?

A 25 billion divided by 30 million, would be less than a thousand.

Q Have you prepared an exhibit showing where this would most likely lay if you used the circular flow?

A It's impossible. If you used a circular you could just assume a circular area around the thousand acres. But in this particular case, from the seismic information which has been furnished, the formation in the devonian is dipping off to the south and southwest, so that it's impossible that

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it may have the limits of the reservoir earlier to the South than you might have it to the North Northeast.

Q In your opinion, is there any evidence to show that the South half of Section 5 will be commercially productive?

A There's a possibility, but at this time it's problematical.

Q It's less likely than the North half?

A Yes, from the basis, the drilling of only one well in the field. Drilling the offset which would be 660 feet from the line as proposed, I think that the 320 acres in the North half, the gas-in-place there is far more assured than it would be under the South half.

Q Have you prepared an economic evaluation using the well cost testified to by Mr. Stapler?

A I have prepared an economic analysis using Pure's information at the last hearing, their Exhibit 5, as to reserves and costs, but in addition I have included the Pennsylvanian as a dual completion. So I have made the analysis on the basis of the costs to drill the completed dual well in the Pennsylvanian, 160 for the Wolfcamp and 320 for the Pennsylvanian.

Q Have you an opinion as to the potential, the commercial potential of the Pennsylvanian Zone based on

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information previously educed?

A Yes, sir. I feel that it's commercial, and that at the present time it's only a problem of breaking the seal in the well that's causing the flow to stop before it gets to the surface. As far as the analysis of the well log, the core, I mean the well log, the drill stem tests, everything was very favorable, and in my opinion it is a plugged well in the tubing and it is not in the formation. The formation looks the same today as it did when it was drilled, or when they ran the first test.

Q In your opinion, would it be a profitable venture for a group of operators to drill a well based on the present spacing?

A A dual well on the present spacing, it would be prudent to do it.

MR. PRAY: I believe I have no further questions of Mr. Keplinger.

MR. PORTER: Anyone else have a question of the witness?

CROSS-EXAMINATION

BY MR. CHRISTY:

Q Mr. Keplinger, you're a petroleum engineer?

A Yes, sir.

Q Are you a log analyst, also?

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A Yes, sir.

Q You can help me a little bit here, then. You said initially, I believe, that the evidence here presented by Union, the new evidence presented by Union did not justify in your mind the granting of a 640-acre spacing?

A That's correct, the logs haven't changed in any way, sir.

Q Would the new evidence plus the past evidence give you an indication that the 640 acres might be justified, taking into consideration the testimony in the prior hearing, plus the testimony today, would you alter your opinion?

A No, I surely wouldn't, because the evidence in the past hearings or past hearing, indicated that the 640 and the 320 Pennsylvanian, and the 160 Wolfcamp was profitable, and I still contend that that's the same. The only thing today is that you have some pressure history, and this pressure history is not exact. If you use two points here you may get 50 billion; if you use a couple other points like this you will get less than 25 billion; or if you do it as Gruy Engineering did you come out in between.

Q What testimony here by Union today would indicate lesser spacing was the correct thing to do?

A Lesser than 160?

Q Lesser than 640? In other words, isn't all the

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evidence presented here today by Union indicative that 640-acre spacing is the correct thing to do? I'm not asking you whether it is or isn't. Isn't what they presented a case for 640 spacing?

A I think that's what they presented.

Q Yes, sir, thank you. You say the core analysis does not help in picking the pay picks, is that correct, did I misunderstand you correct, sir?

A That's right.

Q Would it not in fact rule out one or two of the pay picks of Doctor Cavler, because as a matter of fact, you testified that you agreed with the pay picks of Doctor Cavler, but as a matter of fact, three feet of those pay picks are within the cored section of the log, isn't that correct?

A That's correct.

Q Then those three feet must come out?

A Let me see which --

Q My informants say it's approximately 13,486 feet.

A No, Mr. Cavler picked -- he has the same pay. This bottom part at 80, start at 80; you're right, it's in that section where it was cored and he had a pay pick there, that's correct.

Q So I assume you would wish to correct your testimony and you do not agree with all the picks of Doctor

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Cavler?

A No. This core analysis was taken in that section but during -- in this particular section you had a permeability indicated, I mean a porosity indicated of about 5 percent from the micro log --

Q Yes, sir.

A -- and he thinks that would produce and so do I, that there would be a small production come from that area.

Q Was there in fact a micro log?

A I mean neutron log.

Q You think that thin section might produce?

A It's not completely ruled out.

Q But not definitive pay?

A That's right.

Q And I believe what Mr. Ford testified to today was definitive pay?

A Yes, sir.

Q And admittedly conservative?

A I don't know whether it's conservative or not.

Q You do not agree, I assume, with Mr. Ford that the picks by Doctor Cavler above the core should be ruled out because the mud calculated at that point was about 6700 pounds?

A No, sir.

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Q You do not agree with that statement?

A No, sir.

Q Now, you said that in the pressure build up curves, if you could flatten the curve you could increase the volume?

A Not the pressure build up.

Q Excuse me. If you increase the volume you flatten the curve, didn't that increase the volume?

A The static pressure divided by the "Z" factor, this is your material balance calculation of reserves.

Q If I flatten the curve do I increase the volume?

A That's correct.

Q Now, sir, if the pay picks by Mr. Ford are correct, and you flatten the line, we simply increase the aerial extent, do we not?

A That's correct.

Q Now, sir, you are, of course, familiar with the transit test analysis?

A Yes, sir.

Q I assume they are a reasonable basis of calculation?

A We seem to have a difference of opinion in this case. We come out with the build up pressures very nearly the same as Union Oil Company's.

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Q The pressures?

A Pressure build ups. We don't have the same pressures as Gruy's. It's this part right here, that is very critical.

GOVERNOR CAMPBELL: Which part is that?

THE WITNESS: From "D" to "E" on Exhibit 8, and from "B" to "C" on Exhibit 9, and from a little past "B" to "C" on Exhibit 10. It must be that my eye just doesn't go quite that way, and we plotted them up and we're within a few percentage of Union's figures, and we don't jive with these.

Q Did you use a computer?

A No, sir.

Q You used the eye method?

A Yes, sir.

Q And I believe it was testified to by Mr. Garb that they used a computer picking those figures, they are in Exhibit for the record?

A I've been in this business for 40 years and two and two makes four, and that's what I've done with these pressure tests. I worked with Shell Oil Company when this method was first brought out, and I think Mr. Garb testified that they were some of the old Shell papers that he relied upon, he didn't go all the way back to our first papers that

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the company had prepared. So I think my method is pretty good, and I've used them for many years.

Q Fine. Now, did you estimate an average reservoir pressure from these transit tests that you ran?

A A what?

Q An average reservoir pressure?

A No, sir.

Q You just used the, what is it, the "P" bar?

A The final build up.

Q Final build up. And not the "P" bar?

A That's right.

Q Did you find that the "P" bar was declining in pressure?

A I didn't calculate it.

Q So you couldn't come out with a "B" bar?

A No, sir.

Q So you don't know the average reservoir pressure?

A That's correct.

Q I believe Doctor Cavler used 33 billion in this calculation for aerial extent, is that correct?

A Let me see --

Q My question will be, sir, do you agree with Doctor Cavler in that respect? Page 10 of the March '65 hearings; Doctor Cavler down at the bottom of the page, so it's 33

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million cubic feet of gas reserve attributable to 640 acres, do you agree with that?

A On his Exhibit Number 3, which sets out his 7 percent porosity and his estimate, he used a recovery of 59 million per acre.

Q Do you agree with that?

A No, I used the figure that Pure used in the last hearing, calculated it, and that came up some 30. I didn't use, in making my test today, economics, the 59 billion, no, sir, I didn't use that.

Q All right, sir. You mentioned additional pay zones that were not perforated?

A Yes, sir.

Q Could you tell us where they are?

A Yes, sir.

Q I assume you know they're there, if you can tell us where they are?

A You start up at 13,100.

Q All right, sir.

A You have 10 feet there, 13,100 to 13,110.

Q All right.

A Has 9 percent porosity, probably that range.

Q All right, sir.

A You've got another 5 foot section at 13,174.

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Q To 13,179?

A Right.

Q Porosity?

A Porosity of around 4 percent.

Q All right, sir.

A Then you have a section from 13,390, 13,390 to 13,396.

Q Six more feet?

A Six more feet.

Q Porosity?

A Excess of 20 percent; very prolific, very high porus zone.

Q All right.

A Then you have a section here at 13,419; 4 feet.

Q To 13,423. Porosity?

A In excess of 5 percent.

Q 5 percent.

A At 13,430; 2 feet.

Q A total of 2 feet; and the porosity?

A 15.

Q Percent?

A 15 percent.

Q All right, sir.

A And 13,449 -- 48, sorry; 4 feet.

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Q To thirteen thousand and --

A 52.

Q 52, for a total of 4 feet; and the porosity?

A 5 percent. Now, you have in the form of perforations below that point.

Q Yes, sir, and I believe all these picks were above where we change from the 12-1/4 down to the 9-1/2?

A Yes, sir. You never changed the hole size until 13,895 feet. It is on the log, these depths are, which was 1-22, October 19, 1963, tool model TNGT.

Q Did I understand you, sir, that a dual well would be prudent to operate, that the economics are sound for a dual well?

A Yes, sir.

Q I don't believe you mentioned a single well?

A I don't believe I did.

Q Would that be prudent to operate?

A I didn't testify to a single well.

Q You don't know?

A I could look it up.

Q I would appreciate it.

MR. PRAY: If the Commission please. We have, in our presentation, talked about the Pennsylvanian, also. We have an admission in there case that prudent engineering

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practices would require that you consider all potential productive zones which Mr. Keplinger, I assume, in good engineering practice, has considered, and that I don't believe it's necessary for us to consider the economics of a single completion at this time. I did not go into my case and I would object to cross-examination on that point at this time.

MR. CHRISTY: The witness has not testified to anything as production in the Pennsylvanian, but the statement was made, if you knew you had a Pennsylvanian Reservoir in good economics you would include it in your study. But there's not a word that the Pennsylvanian is productive.

THE WITNESS: I testified as shown on the Pennsylvanian, on Exhibit 5.

Q (By Mr. Christy) My question is, would you as a prudent operator, with your economics, not Pure's, but yours, drill a Wolfcamp Well on a 160-acre spacing?

A Yes.

MR. PRAY: Object to the question, Your Honor.

MR. CHRISTY: He's testifying as an economics expert.

MR. PRAY: You heard him say, yes, didn't you. Withdraw the objection.

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Q (By Mr. Christy) Let me ask you this last question, sir. I believe you mentioned that the North half of Section 5 would have better prospects for production than the South half, is that correct, sir?

A That's correct.

Q I assume a well in the North half North half would effectively and efficiently drain gas underlying the South half of the North half?

A That is correct.

MR. CHRISTY: Thank you.

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

MR. PRAY: I have about two more questions.

REDIRECT EXAMINATION

BY MR. PRAY:

Q In your opinion, is it possible on the basis of one well, in the available information presented at this time, to practicably determine the amount of recoverable gas under the South half of Section 5 in the Wolfcamp as compared to the recoverable gas in the North half of Section 5?

A Practical?

Q No.

A With one well drill?

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Q Yes.

A No, as I stated, the drilling of another well in the North Half would recover gas which I thought was proven, but it would be a less chance of proving up the gas on the South half.

Q In your opinion, would proceeding with the development on the present spacing constitute waste?

A No, there would be no waste.

MR. PRAY: No further questions.

MR. PORTER: Anyone else have a question?

MR. CHRISTY: I believe not, no further questions.

MR. PORTER: Did your witness have any exhibits?

MR. PRAY: No exhibits. I would like to rule for limited purposes.

MR. PORTER: The witness may be excused.

GOVERNOR CAMPBELL: He didn't refer to that chart up there, or was his testimony --

MR. PRAY: He referred to it but what we would offer as an exhibit, it's really an aid in testifying.

GOVERNOR CAMPBELL: I realize that, but I think he made some general reference to it.

MR. PORTER: Would you identify that?

MR. PRAY: This is a curve showing pressure over the gas deviation factor versus cumulative gas in billions of

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feet.

THE WITNESS: The pressures being those given by Pure Oil Company and confirmed by our calculations.

MR. PORTER: What I'm really after is a number.

MR. PRAY: Exhibit Number 1, sir. We would like to recall Mr. Garb, who was earlier excused making calculations for us.

MR. PORTER: Mr. Garb, would you take the stand, please?

MR. PRAY: Since we have a new reporter, I would like to make it clear for the record that Mr. Garb has previously testified in the case and he was excused to make calculations.

* * * *

F O R R E S T G A R B, a witness, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. PRAY:

Q Mr. Garb, you realize that you are still testifying under oath and that you have previously been sworn?

A Yes, sir.

Q I believe I asked you to take the 5 foot of pay which was included in the drill stem test in the Wolfcamp, I don't remember the exact figures, drill stem test interval;

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anyway, you are familiar with the drill stem test I'm talking about?

A Number 4, sir.

Q Drill stem test Number 4. And that you were further to take the permeability as computed from your pressure build up surveys of 1.56 millidarcies, and the pressure of 11,000 pounds from the drill stem test, and you were to compute for me the rate at which this 5 foot zone would be capable of flowing. Have you computed such a rate?

A Yes, sir.

Q What is that rate?

A The one -- may I explain the calculations, sir?

Q Yes.

A The 1.56 millidarcies that is computed from the build up is a weighted average permeability which we attributed to two zones. We do not know that the 5 foot in question has 1.56 millidarcies or perhaps could have as high as 7.8 millidarcies if it had all the permeability zone. I have made a calculation over the range.

Q Based on the figure I stated to you, give it to me, and do you have any information which would be better to show what the actual permeability is in that?

A In that one zone?

Q In that one zone.

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A Only the question as to what it is.

Q The best information you have available is that there is an average permeability?

A A weighted average between two zones of which neither individually I know.

Q We have no better approach than taking the weighted average?

A Yes, sir.

Q Would you give us the figure?

A On the basis of 1 over 5 situation and the steady state flow equation, we had to make several assumptions; one, that the initial drill stem test was 11,376 and that the final flowing pressure as exhibited in that test was 4,310 pounds. We also, by reading the chart, determined that the flow period had been approximately 4.75 hours, and that the radius of drainage or the flow period of that duration with a 1.56 millidarcy permeability, calculated to be approximately 440 feet.

Q I believe what I'm after is not the radius of drainage but it is the rate of flow?

A You cannot calculate it, sir, without the radius of drainage. Once we have computed the RA/RW and we assumed again an average well bore diameter of 1 foot, we computed a flow rate of approximately three million, one ninety, 3.190

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million MCF per day.

Q 3.190 million MCF per day?

A Yes, sir.

Q The actual flow was 12 million from the drill stem test?

A Yes, sir.

Q So that if you had an error of 100 percent you would still come up with only 6 million from that zone?

A If you have a hundred percent error.

MR. PRAY: No further questions.

MR. PORTER: Any further questions? The witness may be excused.

MR. PRAY: Do you have anything else you would like to state to the Commission?

THE WITNESS: With the Commission's permission, if we are allowed to attribute the 7.8 millidarcies, the yield from the well would have been 14.25 MCF per day.

MR. PRAY: Do you have any basis for establishing this maximum permeability?

A No, sir, I do not.

MR. PORTER: The witness may be excused.

MR. PRAY: The respondent rests in the case.

MR. CHRISTY: We would like to recall Mr. Ford just for one question.

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* * * *

M A R T I N E. F O R D, a witness, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. CHRISTY:

Q You are Martin Ford, who has previously testified at this hearing on direct?

A Yes, sir.

Q Mr. Ford, one point from your direct, did you use the cores in calibrating the pay section that you used?

A No, sir, no, I didn't. I believe it's not possible to use the core in that way. However, it is possible, once having established a calibration by the other means that I was describing, to use the core to check whether this calibration is a reasonable one. This I did and I found there was a satisfactory agreement between them.

Q Now, sir, I believe it was testified by Mr. Keplinger, certain other pay zones which he picked from the gamma ray neutron log, a portion of which is shown as Exhibit 7. Do you have the whole log that we might mark so we can get to these other pays he picked above this point?

MR. CHRISTY: This will be Union's Exhibit Number 17.

(Whereupon, Union's Exhibit Number 17 marked for identification.)

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Q (By Mr. Christy) Union's Exhibit Number 17, which is the entire log, is that correct?

A Yes, sir.

Q Now, if you would go over with me, please, very briefly, there was picked a 10 feet of pay from 13,100 to 13,110?

A 100 to 110.

Q You did not pick that as pay?

A No, sir.

Q Why?

A I relied on the information that I had that the well was still retained in control when it should be in excess pressure in effective reservoir rock towards the bore hole, which would result in the movement of reservoir fluids into the bore hole, and the probable loss of control of the well. That particular zone that you've described to me over that depth interval of the Schlumberger log is quite a thick zone and one would expect, therefore, that if that had effective porosity it would very likely result in a large flow of fluid on the well bore.

Q It is the situation of 6700 pounds of mud not blowing out?

A Yes.

Q What is the next pick you used, 13,184 to 13,189?

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A 13,184.

Q 13,184, for 5 feet?

A 184 to 189, that is coming very close to the level of natural gamma ray radiation that one would associate with a shale, and the neutron curves give us a rather similar indication. I believe I would say there was certainly not effective reservoir rock in that interval. Over that interval there is rock which bears some similarity to that which we have recognized as pay. I would -- my estimate is that it would have less than 2 percent porosity.

Q And --

A Although I recognize that there isn't a close association between porosity and permeability. It might lead one to suspect that that might not be pay. However, in the absence of any information about the performance of the well during the drilling of that section, it would be difficult to decide whether that was pay or not.

Q It would or would not?

A Could be.

Q 2 percent?

A Something less than 2 percent, that is without a shale correction.

Q Next was 13,390 to 96, 6 feet?

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A Yes, sir. That section, I think one would have to evaluate in conjunction with the section above. However, it would seem rather surprising -- allow me to put it this way. There's a surprising level of difference of porosity between this and the lower sections without some shale correction, that, according to my calibration, would have a porosity of the order of 25 percent.

Q All right, sir. And you would not pick that as pay?

A No, sir, because I think that the extreme movement of both the curves towards the left is an indication that, in fact, the hole at that point is even larger than the surrounding hole. And this I wouldn't find surprising if there had been a flow of fluids from the formation at the time that the well was nearly blowing out, which might result in some turbulence in the lower section and some increase in hole size.

Q Next, 13,419 to 13,423 feet, a total distance of 4 feet. I believe it was given at 5 percent porosity, may I have your comment on that?

A I believe I would estimate a lower porosity, but I would have to say that could be net pay if not for the performance of the well in that interval.

Q What type of porosity would you use?

A I would say perhaps half the 5 percent or less.

Q The next pay is only 2 feet, it's 13,430 to 13,432 feet, picked for 15 percent porosity?

A Well, if one didn't make a correction for the effects of the shale, one might think that I would estimate that it had a porosity of the order of about 8 percent. However, if I corrected for shale it would be something like 6 percent or less. I think that were it not for the -- again for the evidence of the performance of the well over that interval it might be difficult to decide whether that was net pay or not. However, I do think that when we consider these very thin sections we have to remember that even if there was porosity originally it was very unlikely that it was preserved.

In that connection, too, I would like to draw attention to a zone above the interval you spoke of a little earlier, that is from 80 to 90, which has gamma ray characteristics similar to the zone 30 to 32, which were picked as net pay but which Mr. Keplinger excluded from his estimates.

Q There is one more pick from 13,448 to 452, a total of 4 feet?

A May I have that interval again, please?

Q 448 to 452.

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A Yes.

Q 4 feet, 5 percent porosity, would you agree with that or wish to comment on it?

A I would estimate something of the order of 2-1/2 percent in that interval.

Q 2-1/2 percent porosity for a possible addition of 4 feet of pay?

A Possibly, providing the well didn't go out of control in that interval.

Q Could some of these pays be based on mud log kicks?

A Yes, I think they might.

Q That might be an answer?

A That could be the reason why they were picked. I would have to say that if one were using drilling rigs one would have to use very great caution in interpreting the rate of drilling in terms of porosity, because there are so many other factors that determine rate of drilling other than porosity.

Q Have you seen these mud logs kick where pay is not existent?

A Yes, sir.

MR. CHRISTY: That's all.

CROSS-EXAMINATION

BY MR. PRAY:

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Q Mr. Ford, as I understand it, you're saying to this Commission that because the well was under control that you did not pick these zones which you have testified to, and I'll lump them altogether for sake of time because there was no blow out of this well, is that correct, the well was under control, therefore you didn't pick them as pays?

A Substantially so, except for the zone from 390 to 396, which I thought had it's log characteristics due to an enlarged hole.

Q Then I take it it would be very difficult for us to pick pay unless the well was out of control; you don't pick pay unless the well is out of control?

A No, sir.

Q You want a drill stem test?

A No, sir, that's not what I've said. I have said that this is an additional criterion which one should use if it's available.

Q You're condemning the hole pay picks based on this criterion?

A Some of them.

Q The area where you say porosity is 25 percent, did you say, but you think maybe the hole is larger than the surrounding hole?

A I think that the characteristics above that

section, which for some reason Mr. Keplinger has excluded, he must have used some criteria in excluding that section and I believe that very probably it was enlarged hole size.

Q Do you have any information to confirm that?

A The log.

Q So you're saying it's either a large porosity or it's washed out?

A It's either tremendous porosity or it's washed out.

Q But you don't know which?

A I think it's most unlikely that one would find porosity of 30.

Q 25?

A I believe you said 25, 20 in that section.

Q What would you pick in that zone just above from 80 to 90?

A Allow me to refer, I'd say that would be about 30 percent without making any correction for shaling.

Q You don't make any correction?

A Without making a correction for shalingness. If I did that it would be on the order of 28 percent.

Q That increases it, then, the porosity?

A Did I not say 30? I thought the figure I had given you --

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Q You started at 25, pardon me. Are you familiar with this curve from the Schlumberger log from the porosity index?

A Yes.

Q Does that take into account the shale?

A No, sir.

Q You use yours independently?

A I use the technique prescribed by Mr. Bush.

Q Did you use this type of curve to arrive at your primary picks?

A Yes, sir.

MR. CHRISTY: No further questions. At this time we would like to offer in evidence Union's Exhibit 17, being the complete well log on the gamma ray neutron, a portion of which is shown on Exhibit 7.

(Whereupon, Union's Exhibit No. 17 offered into evidence.)

MR. PORTER: If there is no objection it will be admitted.

(Whereupon, Union's Exhibit No. 17 admitted into evidence.)

MR. CHRISTY: That is all from this witness.

MR. PORTER: Does anyone else desire to present testimony in the case?

MR. HUNKER: Mr. Porter, Mr. Cavler would like

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to have been here to attend this Commission Hearing but he has lateral sclerosis which is the Lou Gehrig disease. He has addressed a letter to the Commission which I would like to present at this time.

GOVERNOR CAMPBELL: Do you have any objection to this?

MR. CHRISTY: No objection to filing it just like the Commission usually receives letters.

MR. PORTER: The Commission will place this letter in its files. I will say that we certainly regret that Mr. Cavler's health is such that he is not able to appear in this case at this time. I think we all know him personally and we have worked with him, and we have a lot of respect for him. Are there any statements to be made?

MR. HINKLE: If the Commission please, you've been very patient in being with us most of the day and I don't want to take very much of your time, but I do want to call your attention briefly to what I believe to be the duty of the Commission.

This whole matter was started by reason of a unit agreement which was approved by the Commission as a conservation measure. The well was drilled by the unit operator. The unit agreement, as you know, has some -- built some Fees which protect Correlative Rights. This particular

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case had those owners of Fee Land in Section 5, if they had been willing to commit 280 acres to the unit, the questions which we have discussed today and the reason we're here today would not have arisen. We believe that we have made out a clear case for 640-acre spacing. I don't think there's any question whatsoever that one well will effectively and efficiently drain more than 640 acres.

Now, I believe that it is also the duty of the Commission, under our statute where they find that to be the case, to take into consideration the economics involved, and we have clearly shown here today that operators would loose money by the drilling of wells on the standard spacing unit of 160 acres; that it's going to cause Correlative Rights to be violated; that by reason of having a 160-acre spacing, because there's going to be a lot of 160-acre units that will be drilled and the waste will be permitted because the gas and liquid hydrocarbons will not be recovered, whereas if you have 640-acre spacing there's an avenue open to the parties who have not joined the unit, to create a 640-acre spacing unit, and then they can be force-pooled, for that matter, to create this so that wells can be drilled and so that Correlative Rights will be protected. And that all of the parties will receive their fair share of the production underlying their lands, which

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would be equivalent to their percentage of the whole pool. In Section 65-3-14 New Mexico Statutes Annotated, Section B provides, "The Commission may establish a proration unit for each pool, such being the area that can be efficiently and economically drained and developed by one well, and in so doing the Commission shall consider the economic loss caused by the drilling of unnecessary wells". So I believe that it's the duty of the Commission in this case to consider the economics as well as the physical aspects of being able to drain more than 640 acres by one well. And as I say, where it shows that it's a loosing proposition for the operators to develop on the 160 acres, that the Commission should go to the larger spacing in order to protect Correlative Rights rather than going to smaller units to protect Correlative Rights, because as I say, a lot of the units are not going to be drilled on 160 acres.

Now, we have also shown here that if the Commission is willing to adopt special field rules for 640-acre spacing that Union has evidenced their willingness to go ahead and drill a well in Section 5, not only to the Wolfcamp but to sufficiently test the Pennsylvanian Zone.



Now, they have a right to participate in the well, and according to their ideas, which is as it should be, and in that way their Correlative Rights will be adequately protected.

MR. PRAY: I'll try to make it as brief as possible.

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I'd like to call the Commission's attention, I know you have heard it many times and seen it, it's contained in your own rules, the statements of what are Correlative Rights, and I would like to point out and imphasize that Correlative Rights are several things. It's the opportunity afforded to each owner to produce without waste his share in the oil and gas, but it is also to permit him to produce his share in the pool being in amount substantially in the proportion that the quantity of recoverable oil or gas, or both, under such property bears to the total recoverable oil or gas.

I'm sure this Commission is also very familiar with the case of Continental Oil versus the Commission in which the Supreme Court of New Mexico extensively discussed the meaning of Correlative Rights, and the court states in its opinion that there must be a consideration and that there must be a determination by the Commission that before Correlative Rights can be protected there must be a finding as to what are the Correlative Rights, and that requires a finding as to the recoverable gas-in-place under each individuals property in the pool and the relationship which that gas bears to the total gas in the pool.

There's no evidence in the record, at all, today, or in the prior hearings as to the amount of gas located in the South half of Section 5, therefore we don't believe

the Commission, without the evidence to support it, can make the finding as to the recoverable gas in the South half of Section 5, and the effect of Union Oil Company would be to bring in the North half of Section 5 to share, and we don't believe this constitutes Correlative Rights under the statutes of the State of New Mexico.

We have made our continuous objection to the evidence presented by the Union Oil Company. As stated by Mr. Hunker, the case of Sims B. Mechum states that there cannot be a new order of the Commission unless there is a finding of waste under the old order of the Commission, and we do not believe there has been a finding of such.

I could go into the matter that we had not always received all the information we desired. I could go into the matter of the location of the well, but I shall not. The Commission knows more about that than most of the people today, because the people here today didn't participate by and large in the last hearing.

We don't believe that this evidence submitted today, other than the last two pressure surveys, is anything new. It's evidence which could have been prepared if they had been inclined to do so at the time of the last hearings.

They changed their pay picks, the porosity, the amounts of taxes, the price which they're getting for the

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gas, they have changed everything which they educed at the last hearing, downward, minimizing the present spacing. We believe they did that the last time.

The original order of this Commission establishing 320-acre spacing in the Pennsylvanian and 160 in the Wolfcamp contained the finding that economic waste will be prevented by this spacing ruling. It contained a finding that no unnecessary wells would be drilled, thereby this finding and this rule was attacked in the last hearing after a well had been drilled, and they attempted at that time to show the economics were such that they couldn't develop a 640-acre spacing; that attack failed. They have come in today and attempted through one bit of information to reopen the entire hearing and to make a new attack without any new wells being drilled. We don't believe the one well sufficiently defines this reservoir, and admittedly with the drilling problems they have we don't believe it gives sufficient information. Therefore, we respectfully request that the Commission deny the application of Union Oil Company.



MR. HINKLE: Just one brief additional statement. I think I ought to call the Commission's attention to the situation which would exist in the event 640 acres of spacing is not granted in this case and we have to continue

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development of this area on 160 acres, two cases pending before the Commission; one of them is for a non-standard location consisting of the North half North half of Section 5, that would be supposedly a dual well from the Wolfcamp and Pennsylvanian; another case pending under which a non-standard unit is sought which would consist of the Southeast Quarter of the Northeast Quarter of the East half of the Southeast Quarter of Section 5, that covers the 280 acres, a question here not committed to the unit.

Now, let's assume the Commission goes ahead and grants these units and they're permitted to drill those wells. The Union and the other owners of the remainder of that section would have to come before the Commission to ask permission to create non-standard units in each instance, because you cannot work out any other way to where you can select a standard unit except with the exception of the Southwest Quarter of Section 5. So you would have to have another non-standard unit consisting of 120 acres and another non-standard unit consisting of 80 acres, and, or if you take 160 acres in one unit and 160-acre non-standard unit, otherwise you would end up with 40 acres that is not allocated to any well; what are you going to do with it? And you can't force pool it because you can't force pool anything except to create a standard unit. In other words, you can't

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force pool to create a non-standard unit but I think you're going to have a bad situation in the event this is continued on a 160 basis.

MR. ANDERSON: John Anderson, Geological Survey, Roswell, New Mexico. We are much interested in this case primarily because of the amount of Federal Lands that are involved and also because it involves lands in the Red Hills Unit area which was approved by the Commissioner of Public Lands, the Oil Conservation Commission, and the Director of Geological Survey. This unit area consists of about 29,000 acres. Only 2,000 acres including the lands owned by Mr. Yager and Schuman are committed. This unit agreement has a section in it called "Plan of Development" and under the terms of the unit agreement the wells that are prescribed in "Plan of Development" are the only ones that can be drilled on committed lands, and the submittal to the approving officers that the Commissioner of Public Lands and the supervisor of Geological Survey establishes insofar as the committed lands are concerned, and to the extent not contradictory to any Commission order, the spacing for those committed lands within the unit area.

Now, in 1965 a plan of development was submitted for an approval calling for a Devonian well to be drilled in the Southwest Quarter of Section 22. That plan was approved

by the Commissioner of Public Lands and the supervisor. In 1966 a plan of development was submitted calling for a Devonian well to be drilled in the Southwest Quarter of Section 22 or the Southeast Quarter of 21 or the Northeast Quarter of 28 or the Northwest Quarter of Section 27. Now, in all of these plans of development and in any conversations that we had with the Pure as the original unit operator and Union of California as successor, we never talked about anything except 640 acre spacing, this is for lands committed to the unit agreement.

There is one thing I think we all should take a good look at, we've got one well drilled in this field. We had testimony today that there was 28 feet of pay in the Wolfcamp. I think all of us will agree that a mile or a mile and a half away from here we may have 10 feet less or 40 or 50 feet more. We don't know anything about this reservoir right now except what we can see from the performance of this one well. So the Survey feels that adoption of a 640-acre spacing for a Wolfcamp on a temporary order at this time would protect the interests of the lands that are committed to the unit agreement as well as those lands that are not committed to the unit agreement. We would certainly hate to see the unit area developed on 160 acres in the Wolfcamp to protect the committed lands from drainage.

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MR. HUNKER: I would like for Mr. Anderson to come forward and be sworn. I would like to ask him some questions.

GOVERNOR CAMPBELL: Do you wish to testify, Mr. Anderson?

MR. HUNKER: I think he's an adverse witness, as is rather obvious. I would like to cross-examine him.

MR. ANDERSON: I'm not permitted to testify.

GOVERNOR CAMPBELL: Do you have any rebuttal?

MR. HUNKER: I would like to make this comment to Mr. Anderson. The Shell Oil Company has a unit called the Antelope Unit and you entered no objection to the statewide rules in connection with that particular unit. Now, Shell was perfectly willing to stay by the statewide rules in connection with deep gas that they've discovered in that particular unit, and to the best of my knowled[illegible] Mr. Anderson didn't come up here and let you all know that he objected to your statewide rules in connection with that particular unit.



I think that if he's going to protest in one instance he ought to let his views be known in all instances. He's a man greatly respected in our community, his opinion in this particular case will undoubtedly have some weight as far as the Commissioners are concerned, but I

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think he's inconsistant, especially since we're not allowed to examine the Pennsylvanian and find out about the unit operation, why they haven't started their well yet in connection with their plan of development.

I would like to ask a lot of questions along these lines, if the Commission please. I feel we have been thwarted and it's unfortunate that the U.S.G.S. has taken this position.

GOVERNOR CAMPBELL: What is it that prohibits an official from testifying?

MR. HINKLE: 43-CFR, you have to have permission of your superior.

MR. PRAY: Let the record show that we object to the statement that was made by Mr. Anderson and we move that it be stricken as being inappropriate. We haven't had the opportunity to cross-examine the witness; it's improper for him to make the statement.

MR. PORTER: The objection is overruled.

MR. HUNKER: Note our exception.

MR. PORTER: Exception will be noted. Mr. Lyon; let the record show that this is Mr. Lyon, L-y-o-n, of Continental Oil Company.

MR. LYON: Continental Oil Company is a working interest owner in the Red Hills Unit by virtue of having committed our leases to the unit, which are within the unit

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area, and we feel that the record today and the record in the previous hearing certainly justifies 640-acre spacing of the Wolfcamp Formation, and we strongly urge the Commission to adopt such a spacing on a permanent basis. Should the Commission feel the evidence is inadequate, we strongly recommend that 640-acre spacing on a temporary basis be provided.

MR. PORTER: Anyone else have a statement? I believe the Commission has received some correspondence which the attorney has. Would you indicate what that is, Mr. Hill?

MR. HILL: I have a letter dated May 16, 1966 from Tidewater Oil Company, signed by John S. Cameron, Jr., Proration Supervisor; "Please be advised that Tidewater fully supports Union's request for 640 spacing. Tenneco Oil Company, dated May 11, 1966, W. Lyons, District Production Superintendent, "Tenneco Oil Company supports Union Oil Company's request for 640 acres. Telegram from George T. Abel, Midland, Texas, received May 17, 1966, he is a working interest owner in the Red Hills Wolfcamp, and he supports Union Oil Company of California's application for 640-acre spacing. Have a letter from Texaco Incorporated dated May 16, 1966, signed by J. H. Markley, Division Manager, "Texaco therefore concurs with the recommendation made under Case 3158.

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Finally, I have a letter from Pan American Petroleum Corporation, May 13, 1966, signed by W. V. Grissom, and they urge the adoption of the rules proposed by Union Oil Company. That's all the communications I have.

MR. PORTER: Anyone else have anything further to offer in this case? The Commission will take the case under advisement.

Mr. Pray, you have two other cases docketed here. How long do you anticipate the direct testimony would take in those cases?

MR. PRAY: Just my direct testimony would probably take 30 minutes, not counting 30 minutes --

GOVERNOR CAMPBELL: Each case?

MR. PRAY: No, total.

MR. PRAY: Do you intend to move to consolidate the cases?

MR. PRAY: I believe they can be considered together, yes, sir, they all have the same type testimony.

MR. PORTER: In that event we will recess the hearing and reconvene at 8:00 o'clock in the morning.

(Whereupon, the hearing was recessed at 6:20 o'clock P.M.)



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STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

We, ADA DEARNLEY and BOBBY J. DAVIS, Court Reporters, do hereby certify that the foregoing and attached transcript of proceedings before the New Mexico Oil Conservation Commission at Santa Fe, New Mexico, is a true and correct record to the best of our knowledge, skill and ability.

IN WITNESS WHEREOF, I have affixed my hand and notarial seal this 7th day of June, 1966.

Ada Dearnley
NOTARY PUBLIC

My Commission Expires:

(date) March 13, 1969.

IN WITNESS WHEREOF, I have affixed my hand and notarial seal this 7th day of June, 1966

Bobby J. Davis
NOTARY PUBLIC

My Commission Expires:

(date)

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BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
November 24, ~~1968~~ 1964

EXAMINER HEARING

IN THE MATTER OF:

APPLICATION OF THE PURE OIL COMPANY FOR THE CREATION OF A NEW GAS POOL AND FOR SPECIAL POOL RULES, LEA COUNTY, NEW MEXICO — Case No. 3158

APPLICATION OF THE PURE OIL COMPANY FOR THE CREATION OF A NEW GAS POOL AND FOR SPECIAL POOL RULES, LEA COUNTY, NEW MEXICO — Case No. 3159

BEFORE:

DANIEL NUTTER

TRANSCRIPT OF HEARING

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MR. NUTTER: Call Case Number 3157.

MR. DURRETT: Application of The Pure Oil Company for a dual completion, Lea County, New Mexico.

MR. MORRIS: If the examiner please, I am Richard Morris of Seth, Montgomery, Federici & Andrews, Santa Fe, New Mexico, appearing for Pure Oil Company in this case. I will also be appearing for Pure in Cases Number 3158 and 3159, and in the interests of orderly procedure we would request that we be permitted to present Cases Number 3158 and 3159 as consolidated, for purposes of testimony, to be followed by presentation of our case in Case Number 3157.

MR. NUTTER: Call Case Number 3158.

MR. DURRETT: Application of The Pure Oil Company for the creation of a new gas pool and for special pool rules, Lea County, New Mexico.

MR. NUTTER: That's the Wolfcamp; and we will call Case Number 3159.

MR. DURRETT: Application of The Pure Oil Company for the creation of a new gas pool and for special pool rules, Lea County, New Mexico.



MR. NUTTER: We will consolidate Cases Number 3158 and 3159 and hear them at this time, and will hear 3157 at the conclusion thereof.

MR. HUNKER: I am George H. Hunker, Jr., Roswell, New

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Mexico. I represent Mr. Gerald Shoemaker and Mr. Saul Yeager of Tulsa, Oklahoma, and I am associated in this matter with Mr. John F. Russell, Roswell, New Mexico; and I would like to present to the Commission another associate, Mr. Donald E. Pray, Attorney at Law from Tulsa, Oklahoma, who will also appear in this particular matter.

MR. NUTTER: Appearing in Cases Number 3158 and 3159?

MR. HUNKER: Yes.

MR. NUTTER: How about 3157?

MR. HUNKER: And in that case as well.

MR. NUTTER: Are there other appearances in Cases Number 3158 and 3159 at this time?

MR. MORRIS: I would like the record also to show the appearance of Mr. Sumner Jewell of our office, Seth, Montgomery, Federici & Andrews.

MR. HUNKER: If the Examiner please, at this time I would like to state for the record that I entered my appearance in connection with these three cases on behalf of my two clients approximately ten days ago, and at that time requested a continuance on the grounds that these two fee mineral owners had not had an adequate opportunity to examine the well data and other materials that were obtained by Pure Oil Company at the time and during the times they drilled the well in question. We feel that our clients will be unduly prejudiced by having the

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Commission proceed to hear these cases at this particular time, inasmuch as it was only yesterday that we received copies of the well logs and some other rather meager information with regard to the matter at hand. We feel that we have been deprived of due process; that this matter is being unduly rushed. We know of no real compelling reason why a continuance cannot be granted in connection with the three cases. I would like to point out further that these two clients of mine will testify that they are the owners of mineral interests which lie immediately to the south of the test well in Section 32. The test well was drilled 330 feet from the line and offsets minerals that are owned in fee by my two clients. We think there is a matter here involving strong correlative rights on the part of these two individuals, and we think the Commission should allow them an opportunity to examine and evaluate all of the materials that can possibly be examined and evaluated, in order that they can determine how best they can protect themselves in this particular situation.

MR. MORRIS: If the examiner please, in opposition to Mr. Hunker's motion for a continuance, I would respectfully state to the examiner that notice has been given in this case, as in other cases that come before the commission or its examiner--that The Pure Oil Company has brought witnesses to this hearing; we have our evidence ready to go, ready to present at this time,

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and I know of no requirement in the law that would put us under any obligation to furnish to other parties our evidence in advance of the hearing, or to in effect try our case to Mr. Hunker's clients in advance of presenting the evidence here to the examiners. This is what the hearings are for--is to lay the evidence on the table, to present testimony concerning the evidence at hand and give all interested parties the opportunity to ask questions of the witnesses and otherwise cross-examine. We know of no reason why the case should be continued for the purpose of Pure submitting information to Mr. Hunker's clients for their perusal, and I am not at all sure that if the case were continued, Pure would be willing to do that. There is urgency for the commission to consider this matter. It will be shown by Pure's witnesses that Pure has a contract to begin selling gas from this well from the two zones in question here, to El Paso Natural Gas Company, beginning December 15th; and, at least as to the dual completion application, we certainly need the approval of the commission as soon as possible. As to the spacing hearing, we need a certain degree of speed there, in that we must formulate our plans of development under the Red Hills Unit agreement--we must submit these plans to the USGS and to other interested parties just as soon as possible. It has taken a long time to drill this first well; Pure has a tremendous investment in this well, and they are anxious to

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have special rules and regulations established to insure the orderly development in this area. For these reasons we oppose a continuance of any of these cases. And I might state further that we would strongly oppose any renewal of the motion for continuance should it be made at the end of our case. We would oppose any continuance at that time which would allow Mr. Hunker's clients to have any opportunity to examine the evidence which we submit, and prepare a case to rebut it and come back at any later date. We think now is the time the hearing has been set for, and we are ready to proceed, and respectfully request that the motion for continuance be denied.

MR. NUTTER: Mr. Morris, this well that is the subject of this hearing is located on the Red Hills Unit Area, is that correct?

MR. MORRIS: Correct.

MR. NUTTER: Located 330 feet from the south line of the section; and Mr. Hunker's clients apparently own acreage in fee immediately south of this section. Is that section immediately south in the unit?

MR. MORRIS: It is in the unit area, and all interested parties in the unit area, including Mr. Hunker's clients, have been given an opportunity to join the unit.

MR. NUTTER: The acreage immediately south, which offsets the well, is not committed to this unit?

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MR. MORRIS: It's a complex situation. You have some fee acreage and you have some acreage which is leased to Pure, but the royalty interest is not committed to the unit. You have varying land situations here, but some of the--some fee interests and some royalty interests are not--it is my understanding, are not committed to the unit.

MR. NUTTER: You are seeking the establishment of a Pennsylvanian pool and a Wolfcamp pool, both for gas, and request special pool rules for 640 acre spacing for those two pools. Are you planning to propose an area to be defined as pool boundaries?

MR. MORRIS: Yes, and that will be a nine-section area in the form of a square, with the center section being the section on which the well is located.

MR. NUTTER: In other words, your proposed boundary will include offsetting acreage to the south in the pool rules?

MR. MORRIS: That is correct.

MR. NUTTER: Now, you stated you have a contract with El Paso Natural Gas Company to sell gas, commencing December 15th, from the well?

MR. MORRIS: That is correct, and our evidence will--this will be brought out more fully by our witness.

MR. NUTTER: Does that contract cover both the Wolfcamp and Pennsylvanian formations?

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MR. MORRIS: It is my understanding that it does.

MR. NUTTER: Mr. Hunker in his letter of November 17th, in which he stated that he would request a continuance, or was requesting a continuance, advised in paragraph 4 the following --and you received a copy of this letter. His clients stated that they know of no reason why Pure Oil Company's rights would be prejudiced in any way by granting at least a thirty-day continuance, since there is no gas gathering system at the well and since no Federal Power Commission authority has been given to produce gas from the well. Is this statement correct, insofar as you know?

MR. MORRIS: Of course I would rather bring this out through my witness--I have limited personal knowledge of this, but I understand the contract with El Paso Natural Gas Company will be effective December 15th, and that El Paso Natural Gas Company will have the right to take gas from both zones of the subject well, beginning on that date. In other words, I don't know for sure that El Paso has Federal Power Commission approval to take it, but I also would be very surprised if they would be taking it if they didn't have some sort of approval.

MR. NUTTER: Has Pure been certified by the Federal Power Commission to sell the gas?

MR. MORRIS: Let me confer with someone who would know about this.

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MR. HUTTER: I will add to the question also, Mr. Morris --will they be certified by December 15th.

MR. MORRIS: I have incomplete information on this point, Mr. Examiner. I'll be glad to put a witness on the stand who can say what he knows about the situation at the present time. There is a contract, and he can explain the general terms of it, but as far as whether Pure has made the application to the Federal Power Commission at this time, I don't know. Now, if Pure will be obligated to make application to the FPC, it would be my assumption that they will do so, in order to give effect to the contract.

MR. HUTTER: Presumably El Paso Natural Gas Company is an interstate transporter, and would have to have the approval of the FPC to take the gas, and presumably Pure would have to have approval to sell gas. I think a determination of these things is germane to the decision as to whether to go on or to continue the cases, if necessary. To get this in the record, why don't you put your witness on?

MR. MORRIS: I would be glad to do that. I would like to make one further observation. Mr. Hunker's motion for continuance is predicated upon the ground that we haven't furnished him the information we're planning to present to the Commission as evidence, and if the case is continued we don't plan to give him that information until the time comes for the hearing.

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there are certain--this is not just a desire to be obstinate on our part, but there are many considerations from a Management standpoint in Pure Oil Company that would make it permissible to divulge information in the course of a regulatory hearing, a hearing before a regulatory body such as this, whereas there are considerations that dictate against divulging such information in other ways.

MR. NUTTER: Mr. Hunker, this question is to you. You stated--was it yesterday or the day before, that you stated you had received certain information?

MR. HUNKER: Yesterday afternoon, about 4:30.

MR. NUTTER: What was the nature of that?

MR. HUNKER: We received a series of logs; we received copies of some gas tests they had run on these two gas producing zones, and there was one additional scale which wasn't--which to me meant nothing, but that might mean something to an engineer, and we don't have an engineer at hand to examine the instrument. There were two other documents presented to us with regard to dual completion concerning the down hole equipment, where perforations were to be--where the well was perforated. That is the information furnished us.

MR. NUTTER: You did receive logs of the well?

MR. HUNKER: We did.

MR. NUTTER: And you received a gas analysis?

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MR. HUNKER: Yes.

MR. NUTTER: And that chart, whatever that is?

MR. HUNKER: It's a chart on the Red Hills Wolfcamp, and other than that I frankly don't understand it--I'm not an engineer.

MR. MORRIS: I might make the observation that most of this information submitted, or in fact all of it, I guess, involved matters that would be germane to dual completion, and it was submitted to him in the hope that he would withdraw his application--I mean his motion for continuance, at least as to the application for dual completion. Now, perhaps we made a mistake in divulging that information, if--

MR. HUNKER: I'd like to make one observation if I may, Mr. Examiner. The fact that they have proposed a nine-section area comes as a complete surprise to us--we had no idea of the area, and in this respect I think the notice is probably vague and indefinite, and that this may be beyond the call of this particular hearing.

MR. MORRIS: This is merely our proposal, Mr. Examiner, and the Commission of course in the creation of a pool is free to establish such horizontal limits for the pool as it deems proper from the evidence presented at the hearing.

MR. NUTTER: The advertisement of the cases doesn't prescribe the boundary of the pool.

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MR. HUNKER: Nor does his application prescribe the boundaries either.

MR. NUTTER: This is correct. Mr. Hunker, do you have any objection to a hearing of the dual completion case, and if so, why?

MR. HUNKER: We feel that the dual completion part of this case is setting a precedent in this particular matter, and that it is probably just one part of the whole picture. We feel like we have been rushed into this situation without having had an opportunity to have an engineer examine, analyze and evaluate the information furnished to us, and for that reason we wanted to continue to object to the hearing of this particular case at this time. We feel like it may be prejudicial to the rights of our clients in connection with the other two cases. That is as much as I have to say in that regard.

MR. NUTTER: Mr. Morris, go ahead and call your witness and we'll see what he has to say about the status of Pure's intent in the sale of gas and so forth.

MR. MORRIS: May I have a moment, Mr. Examiner.

MR. PRAY: It seems to me that if our clients do not know the area which the applicant intends to include within the pool we are prejudiced, for the reason that we don't know what way to go to get information. We had no idea--as we said, this is the first time we knew they requested a nine-section--we had no

idea whether it was going to be a 640 or what, and it's impossible for us to determine where we would get information as to the area without having that information before the hearing.

MR. NUTTER: I think your clients do have notice where the area or pools is concerned, because it's common knowledge--any rules the commission sets out for any pool extend and have effect for one mile around the pool limits. This well is 330 feet from your clients' acreage, and if the pool were defined simply as a 40-acre tract in which the well is located, your clients' acreage is still within one mile, and would be covered by pool rules, so I think whether it's nine square miles or a 40-acre tract, this acreage is covered--by implication, if not by actual notice.

MR. MORRIS: I would further add that it's in the application that we're seeking 640 acre spacing units, and notice was given accordingly. The actual--our proposal for the horizontal limits of the pool might be entirely withdrawn--we might not make any proposal as to what the horizontal limits of the pool would be, and the commission would still, under the call of the hearing, have jurisdiction to establish the horizontal limits of the pool, just as the commission has done in every case for the creation of any new oil or gas pool. If we may have a few minutes recess to check on some basic information, we will be glad to come back and present that to the Examiner.

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MR. NUTTER: We'll take a ten-minute recess.

(The hearing thereupon recessed at 2:00 o'clock P.M., and resumed session at 2:15 o'clock P.M.)

MR. MORRIS: Mr. Examiner, may we call a witness for the purpose of showing what our situation is with respect to the Federal Power Commission.

MR. NUTTER: Yes, sir--go ahead.

MR. MORRIS: I call Mr. John Murphey and ask that he be sworn.

John R. Murphey, Jr. was duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. MORRIS:

Q Mr. Murphey, please state your name, by whom you are employed and in what capacity, and where you are located.

A John R. Murphey, Jr. I am district petroleum engineer for the Pure Oil Company, located in Midland, Texas.

Q What is your connection with the Red Hills unit area?

A This well is located under the supervision of the Midland District.

Q During the most recent recess of this hearing did you make a telephone call?

A Yes, sir, I did.

Q To whom?

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A To Mr. John Brubaker.

Q Who is he?

A Division gas contracts supervisor.

Q For whom?

A Pure Oil Company located in Houston, Texas.

Q What are Mr. Brubaker's duties with respect to the Federal Power Commission?

A He is the responsible individual for Pure Oil Company at division level, for filing and making appearances before the Federal Power Commission.

Q Did you have a conversation with Mr. Brubaker concerning the status of Pure Oil Company's filing with respect to Red Hills Unit Well Number 1?

A Yes, sir, I did.

Q And in substance, relate that conversation.

A He stated that The Pure Oil Company has filed for a certificate on Docket Number CI 65-485, filed at 11:02 A.M., eleven-twenty-sixty-four. He has indicated that we expect this filing to be evidenced out for hearing either the latter part of this week or the first part of next week.

Q Were there any indications as to when you would expect the FPC approval of the filing?

A It is our best evidence that we will have either a temporary or a permanent certificate on or before December 15th.

Q Is there any other pertinent information that was related to you by Mr. Brubaker?

A Yes, sir. In regard to El Paso, I asked him the question as to whether they had filed a certificate for this gas, and he stated that El Paso wasn't required, on this particular gas sale, in order to take the gas they could handle it on their annual budgetary type appropriation.

Q What is the status of a connection from existing El Paso lines in the area of the subject well, to the subject well?

A El Paso has a gathering line less than a mile, or approximately a mile from the Red Hills Unit Well Number 1.

Q How long would it take to connect up the Red Hills Unit Well Number 1 to that line?

A In my opinion this could be done in less than a week.

Q From everything you know about this situation, do you expect that Pure Oil Company will be ready to sell, and El Paso Natural Gas Company will be ready to buy, gas from the subject well on December 15th?

A Yes, sir, I expect that they will.

Q Does Pure Oil have any contract with El Paso?

A Yes, sir, we do.

Q What are, just generally, the terms of the contract?

A The terms are for a sale of 20,000,000 a day from December 15th through March 15th of 1965; then 2,000,000 a day

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per completion from March 15th to January 1, 1966. After that the rate of tax goes on a one-to eight-million basis on reserve.

Q What is the length of the contract?

A Twenty years.

Q Is it limited as to formation?

A No, sir, it is not.

Q What formations do you expect, beginning on December 15, to deliver gas from, to El Paso?

A From the Wolfcamp and Pennsylvanian formations.

Q Will you need dual completion authority in order to sell gas from both of those formations?

A Yes, sir, we will.

MR. MORRIS: I believe that's all.

CROSS EXAMINATION

BY MR. HUNKER:

Q I didn't hear his answer with regard to the terms of the contract. Up to the first of March?

A From December 15, 1964 through March 15th of 1965, it's 20,000,000 a day from the well.

Q And after that?

A Two million a day per completion until eleven-sixty-six; then on a reserve basis of 1,000,000 per day per 3,000,000 reserves thereafter.

Q When was the contract with El Paso executed--approx-

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imately what date?

A It would have been sometime in the middle of November. I don't know the exact date, but it has been executed.

Q Sometime in the middle part of November?

A Yes, sir.

Q One further question I forgot to ask. What was the price to be paid?

A Of course the price is subject to approval. The initial price is sixteen cents and it escalates during the term of the contract.

Q Is that the FPC area price for this area?

A I don't believe so.

Q Or is it in excess of the area price?

A It is in excess, to my knowledge.

MR. NUTTER: Is there anything further?

MR. HUNKER: Nothing further.

MR. MORRIS: At this time, Mr. Examiner, we renew our opposition to any motion for continuance, both as to the dual completion hearing and as to the spacing hearings. Mr. Murphey's testimony here has shown the need and the prejudice that would result to Pure if it wasn't allowed to go ahead with our dual application at this time. Also, inasmuch as Mr. Hunker's motion for a continuance is based upon having an opportunity to examine Pure's evidence, and inasmuch as Pure is not amenable to

producing that evidence except at the hearing, we submit that nothing would be gained by a continuance, and the expense of bringing witnesses to the hearing would be doubled.

MR. PRAY: Mr. Examiner, I'd like to make a statement. I'm a little bit shocked by the statements of counsel for Pure Oil Company that he's not willing to disclose to us any of this information it has before the hearing, but I submit to you, sir, how can we ask intelligent questions unless we know what we're going to be faced with, what their contentions will be; unless we have an opportunity to examine certain basic data, which I believe is information in the public domain, inasmuch as there are certain parts of it in the records; but we do need to get the underlying documents, such as drill stem tests; we need an opportunity for our people to look over the logs, check on core analyses, examine samples of gas from the various zones. We know they have made tests of these, and these are necessary for our engineers to check before we can tell what case we have. We might not have any opposition, once the facts are divulged and we have some sort of educated analysis made. The fact that he hides behind some vague cloak of Management--I'm shocked that this type of thing could take place; I didn't believe we had come to that. It seems to me there should be an exchange of information--I don't believe it's unfair at all, what we're asking.

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MR. MORRIS: We repeat our basic objections to having to try our case separately, to what would appear to be our opposition, and then making a separate presentation to the Commission. We submit that that's what these hearings are for, is to put the evidence on the table, and that this is the form in which the investigation should be conducted.

MR. NUTTER: I believe it would be reasonable, and no one is going to be adversely affected, if we should go ahead today and hear the dual completion case. We will hear Cases Number 3158 and 3159 as those cases relate to the creation of two pools, and that portion relating to the provision for 640 acre spacing will be continued to another hearing. And, assuming approval of the creation of the pools, these two pools would be created subsequent to June 1, 1964, of course, at which time Rule 104 was amended and automatic 320 acre spacing and designated well locations would go into effect upon the creation of these pools. This would afford protection to Pure Oil Company, I think, as far as well locations are concerned--this would prohibit drilling of wells in undesirable locations immediately offsetting this acreage, and such as that, because the rules for the 320 acre spacing require these wells to be located on interior 40-acre tracts, and I think this would afford reasonable protection to Pure Oil Company. I think postponement of the 640 acre spacing case to a later date would afford reason-

able protection to the other people.

MR. MORRIS: May I ask for a clarification here of the commission's ruling concerning 320 acre spacing. Would it be applicable both to the Wolfcamp and to the Pennsylvanian?

MR. NUTTER: It would be applicable to the Pennsylvanian only, and to the Devonian.

MR. MORRIS: Of course, our application here is both for Wolfcamp and Pennsylvanian, and we feel we need to establish special rules to ensure orderly development of both formations.

MR. NUTTER: Do you propose in your case, Mr. Morris, to propose certain locations for these wells and these two pools?

MR. MORRIS: Yes, we will propose special rules and regulations, including a provision for well location requirements.

MR. NUTTER: Inasmuch as the Wolfcamp would not be covered by the spacing regulations of Rule 104 as relates to 320, any order that would ensue would also provide that locations which did not conform with your proposed locations, while the remainder of this is pending, would not be approved. Is that reasonable to you, Mr. Hunker:

MR. HUNKER: Yes, sir.

MR. NUTTER: And a well that is proposed that would conform to spacing location by Pure, while this case is pending, would be acceptable for approval?

MR. HUNKER: That's right.

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MR. MORRIS: Do I understand that we will be allowed at this time to present evidence in Cases Number 3158 and 3159, confined merely to establishment of the two gas pools?

MR. NUTTER: The two gas pools and your proposed locations.

MR. MORRIS: Of course, our proposed locations go hand in hand with the establishment of 640 acre spacing.

MR. NUTTER: I realize they're probably going to be interior locations, but just state what the proposed locations are; and we will hear the dual completion case today also.

MR. MORRIS: May I have a moment to confer with my client.

(Thereupon, at 2:35 o'clock P.M. a recess was held, terminating at 2:42 o'clock P.M.)

MR. MORRIS: Mr. Examiner, we will proceed on the basis that you have outlined. We would ask that we be allowed to present our case with respect to the creation of the two pools first, then followed by the case on dual completion.

MR. NUTTER: Proceed.

MR. MORRIS: I call first Mr. George Fish, and ask that he be sworn.

(Mr. George Fish was sworn and testified as follows:

DIRECT EXAMINATION

BY MR. MORRIS:

Q Mr Fish, please state your name, by whom you are employed and in what capacity, and where you are located.

A My name is George Fish; I am employed by the Pure Oil Company as district development geologist for the Midland District. Our district covers West Texas and the southeastern portion of New Mexico.

Q Have you previously testified before the New Mexico Oil Conservation Commission or one of its examiners?

A Yes, I have.

Q Are you familiar with the applications of Pure Oil Company in Cases Number 3158 and 3159?

A Yes, sir, I am.

Q What is it that Pure Oil Company seeks by these applications?

A We seek to establish new pools for the Pennsylvanian and for the Wolfcamp. Originally our application also requested spacing, but I understand that this portion is now not to be considered at this time.

Q And this is with respect to a new completion in these two zones?

A Yes, sir, it is. The Red Hills Unit Number 1 is located 2310 feet from the east line and 330 feet from the south line of Section 32, Township 25 South, Range 33 East, Lea County, New Mexico. This well was drilled on a Devonian seismography. While drilling the well, shows of gas were encountered in the Wolfgang and Pennsylvanian, and also Devonian formations.

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Since it is apparent that gas is present in all of these horizons it is evident to me that structural placer is an important factor in the tracing component of this field. After reaching total depth the Ellenberger was reached, and total depth actually for the basement location was encountered. At that time testing of the various shows commenced. We have established that there is gas that can be flowed at commercial rates from the Devonian, from the Pennsylvanian and from the Wolfcamp horizons. It is our intention to dually complete the well at this time in the Pennsylvanian and Wolfcamp formations, and by virtue of the evidence we intend to show here, we can establish that Wolfcamp production does exist, Pennsylvanian production does exist; and there is no comparable Wolfcamp or Pennsylvanian production within twelve to fifteen miles; and I feel that it is clearly indicated that this is a discovery and that two new pools are present here.

Q Do you have an exhibit prepared which to the best of your present information shows the extent of your discovery?

A Yes, I have prepared a structural map on a Pennsylvanian horizon with data afforded by the--subsurface data afforded by Red Hills Unit Well Number 1, and Pennsylvanian pay in reflector beds that reflect seismic energy, and the shape and configuration of this structure is based on a composite of that information.

Q You are referring to what has been marked Exhibit 1

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in Cases Number 3158 and 3159?

A Yes, sir.

Q --Or a copy of that exhibit?

A Yes, sir.

Q First let me ask, what is the red outline shown on that exhibit?

A The red outline is the outline of the Red Hills Unit. This is the unit approved both by the Conservation Commission and the State Land Commission, as well as by the USGS. It contains over 28,000 acres. It was established by Order R 2350 entered in Case Number 2671 on October 31, 1962.

Q Does this exhibit also show the location of the Red Hills Unit Well Number 1?

A Yes, sir, it does. It is at the location I described earlier--330 feet from the south line of Section 32; 2310 feet from the east line of Section 32, in Township 25 South, Range 33 East, Lea County, New Mexico.

Q In preparing this structural map, Mr. Fish, what control did you have?

A The only sub-surface control is that afforded by Red Hills Unit Well Number 1. The shape and configuration and the size of the structural anomaly here is based on seismic information, and I wish to point out that this well was located--that seismic information was the basis for this well location.

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This Devonian structural map was presented at a later hearing, and I feel the presence of gas in the Wolfcamp, Pennsylvanian and Devonian indicates that the seismic information must be substantially correct, in that discoveries in all of these zones have resulted from the drilling of this well.

Q The structure you have depicted on Exhibit 1 is on the Pennsylvanian formation. Did this--how would this structure compare with the Wolfcamp?

A I believe that the general shape of this structure at the Wolfcamp level would be substantially the same as it is at the Pennsylvanian level. I haven't prepared a separate Wolfcamp map for that reason--I feel that this one exhibit will show the structural configuration at both of these levels.

Q Now, you testified, Mr. Fish, that this Red Hills Unit Well Number 1 has experienced substantial production--has the capacity to produce substantially in the Wolfcamp and Pennsylvanian formations. Should the Commission decide to create new pools for Wolfcamp and Pennsylvanian production in this area, what would be your recommendation as to the horizontal limits of such pools?

A Well, based on this structure map and the type of reservoir we have, I feel that the section the well is located on, plus all the adjacent or contiguous sections, would be properly designated as the pool limit during this period of temporary

rules, or--I would really prefer to see more development started, and of course we would have more information on the basis of later completions, but it would appear to me that this would be a logical way to designate the initial pool area.

Q Now, if the Commission should determine to establish horizontal limits not so broad as you have recommended, do you have any particular objection to horizontal limits being established, say, just for Section 32?

A No, sir, in that, as Mr. Nutter has explained, whatever rules are in effect would be applicable for a mile in radius. This would substantially do the same thing, anyway, except that--well, it wouldn't quite do that, in that the rules do not provide for spacing larger than 320 in Pennsylvanian and for--I believe it's 160 acres in the Wolfcamp, so it wouldn't be quite that large, but I believe it would be acceptable, certainly.

MR. MORRIS: Would you mark these Exhibits 2A through 2D. Mr. Fish, I hand you now what the reporter has marked Exhibits 2A, 2B, 2C and 2D in Cases Number 3158 and 3159, and ask you to walk around by the examiner and point out the--first, state what those exhibits are.

A This is a suite of well logs. These are the reduced copies. They contain a sonic gamma ray log, a gamma ray neutron log, a composite electrical log, part of which is a lateral log, and a combination induction log and a micro-log.

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Q Would you point out formation tops on those logs, particularly with reference to the two zones that were here concerned with the Wolfcamp and the Pennsylvanian.

A In that we were unable to run open hole locations through a portion of the hole--through the Wolfcamp portion of the hole, the Wolfcamp pick is from the gamma ray neutron log which was run after casing had been run through the Wolfcamp. The top of the Wolfcamp is picked at 11,643 feet. The first Pennsylvanian zone is at 14,310 feet.

MR. NUTTER: This is sonic location--gamma ray?

A This is from the gamma ray log, yes, sir. And the Pennsylvanian section exists down to 15,614 feet, which is the top of the Barnett shale. This is also picked from the sonic gamma ray location. I might point out that the gamma ray neutron location was run--the measuring point was from the surface casing flange. When the portion of the gamma ray sonic log was run below the Wolfcamp the measuring point was the derrick floor, so that there is a 33-foot correction or difference between these locations over the interval of the hole. There is a short portion of the gamma ray neutron that covered the upper part of the Pennsylvanian, and therefore the tops of these two locations would not be exactly the same.

Q (MR. MORRIS) Do you know what intervals in the Wolfcamp and Pennsylvanian will be perforated in this well?

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A Yes, sir. Let me get the well record and I can show you what has been tested so far. The Wolfcamp perforations which have proven gas production to date are from 13,440 to 13,667 overall. The Pennsylvania perforations which have yielded gas are from 14,607 to 14,864 feet.

Q Is it your understanding that Mr. Murphey will cover in his testimony concerning dual completion of that well, this point, in more detail?

A Yes, sir, that is my understanding.

Q Was Exhibit 1 prepared by you or under your direction, and was the information shown on the logs, being Exhibits 2A, 2B, 2C and 2D, placed on there by you or under your direction?

A Yes, that is true.

MR. MORRIS: We offer those exhibits into evidence at this time.

MR. HUNKER: Mr. Examiner, the witness testified that part of this plat was prepared on the basis of the seismic information that was adduced prior to drilling of the well. Case Number 2671 before the Oil Conservation Commission reflects that although seismic information was furnished to the Commission, it has now been withdrawn. I think that is the best evidence, and it is for this reason that I would object to the admission of this particular plat. Of course, you can take it for whatever it is worth, but I think the best evidence is still the seismic

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information previously furnished to the Commission.

MR. MORRIS: Mr. Hunker has perhaps answered himself, by saying that it goes to the weight rather than the admissibility of the evidence. Mr. Fish has testified that this represents the structure as determined by him. This is his best opinion as an expert witness on what the structure appears to be on the Pennsylvania formation, and of course at the original hearing, there was in the unit we presented to the Commission a reflection of the structure on the Devonian rather than the Pennsylvanian, and we submit that this evidence is perfectly admissible in evidence.

MR. NUTTER: I believe the witness did state during direct testimony that this was a composite of seismic and other information he had; and Exhibits 1 and 2A through D will be admitted in evidence.

MR. MORRIS: That's all I have from Mr. Fish at this time.

MR. NUTTER: Any questions?

CROSS EXAMINATION

BY MR. PRAY:

Q Referring to your Exhibit 1, which you stated to be based on what you developed from this well and your seismic data, did you run any dip meter test on this well?

A Yes, sir, a dip meter log was run on this well.

Q How deep was this test run?

A I don't know the exact total depth. There was difficulty encountered in getting the dip meter all the way to the bottom.

Q Do you have copies of the dip meter surveys which were run?

A No, sir, I don't.

Q But you do have them--but not with you, is that correct?

A That is correct.

Q Is it within the purview of your responsibility to select and recommend well locations?

A Yes, sir. Our--my responsibility begins once a well has indicated that new pools are in existence--it is my responsibility to recommend additional development wells for this pool.

Q Then do I understand you correctly--that you had no responsibility in the selection of the initial location?

A None whatsoever.

Q Did you in fact study the seismic data prior to the selection of the location of this well?

A The initial well?

Q Yes.

A No, sir, I did not.

Q Referring again to Exhibit 1, you show the structure

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to be somewhat higher to the north than you do to the south of the discovery well. On what data is this based?

A This is based on--largely on seismic data. As I stated, the shape--the size of this structure is based on seismic reflections from Pennsylvanian level.

Q Did you in fact have this seismic data prior to the drilling of this well?

A Yes, a certain--the same seismic information that was used to make an interpretation for the Devonian structure was--the Pure Oil Company had this, and it was interpreted at various levels. The--of course, the selection of the Devonian as the map that was presented earlier was based on, first, that the reflections at Devonian level are easier to interpret; the reflections at Pennsylvanian level are somewhat harder to interpret.

Q Is it not somewhat unusual to locate a well off the indicated high portion of the structure?

A This well was located, I believe, on the high portion of the Devonian structure, and the Devonian was the governing formation or objective that this well was stacked on. It was a combination of Devonian plus Ellenberger, which were the two most reflective formations to be tested in this well; and it is well known that the Ellenberger is more conformable to the Devonian than other formations. Reflections usually can't be interp-

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reted as deep as the Ellenberger location, so when you select a location for a deep well it's usually based on Mississipian or Devonian seismic.

Q Are you telling me there is a shift in the high point of the structure as you go deeper?

A Yes, I believe that is the case. The structure has shifted basinward at a higher level.

Q So that if we were to look at a structural map based on the Devonian, we would see a different configuration?

A Yes, sir, I believe it would be essentially the same as that presented earlier, when the unit outline was established.

Q I'd like to refer now to your Exhibits 2A, B, C and D. Your application, as I understand it, is to dually complete the Wolfcamp and Pennsylvanian, is that correct?

A That is correct.

Q I hand you this exhibit and ask you to show me the top of the Pennsylvanian.

MR. MORRIS: Let's see which this is referring to--Exhibit 2A.

A The top of the Pennsylvanian is at 14,310.

Q (MR. PRAY) And what is that zone called?

A This first Pennsylvanian age bed is Strawn.

Q And is that marked on the exhibit?

A Yes, sir.

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Q I ask you to look just below that, to the next marking, and tell me what that is.

A The top is 14,530, and this is the top of the beds of the Atoka age.

Q Tell me what is the difference in those two.

A About twenty million years.

Q So that they are different formations, are they, within the Pennsylvanian?

A They are different ages of rock within the Pennsylvanian sequence.

Q Would you tell me, then, something about the basic characteristics of the Strawn. What sort of rock is it?

A In this particular well the Strawn is limestone, shale and sandstone face. All three lithologies exist in the Strawn interval in this well.

Q This is easily recognizable on sample analysis?

A No, sir, I wouldn't say it's easily recognizable. Some work has to be done with the lithology.

Q Does the amount of chert in that differ from that perhaps found in a lower zone?

A There are instances--I'm sure you heard in the earlier hearing where testimony was given that in a well--chert was present in this particular well. However, we didn't encounter any unusual quantities of chert.

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Q Were tests run during the drilling of this well, on the Strawn zone?

MR. MORRIS: If the Examiner please, we object to the question, as going beyond the scope of the hearing that the Examiner has set for us here. We are merely establishing that production has been obtained in the Pennsylvanian and in the Wolfcamp, and as I understand it we are not going into any portion of our spacing case at this time, and I submit that these questions are leading off into areas from which we have been precluded.

MR. PRAY: If the Examiner please, I'd like to explain my position on this. I believe the Commission has given authority to space--to establish pools, and the statute defines a pool as being a common accumulation of oil and gas synonymous with the common source of supply. They are asking that the Pennsylvanian be established as a pool, and I believe that that in fact does include more than one common accumulation or more than one common source of supply, and that the Commission is without authority to grant a pool covering more than one common source of supply unless they are separated, and I would like to determine from the testimony to be adduced here whether or not in fact they are attempting to create a pool containing more than one common accumulation. I believe therefore that it is absolutely essential that we continue this line of questioning to determine whether

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or not this is in fact Straun, Morrow and Atoka, three different common accumulations.

MR. NUTTER: Was it your intent, Mr. Morris, to have a vertical definition of the limits of the pool, or the Pennsylvanian formation as a whole as the vertical limits?

MR. MORRIS: Our basic approach is to establish the Pennsylvanian as the common source of supply. Now, if Mr. Pray's questioning is to be confined to this area, I withdraw my objection to it.

MR. NUTTER: Mr. Pray, it has been customary before this Commission that when an applicant requests a formation which we know does contain numerous different pays, that the Pennsylvanian formation be delineated as the vertical limits of the pool, which sets out the limits for creation. Then if another applicant wants a hearing to separate the Pennsylvanian and other pays, and define the upper or middle or lower, or Cisco Canyon, or whatever it may be, that has been his privilege. I think the applicant here today is requesting the Pennsylvanian formation as a whole.

MR. PRAY: Sir, I believe it is a jurisdictional matter, as the testimony added here shows, and I believe it is material--we must determine whether or not in fact there are these separate formations; if it does show it, then it is jurisdictional, and we would like, if necessary, to make our objections

at this point to their spacing as a common source of supply the entire Pennsylvanian.

MR. MORRIS: If the examiner please, we have requested that a pool be created for Pennsylvanian gas production here, and Mr. Fish has testified that the production is coming from zones of Pennsylvanian age, and it seems completely immaterial at this point to go into the distinctions that might exist in the various porocity intervals at this time, in view of the nature of our application.

MR. NUTTER: Mr. Fish, the Pennsylvanian is perforated from 14,607 to 14,864?

A Yes.

Q Does this lie completely within one of these named pays or formations in the Pennsylvanian?

A Yes, sir, this interval is contained within the Atoka.

Q So all perforations are in the Atoka zone of the formation?

A That's correct--those that are presently capable of producing gas exist in the Atoka.

Q Is there any production within the nine-mile area, or is there any well perforated and capable of producing from any other than the Atoka?

A No, sir.

MR. PRAY: The subject well included?

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A I just testified that the subject well was productive.

Q I'm talking about other zones within the Pennsylvanian.

A Within the Pennsylvanian there are presently no other zones capable of producing gas in commercial quantities. It was--

Q Is this your conclusion?

MR. MORRIS: Let the witness finish his answer.

A It was our intention to produce the interval I have testified to here in our dual completion.

MR. PRAY: Were there tests which indicated possibilities of commercial production during drilling of this well in any zone other than the Atoka? In other words, was there a test in the Strawn?

A There were no drill stem tests. There was a production test in the Strawn that indicated that it was non-productive.

Q Were there any tests in the Morrow?

A There were production tests or perforations were made in the Morrow which yielded no gas.

Q A moment ago you said the test in the Strawn indicated it was non-commercial. Would you tell me the results of the tests.

MR. MORRIS: Object to the question--we're getting into areas far afield to the present purposes of the hearing, which is merely the creation of a pool for Pennsylvanian production. It has been our application that the vertical limits

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be considered for the entire Pennsylvanian, and when the time comes to go into a spacing case to determine what portion of the Pennsylvanian might be contributing to production or might be found in other areas of this unit, then these questions might be germane, but we submit that they are not at this time.

MR. NUTTER: Mr. Pray, I think the witness testified the Straun was non-commercial when production test was made on it.

MR. PRAY: I'd like to ask respectfully that the record reflect that I object to this classification of the Pennsylvanian as a single pool; that it has not been shown that the witness is competent to make a determination that a particular zone is or is not commercial or non-commercial; that he is a geologist and as such no figures have been shown to back up his conclusion that it was or wasn't commercial. I believe I have no further questions of this witness.

MR. IRBY: This may have already been in the record, Mr. Fish; if so please tell me again. Have you potentialed this well?

A No, sir, it hasn't been potentialed according to the rules and test procedure prescribed by the State of New Mexico. There have been production tests made of the Devonian, Pennsylvanian and Wolfcamp reservoirs.

Q Do you have those figures with you? I'm just trying to get some idea.

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A Yes, sir, I believe Mr. Murphey is prepared to go into them.

MR. NUTTER: Mr. Morris, is your other witness going to testify as to the spacing footage--not the spacing but the footage location recommended, and such as that?

MR. MORRIS: Yes, we will go ahead and make recommendations concerning what our proposed pool rules are for 640 acre spacing at this time. It seems a little out of order in a sense, since we're not going ahead with the spacing case itself, but we will be glad to present that at this time.

MR. NUTTER: That portion would still be pending, and the well location requirements should be a matter of record, since they are pending--that would be a matter of public record.

MR. MORRIS: Our other witness, Mr. Murphey, will testify to that.

MR. NUTTER: If there are no further questions of Mr. Fish, he may be excused.

(Mr. Fish thereupon was excused and withdrew from the stand.)

(Mr. John R. Murphey thereupon resumed the stand and testified as follows:)

DIRECT EXAMINATION

BY MR. MORRIS:

Q You are the same Mr. John Murphey who testified previously in this case?

A Yes, sir, I did.

Q Mr. Murphey, has Pure Oil Company run certain potential tests on the Red Hills Unit Well Number 1 in the two formations here in question--the Wolfcamp and the Pennsylvanian?

A We do not have potential tests per se--we do have some production tests on which I have calculated an open flow. It does not conform to the Commission's requirements for four points --it is a single-point test. I have plotted that single point and extrapolated it on a 45-degree, and established an estimated open flow from these two zones from this single-point data.

Q Do you have those in the form of an exhibit?

A Yes, sir.

Q Referring to copies of what have been marked Exhibits 3A and B, Mr. Murphey, are those the calculations in exhibit form that you have just referred to?

A Yes, sir, they are.

Q Explain briefly what those--what that exhibit shows.

A I will discuss the Pennsylvanian first. We had a flow point of 8.8 million, and from the flowing bottom hole pressure was measured by pressure guage, as opposed to the shut-in. We developed the standard formula of pressure squared minus flowing pressure squared, and plotted it on log paper plus flow rate of millions per day. Through this I drew a 45-degree curve to give an estimated absolute flow of 120 million a day.

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Q That was on the Penn formation?

A Yes, sir.

Q What about the Wolfcamp?

A On the Wolfcamp the same thing was done, and our flow point on the Wolfcamp was 9.6 million a day. We had the same basic data on it, and I extrapolated the data out and have an estimated absolute open flow of 27.6 million a day. There's one thing I'd like to call your attention to in regard to these. These wells were not in a clean condition, in that we were still flowing sizeable quantities of mud at the time measurements were being made, so there is some subject variation as to both pressures and flow rates.

Q Do you have anything further with respect to these exhibits?

A Right, sir. I would think these would tend to indicate what would be a representative number in regard to these formations, and if anything, on final completion the calculated open flow will be this great, or greater.

Q Mr. Murphey, do you have gas analyses and liquid analyses on the two formations we are concerned with here today?

A Yes, sir, I do.

Q Are they in exhibit form?

A Yes, sir, we would like to submit a copy of the report of the analysis from Petroleum Analytical Laboratory Service

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of Odessa and Midland, who performed this work for us.

MR. MORRIS: I ask that these be marked Exhibits 5A through D.

MR. NUTTER: While you're doing that, would you give me the flow rates again.

A 8.3 on the Pennsylvanian and 9.6 on the Wolfcamp. We had other flow rates besides these, but they were higher and the friction drop in the tube was sizeable.

MR. MORRIS: With respect to gas analysis and liquid analysis, being Exhibits 5A through 5D, what is the significance of the information shown on those exhibits?

A I think the two most significant points shown on the exhibits are that both of the gases, the Wolfcamp and the Pennsylvanian, are sweet gases. The other thing that is significant is the difference in character between these two zones, indicating a different source of supply. Whereas the Pennsylvanian is a relatively dry gas with a high methylene content, the Wolfcamp has a higher content of wever in the gaseous form. The liquid in these camps reflect this also--the Wolfcamp was considerably more prolific in liquid than the Pennsylvanian, being on the order of 30-plus gallons per million, whereas the Pennsylvanian was limited to a maximum of 10.

Q Mr. Murphey, we are not actually to the point where we are--the Commission is considering our application for 640-acre

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spacing units in these two pools, but in order to place of record our proposals for special rules and regulations on these two pools, I ask you if you have any proposed special rules and regulations for the Pennsylvanian and the Wolfcamp zones.

A Yes, sir, I do.

Q I ask that this be marked Exhibit 6. Mr. Murphey, I will ask you to refer to a copy of Exhibit 6 which is before you, and point out the--I think it would be worthwhile to read the proposed rules into the record.

A The rules as stated here are proposals for the Red Hills Pennsylvanian Gas Pool, but they are the same for the Wolfcamp pool--we would propose the same rules for both pools. "Rule 1: Each well completed in the Red Hills Pennsylvanian Gas Pool or in the Pennsylvanian formation within one mile of the Red Hills Pennsylvanian Gas Pool, and not nearer to nor within the limits of another designated Pennsylvanian pool, shall be spaced, drilled, operated and produced in accordance with these special rules and regulations. Rule 2. Each well completed in the Red Hills Pennsylvanian Gas Pool shall be located on a standard unit containing 640 acres, more or less, consisting of a single governmental section. Rule 3. Each well completed in the Red Hills Pennsylvanian Gas Pool shall be located no nearer than 1650 feet of the outer boundary of the section, and no nearer than 330 feet to any governmental quarter-quarter section.



Any well drilled to or being completed in the

Red Hills Pennsylvanian Gas Pool will be granted an exception to the well location requirements of this rule." Those are the three special rules which we would propose, or would have proposed.

Q Mr. Murphey, was Exhibit 3, being your calculations of absolute open flow--that is, Exhibits 3A and 3B--were they prepared by you or under your direction?

A Yes, sir, they were.

MR. MORRIS: And I believe we skipped Number 4, but Exhibits 5A, B, C and D--those were the gas and liquid analyses and Exhibit 6 is Special Rules and Regulations. We offer in evidence at this time Exhibits 3A and B, 5A, B, C and D, and 6.

MR. HUNKER: I would question some basic data before admitting Exhibits 3A and B...before we admit them I'd like to have the information which goes into calculating them--I guess one parameter gives the main cubic feet per day, and from that we can see what PF square minus PE square is. I can guess what PF and S is, but it would be helpful to know.

MR. NUTTER: Can you furnish us with what those pressures were?

A I'd have to see if I've got it with me. The PF square is 11.95 times 10 to the 6th.

MR. NUTTER: Which zone is that?

A This is in the Pennsylvanian.

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MR. NUTTER: What was it again, James?

A The P squared is 31.77 times 10 to the sixth. The PS squared is 77.7 times 10 to the sixth.

MR. PRAY: What about the Wolfcamp, now.

A This would be the P-sub-F squared--

MR. PRAY: You don't need to square it, if you want to just give it to me.

A --131.0 times 10 to the sixth. P-sub-S squared is 54.3 times 10 to the sixth.

MR. PRAY: All right--I have no objection to their being admitted.

MR. NUTTER: Exhibits 3A and 3B, 5A through D and 6 will be admitted into evidence.

MR. MORRIS: That's all I have from Mr. Murphey.

MR. NUTTER: Does anyone have any questions to ask?

CROSS EXAMINATION

BY MR. PRAY:

Q I have a few questions I'd like to ask. Mr. Murphey, you are a petroleum engineer?

A Yes, sir, I am.

Q Are you familiar with the original application which was made for intent to drill this well?

A Only to the effect that I knew we were to drill a well. This particular well--I designed the drill program for

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the well. As far as the filed application in regard to the exploratory unit, I'm not familiar with it.

Q How far is the well from the section line--the south section line?

A According to our staking report it is 330 feet from the south line of Section 32 and 2310 feet from the east line of Section 32, Township 25 South, 33 East.

Q Are you familiar with the rules of procedure for the Conservation Commission?

A Basically.

Q Is this a usual location for a 640 acre spacing unit?

MR. MORRIS: Objection--there was no 640 acre spacing unit established at the time this well was drilled.

MR. NUTTER: Objection sustained--there isn't yet.

MR. PRAY: I'd like to have administrative notice of the original notice of intent to drill which is in the Commission's file...the official well file, and the dedicated acreage on that is 40 acres.

MR. NUTTER: We will take notice of the well file and the contents thereof.

Q As a petroleum engineer may I ask this question of you, sir: Will this well, being located 330 feet from the south line, drain substantial amounts of gas from under Section 5?

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A I would say that it will drain substantial amounts of gas from in the vicinity.

Q I'd like your direct answer--if it would drain substantial amounts of gas from Section 5, in your opinion.

A You're referring specifically to the--

MR. MORRIS: Excuse me. I object to this question, on the ground that this is not a drainage case, and that this question is beyond the scope of this hearing. If we're going to consider drainage I think we should consider it in all of its aspects, and go ahead and have a full hearing on the 640 acre spacing request at this time. This is merely a hearing to establish two gas pools, and consideration of drainage or counter-drainage, or any other related questions, should not be involved in this hearing.

MR. PRAY: I submit that they have presented for consideration of the Examiner a proposed special rules and regulations which sets forth 1650 feet from the outer boundary of any section as the proper location, yet their well is 330 feet from the outer boundary of the section, so that we must do as they say, not as they do; so that the question of drainage is very serious; counter-drainage could not possibly be compensated by the well location 1650 feet from the section; that this materially affects the rights of our clients, and we believe consideration must be given to drainage and counter-drainage, and

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that's why I think this testimony is proper at this time.

MR. NUTTER: Mr. Murphey, in your opinion will a well in this pool drain a radius of 330 feet?

A Yes, sir.

Q So at least it would drain up to the line?

A Yes, sir.

Q If it would drain 330 feet it would follow, in your opinion, that it would drain in excess of 330 feet?

A Yes, sir, I think it would--considerably in excess.

MR. NUTTER: Mr. Reid, does that--Mr. Pray, does that answer your question?

MR. PRAY: Yes, sir, it does. Mr. Hunker, do you have any further questions?

MR. HUNKER: No further questions.

MR. PRAY: I have no further questions.

MR. NUTTER: Are there any other questions of Mr. Murphey? ... You assumed a 45-degree slope?

A Yes, sir, for making an extrapolation.

MR. NUTTER: If there are no further questions, the witness may be excused.

(The witness thereupon withdrew from the stand.)

MR. NUTTER: Do you have anything further in these cases, Mr. Morris?

MR. MORRIS: No, I don't.

MR. NUTTER: Does anyone have anything they wish to offer in Cases Number 3158 and 3159?

MR. HUNKER: Not at this time, sir.

MR. NUTTER: We will take that portion of these cases under advisement which relates to everything except the 640 acre spacing. That portion of these cases is continued until a later date.

MR. MORRIS: May I ask of the Examiner, until what time that portion of the hearing will be continued?

MR. NUTTER: I thought maybe you fellows might want to discuss when that would come on.

MR. MORRIS: We would ask that it come on as early as possible.

MR. NUTTER: We have an examiners' hearing scheduled for the 15th of December which already has 25 cases on the docket. I'd rather have the hearing some other date, since there is going to be a continuance of the case. Would there be an objection to a continuance until the first examiners' hearing in January?

MR. MURPHEY: I think we would really prefer December 15th, but at the Commission's convenience we would probably defer to the first one in January.

MR. NUTTER: The case is continued until the first hearing in January, and before the end of the hearing of Number 3157 I will have a date for that.

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MR. MORRIS: In order to speed things along--

MR. NUTTER: Does anyone have anything further to offer on Cases 3158 and 3159? That portion is taken under advisement, except as outlined before--the spacing portion, which will be continued until January, the date to be announced. We will take Case Number 3157.

* * *

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

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

IN WITNESS WHEREOF I have affixed my hand and notarial seal this 31st day of November, 1964.

Notary Public - Court Reporter

My Commission Expires:

May 23, 1968.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 3158-3159 heard by me on 11/24, 1964.

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

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List for mailing ruling on motions to quash subpoenas - Cases 3158 & 3159- January 13, 1965

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

April 8, 1965

Mr. Richard S. Morris
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Post Office Box 2307
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Re: Case No. 3158 & 3159
Order No. R-2826-A & R-2827-B
Applicant:
THE PURE OIL COMPANY

Dear Sir:

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

Very truly yours,

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

ir/

Carbon copy of order also sent to:

Hobbs OCC x
Artesia OCC
Aztec OCC
OTHER All appearances entered in these cases.

EX. NO. ____

RESERVE AND ECONOMIC EVALUATION

WOLFCAMP-ATOKA DUAL COMPLETION

I - Atoka-Pennsylvanian Pool Reserve

(A)	Average Porosity	9.2%	
	Connate Water	32.2%	(?)
	Reservoir Pressure, psia	7,863	
	Reservoir Temperature	208 °F	
	Gas Deviation	1.229	
	Gas Gravity	0.580	
	Condensate, Bbls/MMcf	1.5	
	Pay Thickness, Ft.	84+	(42)

* * * * * * *

		Gas, MMcf	Cond., Bbls
(B)	Hydrocarbons In-Place per Ac-Ft.	0.9192	1.38
	Reserve per Ac-Ft. (90% Recovery)	0.8273	1.24
	Reserve per Acre	69.49	104.24
	W. I. Reserve per Acre (after 1/8 Royalty)	60.80	91.21

* * * * * * *

		640 Acres	320 Acres
(C)	Reserve: MMMcf	38.91	19.46
	Bbls.	58,374	29,187
(D)	Revenue: Gas @ $160/MMcf	$ 6,225,600	$3,113,600
	Cond. @ $2.70/Bbl. (15¢ transp.)	157,610	78,805
	Total	$ 6,383,210	$3,192,405

II - Wolfcamp-Atoka Dual Economic Evaluation

(D-a)	Revenue: Wolfcamp (Ex. ____)	$ 8,921,620	$4,460,810
	Atoka	6,383,210	3,192,405
	Total	$15,304,830	$7,653,215
	Operating Expense (360 months)	(216,000)	(216,000)
	Production Tax - 2%	(306,100)	(153,100)
	Operating Income	$14,782,730	$7,284,115
	Investment - Well and Equipment	(900,000)	(900,000)
	Profit	$13,882,730	$6,384,115
	Profit - Investment Ratio	15.43	7.09
	Present Worth Profit (6%)	$ 6,558,063	$3,015,792
	Present Worth Profit - Investment Ratio	7.29	3.35

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Yates Exhibit No. 1
Case No. 3158 et al

EX. NO.____

RESERVE AND ECONOMIC EVALUATION

WOLFCAMP-DEVONIAN DUAL COMPLETION

I - Devonian Pool Reserve

(A)	Average Porosity	5.0%	
	Connate Water	24.4%	
	Reservoir Pressure, psia	7,632	
	Reservoir Temperature	240 °F	
	Gas Deviation	1.206	
	Gas Gravity	0.58	
	Condensate, Bbls/MMcf	0	
	Pay Thickness, Ft.	62	(42)

* * * * * * * *

		Gas, MMcf
(B)	Hydrocarbons In-Place per Ac-Ft.	0.5265
	Reserve per Ac-Ft. (90% Recovery)	0.4739
	Reserve per Acre	29.38
	W. I. Reserve per Acre (after 1/8 Royalty)	25.71

* * * * * * * *

		640 Acres	320 Acres
(C)	Reserve: MMMcf	16.454	8.227
(D)	Revenue: Gas @ $160/MMcf	$ 2,632,640	$1,316,320

II - Wolfcamp-Devonian Dual Economic Evaluation

(D-a)	Revenue: Wolfcamp (Ex.___)	$ 8,921,620	$4,460,810
	Devonian	2,632,640	1,316,320
	Total	$11,554,260	$5,777,130
	Operating Expense (360 months)	(216,000)	(216,000)
	Production Tax - 2%	(231,100)	(115,500)
	Operating Income	$11,107,160	$5,445,630
	Investment - Well and Equipment	(1,150,000)	(1,150,000)
	Profit	$ 9,957,160	$4,295,630
	Profit - Investment Ratio	8.66	3.74
	Present Worth Profit (6%)	$ 4,703,634	$2,029,213
	Present Worth Profit - Investment Ratio	4.09	1.76

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Exhibit No. 2

EX. NO.____

RESERVE AND ECONOMIC EVALUATION

WOLFCAMP POOL

(A)	Average Porosity	7%	(10%)
	Connate Water	30%	(?)
	Reservoir Pressure, psia	11,304	
	Reservoir Temperature	190 °F	
	Gas Deviation	1.596	
	Gas Gravity	0.766	
	Condensate, Bbls/MMcf	40	
	Pay Thickness, Ft.	80+	(28)

* * * * * * * * *

		Gas, Mcf	Cond., Bbls
(B)	Hydrocarbons In-Place per Ac-Ft.	825	33.0
	Reserve per Ac-Ft. (90% Recovery)	743	29.72
	Reserve per Acre	59,440	2,378
	W. I. Reserve per Acre (after 1/8 Royalty)	52,010	2,081

* * * * * * * * *

		640 Acres	320 Acres
(C)	Reserve: MMcf	33,286	16,643
	Bbls	1,331,800	665,900
(D)	Revenue: Gas @ $160/MMcf	$5,325,760	$2,662,880
	Cond. @ $2.70 (15¢ transp.)	3,595,860	1,797,930
	Total	$8,921,620	$4,460,810
	Operating Expense (360 months)	(180,000)	(180,000)
	Production Tax - 2%	(178,400)	(89,200)
	Operating Income	$8,563,220	$4,191,610
	Investment - Well and Equipment	(600,000)	(600,000)
	Profit	$7,963,220	$3,591,610
	Profit - Investment Ratio	13.27	5.99
	Present Worth Profit (6%)	$3,761,745	$1,696,641
	Present Worth Profit - Investment Ratio	6.27	2.83

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Exhibit No. 3
Case No. 3158 et al.

RED HILLS UNIT WELL NO. 1

RESERVOIR ROCK AND FLUID PROPERTIES

NAME	WOLFCAMP	PENNSYLVANIAN	DEVONIAN
AVERAGE POROSITY - %	10.0	9.2	4.91
POROSITY RANGE - %	5 - 20	5 - 14	3.5 - 5.0
AVERAGE PERMEABILITY - md	.94	12.3	6.7
CONNATE WATER SATURATION - %	30.0	32.2	24.4
RESERVOIR PRESSURE - psia	11,304	7,863	7,632
GAS COMPRESSIBILITY	1.596	1.229	1.206
GAS GRAVITY - (Air = 1.0)	.766	.580	.58
STOCK TANK LIQUIDS - Bbls./MMCF	40	0	0

[illegible] UNIT

WELL COST ESTIMATE [illegible] PLAN PLAN

Labor, Transportation, District Expense	$ 30,000
Location, Roads, ROW, Damages	20,000
Contract Rig	400,000
Drilling Mud	230,000
Cementing Service & Cement	70,000
Logging, Perforating, Coring & Testing	60,000
Bits	50,000
Stimulation	10,000
Miscellaneous	20,000
Casing:	
550' - 20"	7,000
5,000' - 13-3/8"	45,000
13,000' - 10-3/4"	145,000
16,000' - 7-5/8"	100,000
2,000' - 5"	10,000
Tubing:	
30,000' - 2-7/8"	75,000
Control Equipment & Christmas Tree	35,000
Float Equipment, Centralizers, etc.	18,000
Packers & Down Hole Equipment	10,000
Miscellaneous	20,000
Surface Equipment	105,000
TOTAL	$1,460,000

Pure Exh 6
Cs 3/15-8-59
3/17/65

DEVONIAN RESERVES	640 Ac.	320 Ac.
Gas Reserves - MMMCF	11.6	5.8
Liquid Reserves	0	0
Net Gas Revenue @ $141/MMCF Average	$1,635,600	$ 817,800
Total Net Revenue	$1,635,600	$ 817,800

WOLFCAMP RESERVES		
Gas Reserves - MMMSCF	10.065	5.032
Liquid Reserves - Thousands Bbls.	402.4	201.2
Net Gas Revenue @ $146/MMCF Average	$1,469,490	$ 734,745
Net Liquid Revenue @ $2.00/Bbl. Average	804,800	402,400
Total Net Revenue	$2,274,290	$1,137,145
Net Value of Production	$3,909,890	$1,954,945
Investment	1,460,000	1,460,000
Profit	2,449,890	494,945
Profit to Investment	1.68	.328
Net Value of Production 6% Discount	$2,569,200	$1,165,000
Investment	1,460,000	1,460,000
Profit @ 6% Discount	1,109,200	5,000
Profit @ 6% Discount to Investment	.76	.0034

All values are net to operator assuming 80% Net to Gross ratio and before Federal Income Tax.

Pubco Exh 7
Cv 3158-59
2/17/65

RED HILLS UNIT

WELL COST ESTIMATE [illegible]

Labor, Transportation, District Expense	$ 30,000
Location, Roads, Misc., Damages	20,000
Contract Rig	[illegible]
Drilling Mud	[illegible]
Cementing Service & Cement	70,000
Logging, Perforating, Coring & Testing	65,000
Bits	50,000
Stimulation	15,000
Miscellaneous	20,000

Casing:

550' - 20"	7,000
5,000' - 13-3/8"	45,000
13,000' - 10-3/4"	225,000
16,000' - 7-5/8"	100,000
2,000' - 5"	10,000

Tubing:

46,000' - 2-7/8"	105,000

Control Equipment & Christmas Tree	45,000
Float Equipment, Centralizers, Etc.	18,000
Packers & Down Hole Equipment	15,000
Miscellaneous	20,000
Surface Equipment	120,000
TOTAL	$1,535,000

Pure Exh 8
[illegible]
Feb 17 62

RED HILLS

ECONOMIC CALCULATIONS

WOLFCAMP-PENNSYLVANIAN-DEVONIAN TRIPLE
WELL COST $1,535,000

	640 Ac.	320 Ac.
DEVONIAN RESERVES		
Gas Reserves - MMMCF	11.60	5.80
Liquid Reserves - Thousands Bbls.	0	0
Net Gas Revenue @ $141/MMCF Average	$1,635,600	$ 817,800
Total Net Revenue	1,635,600	817,800
PENNSYLVANIAN RESERVES		
Gas Reserves - MMMCF	.757	.3785
Liquid Reserves - Thousands Bbls.	0	0
Net Gas Revenue @ $146/MMCF Average	$ 110,500	$ 55,250
Net Liquid Revenue @ $200/Bbl. Average	0	0
Total Net Revenue	$ 110,500	$ 55,250
WOLFCAMP RESERVES		
Gas Reserves - MMMCF	10.065	5.032
Liquid Reserves-Thousands Bbls.	402.4	201.2
Net Gas Revenue @ $146/MMCF Average	$1,469,490	$ 734.745
Net Liquid Revenue @ $2.00/Bbl. Average	804,800	402,400
Total Net Revenue	$2,274,290	$1,137,145
Net Value of Production	$4,020,390	$2,010,195
Investment	1,535,000	1,535,000
Profit	2,485,390	475,195
Profit to Investment	1.62	.31
Net Value of Production 6% Discount	$2,641,800	$1,506,400
Investment	1,535,000	1,535,000
Profit @ 6% Discount	1,106,800	(-28,600)
Profit @ 6% Discount to Investment	.72	-

All values are net to operator 80% net to gross ration and before federal income tax.

Rore 9
wk 3/17/65

RED HILLS UNIT

WELL COST ESTIMATE WOLFCAMP-PENN DUAL

Labor, Transportation, District Expense	$ 20,000
Location, Roads, ROW, Damages	20,000
Contract Rig	280,000
Drilling Mud	200,000
Cementing Service & Cement	40,000
Logging, Perforating, Coring, & Testing	40,000
Bits	15,000
Stimulation	10,000
Miscellaneous	10,000
Casing:	
550' - 20"	7,000
5,000' - 13-3/8"	45,000
13,000 - 10-3/4"	145,000
16,000' - 7-5/8"	100,000
Tubing:	
27,000' - 2-7/8"	60,000
Control Equipment & Christmas Tree	35,000
Float Equipment, Centralizers, etc.	18,000
Packers & Down Hole Equipment	10,000
Miscellaneous	10,000
Surface Equipment	45,000
TOTAL	$1,100,000

Texas Exh 10
2-15-89
2/17/89

RED HILLS

ECONOMIC CALCULATIONS

WOLFCAMP-PENN DUAL
WELL COST $1,100,000

	640 Ac.	320 Ac.
WOLFCAMP RESERVES		
Gas Reserves - MMMCF	10.065	5.032
Liquid Reserves - Thousands Bbls.	402.4	201.2
Net Gas Revenue @ $146/MMCF Average	$1,469,490	$ 734,745
Net Liquid Revenue @ $2.00/Bbl. Average	804,800	402,400
Total Net Revenue	$2,274,290	$1,137,145
PENNSYLVANIAN RESERVES		
Gas Reserves - MMMCF	.757	.3785
Liquid Reserves - Thousands Bbls.	0	0
Net Gas Revenue @ $146/MMCF Average	$ 110,500	$ 55,250
Net Liquid Revenue @ $2.00/Bbl. Average	0	0
Total Net Revenue	$ 110,500	$ 55,250
Net Value of Production	$2,384,790	$1,192,395
Investment	1,100,000	1,100,000
Profit	1,284,790	92,395
Profit to Investment	1.17 to 1	.077 to 1
Net Value of Production 6% Discount	$1,569,000	$ 893,500
Investment	1,100,000	1,100,000
Profit @ 6% Discount	469,000	(-206,500)
Profit @ 6% Discount to Investment	.30 to 1	-

All values are net to operator assuming 80% Net to Gross ratio and before Federal Income Tax.

RED HILLS UNIT

WELL COST ESTIMATE WOLFCAMP-SINGLE

Labor, Transportation, District Expense	$ 20,000
Location, Roads, ROW, Damages	20,000
Contract Rig	200,000
Drilling Mud	120,000
Cementing Service & Cement	40,000
Logging, Perforating, Coring, & Testing	30,000
Bits	13,000
Stimulation	5,000
Miscellaneous	10,000
Casing:	
550'- 13-3/8"	4,700
5,000'- 9-5/8"	30,000
13,000'- 7"	65,000
1,400'- 5"	7,000
Tubing:	
13,500'- 3-1/2"	47,000
Control Equipment & Christmas Tree	15,000
Float Equipment, Centrelizers, etc.	15,000
Packers & Down Hole Equipment	4,000
Mascellaneous	10,000
Surface Equipment	31,000
TOTAL	$686,700

Pan Exh 12

Wolfcamp Reserves	640 ac.	320 ac.
Gas Reserves - MMMCF	10.065	5.032
Liquid Reserves - Thousand Bbls.	402.4	201.2
Net Gas Revenue @ 11¢/MMCF Average	$1,469,190	$ 734,595
Net Liquid Revenue @ $2.00/Bbl. Average	804,800	402,400
Total Revenue	2,274,290	1,137,145
Investment	$ 686,700	$ 686,700
Profit	1,587,590	450,445
Profit to Investment	2.31	.655
Net Value of Production 6% Discount	$1,194,400	$ 842,200
Investment	686,700	686,700
Profit @ 6% Discount	807,700	155,500
Profit @ 6% Discount to Investment	1.175	.226

All value are net to operator assuming 80% net to gross ratio and before federal income tax.

Pet. Exh 13
Cs 5155 - 59
2/17/65

SPECIAL RULES AND REGULATIONS
FOR THE
RED HILLS-WOLFCAMP GAS POOL

RULE 1. Each well completed in the Red Hills-Wolfcamp Gas Pool or in the Wolfcamp formation within one mile of the Red Hills-Wolfcamp Gas Pool, and not nearer to or within the limits of another designated Wolfcamp pool, shall be spaced, drilled, operated, and produced in accordance with these Special Rules and Regulations.

RULE 2. Each well completed in the Red Hills-Wolfcamp Gas Pool shall be located on a standard unit containing 640 acres, more or less, consisting of a single governmental section.

RULE 3. Each well completed in the Red Hills-Wolfcamp Gas Pool shall be located no nearer than 1650 feet to the outer boundary of the section and no nearer than 330 feet to any governmental quarter-quarter section line. Any well drilled to or being completed in the Red Hills-Wolfcamp Gas Pool is granted an exception to the well location requirements of this rule.

SPECIAL RULES AND REGULATIONS
FOR THE
RED HILLS-PENNSYLVANIAN GAS POOL

RULE 1. Each well completed in the Red Hills-Pennsylvanian Gas Pool or in the Pennsylvanian formation within one mile of the Red Hills-Pennsylvanian Gas Pool, and not nearer to or within the limits of another designated Pennsylvanian pool, shall be spaced, drilled, operated, and produced in accordance with these Special Rules and Regulations.

RULE 2. Each well completed in the Red Hills-Pennsylvanian Gas Pool shall be located on a standard unit containing 640 acres, more or less, consisting of a single governmental section.

RULE 3. Each well completed in the Red Hills-Pennsylvanian Gas Pool shall be located no nearer than 1650 feet to the outer boundary of the section and no nearer than 330 feet to any governmental quarter-quarter section line. Any well drilled to or being completed in the Red Hills-Pennsylvanian Gas Pool is granted an exception to the well location requirements of this rule.

SPECIAL RULES AND REGULATIONS
FOR THE
RED HILLS-DEVONIAN GAS POOL

RULE 1. Each well completed in the Red Hills-Devonian Gas Pool or in the Devonian formation within one mile of the Red Hills-Devonian Gas Pool, and not nearer to or within the limits of another designated Devonian pool, shall be spaced, drilled, operated, and produced in accordance with these Special Rules and Regulations.

RULE 2. Each well completed in the Red Hills-Devonian Gas Poo. shall be located on a standard unit containing 640 acres, more or less, consisting of a single governmental section.

RULE 3. Each well completed in the Red Hills-Devonian Gas Pool shall be located no nearer than 1650 feet to the outer boundary of the section and no nearer than 330 feet to any governmental quarter-quarter section line. Any well drilled to or being completed in the Red Hills-Devonian Gas Pool is granted an exception to the well location requirements of this rule.

EASTMAN DIRECTIONAL DRILLING INSTRUMENTATION

"Symbol of Service"

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Exhibit No. 1-b
Case No. 3105

3158-59
2/17/65

REPORT of SUB-SURFACE DIRECTIONAL SURVEY

PURE OIL COMPANY
COMPANY

RED HILLS UNIT WELL NO. 1
WELL NAME

WILDCAT FIELD
LEA COUNTY, NEW MEXICO
LOCATION

JOB NUMBER	TYPE OF SURVEY	DATE
WT-85964	MAGNETIC	AUGUST 13, 1964

SURVEY BY
JACK B. JONES

OFFICE
ODESSA, TEXAS

RECORD OF SURVEY

CHECKED BY ASSUMED VERTICAL TO 16,900' JOB NO. WT-85964 DATE August 13, 1964

STATION	MEASURED DEPTH	DRIFT ANGLE	TRUE VERTICAL DEPTH	VERTICAL SECTION	COURSE DEVIATION	DRIFT DIRECTION	RECTANGULAR COORDINATES			
							NORTH	SOUTH	EAST	WEST
1	17000 00	0° 30'			87	S 09 W		0 86		0 14
2	17100 00	3° 15'			5 67	N 74 E	0 70		5 31	
3	17200 00	6° 00'			10 45	N 67 E	4 78		14 93	
4	17300 00	4° 30'			7 85	N 67 E	7 85		22 15	
5	17400 00	2° 00'	17398 92		3 49	EAST	7 85		25 64	
6	17500 00	1° 45'			3 05	S 84 E	7 53		28 68	
7	17600 00	2° 15'			3 93	N 82 E	8 08		32 57	
8	17700 00	1° 00'			1 75	S 60 E	7 21		34 08	
9	17900 00	1° 00'			3 50	S 78 E	6 48		37 50	
10	18100 00	0° 45'	18098 71		2 62	N 74 E	7 20		40 02	
11	18300 00	2° 15'			7 86	N 27 E	14 20		43 59	
12	18400 00	2° 00'			3 49	N 45 E	16 67		46 06	
13	18500 00	2° 00'			3 49	N 65 E	18 14		49 22	
14	18600 00	4° 00'			6 98	N 54 E	22 24		54 86	

RECORD OF SURVEY

CHECKED BY ASSUMED VERTICAL TO 16,900' JOB NO. WT-85964 DATE August 13, 1964

STATION	MEASURED DEPTH	DRIFT ANGLE	TRUE VERTICAL DEPTH	VERTICAL SECTION	COURSE DEVIATION	DRIFT DIRECTION	RECTANGULAR COORDINATES NORTH	SOUTH	EAST	WEST
1	17000 00	0° 30'			87	S 09 W		0 86		0 14
2	17100 00	3° 15'			5 67	N 74 E	0 70		5 31	
3	17200 00	6° 00'			10 45	N 67 E	4 78		14 93	
4	17300 00	4° 30'			7 85	N 67 E	7 85		22 15	
5	17400 00	2° 00'	17398 92		3 49	EAST	7 85		25 64	
6	17500 00	1° 45'			3 05	S 84 E	7 53		28 68	
7	17600 00	2° 15'			3 93	N 82 E	8 08		32 57	
8	17700 00	1° 00'			1 75	S 60 E	7 21		34 08	
9	17900 00	1° 00'			3 50	S 78 E	6 48		37 50	
10	18100 00	0 45'	18098 71		2 62	N 74 E	7 20		40 02	
11	18300 00	2° 15'			7 86	N 27 E	14 20		43 59	
12	18400 00	2° 00'			3 49	N 45 E	16 67		46 06	
13	18500 00	2° 00'			3 49	N 65 E	18 14		49 22	
14	18600 00	4° 00'			6 98	N 54 E	22 24		54 86	

FORM 108 37 P80 10-68

Red Hills Production

	Wolfcamp Gas	Wolfcamp Total	Wolfcamp Cond.	Wolfcamp Total	Penn Gas	Penn Total	Penn Cond.	Penn Total
11/27	4.4	4.4	143.2	143.2	3.6	3.6	18.4	18.4
28	12.4	16.8	356.6	499.8	14.0	17.6	23.4	41.8
29	11.8	28.6	499.2	999.0	14.0	31.6	20.0	61.8
30	11.9	40.5	453.4	1452.4	14.0	45.6	26.0	87.8
31	11.3	51.8	506.2	1958.6	9.0	54.6	13.2	101.0
1/1	11.7	63.5	528.0	2486.6	11.0	65.6	7.8	108.8
2	10.9	74.4	543.9	3030.5	14.4	80.0	31.3	140.1
3	11.5	85.9	444.3	3474.8	16.1	96.1	31.1	171.2
4	10.7	96.6	466.4	3941.2	16.4	112.5	33.9	205.1
5	4.5	101.1	213.5	4154.7	5.9	118.4	10.0	215.1
6	2.7	103.8	96.5	4251.2	7.7	126.1	3.2	218.3
7	6.9	110.7	338.9	4590.1	12.8	138.9	24.7	243.0
8	9.9	120.6	479.8	5069.9	14.7	153.6	15.6	258.6
9	10.8	131.4	518.2	5588.1	15.7	169.3	7.8	266.4
10	9.5	140.9	426.9	6015.0	7.5		11.9	
11	11.3	152.2	513.3	6528.3	7.0		2.6	
12	11.3	163.5	537.5	7065.8	0			
13	11.2	174.7	531.6	7597.4	8.3	192.1	7.8	288.7
14	10.7	185.4	521.0	8118.4	0	Plugged off		
15	0.5	185.9	57.2	8175.6	0			
16	0	185.9	0	8175.6				
17	0	185.9	0	8175.6				
18	3.9	189.8	75.3	8250.9				
19	8.4	198.2	384.2	8635.1				
20	11.8	210.0	495.4	9130.5				
21	11.5	221.5	448.1	9578.6				
22	11.4	232.9	446.0	10,024.6				
23	7	233.6	225.9	10,250.5				
24	5.5	239.1	231.7	10,482.2				
25	7.0	246.1	328.7	10,810.9				
26	9.0		403.6					
27	11.3	246.4	541.6	11,756.1				
28	11.4		523.4					
29	11.6		519.0					
30	11.3	300.7	518.2	13,314.7				
31	11.1		505.0					
1	11.0		501.0					
2	12.6		481.0					
3	12.9	348.3	467.0	15,220.7				
4	12.8	361.1	466.0	15,737				
5	12.4		487.0					
6	12.3		464.0					
7	12.2	378.0	471.0	17,159				
8	12.2		453					
9	12.0		436					
10	11.8		438					
11	11.8		416					

Wolfcamp

12th	12		430	
13th	12		410	
14th	11.9	481.7	412	20,154

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Exhibit No. 1-C
Case No. 3458

CASES 3158 & 3159 - Correspondence
and MOTIONS

CASE NO.
359

Application,
Transcripts,
Small Exhibits
ETC.

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

CASE No. 3159
Order No. R-2827-A
NOMENCLATURE

APPLICATION OF THE PURE OIL COMPANY
FOR THE CREATION OF A NEW GAS POOL
AND FOR SPECIAL POOL RULES, LEA COUNTY,
NEW MEXICO.

NUNC PRO TUNC ORDER

BY THE COMMISSION:

It appearing to the Commission that due to typographical error, Order No. R-2827, dated December 7, 1964, does not correctly state the intended order of the Commission,

IT IS THEREFORE ORDERED:

(1) That Paragraph (1) on page 2 of Order No. R-2827, dated December 7, 1964, is hereby corrected to read as follows:

"(1) That a new pool in Lea County, New Mexico, classified as a gas pool for Pennsylvanian production, is hereby created and designated the Red Hills-Pennsylvanian Gas Pool, with vertical limits comprising the Pennsylvanian formation, and horizontal limits comprising all of Sections 31, 32, and 33, Township 25 South, Range 33 East, and all of Sections 4, 5, and 6, Township 26 South, Range 33 East, NMPM, Lea County, New Mexico."

(2) That the correction set forth above shall be effective nunc pro tunc as of December 7, 1964.

DONE at Santa Fe, New Mexico, on this 25th day of March, 1965.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

Jack M Campbell
JACK M. CAMPBELL, Chairman

Guyton B. Hays
GUYTON B. HAYS, Member

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

esr/

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

CASE No. 3159
Order No. R-2827-A
NOMENCLATURE

APPLICATION OF THE PURE OIL COMPANY
FOR THE CREATION OF A NEW GAS POOL
AND FOR SPECIAL POOL RULES, LEA COUNTY,
NEW MEXICO.

NUNC PRO TUNC ORDER

BY THE COMMISSION:

It appearing to the Commission that due to typographical error, Order No. R-2827, dated December 7, 1964, does not correctly state the intended order of the Commission,

IT IS THEREFORE ORDERED:

(1) That Paragraph (1) on page 2 of Order No. R-2827, dated December 7, 1964, is hereby corrected to read as follows:

"(1) That a new pool in Lea County, New Mexico, classified as a gas pool for Pennsylvanian production, is hereby created and designated the Red Hills-Pennsylvanian Gas Pool, with vertical limits comprising the Pennsylvanian formation, and horizontal limits comprising all of Sections 31, 32, and 33, Township 25 South, Range 33 East, and all of Sections 4, 5, and 6, Township 26 South, Range 33 East, NMPM, Lea County, New Mexico."

(2) That the correction set forth above shall be effective nunc pro tunc as of December 7, 1964.

DONE at Santa Fe, New Mexico, on this 25th day of March, 1965.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

JACK M. CAMPBELL, Chairman

GUYTON B. HAYS, Member

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

esr/

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

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

CASE No. 3159
Order No. R-2827
NOMENCLATURE

APPLICATION OF THE PURE OIL COMPANY
FOR THE CREATION OF A NEW GAS POOL
AND FOR SPECIAL POOL RULES, LEA COUNTY,
NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on November 24, 1964, at Santa Fe, New Mexico, before Examiner Daniel S. Nutter.

NOW, on this 7th day of December, 1964, the Commission, a quorum being present, having considered the testimony, the record, and the recommendations of the Examiner, 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 Pure Oil Company, seeks the creation of a new Pennsylvanian gas pool for its Red Hills Unit Well No. 1, located 330 feet from the South line and 2310 feet from the East line of Section 32, Township 25 South, Range 33 East, NMPM, Lea County, New Mexico, and the promulgation of special rules and regulations governing said pool, including a provision for 640-acre spacing.

(3) That the portion of this case concerning the promulgation of special pool rules was continued at the above hearing by the examiner to the examiner hearing to be held on January 6, 1965, and that a subsequent order or orders should be issued concerning this portion of the case.

(4) That the Red Hills Unit Well No. 1, located 330 feet from the South line and 2310 feet from the East line of Section 32, Township 25 South, Range 33 East, NMPM, Lea County, New Mexico, has discovered a separate common source of supply which should be designated the Red Hills-Pennsylvanian Gas Pool; that the vertical limits of said pool should be the Pennsylvanian formation, and that the horizontal limits of said pool should include all of Sections 31, 32, and 33, Township 25 South, Range 33 East, and all of Sections 4, 5, and 6, Township 26 South, Range 33 East, NMPM, Lea County, New Mexico.

IT IS THEREFORE ORDERED:

(1) That a new pool in Lea County, New Mexico, classified as a gas pool for Pennsylvanian production, is hereby created and designated the Red Hills-Pennsylvanian Gas Pool, with vertical limits comprising the Pennsylvanian formation, and horizontal limits comprising all of Sections 31, 32, and 33, Township 25 South, Range 33 East, and all of Sections 4, 5, and 6, Township 25 South, Range 33 East, NMPM, Lea County, New Mexico.

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

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

Jack M Campbell
JACK M. CAMPBELL, Chairman

E. S. WALKER, Member

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

esr/

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

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

CASE No. 3159
Order No. R-2827-B

APPLICATION OF THE PURE OIL COMPANY
FOR THE CREATION OF A NEW GAS POOL
AND FOR SPECIAL POOL RULES, LEA
COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on March 17, 1965, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission."

NOW, on this 8th day of April, 1965, the Commission, a quorum being present, having considered the testimony presented and the exhibits received at said hearing, and being fully advised in the premises,

FINDS:

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

(2) That by Order No. R-2827, as amended by Order No. R-2827-A, the Commission granted The Pure Oil Company's request for the creation of a new gas pool in Lea County, New Mexico, designated the Red Hills-Pennsylvanian Gas Pool, and established vertical and horizontal limits for said pool.

(3) That the applicant, The Pure Oil Company, also seeks the promulgation of temporary special rules and regulations governing said pool, including a provision for 640-acre spacing and a provision requiring wells subsequently completed in said pool to be located no nearer than 1650 feet to the outer boundary of a section.

(4) That The Pure Oil Company Red Hills Unit Well No. 1 is the only well presently completed in the subject pool and is located 330 feet from the South line and 2310 feet from the East line of Section 32, Township 25 South, Range 33 East, NMPM, Lea County, New Mexico.

(5) That the applicant has not established that the proposed special rules and regulations would afford to the owner of each property in the pool the opportunity to produce his just and equitable share of the gas in the pool.

(6) That the applicant's request for special rules and regulations governing the Red Hills-Pennsylvanian Gas Pool should be denied.

IT IS THEREFORE ORDERED:

(1) That the applicant's request for special rules and regulations governing the Red Hills-Pennsylvanian Gas Pool is hereby denied.

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

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

Jack M Campbell
JACK M. CAMPBELL, Chairman

Guyton B. Hays
GUYTON B. HAYS, Member

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

esr/

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

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

CASE No. 3158
and
CASE No. 3159

APPLICATION OF THE PURE OIL COMPANY
FOR THE ESTABLISHMENT OF SPECIAL RULES
AND REGULATIONS GOVERNING THE RED HILLS-
WOLFCAMP AND RED HILLS-PENNSYLVANIAN GAS
POOLS, LEA COUNTY, NEW MEXICO.

RULING ON MOTION TO QUASH SUBPOENA DUCES TECUM

BY THE COMMISSION:

This matter came on for hearing at 9 o'clock a.m. on January 13, 1965, at Santa Fe, New Mexico, upon Motion to Quash Subpoena Duces Tecum filed by John R. Murphey, Jr., George Fish, Fred Tyner, and The Pure Oil Company.

NOW, on this 8th day of February, 1965, the Commission, a quorum being present, having read the motion and having considered the arguments of counsel, and being otherwise fully advised in the premises,

FINDS:

(1) That the documents described in the Subpoena Duces Tecum issued December 22, 1964, to Mr. John R. Murphey, Jr., Mr. George Fish, and Mr. Fred Tyner may be material and pertinent to a proper determination of the issues in these cases.

(2) That the Subpoena Duces Tecum should be modified to require production of the documents described therein at the hearing of these cases on the merits subject to objections as to the admissibility of said documents.

IT IS THEREFORE ORDERED:

(1) That the Subpoena Duces Tecum issued in the above cases on December 22, 1964, is hereby modified to require production of the documents described therein at the hearing of these cases on the merits subject to objections as to the admissibility of said documents.

(2) That, except as provided herein, the Motion to Quash Subpoena Duces Tecum is hereby overruled.

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

Jack M Campbell
JACK M. CAMPBELL, Chairman

Guyton B. Hays
GUYTON B. HAYS, Member

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

esr/

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

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

CASE No. 3158
and
CASE No. 3159

APPLICATION OF THE PURE OIL COMPANY
FOR THE ESTABLISHMENT OF SPECIAL RULES
AND REGULATIONS GOVERNING THE RED HILLS-
WOLFCAMP AND RED HILLS-PENNSYLVANIAN GAS
POOLS, LEA COUNTY, NEW MEXICO.

RULING ON MOTION TO QUASH SUBPOENA DUCES TECUM

BY THE COMMISSION:

This matter came on for hearing at 9 o'clock a.m. on January 13, 1965, at Santa Fe, New Mexico, upon Motion to Quash Subpoena Duces Tecum filed by John R. Murphey, Jr., George Fish, Fred Tyner, and The Pure Oil Company.

NOW, on this 17th day of February, 1965, the Commission, a quorum being present, having read the motion and having considered the arguments of counsel, and being otherwise fully advised in the premises,

FINDS:

(1) That the documents described in the Subpoena Duces Tecum issued December 22, 1964, to Mr. John R. Murphey, Jr., Mr. George Fish, and Mr. Fred Tyner may be material and pertinent to a proper determination of the issues in these cases.

(2) That the Subpoena Duces Tecum should be modified to require production of the documents described therein at the hearing of these cases on the merits subject to objections as to the admissibility of said documents.

IT IS THEREFORE ORDERED:

(1) That the Subpoena Duces Tecum issued in the above cases on December 22, 1964, is hereby modified to require production of the documents described therein at the hearing of these cases on the merits subject to objections as to the admissibility of said documents.

(2) That, except as provided herein, the Motion to Quash Subpoena Duces Tecum is hereby overruled.

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

JACK M. CAMPBELL, Chairman

GUYTON B. HAYS, Member

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

S E A L

esr/

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

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

CASE No. 3159
Order No. R-2827

APPLICATION OF THE PURE OIL COMPANY
FOR THE CREATION OF A NEW GAS POOL
AND FOR SPECIAL POOL RULES, LEA
COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on March 17, 1965, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission."

NOW, on this 8th day of April, 1965, the Commission, a quorum being present, having considered the testimony presented and the exhibits received at said hearing, and being fully advised in the premises,

FINDS:

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

(2) That by Order No. R-2827, as amended by Order No. R-2827-A, the Commission granted The Pure Oil Company's request for the creation of a new gas pool in Lea County, New Mexico, designated the Red Hills-Pennsylvanian Gas Pool, and established vertical and horizontal limits for said pool.

(3) That the applicant, The Pure Oil Company, also seeks the promulgation of temporary special rules and regulations governing said pool, including a provision for 640-acre spacing and a provision requiring wells subsequently completed in said pool to be located no nearer than 1650 feet to the outer boundary of a section.

(4) That The Pure Oil Company Red Hills Unit Well No. 1 is the only well presently completed in the subject pool and is located 330 feet from the South line and 2310 feet from the East line of Section 32, Township 25 South, Range 33 East, NMPM, Lea County, New Mexico.

(5) That the applicant has not established that the proposed special rules and regulations would afford to the owner of each property in the pool the opportunity to produce his just and equitable share of the gas in the pool.

(6) That the applicant's request for special rules and regulations governing the Red Hills-Pennsylvanian Gas Pool should be denied.

IT IS THEREFORE ORDERED:

(1) That the applicant's request for special rules and regulations governing the Red Hills-Pennsylvanian Gas Pool is hereby denied.

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

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

JACK M. CAMPBELL, Chairman

GUYTON B. HAYS, Member

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

S E A L

esr/

Return.

SUBPOENA DUCES TECUM

THE STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

TO: Mr. John R. Murphey, Jr.
District Petroleum Engineer
The Pure Oil Company
Midland, Texas
c/o The Corporation Company
123 East Palace Avenue
Santa Fe, New Mexico

Mr. George Fish
District Development Geologist
The Pure Oil Company
Midland, Texas
c/o The Corporation Company
123 East Palace Avenue
Santa Fe, New Mexico

Mr. Fred Tyner
The Pure Oil Company
Suite 425 J. P. White Building
Roswell, New Mexico

Greeting:

You and each of you are hereby commanded to appear before the Oil Conservation Commission of the State of New Mexico, State Land Office Building, Santa Fe, New Mexico, on January 6, 1965, at the hour of 9 o'clock a.m., then and there to testify in Case No. 3158, styled, Application of The Pure Oil Company for the creation of a new gas pool and for special pool rules, Lea County, New Mexico, and Case No. 3159, styled, Application of The Pure Oil Company for the creation of a new gas pool and for special pool rules, Lea County, New Mexico, pending before the Oil Conservation Commission; and

You and each of you are hereby commanded to appear before the Oil Conservation Commission of the State of New Mexico, State Land Office Building, Santa Fe, New Mexico, on or before December 28, 1964, then and there to produce and deliver in the above cases the following documents concerning The Pure Oil Company Red Hills Unit Well No. 1 located 330 feet from the South line and 2310 feet from the East line of Section 32, Township 25 South, Range 33 East, NMPM, Lea County, New Mexico:

1. Copy of all drill stem test reports made of each formation tested and the surface flows, if any, on each test.

2. Copies of the core analysis made on each of the 14 cores cut from the subject well.

3. Copy of all sample analyses made on any of the products which have been tested on the subject well.

4. Copy of all well logs, including lateral logs, gamma neutron logs, sonic logs, micro logs and the porosity and saturation calculations from these logs which have been furnished to Pure by the logging company.

5. A copy of the directional survey made on the well from 16,954 feet to 21,000 feet and any other directional survey made at any time during the drilling of the well.

6. A copy of the report which is approved by the Commission detailing the deviation survey of the "Totco" type.

7. The depth of any perforations, the treatment of any perforations and test flows recorded from such perforations in each of the following horizons:

Bone Springs (top 9020)
Wolfcamp (top 11,643)
Strawn (top 14,310)
Atoka (top 14,530)
Morrow (15,020)
Devonian (17,424)

8. Copy of the seismic structure map introduced into evidence at the hearing on the application for unit approval.

This do you under penalty of law as provided in Section 65-3-8, New Mexico Statutes Annotated, 1953 Compilation.

GIVEN under my hand and the official seal of the Oil Conservation Commission of the State of New Mexico, this 22nd day of December, 1964.

A. L. Porter, Jr.

A. L. PORTER, Jr.

MEMBER AND SECRETARY-DIRECTOR
OIL CONSERVATION COMMISSION OF
THE STATE OF NEW MEXICO

S E A L

SHERIFF'S RETURN

STATE OF NEW MEXICO)
) SS
COUNTY OF CHAVES)

I, W. E. Smith, Sheriff of Chaves County, State of New Mexico, do hereby certify that I served this subpoena duces tecum by delivering 1 copies thereof, in the County aforesaid, in person to Fred Tyner

on 23 December 1964

Dated: 12-23-64

Fees: $5.00

W. E. Smith
SHERIFF

By J. L. Deakers.
Deputy.

W. E. Smith
Sheriff of Chaves County
Box 1396
Roswell, N. M.

CLARENCE E. HINKLE
W. E. BONDURANT, JR.
S. B. CHRISTY IV
LEWIS C. COX, JR.
PAUL W. EATON, JR.
CONRAD E. COFFIELD
HAROLD L. HENSLEY, JR.
MICHAEL R. WALLER

LAW OFFICES
HINKLE, BONDURANT & CHRISTY
HINKLE BUILDING
ROSWELL, NEW MEXICO

OF COUNSEL [illegible] M. DOW

TELEPHONE 622-6510
AREA CODE 505
POST OFFICE BOX 10

February 15, 1965

New Mexico Oil Conservation Commission
Box 2088
Santa Fe, New Mexico 87501

Re: Regular hearing February 17, 1965
Cases 3158, 3159, 3207 and 3208
Statement of Humble Oil & Refining Company

Gentlemen:

The Humble Oil & Refining Company desires that the following statement be made a part of the record in each of the captioned cases:

"Humble Oil & Refining Company owns acreage within the Unit Area of the Pure Oil Company Red Hills Unit, Well No. 1 and has adjoining acreage under study for development. Because of the high development cost of the deep Wolfcamp, Pennsylvanian and Devonian formations in the area of the Red Hills Unit, Humble requests adoption of temporary rules establishing 640-acre spacing. In view of the extended period of time necessary to drill, test, and complete wells in this area, Humble requests that temporary rules be estaboished for at least two years. Humble feels that the 640-acre spacing is reasonable in this case and wishes to cite other gas pools; namely, Jal-West Strawn Pool, Lusk-Morrow Gas Pool, and Antelope Ridge Devonian Gas Pool which are similar geologically to the Red Hills Unit zones and which have 640-acre spacing rules.

"Humble does not wish to make a statement at this time with regard to zones which should be delineated as separate reservoirs but is strongly in favor of the wider spacing in any reservoir which is designated."

We are enclosing four copies of the above statement so that one copy may be filed in each case.

Respectfully submitted,

HUMBLE OIL & REFINING COMPANY

By [signature] Atty

HINKLE, BONDURANT & CHRISTY
Attorneys for Humble Oil & Refining Company
P.O. Box 10
Roswell, New Mexico

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION
OF THE PURE OIL COMPANY FOR THE
ESTABLISHMENT OF SPECIAL RULES
AND REGULATIONS IN THE RED HILLS-
WOLFCAMP AND RED HILLS-PENNSYLVANIAN
GAS POOLS, LEA COUNTY, NEW MEXICO.

Cases Nos. 3158
3159

MEMORANDUM IN SUPPORT
OF MOTION TO QUASH
SUBPOENA DUCES TECUM

On December 22, 1964, the Commission, at the request of Saul A. Yager, Barbara A. Whitten, Jerald M. Schuman, Avrome Schuman, J. Harold Schuman and Earl Schuman, issued its Subpoena Duces Tecum to John R. Murphey, Jr., George Fish and Fred Tyner, all employees of The Pure Oil Company, directing them to produce certain documents concerning the Red Hills Unit Well No. 1, Section 32, Township 25 South, Range 33 East, Lea County, New Mexico.

On December 28, 1964, the individuals to whom the subpoena was directed and The Pure Oil Company filed with the Commission their Motion To Quash Subpoena Duces Tecum. Thereafter, on January 8, 1965, some of the information requested by the subpoena was delivered to the Commission, to-wit:

1. Summary of drill stem tests taken in the Wolfcamp and Pennsylvanian formations.

2. Gamma Ray-Neutron Log, Gamma Ray-Sonic Log, Laterolog, Microlog, and Radioactivity Log.

3. Tabulation of Totco surveys from surface to total depth.

4. Summary of flow tests taken prior to final completion in the Wolfcamp and Pennsylvanian formations.

5. Copy of structure map submitted by The Pure Oil Company in connection with its application for approval of the Red Hills Unit Agreement, NMOCC Case No. 2671.

Some of the requested information has not been produced, and it is respectfully submitted that it cannot lawfully be subpoenaed, for the following reasons:

I. The New Mexico Oil Conservation Commission has no authority to require the production of documents for purposes of prehearing discovery and inspection.

Movants do not deny the power of the Commission to require the production of documents for use in a proceeding before the Commission, for such power is expressly conferred by Section 65-3-7, N.M.S.A., 1953 Comp., but there is nothing in that statute or the other statutes governing Commission action authorizing it to require the production of documents for discovery and inspection by opposing parties prior to a hearing.

By Section 65-3-6, N.M.S.A., 1953 Comp., the Commission is authorized to prescribe its rules of order or procedure, and pursuant to this authorization the Commission has adopted rules of procedure being Rules 1201-1223, but nowhere in these rules is there any provision for prehearing discovery and inspection.

In his Treatise On Administrative Law, Mr. K. C. Davis discusses the authority of a federal administrative agency to require prehearing discovery under the Administrative Procedure Act, which also contains general provisions authorizing federal agencies to issue subpoenas.

At Section 8.15, page 588 of Volume 1 of the Treatise, Mr. Davis states:

> "The APA contains no provision for pretrial discovery in the administrative process and, of course, the provisions of the Federal Rules of Civil Procedure for discovery do not apply to administrative proceedings. Therefore, in absence of special statutory provision, and in absence of special administrative regulation, no procedure for discovery is normally available in a Federal administrative proceeding."

See also: National Labor Relations Board v. Globe Wireless, 193 F.2d 748, 751 (9th Cir. 1951) denying prehearing discovery by deposition.

II. The subpoenaed documents which pertain to formations and depths other than the Wolfcamp and Pennsylvanian formations are irrelevant to the proceedings before the Commission in Cases Nos. 3158 and 3159.

It is fundamental that the Commission's power to require the production of documents at a proceeding before it extends only to such documents as are relevant to that proceeding. 2 Am. Jur.2d, Administrative Law, Secs. 263, 264, pp. 93-95.

In the proceedings before the Commission in Cases Nos. 3158 and 3159 the Commission is asked only to establish special rules and regulations for the Red Hills-Wolfcamp and Red Hills-Pennsylvanian Gas Pools, which pools already have been created by Orders Nos. R-2826 and R-2827 respectively. Accordingly, any information not pertaining to the Wolfcamp or the Pennsylvanian formations in these pools is irrelevant to the present proceedings.

In its Subpoena Duces Tecum the Commission has ordered the production of the following data:

> "1. Copy of all drill stem test reports made of each formation tested and the surface flows, if any, on each test."

On January 8, 1965, the Commission was furnished with a summary of drill stem tests taken in the Wolfcamp and Pennsylvanian formations. Such tests on any other formations are irrelevant to these proceedings.

> "2. Copies of the core analysis made on each of the 14 cores cut from the subject well."

There is no core analysis on any core taken in the Wolfcamp formation, the only core taken in that formation having been in unproductive portion thereof. There were no cores taken in the Pennsylvanian formation. The core analyses made on cores taken from other formations are irrelevant to these proceedings.

> "3. Copy of all sample analyses made on any of the products which have been tested on the subject well."

Analyses of the products taken from the Wolfcamp and Pennsylvanian formations were supplied to the Commission and to opposing counsel at the hearing of Case No. 3157 on November 24, 1964. Sample analyses as to other formations are irrelevant to these proceedings.

> "4. Copy of all well logs, including lateral logs, gamma neutron logs, sonic logs, micro logs and the porosity and saturation calculations from these logs which have been furnished to Pure by the logging company."

These logs were furnished to the Commission on January 8, 1965.

> "5. A copy of the directional survey made on the well from 16,954 feet to 21,000 feet and any other directional survey made at any time during the drilling of the well."

In the subject well the Wolfcamp formation occurs in the interval 11,643-14,310 feet, and the Pennsylvanian formation occurs in the interval 14,310-15,614 feet. No directional survey was made on the well in these intervals and any other directional survey is irrelevant to these proceedings.

> "6. A copy of the report which is approved by the Commission detailing the deviation survey of the 'Totco' type."

This report was furnished to the Commission on January 8, 1965.

> "7. The depth of any perforations, the treatment of any perforations and test flows recorded from such perforations in each of the following horizons:
> Bone Springs (top 9020)
> Wolfcamp (top 11,643)
> Strawn (top 14,310)
> Atoka (top 14,530)
> Morrow (15,020)
> Devonian (17,424)"

On January 8, 1965, the summary of flow tests taken prior to final completion in the Wolfcamp and Pennsylvanian formations was submitted to the Commission. Such information on other formations is irrelevant to these proceedings.

> "8. Copy of the seismic structure map introduced into evidence at the hearing on the application for unit approval."

This map was delivered to the Commission on January 8, 1965.

III. The Subpoena Duces Tecum is unreasonable and unlawful in requiring movants to produce documents and information which are the work products and opinions of expert witnesses and which constitute confidential information.

By its subpoena the Commission has directed the production of various reports, analyses and calculations which have been made by engineers and geologists of The Pure Oil Company and by other technical personnel.

This information constitutes the work product and the opinions of these personnel and is confidential to The Pure Oil Company and the other participants in the Red Hills Unit area. It is well known throughout the oil industry that the methods by which reserves are calculated are confidential and secret processes.

Even under the discovery provisions of the Federal Rules of Civil Procedure such secret processes and trade secrets may not be discoverable, for under Rule 30(b) the court may issue a protective order against discovery of such information. In this regard see the article by Charles Schoenfeld, "Deposition-Discovery Rules re Trade Secrets," 10 F.R.D. 493. This rule was applied in Korman v. Shull, 184 F.Supp.928 (W.D. Mich. 1960) (parties to patent interference proceeding not required to produce books, papers and documents concerning secret, confidential and privileged material), and in In Re Application Of Consumers Union of United States, Inc., 27 F.R.D. 251 (S.D.N.Y. 1961),(the same rule applied in a trademark infringement suit).

While protection against discovery of secret processes and trade secrets is within the discretion of the tribunal before which the proceeding is pending, we submit that the Commission in the exercise of its discretion should refuse to order the production of The Pure Oil Company's reserve calculations and other secret processes which our opponents seek to discover.

Movants respectfully submit that their Motion To Quash Subpoena Duces Tecum is supported by reason and authority, and should be granted.

Respectfully submitted,

SETH, MONTGOMERY, FEDERICI & ANDREWS

By Richard S. Morris

350 E. Palace Ave., Santa Fe, N.M.
Attorneys for Movants.

Memo

From IDA RODRIGUEZ

To

DOCKETS MAILED TO PEOPLE LISTED ON THE ATTACHED SUBPOENA FOR THE FEBRUARY 17, 1965 REGULAR HEARING.

DOCKET MAILED

Date 2-5-65 IR

SUBPOENA DUCES TECUM

THE STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

TO: Mr. John R. Murphey, Jr.
District Petroleum Engineer
The Pure Oil Company
Midland, Texas
c/o The Corporation Company
123 East Palace Avenue
Santa Fe, New Mexico

Mr. George Fish
District Development Geologist
The Pure Oil Company
Midland, Texas
c/o The Corporation Company
123 East Palace Avenue
Santa Fe, New Mexico

Mr. Fred Tyner
The Pure Oil Company
Suite 425 J. P. White Building
Roswell, New Mexico

Greeting:

You and each of you are hereby commanded to appear before the Oil Conservation Commission of the State of New Mexico, State Land Office Building, Santa Fe, New Mexico, on January 6, 1965, at the hour of 9 o'clock a.m., then and there to testify in Case No. 3158, styled, Application of The Pure Oil Company for the creation of a new gas pool and for special pool rules, Lea County, New Mexico, and Case No. 3159, styled, Application of The Pure Oil Company for the creation of a new gas pool and for special pool rules, Lea County, New Mexico, pending before the Oil Conservation Commission; and

You and each of you are hereby commanded to appear before the Oil Conservation Commission of the State of New Mexico, State Land Office Building, Santa Fe, New Mexico, on or before December 28, 1964, then and there to produce and deliver in the above cases the following documents concerning The Pure Oil Company Red Hills Unit Well No. 1 located 330 feet from the South line and 2310 feet from the East line of Section 32, Township 25 South, Range 33 East, NMPM, Lea County, New Mexico:

1. Copy of all drill stem test reports made of each formation tested and the surface flows, if any, on each test.

2. Copies of the core analysis made on each of the 14 cores cut from the subject well.

3. Copy of all sample analyses made on any of the products which have been tested on the subject well.

4. Copy of all well logs, including lateral logs, gamma neutron logs, sonic logs, micro logs and the porosity and saturation calculations from these logs which have been furnished to Pure by the logging company.

5. A copy of the directional survey made on the well from 16,954 feet to 21,000 feet and any other directional survey made at any time during the drilling of the well.

6. A copy of the report which is approved by the Commission detailing the deviation survey of the "Totco" type.

7. The depth of any perforations, the treatment of any perforations and test flows recorded from such perforations in each of the following horizons:

Bone Springs (top 9020)
Wolfcamp (top 11,643)
Strawn (top 14,310)
Atoka (top 14,530)
Morrow (15,020)
Devonian (17,424)

8. Copy of the seismic structure map introduced into evidence at the hearing on the application for unit approval.

This do you under penalty of law as provided in Section 65-3-8, New Mexico Statutes Annotated, 1953 Compilation.

GIVEN under my hand and the official seal of the Oil Conservation Commission of the State of New Mexico, this 22nd day of December, 1964.

A. L. Porter, Jr.

A. L. PORTER, Jr.

MEMBER AND SECRETARY-DIRECTOR
OIL CONSERVATION COMMISSION OF
THE STATE OF NEW MEXICO

RETURN

STATE OF NEW MEXICO)
) SS.
COUNTY OF SANTA FE)

Ida Rodriguez, being duly sworn, upon her oath, says: I am over the age of eighteen years, I served this subpoena duces tecum by delivering 2 copies, in the County aforesaid, in person to L.C. White Assistant Secretary of the Corporation Company on December 23, 1964.

Ida Rodriguez

Subscribed and sworn to before me this 24th day of December, 1964.

James M. Durrett Jr.
Notary Public

My Commission Expires:

12-3-65

'64 Dec 11 AM 8 07

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE
APPLICATION OF THE PURE
OIL COMPANY 640 ACRE SPAC-
ING FOR WOLFCAMP and PENN-
SYLVANIAN FORMATIONS

CASE NOS. 3158
3159

APPLICATION OF SAUL A. YAGER,
BARBARA A. WHITTEN, JERALD M.
SCHUMAN, AVROME SCHUMAN, J.
HAROLD SCHUMAN and EARL SCHUMAN.

APPLICATION

Come now the applicants by their attorneys, George H. Hunker, Jr., John F. Russell and Donald E. Pray, and state:

The application of the Pure Oil Company, hereinafter referred to as "Pure" in causes No. 3158 and 3159, requesting 640 acres spacing of the Wolfcamp and Pennsylvanian formations are now pending before the Examiner and are set for a continuation of the hearings on January 6, 1965. These applications were heard only insofar as they concern the establishment of two (2) gas pools in the hearing on November 24, 1964, before Mr. Nutter, the Hearing Examiner.

At that hearing we requested a continuance of these two (2) causes until such time as Pure furnished us with sufficient information so as to enable us to prepare our case in order to protect our correlative rights. Mr. Nutter granted a continuance on the matter of the spacing applications until January 6, 1965.

The protection of our correlative rights requires a proper evaluation of Pure's applications. And, as the Examiner and the Commission well know, this is a highly technical matter calling for analysis by a qualified engineer of all data disclosed by the records of the well and other information pertinent thereto.

Pure has consistently refused to furnish us with the necessary records and information, which are in its possession and subject to its control, which are necessary to enable us to properly evaluate and protect our correlative rights in relation to its applications.

It was not until the evening before the hearing set for 9:00 o'clock a.m., November 24, 1964, that Pure finally permitted us to view the well logs and gave us copies of two openflow calculations and gas sample analyses. This information was totally inadequate to permit us to make any evaluation of the well involved, or of the matters pertinent to Pure's applications, and thus protect our correlative rights.

Pure stated at the time of the hearing of November 24, 1964, that in advance of any hearing it would not furnish us with, or permit examination by us of any other records of the well or other information or records in its possession or control pertaining to its applications; and that even at a hearing, it would present only such records and information in its possession and control as it would choose, unless otherwise expressly directed by the Examiner or the Commission.

The attached EXHIBIT "A" is a list of records known to be in the possession and control of Pure. We have consulted with engineers, qualified and well recognized in the industry, to evaluate Pure's applications and our correlative rights; but unless afforded the opportunity to study and analyze the records and information set out in EXHIBIT "A", it is impossible for any engineer to make an intelligent evaluation of Pure's applications and of our correlative rights in relation thereto.

We submit that for the protection of our correlative rights we are entitled to have a full disclosure of the relevant information so that we may make an evaluation of Pure's applications to the end that the Examiner and the Commission may be fully informed prior to the entry of any order granting an exception to the Commission's established rules. Unless we are permitted to properly prepare, the Commission would only have an opportunity to view Pure's side of the case and then only so much of the case as Pure desires to disclose.

We would even be unable to conduct an intelligent cross-examination of Pure's witnesses unless we can first have an opportunity to evaluate the information being kept from us by Pure. The Commission should not be called upon to render a decision affecting our correlative rights based only on such information as Pure chooses to disclose, withholding facts which could have an impact on the matters in issue.

We respectfully submit that the Examiner, by virtue of New Mexico laws, has been granted the power to regulate all proceedings before him and to perform all acts and take all measures necessary and proper for the efficient and orderly conduct of such hearings in order that our correlative rights will be protected.

WHEREFORE, the applicants request:

(a) The Examiner or the Commission enter such order or issue such appropriate process as may be necessary to cause Pure to come forward at least ten (10) days prior to the hearing set for January 6, 1965, and furnish us the records and information shown on EXHIBIT "A" and permit us to make copies thereof.

(b) Without in any manner waiving our request contained in (a) above, if such be denied, we request that the Examiner or the Commission issue a subpoena duces tecum or other appropriate process requiring Pure to come forward and produce at the time of the hearing on January 6, 1965, the records and information set out in EXHIBIT "A". It is also requested that if we be denied access to these records and information until the time of the said hearing , we be given sufficient time to examine and analyze the records and information produced by Pure upon the hearing in order that we may prepare our witnesses and testimony.

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George H. Hunker
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Roswell, New Mexico

Donald E. Pray
Petroleum Club Building
Tulsa, Oklahoma

ATTORNEYS FOR APPLICANTS

EXHIBIT "A"

The following information is requested in connection with the application of The Pure Oil Company for 640-acre spacing of the Pennsylvanian and Wolfcamp formations as proven by the Red Hills Unit No. 1:

1. Copy of all drill stem test reports made of each formation tested and the surface flows, if any, on each test.
2. Copies of the core analysis made on each of the 14 cores cut from the subject well.
3. Copy of all sample analyses made on any of the products which have been tested on the subject well.
4. Copy of all well logs, including lateral logs, gamma neutron logs, sonic logs, micro logs and the porosity and saturation calculations from these logs which have been furnished to Pure by the logging company.
5. A copy of the directional survey made on the well from 16,954 feet to 21,000 feet and any other directional survey made at any time during the drilling of the well.
6. A copy of the report which is approved by the Commission detailing the deviation survey of the "Totco" type.
7. The depth of any perforations, the treatment of any perforations and test flows recorded from such perforations in each of the following horizons:
   Bone Springs (top 9020)
   Wolfcamp (top 11643)
   Strawn (top 14,310)
   Atoka (top 14,530)
   Morrow (15020)
   Devonian (17,424)
8. Copy of the seismic structure map introduced into evidence at the hearing on the application for unit approval.

'64 DEC 28 PM

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION OF THE PURE OIL COMPANY FOR THE ESTABLISHMENT OF SPECIAL RULES AND REGULATIONS IN THE RED HILLS-WOLFCAMP AND RED HILLS-PENNSYLVANIAN GAS POOLS, LEA COUNTY, NEW MEXICO.

Cases Nos. 3158
3159

MOTION TO QUASH SUBPOENA DUCES TECUM

Come now John R. Murphey, Jr., George Fish, Fred Tyner and The Pure Oil Company, by their attorneys, Seth, Montgomery, Federici & Andrews, and move the New Mexico Oil Conservation Commission to quash the Subpoena Duces Tecum heretofore issued in this cause on December 22, 1964 and directed to the individual movants, and in support of their motion state:

1. The New Mexico Oil Conservation Commission has no authority to require the production of documents for purposes of prehearing discovery and inspection.

2. The subpoenaed documents which pertain to formations and depths other than the Wolfcamp and Pennsylvanian formations in the Red Hills Unit Well No. 1 are irrelevant to the proceedings before the Commission in Cases Nos. 3158 and 3159.

3. The subpoena duces tecum is unreasonable and unlawful in requiring movants to produce documents and information which are the work product and opinions of expert witnesses.

4. Until such time as the subpoenaed documents, and the information contained therein, may be offered as evidence in a public hearing, they constitute confidential information belonging to the participants in the Red Hills Unit Area, which movants

are not at liberty to disclose.

WHEREFORE, movants request that this motion be set for hearing before the Commission at the earliest possible time and that the Commission enter its order quashing the aforementioned subpoenas.

SETH, MONTGOMERY, FEDERICI & ANDREWS

By Richard S. Morris

350 East Palace Avenue
Santa Fe, New Mexico

Attorneys for Movants.

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

In the Matter of the Application of the Pure Oil Company for the Establishment of Special Rules and Regulations in the Red Hills-Wolfcamp and Red Hills-Pennsylvanian Gas Pools, Lea County, New Mexico.

Cases Nos. 3158
3159

BRIEF IN SUPPORT OF SUBPOENA DUCES TECUM

FACTS

Pure Oil Company, hereinafter referred to as "Pure," is the operator of the Red Hills Governmental Unit located in Lea County, New Mexico. Mr. Saul Yager and Mr. Jerald M. Schuman, hereinafter referred to as "Applicants," are owners of interests in the minerals in the North Half (N/2) of Section Five (5), Township Twenty-Six (26) South, Range Thirty-Three (33) East, Lea County, New Mexico, which land is within the unit boundaries but is not committed to the unit. Pure drilled its Red Hills Unit No. 1 in the south part of Section Thirty-Two (32), Township Twenty-five (25) South, Range Thirty-Three (33) East, just 330 feet from the section line which is the boundary between the unit and the Applicants' land. This well was drilled to a total depth of approximately 21, 321 feet.

Pure has filed application for the creation of a new Wolfcamp gas pool and for special pool rules (Case No. 3158) and for the creation of a new Pennsylvanian gas pool and for special pool rules (Case No. 3159). As the result of a hearing on these two applications on November 24, 1964, the Commission entered its order dated December 7, 1964, establishing the two new pools, but continued the matter of special pool rules to a later date. Pure has asked that the Commission establish 640 acre drilling and spacing units for each of these pools with the permitted well no nearer than 1650 feet from the outer boundary of the section.

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Applicants requested prior to the hearing on November 24, 1964, that Pure furnish them with the information necessary to intelligently and effectively evaluate the merits of Pure's application. On the evening prior to the above mentioned hearing, Pure furnished Applicants for their viewing, the electric and radioactive and sonic well logs, sample analyses and calculated open flow potentials from the Pennsylvanian and Wolfcamp formation. This information was woefully inadequate to permit of any evaluation of the merits of the application. At the time of the hearing Applicants repeatedly requested that they be granted a continuance and that Pure furnish them with certain specified information which was necessary in order to permit a full and fair hearing on the application. The Commission continued the hearing on the establishment of special pool rules until January 6, 1965.

Upon motion of the Applicants, the Commission issued a Subpoena Duces Tecum ordering three representatives and agents of Pure to appear and produce certain specified documents on or before December 28, 1964. Pure refused to comply and filed a Motion to Quash the Subpoena urging four grounds for their motion. This matter comes on for hearing on the Motion to Quash and the following arguments and authorities are in support of the lawfulness and validity of the Subpoenas.

I.

Power of the Commission to Issue the Subpoena Duces Tecum

The sole question to be decided by the Commission is the construction and application of the provision of the New Mexico Statutes, Section 65-3-7, empowering the Commission

> "...to subpoena witnesses, to require their attendance and giving of testimony before it, and to require the production of books, papers, and records in any proceeding before the Commission... Provided that nothing herein contained shall be construed as requiring any person to produce any books, papers, or records, or to testify in response to any inquiry, not pertinent to some question lawfully before such Commission or court for determination."

The Subpoena power is a necessary tool supplied to the Commission by the legislature for the orderly discharge of its duties in preventing waste and

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protecting correlative rights. In addition to the express provision granting the subpoena power, the legislature also gave the Commission

> "...control of and over all persons or things necessary or proper to enforce effectively the provision of this act or any other law of this state relating to the conservation of oil or gas." (New Mexico Statute 65-3-5)

The question is then whether the subject Subpoena Duces Tecum is necessary or proper.

Pure contends first of all, that the Commission has no authority to require the production of documents for purposes of prehearing discovery and inspection. It is one of the fundamental principles of justice that due process of law requires a full and fair hearing which by its very nature contemplates a full opportunity on the part of the parties adversary to prepare their case. In New York Edison Co. vs. City of New York, 118 N. Y. Supp. 238, involving rate making, the Court said, among other things:

> "And it is quite apparent that the defendant, unless it can have an inspection and discovery, cannot prepare its case for trial."

In this present matter before the Commission, Pure has applied for affirmative relief from the Commission. It has asked for 640 acre spacing on the Wolfcamp formation for which, as recently as May 25, 1964, the Commission established 160 acre spacing in Lea County. Pure has also asked for 640 acre spacing on the Pennsylvanian formation, for which 320 acre spacing was established on May 25, 1964. Although seeking affirmative relief on the one hand, Pure refuses to cooperate in disclosing relevant and material information upon the exercise of the Commission's subpoena power.

The Supreme Court of the United States has spoken to this type of situation, thusly:

> "On the other hand, persons summoned as witnesses by competent authority have certain minimum duties and obligations which are necessary concessions to the public interest in the orderly operation of legislative and judicial machinery. A subpoena has never been treated as an invitation to a game of hare and hounds, in which the witness must testify only if cornered at the end of the chase. If that

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> were the case, then, indeed, the great power of testimonial compulsion, so necessary to the effective functioning of courts and legislatures, would be a nullity. We have often reiterated the importance of this public duty, which every person within the jurisdiction of the Government is bound to perform when properly summoned." U. S. vs. Bryan 339 US 99 170 S. Ct. 724 (1950) (Emphasis added)

Why does Pure object to production of these documents? In a hearing to grant an exception to established rules spacing a particular area, the following information is necessary in order that the Commission may be fully advised before rendering a decision.

1) The name and depth of all formations which may possibly produce hydrocarbons.

2) The nature and extent of these formations insofar as known.

3) All data which might tend to aid in evaluation of the commercial potential of these zones.

4) Information as to the costs of drilling a comparable well.

These items are necessary in order that the economics of drilling on the proposed spacing can be compared with the economics of drilling on the established spacing. Shell Oil Co. vs. Davidor & Davidor, 315 P2d 259 (Okl. 1959). Surely, Pure cannot in good faith argue that the Commission must look only to the Wolfcamp and Pennsylvanian formation in determining economics, if in fact there are other commercial horizons penetrated by the well. In fact, Pure has testified that gas can be flowed at commercial rates not only from the Wolfcamp and Pennsylvanian, but also from the Devonian. (Transcript of Hearing on November 24, 1964, at Page 24) Indeed, indications from tests made during drilling reflect that there are other commercial possibilities which Pure is not disclosing to the Commission. It is the purpose of the Applicants in requesting the issuance of these subpoenas, that full disclosure be made to the Commission of all possible productive zones.

> "I can see no good reason why a party should be permitted to withhold from the knowledge of his adversary documentary evidence affecting the merits of the controversy, only to surprise him by its production at the trial, unless, for some

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> satisfactory reason, to be made apparent to the court, each party ought to be required, when it is desired, to disclose to the other any books, papers, and documents within his power which may contain evidence pertinent to the issues to be tried." Hart vs. Ogdensburg & L. C. R. Co. 23 N. Y. Supp. 713.

Certainly, the Commission under its express grant from the legislature of the subpoena power, coupled with the broad grant of power to do all things necessary and proper to enforce the provisions of the conservation laws, could use the subpoena duces tecum prior to the hearing so that it could be properly informed. In fact, in Oklahoma Press Publishing Co. vs. Walling, 327 U. S. 186, 66 S. Ct. 494, (1946) the leading case dealing with administrative use of Subpoena Duces Tecum, the administrative agency issued a Subpoena Duces Tecum as an aid to investigation. The Supreme Court of the United States devoted its entire opinion to the validity and enforcement of the subpoena. The Court found that Congress had authorized the agency to determine in the first instance the question of coverage of the material sought by the Subpoena Duces Tecum in a preliminary investigation. The Court stated that, "Historically private corporations have been subject to broad visitorial power, both in England and in this country." The Court then examined many cases dealing with the use of a Subpoena Duces Tecum and came to this conclusion:

> "Without attempt to summarize or accurately distinguish all the cases, the fair distillation, in so far as they apply merely to the production of corporate records and papers in response to a subpoena or order authorized by law and safeguarded by judicial sanction, seems to be that the Fifth Amendment affords no protection by virtue of the self-incrimination provision, whether for the corporation or for its officers; and the Fourth, if applicable, at the most guards against abuse only by way of too much indefiniteness or breadth in the things required to be particularly described; if also the inquiry is one the demanding agency is authorized by law to make and the materials specified are relevant. The gist of the protection is in the requirement, expressed in terms, that the disclosure sought shall not be unreasonable."

There can be no doubt that the Oil Conservation Commission has the authority to make an investigation into the subject matter of spacing a gas

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pool. Likewise, there can be no doubt that they can make such an investigation before a formal hearing, subject to the questions of relevancy and scope.

In a 1963 case in Texas, the Railroad Commission ordered a survey made of a well, and the corporation owning the well contended that the Commission had no power of discovery prior to the filing of an action in the courts. The discovery and investigative powers of the Commission were upheld:

> "The legislature has delegated to the Railroad Commission broad and extensive powers to regulate and control the drilling for and production of oil and gas to the end that these natural resources be conserved and that the interest of the public as well as individual operation be protected.... Surely the Commission invested with all of these powers and responsibilities, is not required to bring a suit each time that it seeks to make an investigation or inspection as to whether its rules and regulations are being enforced. Such a requirement has, so far as we know, never been urged before and if adopted would cripple the Commission and incapacitate it from carrying out and performing the duties imposed upon it by legislative command." L & G Oil Co. vs. Railroad Commission, 368 SW2d 187 (Sup. Ct. Tex. 1963)

The New Mexico Oil Conservation Commission has the same duties and responsibilities as does the Texas Railroad Commission. It must prevent waste and protect correlative rights. Thus, it must have full power of investigation and discovery and should not be limited in the reasonable exercise of these powers. Mr. Justice Douglas said that discovery together with pre-trial procedures

> "Make a trial less a game of blindman's bluff and more a fair contest with the basic issues and facts disclosed to the fullest practicable extent." United States vs. Procter & Gamble Co., 356 USG 77, 78 S. G. 983 (1958)

II.

Relevancy of Documents Sought

Pure advances as the secondgroundin support of the Motion to Quash, that the subpoenaed documents pertain to formations and depths other than the Wolfcamp and Pennsylvanian formations and thus are irrelevant to these proceedings. This contention is totally without merit. Each of the documents requested pertains to the Red Hills Unit No. 1 Well, and contains information

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which necessarily must be considered prior to the entry of any order increasing the spacing in the subject area.

The pertinent provision of the New Mexico law is found in Section G5-3-14(b) of the New Mexico Statutes concerning the information which must be considered by the Commission in the establishment of a proration unit:

> "...the Commission shall consider the economic loss caused by the drilling of unnecessary wells, the protection of correlative rights, including those of royalty owners, the prevention of waste, the avoidance of the augmentation of risks arising from the drilling of an excessive number of wells, and the prevention of reduced recovery which might result from the drilling of too few wells."

Of course, one of the primary factors to be considered in determining whether to permit an exception to the established spacing is the economic picture presented by one plan of development as compared to the economic picture presented by the alternative plan of development. In Shell Oil Co. vs. Davidor & Davidor, 315 P2d 259 (Okl. 1959), the Oklahoma Corporation Commission examined the economics of development on 320 acre units as opposed to the economics of development on 640 acres and held that profit to cost ratio on 320 acres indicated a sufficient profit to warrant development without waste. The Oklahoma Supreme Court examined the record and affirmed the decision of the Commission and stated that there was no evidence that no prudent operator would undertake development on 320 acre spacing.

Before an economic picture can be projected based on the present spacing or on the spacing sought by Pure, it is absolutely essential that the expected recovery from the well be predicted. This does not mean just the recovery from one or two of the formations, but from all formations which are potentially productive. It would not be possible to determine profitability of a ten-story apartment building by only looking at the income from the top five floors, nor is it possible to determine profitability of a well by considering two formations, when there are other formations capable of commercial production. As pointed out previously, Pure testified that there are three commercially productive zones; Wolfcamp, Pennsylvanian, and Devonian. In ad-

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dition, there is reason to believe, based on tests made during drilling, that there are other zones with productive potential.

Pure should not be permitted to hide behind a false cloak of secrecy, information which has a bearing on this matter, by asserting that other zones in the well are "irrelevant."

An additional reason for the production of the documents sought by Applicants is to determine if Pure is attempting to space as one pool, several separate pools. The spacing statute permits the spacing of a "pool." A "pool" is defined as a common accumulation of hydrocarbons and is synonymous with "common source of supply." The logs introduced into evidence at the hearing on November 24, 1964, showed that Pure had identified three formations within the Pennsylvanian age of rocks as the Strawn, Atoka, and Morrow. It is commonly understood in geological reference, that these are three formations of different ages, and Pure's representative so testified. Some of the documents requested might tend to show that the Pennsylvanian "pool" established by Pure, in fact consists of three separate pools.

III.

Documents Requested are not Privileged

The third and fourth grounds in support of Pure's Motion to Quash will be considered together. Pure asserts that the Subpoena Duces Tecum is unreasonable and unlawful in requiring the production of documents and information which are the work product and opinion of expert witnesses. It is also contended that the information constitutes confidential information belonging to the participants in the Red Hills Unit and should not be disclosed until introduced into evidence.

Unless the requested documents are legally "privileged", then the fact they may contain confidential material is of no legal significance. The "privilege" accorded certain relationships by the law, such as doctor-patient, lawyer-client, priest-penitent, and husband-wife are strictly construed and limited to these relationships. However, the documents sought here are sub-

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ject to no such relationship. This type of argument advanced by Pure has been considered by the Supreme Court of the United States in United States vs. Bryan, 339 U. S. 991 70 S. Ct. 724 (1950):

> "Certain exemptions from attending, or having attended, giving testimony are recognized by all courts. But every such exemption is grounded in a substantial individual interest which has been found, through centuries of experience, to outweigh the public interest in the search for truth. Dean Wigmore stated the proposition thus: 'For more than three centuries it has now been recognized as a fundamental maxim that the public (in the words sanctioned by Lord Hardwicke) has a right to e very man's evidence. When we come to examine the various claims of exemption, we start with the primary assumption that there is a general duty to give what testimony one is capable of giving, and that any exemptions which may exist are distinctly exceptional, being so many derogations from a positive general rule.' "

In McMann vs. SEC, 87 F 2d 377 (2nd Cir. 1937) the Court noted that the person complaining of the Subpoena Duces Tecum was neither a client, penitent, patient, or spouse:

> "Therefore, although we assume, as we do, that the conduct of investigations under these statutes is subject to the same testimonial privileges as judicial proceedings, it will not serve McMann; he must erect a new privilege ad hoc. The suppression of truth is a grievous necessity at best, more especially when as here, the inquiry concerns the public interest; it can be justified at all only when the opposed private interest is supreme." (Emphasis added)

In the same case, McMann argued that the information sought was a "property" right made between a broker and a customer and was thus made under a promise of secrecy. Similarly, Pure argues that these documents are a "property" right of the unit and are confidential. The Court's answer to McMann should satisfy Pure's contention.

> "But the very fact that testimonial privileges are based upon specified confidential relationships is proof that they do not extend to all, and it hardly needs to be said that nobody by contract, express or implied, can abridge public duties. So far as the principal's rights may be classed as "property" at all, they are subject to this condition." (Emphasis added)

Thus, Pure cannot avoid its duty to produce the requested documents, which it is in the public interest to disclose, to the end that the Commission may be fully advised.

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Pure's contention that the requested documents are a "work product" and opinion of its experts, does not raise a privilege against production of these documents. The "work product" doctrine is one which protects an attorneys' work product from disclosure. Obviously, the attorney for Pure did not cause the formation tests or the logs to be run at his instance and request. If the line of reasoning advanced by Pure were followed to the effect that any work done for a corporation or individual was that individual's work product, then it would be impossible to ever subpoena books and records of such an individual.

The following excerpts of cases from several jurisdictions show that Pure's contention that their documents are a "work product," is without merit.

> "Work product" doctrine which protects attorneys' work product from disclosure is based upon theory that one attorney may not take undue advantage of adversary's efforts, and doctrine is, in essence, form of statutory privilege which should not be extended by judicial fiat." Greyhound Corp. vs. Superior Court, In and For Merced County, 15 Cal. Rptr. 90, 115, 364 P2d 266, 56 C. 2d 355.

> "Statement of a witness taken by an attorney is not clothed in the mantle of "work product," and is not exempt from production in an admiralty action on such theory." Caruso vs. Moore McCormack Lines, Inc., D. C. N. Y., 196 F. Supp. 675, 676.

> "Where factual information contained in document sought to be discovered in condemnation proceeding had been gathered for Government by third persons under supervision of Government's attorneys, supervision or acquisition by Government's attorneys did not convert the result into the "work product" of a lawyer, and, therefore, there was not any privilege which would prevent defendant landowners from pursuing the usual purpose of a pre-trial discovery to obtain such facts." U. S. vs. Certain Parcels of Land, etc., D. C. Cal., 15 F. R. D. 224, 236.

It has been held that it is no ground for the refusal of a witness to produce books and papers, when required by lawful authority, that they are private. Re Bolster 59 Wash 655, 110 Pac. 547. The duty of witnesses to disclose the details of their private business for the benefit of third persons, when required in the administration of justice, is one devolving on them as members

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of a civilized community. Boston & M. R. Co. vs. State, 75 N. H. 513, 77 Atl. 996.

WHEREFORE, Applicants ask that the Oil Conservation Commission overrule the Motion to Quash Subpoena Duces Tecum and cause Pure to come forward with the requested documents, and that Applicants be granted sufficient time to inspect and evaluate the requested documents.

Respectfully submitted,

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BEFORE THE NEW MEXICO OIL CONSERVATION COMMISSION

In the matter of the Application of Pure Oil Company for the creation of the Red Hills-Wolfcamp, Pennsylvanian Gas Pools and for the establishment of special rules and regulations for said pools,	)	Case Nos. 3158, 3159
and		
In the matter of the Application of Saul A. Yager, et al for the creation of the Red Hills-Devonian Gas Pool and the response of Pure Oil Company for the establishment of special rules and regulations for said pools,	)	Case No. 3208
and		
In the matter of the Application of Saul A. Yager, et al for an amendment of Order No. R-2827, Case 3159, for the creation of the Red Hills-Atoka, Strawn and Morrow Gas Pools and the response of Pure Oil Company for the establishment of special rules and regulations for said pools.	)	Case No. 3207

R E S P O N S E

Come now Saul A. Yager, Barbara A. Witten, Jerald M. Schuman, Avrome Schuman, J. Harold Schuman and Earl Schuman, by their attorneys, in protest to the Application of the Pure Oil Company in the above entitled matters for the establishment of 640 acre spacing for the Red Hills Unit and the establishment of special rules and regulations for the Wolfcamp, Pennsylvanian, and Devonian formations, and the Protestants allege and state:

I.

The Protestants are owners of substantially all of the mineral interest in the following described lands:

> The N/2 of N/2 and the SE/4 of NE/4 and the E/2 of SE/4 of Section 5, Township 26 South, Range 33 East, Lea County, New Mexico,

and that said mineral interests are owned in the following manner, to-wit: Saul A. Yager and Barbara A. Witten each owns approximately an undivided one-fourth (1/4th) interest in the described lands, which interests are unleased. The Schumans are the owners of approximately an undivided one-half (1/2) interest of which Jerald M. Schuman owns 85 per cent, and the Schuman interests are leased, with Pure Oil Company being the present owner of said leases.

II.

The Pure Oil Company (hereafter called "Pure") is operator of the Red Hills Unit and has caused a well to be drilled in the SW/4 of the SW/4 of the SE/4 of Section 32, Township 25 South, Range 33 East, Lea County, New Mexico, the surface location of which is approximately 330 feet north of the Protestants' land in Section 5, Township 26 South, Range 33 East. The said well was drilled to a total depth of 21, 321 feet, and it will hereafter sometimes be referred to as "Red Hills No. 1" or "Pure's well". It was a wildcat and is the only deep producing well in the area.

For convenience, when Section 32 and Section 5, which adjoin it to the south, are hereafter referred to, the Townships and Ranges will be omitted.

III.

Pure has made application in each of the captioned cases for the establishment of 640 acre spacing from each of the pools which may be established by the Commission and for the establishment of special field rules which would prohibit the location of any well closer than 1650 feet from the boundary lines of a section. In testimony before the Commission on February 17, 1965, Pure stated that the application for the establishment of 640 acre spacing and for special field rules was for a temporary order which was to last only two years; and that Section 32 is to comprise the 640 acre spacing unit sought to be established for the Red Hills No. 1. It has been established that at least three formations, viz: the Wolfcamp, the Pennsylvanian, and the Devonian, are capable of producing gas in commercial quantities. In Addition to these three formations, a drill stem test made in the Bone Springs formation indicates potential commercial production.

IV.

Pure, in its application for the establishment of 640 acre spacing and the promulgation of special field rules, seeks an exception to the present

field rules established by the New Mexico Oil Conservation Commission on May 25, 1964. These rules established for Lea County: 160 acre spacing for the Wolfcamp formation, and 320 acre spacing for the Pennsylvanian and Devonian formations. The permitted well location under these present rules would be no closer than 660 feet to the north line of Section 5. In its application for special field rules, Pure has asked that no well be permitted nearer than 1650 feet from a section line, despite the fact that Pure's well is located only 330 feet from the section line which is the north boundary of these Protestants' land. In the November 24th hearing on Cases Nos. 3158 and 3159, the engineering representative for Pure was asked by the Hearing Examiner whether a gas well in this pool would drain in excess of a radius of 330 feet. The response was: "Yes, sir, I think it would -- considerably in excess." (page 49 of the transcript) Since Pure's application must necessarily be based upon an assumption that one well will drain 640 acres, it would follow inescapably that substantial quantities of gas will be produced and drained from under the Protestants' lands by Pure's well. But under Pure's application for special field rules no well in Section 5 would be permitted closer than 1650 feet from the north line of Section 5, and because of this location, the drainage from Section 5 caused by Pure's well could not be compensated.

V.

Furthermore, Protestants urge that no exception to the present spacing rules be granted to Pure at this time for the reason that one well does not give sufficient information as to the areal extent of the reservoir, its character, and the expected recovery potential of the reservoir on which to base a change in the established rules of the Commission, particularly where, as in this situation, correlative rights will be seriously affected. Pure asks that a "temporary" order be entered granting them 640 acre spacing, based

upon the information obtained from the Red Hills No. 1. Even if we accept, for the sake of argument, Pure's hypothesis as to the 640 acre spacing, what is the most the Red Hills No. 1 establishes? At most, Red Hills No. 1 tends to establish only this much: That it could be expected that the S/2 of Section 32 and the N/2 of Section 5 are underlain by production. Obviously, it is more probable that the productivity of the N/2 of Section 5 has been established by the Red Hills No. 1 than has the productivity of the N/2 of Section 32, which is several times further removed from the Pure well than is the N/2 of Section 5. Moreover, if a well in Section 5 is permitted no closer than 1650 feet to the North line of said Section 5, such location, approximately 1/2 mile south of the Red Hills No. 1, may not encounter the same prolific type of reservoir rock as was encountered in the Red Hills No. 1 well. It is equally true that if a well were located in the center of Section 32, approximately 1/2 mile north of the Red Hills No. 1, such a well in that location might not encounter equally prolific reservoir rock as did the Red Hills No. 1 well. It is perfectly clear, then, that the information provided by one well is so limited that it is totally inadequate upon which to base a practical determination as to the proper spacing. In fact, the testimony of Pure's witnesses in the February 17, 1965, hearing is replete with statements to the effect that not enough information is available to accurately evaluate this pool.

> "This (net pay) may be conservative, because we did not have all the data available that we really need to pin the net effective pay down" (page 18 of Transcript)

> "I don't think this well proves anything definitely. I think you'll have to have additional well control if you move a half mile south or two miles north." (page 35 of Transcript)

So until such time as there has been further development of this area, the present spacing rules should be continued in effect and in this manner only

will the correlative rights of these Protestants be protected. This can be done without prejudice to the rights of Pure Oil Company. Under the existing rules, Pure need drill only one well in any section until such time as further development in the field provides sufficient information upon which to base a proper and sensible program of development. In this manner Pure will not be required to drill unnecessary wells, and continuing the present spacing rules is the only way the correlative rights of these Protestants will be protected.

VI.

Protestants believe that if Pure's application is granted, Protestants correlative rights could not possibly be protected by a well in Section 5 located in accordance with the special field rules sought by Pure. The laws of New Mexico provide that the rules and regulations or orders of the Commission shall, so far as it is practicable to do so, afford the owner of each property in a pool the opportunity to produce his just and equitable share of the oil or gas. It is further provided that this fair share is an amount, insofar as can be practically determined, that can be obtained without waste in proportion that the quantity of the recoverable gas under such property bears to the total recoverable gas in the pool. It is well recognized in the petroleum industry that the most logical hypothesis concerning drainage from a well is that the drainage area lies regularly around the well. In fact, the theory underlying the spacing of wells of a common source of supply is based upon the proposition that one well drilled in the center of the unit will ultimately produce all of the recoverable hydrocarbons without wasting and without uncompensated drainage from adjacent units. However, Pure, knowing full well that their drilling objective was the Devonian formation at a depth of approximately 18,000 feet and expecting gas production, nevertheless located their well only 330 feet from the South line of Section 32. Pure ~~is~~ WAS bound to know that by so

locating this well there would be uncompensated drainage from the North half of Section 5 which would irreparably injure the correlative rights of the adjacent owners. It is so obviously imprudent to locate such a deep gas well in such close proximity to adjacent owners that it appears Pure must have intended an injurious result.

The Supreme Court of New Mexico, in Continental Oil Company vs. Oil Conservation Commission, stated:

> "Additionally, it should be observed that the Commission, insofar as is practicable, shall prevent drainage between producing tracts in a pool which is not equalized by counter-drainage, under the provisions of Section 65-3-13(c)."

The proposed special field rules sought by Pure will cause serious drainage which cannot be equalized by counter-drainage, and the correlative rights of the Protestants will be irreparably impaired.

VII.

Pure asks for special field rules in order, it claims, that orderly development might proceed. If it can be said that there is any one factor in this entire matter which is affecting orderly development, it is the fact that Pure located its well on a 10 acre location in Section 32, just 330 feet from Protestants' lands. Pure's initial application for a well location shows that the intended well depth was to the Devonian formation at approximately 18,000 feet. Even though Pure may contend that the 10 acre surface location of its well was proper under the rules then applicable, Pure should have known, as any prudent operator would be bound to know, that a well to such a depth would necessarily have to be located on greater than the 10 acre location on which Red Hills No. 1 was drilled. The responsibility rests with Pure for not so locating its well that it would be in the approximate center of the area from which it was expected to drain. To be a prudent operator, Pure should have considered the question of orderly development at the time it established the location for Red Hills No. 1. Now Pure asks for special field rules urging that they are necessary for orderly development, while Pure's well is located five times nearer to the section line than would be permitted under its proposed

rules. Obviously, this is for Pure's benefit at the expense of irreparably impairing the correlative rights of the Protestants. Arrogance has reached its peak when the blameless are asked to suffer for the errors of the culpable.

But there is nothing at the present time which prevents Pure from proceeding in orderly development under the existing rules. These rules afford full opportunity for orderly development, and at the same time, unlike Pure's proposed special field rules, they afford protection for the correlative rights of the Protestants.

VIII.

Protestants respectfully reserve the right to offer evidence to substantiate the economics of development on the existing spacing. Protestants believe that the information withheld by Pure will economically justify the development of this area on the existing spacing.

Respectfully submitted,

George H. Hunker, Jr.
P. O. Box 2086
Roswell, New Mexico, 88201

John F. Russell
P. O. Drawer 640
Roswell, New Mexico 88201

Donald E. Pray
1109 Petroleum Club Building
Tulsa, Oklahoma 74119

ATTORNEYS FOR PROTESTANTS

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. 3158
Order No. R-2826-A

APPLICATION OF THE PURE OIL COMPANY
FOR THE CREATION OF A NEW GAS POOL
AND FOR SPECIAL POOL RULES, LEA
COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on March 17, 1965, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission."

NOW, on this 8th day of April, 1965, the Commission, a quorum being present, having considered the testimony presented and the exhibits received at said hearing, and being fully advised in the premises,

FINDS:

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

(2) That by Order No. R-2826, the Commission granted The Pure Oil Company's request for the creation of a new gas pool in Lea County, New Mexico, designated the Red Hills-Wolfcamp Gas Pool, and established vertical and horizontal limits for said pool.

(3) That the applicant, The Pure Oil Company, also seeks the promulgation of temporary special rules and regulations governing said pool, including a provision for 640-acre spacing and a provision requiring wells subsequently completed in said pool to be located no nearer than 1650 feet to the outer boundary of a section.

(4) That The Pure Oil Company Red Hills Unit Well No. 1 is the only well presently completed in the subject pool and is located 330 feet from the South line and 2310 feet from the East line of Section 32, Township 25 South, Range 33 East, NMPM, Lea County, New Mexico.

(5) That the applicant has not established that the proposed special rules and regulations would afford to the owner of each property in the pool the opportunity to produce his just and equitable share of the gas in the pool.

(6) That the applicant's request for special rules and regulations governing the Red Hills-Wolfcamp Gas Pool should be denied.

IT IS THEREFORE ORDERED:

(1) That the applicant's request for special rules and regulations governing the Red Hills-Wolfcamp Gas Pool is hereby denied.

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

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

Jack M Campbell

JACK M. CAMPBELL, Chairman

Guyton B. Hays

GUYTON B. HAYS, Member

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

S E A L

esr/

GOVERNOR
JACK M. CAMPBELL
CHAIRMAN

State of New Mexico
Oil Conservation Commission

LAND COMMISSIONER
GUYTON B. HAYS
MEMBER

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

P. O. BOX 2088
SANTA FE

April 8, 1965

Mr. Richard S. Morris
Seth, Montgomery, Federici & Andrews
Attorneys at Law
Post Office Box 2307
Santa Fe, New Mexico

Re: Case No. 3158 & 3159
Order No. R-2826-A & R-2827-B
Applicant:

THE PURE OIL COMPANY

Dear Sir:

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

Very truly yours,

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

ir/

Carbon copy of order also sent to:

Hobbs OCC X
Artesia OCC
Aztec OCC
OTHER All appearances entered in these cases.

GOVERNOR
JACK M. CAMPBELL
CHAIRMAN

State of New Mexico
Oil Conservation Commission

LAND COMMISSIONER
GUYTON B. HAYS
MEMBER

P. O. BOX 2088
SANTA FE

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

March 25, 1965

Mr. Richard S. Morris
Seth, Montgomery, Federici & Andrews
Attorneys at Law
Post Office Box 2307
Santa Fe, New Mexico

Re: Case No. 3159
Order No. R-2827-A
Applicant:
The Pure Oil Company

Dear Sir:

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

Very truly yours,

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

ir/

Carbon copy of order also sent to:

Hobbs OCC x
Artesia OCC
Aztec OCC
OTHER Mr. George Hunker, Mr. John Russell and Mr. Donald Pray

SCHUMAN, DEAS, PRAY & DOYLE
ATTORNEYS AND COUNSELORS AT LAW
SUITE 1109 PETROLEUM CLUB BUILDING
TULSA, OKLAHOMA

TELEPHONE 918 LUTHER 7-3324

JERALD M. SCHUMAN
JOHN E. DEAS
DONALD E. PRAY
STANLEY P. DOYLE

GEORGE H. BOWEN
OF COUNSEL

March 10, 1965

Mr. A. L. Porter
Secretary of New Mexico
Oil Conservation Commission
Santa Fe, New Mexico

In Re: Cases No. 3158, 3159, 3208, 3207

Dear Mr. Porter:

Enclosed is a Response to the application of Pure Oil Company in the above captioned cases. This Response is intended to present the position of Protestants, Jerald M. Schuman and Saul Yager, et al in the above captioned cases.

Thanking you, I am

Very truly yours,

SCHUMAN, DEAS, PRAY & DOYLE

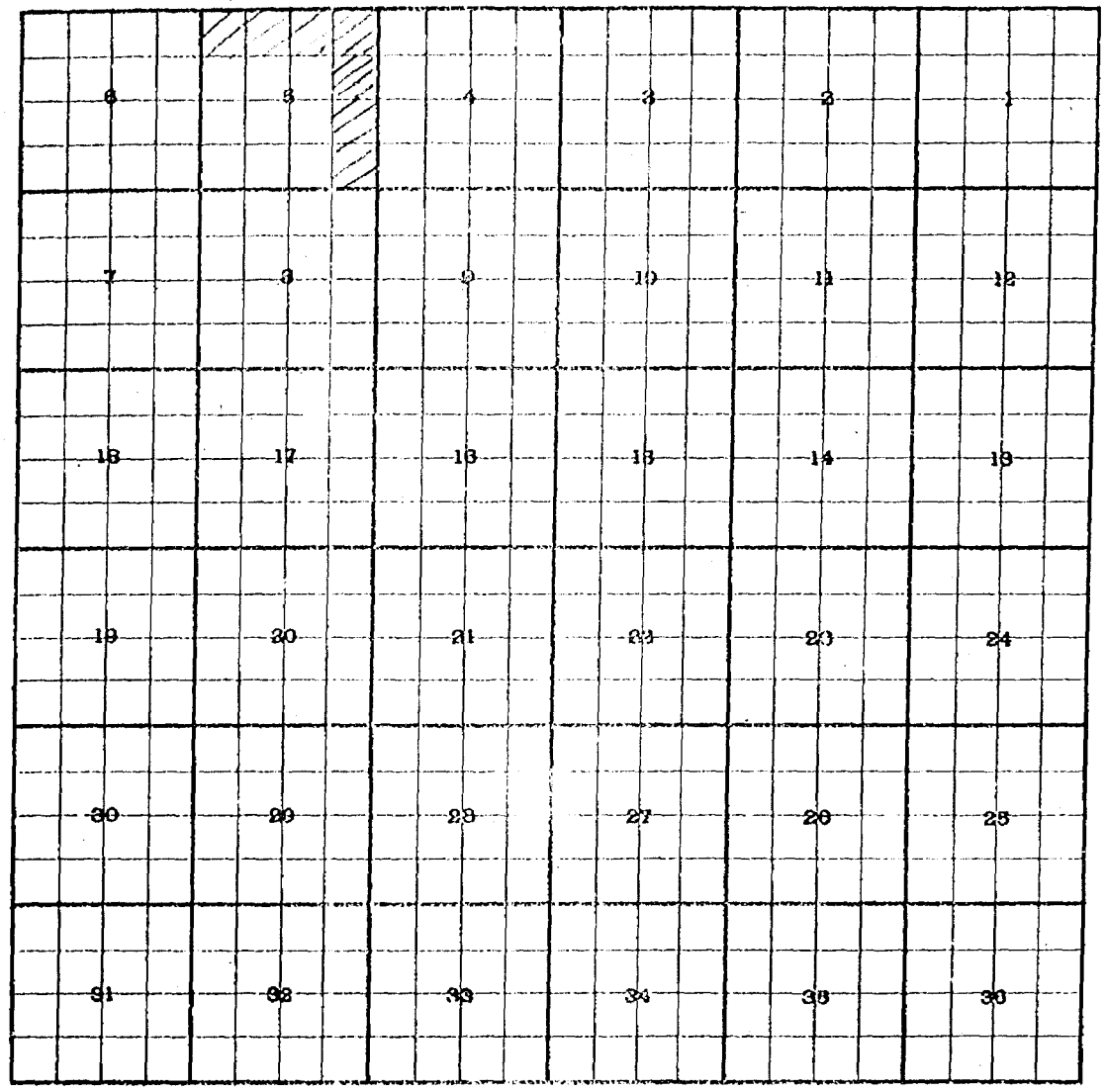
Donald E. Pray

Donald E. Pray

DEP:pdp
Encl.

County Lea Pool

TOWNSHIP 26 South, RANGE 33 East, NEW MEXICO PRINCIPAL MERIDIAN



Mineral interest owned by Paul A. Yazer et al

BEFORE THE NEW MEXICO OIL CONSERVATION COMMISSION

In the matter of the Application of Pure Oil Company for the creation of the Red Hills-Wolfcamp, Pennsylvanian Gas Pools and for the establishment of special rules and regulations for said pools,	)	Case Nos. 3158, 3159
and		
In the matter of the Application of Saul A. Yager, et al for the creation of the Red Hills-Devonian Gas Pool and the response of Pure Oil Company for the establishment of special rules and regulations for said pools,	)	Case No. 3208
and		
In the matter of the Application of Saul A. Yager, et al for an amendment of Order No. R-2827, Case 3159, for the creation of the Red Hills-Atoka, Strawn and Morrow Gas Pools and the response of Pure Oil Company for the establishment of special rules and regulations for said pools.	)	Case No. 3207

R E S P O N S E

Come now Saul A. Yager, Barbara A. Witten, Jerald M. Schuman, Avrome Schuman, J. Harold Schuman and Earl Schuman, by their attorneys, in protest to the Application of the Pure Oil Company in the above entitled matters for the establishment of 640 acre spacing for the Red Hills Unit and the establishment of special rules and regulations for the Wolfcamp, Pennsylvanian, and Devonian formations, and the Protestants allege and state:

I.

The Protestants are owners of substantially all of the mineral interest in the following described lands:

> The N/2 of N/2 and the SE/4 of NE/4 and the E/2 of SE/4 of Section 5, Township 26 South, Range 33 East, Lea County, New Mexico,

and that said mineral interests are owned in the following manner, to-wit: Saul A. Yager and Barbara A. Witten each owns approximately an undivided one-fourth (1/4th) interest in the described lands, which interests are unleased. The Schumans are the owners of approximately an undivided one-half (1/2) interest of which Jerald M. Schuman owns 85 per cent, and the Schuman interests are leased, with Pure Oil Company being the present owner of said leases.

II.

The Pure Oil Company (hereafter called "Pure") is operator of the Red Hills Unit and has caused a well to be drilled in the SW/4 of the SW/4 of the SE/4 of Section 32, Township 25 South, Range 33 East, Lea County, New Mexico, the surface location of which is approximately 330 feet north of the Protestants' land in Section 5, Township 26 South, Range 33 East. The said well was drilled to a total depth of 21, 321 feet, and it will hereafter sometimes be referred to as "Red Hills No. 1" or "Pure's well". It was a wildcat and is the only deep producing well in the area.

For convenience, when Section 32 and Section 5, which adjoin it to the south, are hereafter referred to, the Townships and Ranges will be omitted.

III.

Pure has made application in each of the captioned cases for the establishment of 640 acre spacing from each of the pools which may be established by the Commission and for the establishment of special field rules which would prohibit the location of any well closer than 1650 feet from the boundary lines of a section. In testimony before the Commission on February 17, 1965, Pure stated that the application for the establishment of 640 acre spacing and for special field rules was for a temporary order which was to last only two years; and that Section 32 is to comprise the 640 acre spacing unit sought to be established for the Red Hills No. 1. It has been established that at least three formations, viz: the Wolfcamp, the Pennsylvanian, and the Devonian, are capable of producing gas in commercial quantities. In Addition to these three formations, a drill stem test made in the Bone Springs formation indicates potential commercial production.

IV.

Pure, in its application for the establishment of 640 acre spacing and the promulgation of special field rules, seeks an exception to the present

field rules established by the New Mexico Oil Conservation Commission on May 25, 1964. These rules established for Lea County: 160 acre spacing for the Wolfcamp formation, and 320 acre spacing for the Pennsylvanian and Devonian formations. The permitted well location under these present rules would be no closer than 660 feet to the north line of Section 5. In its application for special field rules, Pure has asked that no well be permitted nearer than 1650 feet from a section line, despite the fact that Pure's well is located only 330 feet from the section line which is the north boundary of these Protestants' land. In the November 24th hearing on Cases Nos. 3158 and 3159, the engineering representative for Pure was asked by the Hearing Examiner whether a gas well in this pool would drain in excess of a radius of 330 feet. The response was: "Yes, sir, I think it would -- considerably in excess." (page 49 of the transcript) Since Pure's application must necessarily be based upon an assumption that one well will drain 640 acres, it would follow inescapably that substantial quantities of gas will be produced and drained from under the Protestants' lands by Pure's well. But under Pure's application for special field rules no well in Section 5 would be permitted closer than 1650 feet from the north line of Section 5, and because of this location, the drainage from Section 5 caused by Pure's well could not be compensated.

V.

Furthermore, Protestants urge that no exception to the present spacing rules be granted to Pure at this time for the reason that one well does not give sufficient information as to the areal extent of the reservoir, its character, and the expected recovery potential of the reservoir on which to base a change in the established rules of the Commission, particularly where, as in this situation, correlative rights will be seriously affected. Pure asks that a "temporary" order be entered granting them 640 acre spacing, based

upon the information obtained from the Red Hills No. 1. Even if we accept, for the sake of argument, Pure's hypothesis as to the 640 acre spacing, what is the most the Red Hills No. 1 establishes? At most, Red Hills No. 1 tends to establish only this much: That it could be expected that the S/2 of Section 32 and the N/2 of Section 5 are underlain by production. Obviously, it is more probable that the productivity of the N/2 of Section 5 has been established by the Red Hills No. 1 than has the productivity of the N/2 of Section 32, which is several times further removed from the Pure well than is the N/2 of Section 5. Moreover, if a well in Section 5 is permitted no closer than 1650 feet to the North line of said Section 5, such location, approximately 1/2 mile south of the Red Hills No. 1, may not encounter the same prolific type of reservoir rock as was encountered in the Red Hills No. 1 well. It is equally true that if a well were located in the center of Section 32, approximately 1/2 mile north of the Red Hills No. 1, such a well in that location might not encounter equally prolific reservoir rock as did the Red Hills No. 1 well. It is perfectly clear, then, that the information provided by one well is so limited that it is totally inadequate upon which to base a practical determination as to the proper spacing. In fact, the testimony of Pure's witnesses in the February 17, 1965, hearing is replete with statements to the effect that not enough information is available to accurately evaluate this pool.

> "This (net pay) may be conservative, because we did not have all the data available that we really need to pin the net effective pay down" (page 18 of Transcript)

> "I don't think this well proves anything definitely. I think you'll have to have additional well control if you move a half mile south or two miles north." (page 35 of Transcript)

So until such time as there has been further development of this area, the present spacing rules should be continued in effect and in this manner only

will the correlative rights of these Protestants be protected. This can be done without prejudice to the rights of Pure Oil Company. Under the existing rules, Pure need drill only one well in any section until such time as further development in the field provides sufficient information upon which to base a proper and sensible program of development. In this manner Pure will not be required to drill unnecessary wells, and continuing the present spacing rules is the only way the correlative rights of these Protestants will be protected.

VI.

Protestants believe that if Pure's application is granted, Protestants correlative rights could not possibly be protected by a well in Section 5 located in accordance with the special field rules sought by Pure. The laws of New Mexico provide that the rules and regulations or orders of the Commission shall, so far as it is practicable to do so, afford the owner of each property in a pool the opportunity to produce his just and equitable share of the oil or gas. It is further provided that this fair share is an amount, insofar as can be practically determined, that can be obtained without waste in proportion that the quantity of the recoverable gas under such property bears to the total recoverable gas in the pool. It is well recognized in the petroleum industry that the most logical hypothesis concerning drainage from a well is that the drainage area lies regularly around the well. In fact, the theory underlying the spacing of wells of a common source of supply is based upon the proposition that one well drilled in the center of the unit will ultimately produce all of the recoverable hydrocarbons without wasting and without uncompensated drainage from adjacent units. However, Pure, knowing full well that their drilling objective was the Devonian formation at a depth of approximately 18,000 feet and expecting gas production, nevertheless located their well only 330 feet from the South line of Section 32. Pure was bound to know that by so

locating this well there would be uncompensated drainage from the North half of Section 5 which would irreparably injure the correlative rights of the adjacent owners. It is so obviously imprudent to locate such a deep gas well in such close proximity to adjacent owners that it appears Pure must have intended an injurious result.

The Supreme Court of New Mexico, in Continental Oil Company vs. Oil Conservation Commission, stated:

> "Additionally, it should be observed that the Commission, insofar as is practicable, shall prevent drainage between producing tracts in a pool which is not equalized by counter-drainage, under the provisions of Section 65-3-13(c)."

The proposed special field rules sought by Pure will cause serious drainage which cannot be equalized by counter-drainage, and the correlative rights of the Protestants will be irreparably impaired.

VII.

Pure asks for special field rules in order, it claims, that orderly development might proceed. If it can be said that there is any one factor in this entire matter which is affecting orderly development, it is the fact that Pure located its well on a 10 acre location in Section 32, just 330 feet from Protestants' lands. Pure's initial application for a well location shows that the intended well depth was to the Devonian formation at approximately 18,000 feet. Even though Pure may contend that the 10 acre surface location of its well was proper under the rules then applicable, Pure should have known, as any prudent operator would be bound to know, that a well to such a depth would necessarily have to be located on greater than the 10 acre location on which Red Hills No. 1 was drilled. The responsibility rests with Pure for not so locating its well that it would be in the approximate center of the area from which it was expected to drain. To be a prudent operator, Pure should have considered the question of orderly development at the time it established the location for Red Hills No. 1. Now Pure asks for special field rules urging that they are necessary for orderly development, while Pure's well is located five times nearer to the section line than would be permitted under its proposed

rules. Obviously, this is for Pure's benefit at the expense of irreparably impairing the correlative rights of the Protestants. Arrogance has reached its peak when the blameless are asked to suffer for the errors of the culpable.

But there is nothing at the present time which prevents Pure from proceeding in orderly development under the existing rules. These rules afford full opportunity for orderly development, and at the same time, unlike Pure's proposed special field rules, they afford protection for the correlative rights of the Protestants.

VIII.

Protestants respectfully reserve the right to offer evidence to substantiate the economics of development on the existing spacing. Protestants believe that the information withheld by Pure will economically justify the development of this area on the existing spacing.

Respectfully submitted,

George H. Hunker, Jr.
P. O. Box 2086
Roswell, New Mexico, 88201

John F. Russell
P. O. Drawer 640
Roswell, New Mexico 88201

Donald E. Pray
1109 Petroleum Club Building
Tulsa, Oklahoma 74119

ATTORNEYS FOR PROTESTANTS

Case file

George T. Abell
Box 430
Midland, Texas

February 8, 1965

Oil Conservation Commission
State Land Office Building
Santa Fe, New Mexico

Gentlemen:

George T. Abell is a working interest owner in the Red Hills Unit operated by The Pure Oil Company. His working interest is 4.36911%, and he has participated in the cost of drilling the Red Hills Unit Well No. 1.

The Pure Oil Company has requested the promulgation of special field rules to cover the drilling and production from the Red Hills Unit Field, and these special field rules will be heard in Case 3158 and Case 3159 on February 17, 1965, at 9 A.M., Morgan Hall, State Land Office Building, Santa Fe, New Mexico.

We are especially interested in the adoption of the provision included in these special rules of a temporary spacing of 640 acres per well. Even though George T. Abell's interest in the initial well in this field was 4.36911% his total cost in this well is $146,916.26. Based on the available geologic and engineering data any drilling on less than 640 acre spacing would result in drilling uneconomic wells, and George T. Abell would definitely not be interested in any further development of the field on a 320 acre spacing program.

For the above reason we are not in agreement with the proposal of Mr. Saul A. Yager, et al, in Case 3207 for 320 acre spacing, nor are we in agreement with his application to create three separate gas pools for the Atoka, Strawn, and Morrow zones in the Pennsylvanian formation. Neither are we in agreement with Mr. Saul A. Yager's application in Case 3208 which requests special field rules for the Devonian formation to provide for 320 acre spacing.

FEB 15 AM

We do know that the drilling and development of the Red Hills Unit will be very expensive, and the reserves per acre relatively low. If 320 acre spacing is adopted it will discourage, and in fact may eliminate, the possibility of further development. If subsequent drilling proves that 320 acre spacing is required and necessary for efficient development and production of the field infill wells could then be drilled.

Yours very truly,

GEORGE T. ABELL

James I. Trott, Supt.

JIT:ds

GOVERNOR
JACK M. CAMPBELL
CHAIRMAN

State of New Mexico
Oil Conservation Commission

LAND COMMISSIONER
GUYTON B. HAYS
MEMBER

P. O. BOX 2088
SANTA FE

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

February 8, 1965

Dear Sir:

We are transmitting herewith a copy of the Ruling on Motion to Quash Subpoena Duces Tecum in Cases Nos. 3158 and 3159.

Very truly yours,

A. L. Porter, Jr.

A. L. PORTER, Jr.
Secretary-Director

ALP/esr
Enclosure

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. 3158
and
CASE No. 3159

APPLICATION OF THE PURE OIL COMPANY
FOR THE ESTABLISHMENT OF SPECIAL RULES
AND REGULATIONS GOVERNING THE RED HILLS-
WOLFCAMP AND RED HILLS-PENNSYLVANIAN GAS
POOLS, LEA COUNTY, NEW MEXICO.

RULING ON MOTION TO QUASH SUBPOENA DUCES TECUM

BY THE COMMISSION:

This matter came on for hearing at 9 o'clock a.m. on January 13, 1965, at Santa Fe, New Mexico, upon Motion to Quash Subpoena Duces Tecum filed by John R. Murphey, Jr., George Fish, Fred Tyner, and The Pure Oil Company.

NOW, on this 8th day of February, 1965, the Commission, a quorum being present, having read the motion and having considered the arguments of counsel, and being otherwise fully advised in the premises,

FINDS:

(1) That the documents described in the Subpoena Duces Tecum issued December 22, 1964, to Mr. John R. Murphey, Jr., Mr. George Fish, and Mr. Fred Tyner may be material and pertinent to a proper determination of the issues in these cases.

(2) That the Subpoena Duces Tecum should be modified to require production of the documents described therein at the hearing of these cases on the merits subject to objections as to the admissibility of said documents.

IT IS THEREFORE ORDERED:

(1) That the Subpoena Duces Tecum issued in the above cases on December 22, 1964, is hereby modified to require production of the documents described therein at the hearing of these cases on the merits subject to objections as to the admissibility of said documents.

(2) That, except as provided herein, the Motion to Quash Subpoena Duces Tecum is hereby overruled.

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

Jack M Campbell
JACK M. CAMPBELL, Chairman

Guyton B. Hays
GUYTON B. HAYS, Member

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

S E A L

esr/

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

WESTERN UNION
TELEGRAM (10)

W. P. MARSHALL, PRESIDENT

1201 (4-60)

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

The filing time shown in the date line on domestic telegrams is LOCAL TIME at point of origin. Time of receipt is LOCAL TIME at point of destination

1960 FEB 16 PM 3 48

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D MDA100 PD 3 EXTRA=FAX MIDLAND TEX 16 408P CST=
NEW MEXICO OIL CONSERVATION COMMISSION=
SECRETARY & DIRECTOR STATE LAND OFFICE BLDG SANTAFE NMDX:

=REGARDING CASES 3158, 3159, 3207, AND 3208 ON FEBRUARY 17
DOCKET TEXACO INC. CONCURS WITH PURE OIL COMPANY
REQUESTING TEMPORARY RULES PROVIDING FOR 640 ACRE P
RORATION UNITS FOR ED HILLS WOLXAMP PENNSYLVANIAN AND
DEVONIAN GAS POOLS=
TEXACO INC W C LENZ ASSISTANT DIVISION MANAGER.:

=3158 3159 3207 3208 17 640.:

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

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

WESTERN UNION
TELEGRAM

W. P. MARSHALL, PRESIDENT

SYMBOLS
DL = Day Letter
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1391

The filing time shown in the date line on domestic telegrams is LOCAL TIME at point of origin. Time of receipt is LOCAL TIME at point of destination

1965 FEB 16 PM 3 56

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A L PORTER SECRETARY=DIRECTOR, NEW MEXICO OIL CONSERVATION COMMISSION=
STATE LAND OFFICE SANTA FE NMEX=

'65 FEB 16 PM

RE OUR WIRE OF JANUARY 12, 1965, RECOMMDNDING 640=ACRE UNITS AND OTHER TEMPORARY RULES RECOMMENDED BY PURE OIL COMPANY IN CASES 3158 AND 3159, HEARINGS CONCERNING PUREYS RED HILLS NO. 1 HAVE NOW BEEN EXPANDED TO CASES 3207 AND 3208 AS WELL AS CASES 3158 AND 3159 TO BE HEARING. THE FEBRUARY 17, 1965, HEARING. PAN AMERICAN PETROLEUM CORPORATION IS AN INTEREST OWNER IN THE RED HILLS UNIT OPERATED BY PURE OIL COMPANY AND SUPPORTS

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

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

WESTERN UNION
TELEGRAM

W. P. MARSHALL, PRESIDENT

1201 (4-60)

SYMBOLS
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THEIR RECOMMENDATIONS IN THESE FOUR CASES=
W V GRISHAM PAN AMERICAN PETROLEUM CORP=

'65 FEB 16 PM 4 02

=12 1965 640 3158 3159 1 3207 3208 3158 3159 17 1965=

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

CLARENCE E. HINKLE
W. E. BONDURANT, JR.
S. B. CHRISTY IV
LEWIS C. COX, JR.
PAUL W. EATON, JR.
CONRAD E. COFFIELD
HAROLD L. HENSLEY, JR.
MICHAEL R. WALLER

LAW OFFICES
HINKLE, BONDURANT & CHRISTY
HINKLE BUILDING
ROSWELL, NEW MEXICO

OF COUNSEL: HIRAM M. DOW

TELEPHONE 622-6510
AREA CODE 505
POST OFFICE BOX 10

February 15, 1965

New Mexico Oil Conservation Commission
Box 2088
Santa Fe, New Mexico 87501

Re: Regular hearing February 17, 1965
Cases 3158, 3159, 3207 and 3208
Statement of Humble Oil & Refining Company

Gentlemen:

The Humble Oil & Refining Company desires that the following statement be made a part of the record in each of the captioned cases:

"Humble Oil & Refining Company owns acreage within the Unit Area of the Pure Oil Company Red Hills Unit, Well No. 1 and has adjoining acreage under study for development. Because of the high development cost of the deep Wolfcamp, Pennsylvanian and Devonian formations in the area of the Red Hills Unit, Humble requests adoption of temporary rules establishing 640-acre spacing. In view of the extended period of time necessary to drill, test, and complete wells in this area, Humble requests that temporary rules be estaboished for at least two years. Humble feels that the 640-acre spacing is reasonable in this case and wishes to cite other gas pools; namely, Jal-West Strawn Pool, Lusk-Morrow Gas Pool, and Antelope Ridge Devonian Gas Pool which are similar geologically to the Red Hills Unit zones and which have 640-acre spacing rules.

"Humble does not wish to make a statement at this time with regard to zones which should be delineated as separate reservoirs but is strongly in favor of the wider spacing in any reservoir which is designated."

We are enclosing four copies of the above statement so that one copy may be filed in each case.

Respectfully submitted,

HUMBLE OIL & REFINING COMPANY

By _____

HINKLE, BONDURANT & CHRISTY
Attorneys for Humble Oil &
Refining Company
P.O. Box 10
Roswell, New Mexico

POST OFFICE DEPARTMENT
OFFICIAL BUSINESS

PENALTY FOR PRIVATE USE TO AVOID PAYMENT OF POSTAGE, $300

Mr. George Fish
District Development Geologist
The Pure Oil Company
P. O. Box 671
Midland, Texas

POSTMARK OF DELIVERING OFFICE
MIDLAND, TEX.
FEB 10 1965

INSTRUCTIONS: Fill in items below and complete #1 on other side, when applicable. Moisten gummed ends and attach to back of article. Print on front of article RETURN RECEIPT REQUESTED.

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859727	P. O. Box 2088 IR
INSURED NO.	CITY, ZONE AND STATE
	Santa Fe, New Mexico

P.O. Form 3811 Jan. 1958

CSS-16-71848-4

CASES 3158-3159

No. 859727

RECEIPT FOR CERTIFIED MAIL—20¢

SENT TO Mr. George Fish
District Development Geologist
STREET AND NO. The Pure Oil Company
P. O. Box 671
CITY AND STATE Midland, Texas

POSTMARK OR DATE 2-8-65

If you want a return receipt, check which
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☐ 50¢ fee

FEES ADDITIONAL TO 20¢ FEE

Form 3800 Apr. 1960 SEE OTHER SIDE

Copy of Ruling on Motion to Quash Subpoena Duces Tecum, Cases 3158-3159

POST OFFICE DEPARTMENT
OFFICIAL BUSINESS

PENALTY FOR PRIVATE USE TO AVOID PAYMENT OF POSTAGE, $300

Mr. John R. Murphey, Jr.
District Petroleum Engineer
The Pure Oil Company
P. O. Box 671
Midland, Texas

POSTMARK OF DELIVERING OFFICE
MIDLAND, TEX.
FEB 10 1965

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INSURED NO.	CITY, ZONE AND STATE
	Santa Fe, New Mexico

CSS-16-71848-4

Cases 3158-3159

No. 859726

RECEIPT FOR CERTIFIED MAIL—20¢

SENT TO Mr. John R. Murphey, Jr.
District Petroleum Engineer
STREET AND NO. The Pure Oil Company
P. O. Box 671
CITY AND STATE Midland, Texas

POSTMARK OR DATE 2-8-65

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FEES ADDITIONAL TO 20¢ FEE

Form 3800 Apr. 1960 SEE OTHER SIDE

Copy of Ruling on Motion to Quash Subpoena Duces Tecum, Cases 3158-3159

POST OFFICE DEPARTMENT
OFFICIAL BUSINESS

PENALTY FOR PRIVATE USE TO AVOID PAYMENT OF POSTAGE, $300

Mr. Fred Tyner
The Pure Oil Company
Suite 425, J. P. White Bldg.
Roswell, New Mexico

POSTMARK OF DELIVERING POST OFFICE
FEB 10 1965
U.S.P.O. N. MEX.

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	OIL CONSERVATION COMMISSION
CERTIFIED NO.	STREET AND NO. OR P. O. BOX
859728	P. O. BOX 2088 IR
INSURED NO.	CITY, ZONE AND STATE
	Santa Fe, New Mexico

CSS-16-71848-4

CASES 3158-3159

No. 859728

RECEIPT FOR CERTIFIED MAIL—20¢

SENT TO Mr. Fred Tyner
The Pure Oil Company
STREET AND NO. Suite 425, J. P. White Building
CITY AND STATE Roswell, New Mexico

POSTMARK OR DATE 2-8-65

If you want a return receipt, check which
☐ 10¢ shows to whom and when delivered
☐ 35¢ shows to whom, when, and address where delivered
If you want restricted delivery, check here
☐ 50¢ fee

FEES ADDITIONAL TO 20¢ FEE

Form 3800 Apr. 1960 SEE OTHER SIDE

Copy of Ruling on Motion to Quash Subpoena Duces Tecum, Cases 3158-3159

#1-INSTRUCTIONS TO DELIVERING EMPLOYEE

☐ Deliver *ONLY* to addressee ☐ Show address where delivered

(Additional charges required for these services)

RETURN RECEIPT

Received the numbered article described on other side.

SIGNATURE OR NAME OF ADDRESSEE *(must always be filled in)*

George Fink & David L. Burkett

SIGNATURE OF ADDRESSEE'S AGENT, IF ANY

DATE DELIVERED: FEB 10 19[illegible]

ADDRESS WHERE DELIVERED *(only if requested in item #1)*

CSS—15—71548-4 GPO

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   The certified mail fee
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2. If you want this receipt postmarked, stick the gummed stub on the left portion of the address side of the article, *leaving the receipt attached*, and present the article to a postal employee.
3. If you do not want this receipt postmarked, stick the gummed stub on the left portion of the address side of the article, detach and retain the receipt, and mail the article.
4. If you want a return receipt, write the certified-mail number and your name and address on a return receipt card, Form 3811, and attach it to the back of the article by means of the gummed ends. Endorse front of article RETURN RECEIPT REQUESTED.
5. If you want the article delivered only to the addressee, endorse it on the front DELIVER TO ADDRESSEE ONLY. Place the same endorsement on line 2 of the return receipt card.
6. Save this receipt and present it if you make inquiry.

25-C1657-6 ★ GPO

#1-INSTRUCTIONS TO DELIVERING EMPLOYEE

☐ Deliver *ONLY* to addressee ☐ Show address where delivered

(Additional charges required for these services)

RETURN RECEIPT

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SIGNATURE OR NAME OF ADDRESSEE *(must always be filled in)*

John R. Murphy & David L. Burkett

SIGNATURE OF ADDRESSEE'S AGENT, IF ANY

DATE DELIVERED: FEB 10 19[illegible]

ADDRESS WHERE DELIVERED *(only if requested in item #1)*

CSS—15—71548-4 GPO

1. Stick postage stamps to your article to pay:
   The certified mail fee
   First-class or airmail postage
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   Special-delivery fee *(optional)*
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25-C1657-6 ★ GPO

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☐ Deliver *ONLY* to addressee ☐ Show address where delivered

(Additional charges required for these services)

RETURN RECEIPT

Received the numbered article described on other side.

SIGNATURE OR NAME OF ADDRESSEE *(must always be filled in)*

Fred Jones

SIGNATURE OF ADDRESSEE'S AGENT, IF ANY

DATE DELIVERED: FEB 10 1965

ADDRESS WHERE DELIVERED *(only if requested in item #1)*

CSS—15—71548-4 GPO

1. Stick postage stamps to your article to pay:
   The certified mail fee
   First-class or airmail postage
   Either return receipt fee—10¢ or 35¢ *(optional)*
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WESTERN UNION
TELEGRAM

W. P. MARSHALL, PRESIDENT

1201 (4-60)

SYMBOLS
DL = Day Letter
NL = Night Letter
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1965 JAN 11 AM 10 53

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LA042 DB108

D FWB110 PD=FAX FORT WORTH TEX 11 1113A CST=

MR A L PORTER JR SECRETARY DIRECTOR=

NEW MEXICO OIL CONSERVATION COMMISSION SANTA FE

NEW MEXICO=

DOCKET MAILED
Date 2-5-65 jlr

RICHARDSON OILS INC DELBASIN CORP AND PERRY R BASS, AS WORKING INTEREST OWNERS IN THE RED HILLS UNIT, HAVE EVALUATED THE ENGINEERING AND GEOLOGICAL DATA FURNISHED TO THEM BY THE PURE OIL COMPANY, UNIT OPERATOR OF THE RED HILLS UNIT CONCERNING THE RED HILLS UNIT WELL NO 1 AND ARE OF THE OPINION THAT AN AREA OF 640 ACRES CAN BE EFFICEINTLY AND ECONOMICALLY DRAINED AND DEVELOPED BY ONE WELL IN BOTH THE RED HILLS WOLFCAMP AND RED HILLS

CLASS OF SERVICE
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WESTERN UNION TELEGRAM

1201 (4-60)

SYMBOLS
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W. P. MARSHALL, PRESIDENT

The filing time shown in the date line on domestic telegrams is LOCAL TIME at point of origin. Time of receipt is LOCAL TIME at point of destination

PENNSYLVANIAN GAS POOLS AND THEREFORE SUPPORT THE
APPLICATIONS OF THE PURE OIL CO IN NMOCC CASES NOS
3158 AND 3159 FOR THE ESTABLISHMENT OF SPECIAL
RULES AND REGULATIONS IN THESE POOLS=
RICHARDSON OILS IN DELBASIN CORP PERRY R BASS
BY HOWARD W JENNINGS==

:1 640 NMOCC 3158 3159=

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

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WESTERN UNION
TELEGRAM

W. P. MARSHALL, PRESIDENT

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1965 JAN 12 PM 12 32

LA066 DA244

D FWA125 PD=FAX FORT WORTH TEX 12 1250P CST=

:A L PORTER JR=

MAIN OFF

DOCKET MAILED SEC DIRECTOR NEW MEXICO OIL CONSERVATION

'65 JAN 12 PM

Date 2-5-65 COMMISSION STATE LAND OFFICE BLDG SANTA FE NMEX:

=PAN AMERICAN PETROLEUM CORPORATION RESPECTFULLY URGES THE COMMISSION TO ADOPT TEMPORARY 640-ACRE UNITS AND THE OTHER TEMPORARY RULES RECOMMENDED BY PURE OIL COMPANY FOR THE RED HILLS-WOLFCAMP AND RED HILLS-PENNSYLVANIAN GAS POOLS DISCOVERED IN THEIR RED HILLS UNIT NO. 1, SEC. 22, T-25S, R-33-E, LEA COUNTY, NEW MEXICO, CASES 3158 AND 3159, SCHEDULED FOR HEARING JANUARY 13, 1965.=

W V GRISHAM PAN AMERICAN PETROLEUM CORPORATION=

J. O. SETH (1883-1963)

A. K. MONTGOMERY
WM. FEDERICI
FRANK ANDREWS
FRED C. HANNAHS
RICHARD S. MORRIS

JOHN G. JASPER
SUMNER G. BUELL

SETH, MONTGOMERY, FEDERICI & ANDREWS
ATTORNEYS AND COUNSELORS AT LAW
350 EAST PALACE AVENUE
SANTA FE, NEW MEXICO 87501

POST OFFICE BOX 2307
AREA CODE 505
TELEPHONE 982-38'6

February 4, 1965

New Mexico Oil Conservation Commission
State Land Office Building
Santa Fe, New Mexico

'65 FEB 5 AM

Re: Creation of Red Hills-Devonian Gas Pool, Lea County, New Mexico, and the establishment of Special Rules and Regulations therein.

Gentlemen:

Although we have not yet received a docket for the Commission's regular hearing on February 17, 1965, we understand that the above referenced matter will be considered at the hearing on that date. In connection with that hearing we submit herewith on behalf of the Pure Oil Company the following data concerning the Devonian formation in the Red Hills Unit Well No. 1:

1. Summary of drill stem tests taken in the Devonian formation.

2. Summary of production tests taken in the Devonian formation.

3. Analysis of gas taken from the Devonian formation.

The above information is submitted for use by the Commission and by any person interested in the proposed Red Hills-Devonian Gas Pool. Also, with this letter, we are furnishing to Mr. John F. Russell a copy of Forms C-103, 104, 105 and 122 concerning the Red Hills Unit Well No. 1.

Very truly yours,

Richard S. Morris

RSM:LHS
Encls.

cc: Mr. John F. Russell
Mr. George H. Hunker, Jr.
Mr. Donald E. Pray

RED HILLS UNIT NO. 1

DEVONIAN DST DATA

'65 FEB 5 AM 11

DST #1 17,464'-17,575'

Load drillpipe with nitrogen - 1,800 psig surface pressure. Open tool for 13 min. first flow. Closed tool for 60 min. initial closed in pressure. Reopen tool for 240 min. second flow. Blow increased slowly to good blow in 35 min. Unload water cushion with gas to surface in 20 min. Gas flow decreased to weak blow at end of test. Closed tool for 120 min. final closed in pressure. Recovered 10.14 Bbl sulphur water. ISIP 7,601 psig, IFP 5,728 psig, FFP 910 spig, FSIP 7,579 psig, Reservoir Temperature 240°.

DST #2 17,597'-17,638'

Load drillpipe with nitrogen. Tool open for a 10 min. first flow. Closed in for a 60 min. initial closed in pressure. Reopen tool and started bleeding of nitrogen thru 1/4" to 3/4" chokes. No pressure in 2 hours. Gas to surface in 2 hours, 10 min. Maximum gas rate 478 MCF/D, 3/4" choke. Recovered 11 Bbls heavy gas cut sulphur water. ISIP 7,618 psig, IFP 5,491 psig, FFP 1,978 psig, FSIP 7,579 psig, Reservoir temperature 246°.

DST #3 17,469'-17,693'

Open tool for a 15 min. first flow. Closed tool for 60 min. initial closed in pressure. Reopen tool for 420 min. second flow with very weak blow and strong blow in 10 min. Gas to surface in 5 min. Well flowed gas at a rate

of 3,000 MCF/D and 12 Bbl/Hr. salty sulphur water. Closed tool for 180 min. final closed in pressure. Recovered 1,580' of black salty sulphur water in drillpipe. ISIP 7,535 psig, IFP 2,070 psig, FFP 2,807 psig, FSIP 7,504 psig, Reservoir Temperature 248°.

RED HILLS UNIT NO. 1

DEVONIAN

Perforate 17,663-17,684', pump 10 barrels water in formation at 3 BPM with 2600#. Acidize with 3000 gallons acid. Producing gas at a rate too small to measure. Reversed 160 barrels acid water from drill pipe and squeezed perforations with cement.

Perforate 17,476-92', 17,523-44', acidize with 5000 gallons acid. Flow 23 hours to the pit for cleanup. Shut-in for 7 hours before flowing 5-1/2 hours at 7.8 MMCF/D through 20/64" choke with 4950 psi. Flow 3 hours at 10.4 MMCF/D through 26/64" choke with 4370 psi. Shut-in 2-1/2 hours. Final pressure 5900 psi.

MAIL O[illegible]

'65 FEB 5 AM 1[illegible]

WOLF PETRO LAB, INC.
DIAL EMERSON 6-9701
DIAL EMERSON 6-7171
2411 WEST 42ND STREET
P. O. BOX 643
ODESSA, TEXAS
79760

HYDROCARBON ANALYSIS

LABORATORY REPORT

Charge The Pure Oil Company
Test No. PL-64-999
Date of Run 9-21-64
Date Received 9-18-64

A Sample of Gas From Separator - Red Hills No. 1

Secured from Upper Devonian Formation

At _____ Secured by _____

Purpose _____ Time 2:15 P. M. Date 9-1-64

Sampling Conditions: 130 psig

CHROMATOGRAPH ANALYSIS

	Gas Vol. or Mol. %	Liquid Vol. %	GPM
Hydrogen Sulfide	.32		
Carbon Dioxide	1.62		
Air			
Nitrogen	1.17		
Oxygen			
Methane	96.36		
Ethane	.51		
Propane	.02		.005
Iso-Butane			
N-Butane			
Iso-Pentane			
N-Pentane			
Iso-Hexane			
N-Hexane			
Pentanes (2)			
Hexanes (2)			
Heptane (2)			
TOTAL	100.00		.005

(1) and lighter
(2) and heavier

ANALYSIS INFORMATION

Volume of Sample _____ cc. @ _____ ° F
Sp. Gr. Residue _____ Vol. of Residue _____ cc.
Molecular Wgt. of Residue _____
Gal/lb. Mol. _____

VAPOR PRESSURE

_____ lbs. @ 100° F
Calculated _____ lbs. @ 100° F

GASOLINE CONTENT

_____ Gasoline _____ G. P. M.
_____ Propane _____ G. P. M.
_____ Butanes _____ G. P. M.
TOTAL _____ G. P. M.

SULPHUR DETERMINATION

Hydrogen Sulfide	H_2S	203.07	grs/100 SCF
Mercaptans	RSH		grs/100 SCF
Sulfides	RSR		grs/100 SCF
Residual Sulphur	RSSR		grs/100 SCF
Total Sulphur		215.56	grs/100 SCF

OTHER DATA

BTU Content (Actual) Dry Basis (Calc.) 985
Sp. Gravity (Actual) _____ (Calc.) .5791
A. P. I. Gr. (Actual) _____ (Calc.) _____

Run by: J. Wolf Checked by: J. Wolf Approved: '65 FEB 5 AM 11

Additional Data and Remarks

COPIES

GOVERNOR
JACK M. CAMPBELL
CHAIRMAN

State of New Mexico
Oil Conservation Commission

LAND COMMISSIONER
E. S. JOHNNY WALKER
MEMBER

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

P. O. BOX ~~2046~~ 1980
HOBBS
Jan. 15, 1965

Mr. A. L. Porter, Jr., Director
Oil Conservation Commission
Box 2088
Santa Fe, New Mexico

Dear Sir:

In reference to the application of Pure Oil Company for special rules in the Red Hills Wolfcamp and Penn Gas Pools and our supoena action, it is my opinion that the application to quash the supoena should be honored. In support of this, I would think that these special rules could be granted on the merits of the Wolfcamp and Pennsylvanian alone providing well costs are not a factor in their application. If they are required to submit all information requested in the supoena, I could visualize their being required to do development drilling in the Devonian and Bone Spring, which would not fit Pure's development pattern for this unit; and we have never been a party to requiring development or meeting forced offsets. Also, it appears that the dissenters in this case are interested in this information for this express purpose, and our requiring supoenaed information would certainly help their cause and harm Pure's right of confidential information.

To require the full information as requested would certainly not hurt our position in any further action of this nature, but it is my opinion that we would not have to be bound completely by precedence.

Yours very truly,

OIL CONSERVATION COMMISSION

Joe D. Ramey
Supervisor, District I

JDR/mc

65 JAN 17 PM 2

NEIL H. WILLS
P. O. BOX 529
CARLSBAD, NEW MEXICO

January 11, 1965

New Mexico Oil Conservation Commission
State Land Office Building
Santa Fe, New Mexico

RE: NMOCC Cases No's. 3158 and 3159, Special Temporary Rules and Regulations in the Red Hills-Wolfcamp and Red Hills-Pennsylvanian Gas Pools, Lea County, New Mexico

Gentlemen:

The undersigned is the owner of overriding royalty interest in leases covering certain fee lands in the captioned area.

In connection with The Pure Oil Company's application in the above styled cases, it is my opinion that their request is reasonable and practical due to the extreme depths involved and the tremendous costs of drilling and completing wells of this nature.

I hereby offer my support in favor of Pure's applications.

Very truly yours,

Neil H. Wills

NHW:md

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

WESTERN UNION
TELEGRAM

(04).

1220 R 11-54)

W. P. MARSHALL, PRESIDENT

SYMBOLS
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L HBA013 LONG PD 2 EXTRA=HOBBS NMEX 12 901A MST=
:NEW MEXICO OIL CONSERVATION COMMISSION=
SANTA FE NMEX=

1965 JAN 12 AM 9 41

:MR A L PORTER JR:

REFERENCES TO CASE 3158 AND 3159 AT THE REGULAR HEARING JANUARY 13 1965 CONTINENTAL OIL COMPANY AS A WORKING INTEREST OWNER IN THE RED HILLS UNIT OPERATED BY PURE OIL COMPANY INFORMATION AVAILABLE TO CONTINENTAL INDICATES THAT THE PENNSYLVANIAN WOLFCAMP RESORVOIRS CAN BE ADEQUATELY DRAINED ON A WELL DENSITY OF ONE WELL TO EACH 640 ACRES THE EXPENSE OF DRILLING TO THIS DEPTH IS : SUCH THAT THE WIDEST EFFICIENT WELL SPACING SHOULD BE EMPLOYED IN VIEW OF THE ABOVE CONSIDERATION CONTINENTAL OIL COMPANY RECOMMENDS THAT THE COMMISSION APPROVE 640 ACRE SPACING FOR THE PENNSYLVANIA AND WOLFCAMP RESORVOIRS AS PROPOSED BY PURE OIL COMPANY=

JACK MARSHALL CONTINENTAL OIL CO HOBBS NMEX==

DOCKET MAILED
Date 2-5-65
MAP

'65 JAN 12 AM 9

=3158 3159 13 1965 640 640=

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

J. O. SETH (1883-1963)

A. K. MONTGOMERY
WM. FEDERICI
FRANK ANDREWS
FRED C. HANNAHS
RICHARD S. MORRIS

JOHN G. JASPER
SUMNER G. BUELL

SETH, MONTGOMERY, FEDERICI & ANDREWS
ATTORNEYS AND COUNSELORS AT LAW
350 EAST PALACE AVENUE
SANTA FE, NEW MEXICO 87501

POST OFFICE BOX 2307
AREA CODE 505
TELEPHONE 982-3876

January 8, 1965

New Mexico Oil Conservation Commission
State Land Office Building
Santa Fe, New Mexico

Re: NMOCC Cases Nos. 3158 and 3159,
Applications of The Pure Oil
Company for the Establishment of
Special Rules and Regulations
in the Red Hills-Wolfcamp and
Red Hills-Pennsylvanian Gas Pools,
Lea County, New Mexico.

Gentlemen:

Reference is made to the Subpoena Duces Tecum issued by the New Mexico Oil Conservation Commission in Cases Nos. 3158 and 3159 on December 22, 1964, and directed to Messrs. John R. Murphey, Jr., George Fish and Fred Tyner. Reference also is made to the Motion To Quash Subpoena Duces Tecum filed in Cases Nos. 3158 and 3159 on December 28, 1964, on behalf of Messrs. Murphey, Fish and Tyner and The Pure Oil Company.

Without waiving any rights or abandoning any grounds for relief set forth in the Motion To Quash Subpoena Duces Tecum, we herewith submit to the Commission the following information and documents concerning the Red Hills Unit Well No. 1, Section 32, Township 25 South, Range 33 East, Lea County, New Mexico, for the use by any person interested in Cases Nos. 3158 and 3159:

1. Summary of drill stem tests taken in the Wolfcamp and Pennsylvanian formations.

2. Gamma Ray-Neutron Log, Gamma Ray-Sonic Log, Laterolog, Micrologs and Radioactivity Log.

3. Tabulation of Totco surveys from surface to total depth.

4. Summary of flow tests taken prior to final completion in the Wolfcamp and Pennsylvanian formations.

5. Copy of structure map submitted by The Pure Oil Company in connection with its application for approval of the Red Hills Unit Agreement, NMOCC Case No. 2671.

At the hearing of Cases Nos. 3158 and 3159 on January 13, 1965, we will ask to be heard on the Motion To Quash Subpoena Duces Tecum, as to the documents called for by the subpoena and not submitted herewith, and then will ask to be heard upon the merits of our applications for the establishment of special rules and regulations for the Red Hills-Wolfcamp and Red Hills-Pennsylvanian Gas Pools.

Very truly yours,

Richard S. Morris

RSM:dd
Enclosures

CC - Mr. John F. Russell
Attorney at Law
P. O. Drawer 640
Roswell, New Mexico

Mr. George H. Hunker, Jr.
Attorney at Law
P. O. Box 2086
Roswell, New Mexico

Mr. Donald E. Pray
Attorney at Law
600 Petroleum Club Bldg.
Tulsa, Oklahoma

OIL CONSERVATION COMMISSION
P. O. BOX 2088
SANTA FE, NEW MEXICO

LEGAL DIVISION
PHONE 827-2741

December 23, 1964

COPY

Mr. Richard S. Morris
Seth, Montgomery, Federici & Andrews
Attorneys at Law
P. O. Box 2307
Santa Fe, New Mexico

Re: Case No. 3158 and Case No. 3159
The Pure Oil Company

Dear Dick:

I am enclosing for your file a copy of the subpoena duces tecum which has been issued by the Commission in the above cases at the request of Jack Russell, George Hunker, and Donald Pray.

Very truly yours,

J. M. DURRETT, Jr.
Attorney

JMD/esr

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

LEGAL DIVISION
PHONE 827-2741

December 22, 1964

Mr. M. W. Van Zandt
Vice President of Exploration
and Production
The Pure Oil Company
200 East Golf Road
Palatine, Illinois

Re: Cases No. 3158 and No. 3159, Applications of
The Pure Oil Company for Special Pool Rules,
Lea County, New Mexico

Gentlemen:

I am enclosing a copy of the subpoena duces tecum which has been issued by the Commission in the above cases. This subpoena was issued on the request of Mr. John F. Russell, Attorney at Law, Roswell, New Mexico, Mr. George H. Hunker, Attorney at Law, Roswell, New Mexico, and Mr. Donald E. Pray, Attorney at Law, Tulsa, Oklahoma, representing royalty owners and working interest owners in the above cases and is forwarded to you at the request of these attorneys.

Very truly yours,

J. M. DURRETT, Jr.
Attorney

JMD/esr
Enclosure

cc: Mr. John F. Russell
Attorney at Law
P. O. Drawer 640
Roswell, New Mexico 88201

Mr. George H. Hunker
Attorney at Law
P. O. Box 2086
Roswell, New Mexico 88201

Mr. Donald E. Pray
Attorney at Law
c/o Mosteller, Andrews, Mosburg
and Bowen
600 Petroleum Club Building
Tulsa, Oklahoma 74119

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

LEGAL DIVISION
PHONE 827-2741

December 22, 1964

COPY

Mr. John F. Russell
Attorney at Law
Suite 1010 Security National
Bank Building
P. O. Drawer 640
Roswell, New Mexico

Re: Cases No. 3158 and No. 3159

Dear Jack:

In accordance with our telephone conversation, I am enclosing herewith a copy of the subpoena duces tecum in order that you may have the same served upon Mr. Fred Tyner. The other copies should be served today or tomorrow on The Corporation Company.

I also have forwarded today a copy of the subpoena to Mr. Van Zandt and I am enclosing a copy of the transmittal letter for your files.

Very truly yours,

J. M. DURRETT, Jr.
Attorney

JMD/esr

cc: Mr. George H. Hunker
Attorney at Law
P. O. Box 2086
Roswell, New Mexico 88201

Mr. Donald E. Pray
Attorney at Law
c/o Mosteller, Andrews, Mosburg
and Bowen
600 Petroleum Club Building
Tulsa, Oklahoma 74119

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

LEGAL DIVISION
PHONE 827-2741

December 22, 1964

Mr. H. W. Van Zandt
Vice President of Exploration
and Production
The Pure Oil Company
200 East Golf Road
Palatine, Illinois

DOCKET MAILED
Date 12-23-64

Re: Cases No. 3158 and No. 3159, Applications of
The Pure Oil Company for Special Pool Rules,
Lea County, New Mexico

Gentlemen:

I am enclosing a copy of the subpoena duces tecum which has been issued by the Commission in the above cases. This subpoena was issued on the request of Mr. John F. Russell, Attorney at Law, Roswell, New Mexico, Mr. George H. Hunker, Attorney at Law, Roswell, New Mexico, and Mr. Donald E. Pray, Attorney at Law, Tulsa, Oklahoma, representing royalty owners and working interest owners in the above cases and is forwarded to you at the request of these attorneys.

Very truly yours,

J. M. DURRETT, Jr.
Attorney

JMD/esr
Enclosure

cc: Mr. John F. Russell
Attorney at Law
P. O. Drawer 640
Roswell, New Mexico 88201

Mr. George H. Hunker
Attorney at Law
P. O. Box 2086
Roswell, New Mexico 88201

Mr. Donald E. Pray
Attorney at Law
c/o Mosteller, Andrews, Mosbury
and Bowen
600 Petroleum Club Building
Tulsa, Oklahoma 74119

LAW OFFICES OF
JOHN F. RUSSELL
SUITE 1010 SECURITY NATIONAL BANK BUILDING
P O DRAWER 640
ROSWELL, NEW MEXICO 88201

TELEPHONE 622-4641
AREA CODE 505

December 10, 1964

Mr. A. L. Porter
Secretary-Director
Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Dear Mr. Porter:

I transmit herewith an application in triplicate for documents in aid of discovery in Case Nos. 3158 and 3159.

For your further information, the applicants are either royalty owners or working interest owners under certain lands within the horizontal limits of the Red Hills-Pennsylvanian Gas Pool defined in Order No. R-2827 entered in Case No. 3159 and within the horizontal limits of the Red Hills-Wolfcamp Gas Pool defined by Order R-2826 entered in Case No. 3153.

Very truly yours,

John F. Russell

JFR:np

cc: Mr. Donald E. Pray
Attorney at Law
c/o Mosteller, Andrews, Mosburg
and Bowen
600 Petroleum Club Building
Tulsa, Oklahoma 74119

Mr. George H. Hunker
Attorney at Law
P. O. Box 2086
Roswell, New Mexico 88201

GOVERNOR
JACK M. CAMPBELL
CHAIRMAN

State of New Mexico

Oil Conservation Commission

LAND COMMISSIONER
E. S. JOHNNY WALKER
MEMBER

P. O. BOX 871
SANTA FE

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

December 7, 1964

Mr. Richard S. Morris
Seth, Montgomery, Federici & Andrews
Attorneys at Law
Post Office Box 2307
Santa Fe, New Mexico

Re: Case No. 3158 and 3159
Order No. R-2826 & R-2827
Applicant:
THE PURE OIL COMPANY

DOCKET MAILED
Date 12-9-64

Dear Sir:

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

Very truly yours,

A. L. Porter, Jr.

A. L. PORTER, Jr.
Secretary-Director

ir/

Carbon copy of order also sent to:

Hobbs OCC x
Artesia OCC
Aztec OCC
OTHER Mr. George Hunker, Mr. John Russell, Mr. Donald Pray.

DOCKET MAILED
Date 12-24-64

OIL CONSERVATION COMMISSION
P. O. BOX 2088
SANTA FE, NEW MEXICO

LEGAL DIVISION
PHONE 827-2741

December 4, 1964

COPY

VIA AIR MAIL

Mr. Don Pray
Attorney at Law
600 Petroleum Club Building
Tulsa, Oklahoma

DOCKET MAILED Date 12-24-64 jc

Re: Case No. 3158 and 3159

Dear Don:

As you requested during our recent telephone conversation, I am enclosing the following exhibits concerning the The Pure Oil Company Red Hills Unit Well No. 1:

Exhibit No. 2A, Sonic Log-Gamma Ray
Exhibit No. 2B, Gamma Ray-Neutron Log
Exhibit No. 2C, Laterolog
Exhibit No. 2D, Microlog

Please return these logs as soon as possible. If your engineers will need longer than two or three days to examine the logs, perhaps you could have the same photographed and return the originals to us.

Please advise me if we can be of further assistance to you.

Very truly yours,

J. M. DURRETT, Jr.
Attorney

JMD/esr
Enclosures

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

November 30, 1964

COPY

Dear Ada:

I am enclosing the following exhibits in Cases 3158 and 3159:

Exhibits No. 1 and 2
2-A
2-B
2-C
2-D
3-A
5-A, B, C, and D
and 6

These are the only exhibits we have for these cases, so we will need them back as soon as possible.

With best regards,

Ida Rodriguez

Returned
12-3-64

Memo

11/25/64

From
D. S. NUTTER
CHIEF ENGINEER

To Joe Ramey

Cases 3157, 3158, 3159 heard yesterday relate to Pure Oil Co's Red Hills Unit discovery in the Wolfcamp and Penn. There was opposition and the spacing portion of the cases was continued to Jan 6.

However we made clear that no wells would be approved that did not conform to the pending well location requirements.

Memo

From
D. S. NUTTER
CHIEF ENGINEER

To
John Anderson w/ the USGS has been advised of this and concurs.

The pending well locations requirements are at least 1650' from the outer boundary of the section and 330' from the quarter quarter section lines.

The following memo sent to Joe Ramey 11/25/64

Rec'd 7-12-72
Rules for Red Hills Pool

SPECIAL RULES AND REGULATIONS
FOR THE
RED HILLS-PENNSYLVANIAN GAS POOL

RULE 1. Each well completed in the Red Hills-Pennsylvanian Gas Pool or in the Pennsylvanian formation within one mile of the Red Hills-Pennsylvanian Gas Pool, and not nearer to or within the limits of another de nated Pennsylvanian pool, shall be spaced, drilled, operated, and produced in accordance with these Special Rules and Regulations.

RULE 2. Each well completed in the Red Hills-Pennsylvanian Gas Pool shall be located on a standard unit containing 640 acres, more or less, consisting of a single governmental section.

RULE 3. Each well completed in the Red Hills-Pennsylvanian Gas Pool shall be located no nearer than 1650 feet to the outer boundary of the section and no nearer than 330 feet to any governmental quarter-quarter section line. Any well drilled to or being completed in the Red Hills-Pennsylvanian Gas Pool is granted an exception to the well location requirements of this rule.

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

LEGAL DIVISION
PHONE 827-2741

November 20, 1964

Mr. George H. Hunker, Jr.
Attorney at Law
418 Hinkle Building
P. O. Box 2086
Roswell, New Mexico

DOCKET MAILED
Date 12-24-64

Re: Case No. 3157, Pure Oil Company, Dual Completion
Case No. 3158, Pure Oil Company, 640-acre spacing-Wolfcamp
Case No. 3159, Pure Oil Company, 640-acre spacing-Pennsylvanian

Dear George:

We have your letters of November 17 and 18, 1964, entering your appearance in the above cases and requesting continuance of the cases.

As Dick Morris has advised me that his clients desire to resist the motions for continuance, it will be necessary to argue the motions at the hearing on November 24, 1964, when the cases are called.

Very truly yours,

J. M. DURRETT, Jr.
Attorney

JMD/esr

cc: Mr. Richard S. Morris
Attorney at Law
350 East Palace Avenue
P. O. Box 2307
Santa Fe, New Mexico

COPY

LAW OFFICES
GEORGE H. HUNKER, JR.
418 HINKLE BUILDING
ROSWELL, NEW MEXICO

505 622-3405

POST OFFICE BOX 2086

November 18, 1964

Mr. A. L. Porter, Jr.
Secretary and Director
New Mexico Oil Conservation Commission
Santa Fe, New Mexico

Re: Case No. 3158, Pure Oil Company
640-acre spacing - Wolfcamp

Dear Mr. Porter:

I would like to enter my appearance in the above styled case for and on behalf of the following named persons:

Mr. Jerald M. Schuman
Suite 1109 Petroleum Club Building
Tulsa, Oklahoma

Mr. Saul A. Yager
902 Enterprise Building
Tulsa 5, Oklahoma

My clients own mineral interests in certain fee lands in Section 5, Township 26 South, Range 33 East (and other lands) south of Pure Oil Company's Red Hills Unit Well No. 1, located 330 feet from the south line and 2,310 feet from the east line of Section 32, Township 25 South, Range 33 East. My clients would like to have a continuance of the above styled case and as grounds for the continuance, state:

1. That they were not aware of the Pure Oil Company's application for the creation of a new gas pool and for special pool rules until on or about November 7, 1964 when the Commission's Chief Engineer advised Mr. Schuman concerning the same.

2. That they have not had an opportunity to examine the Pure Oil Company's application.

3. That Pure Oil Company's attorney has been asked to furnish Messrs. Schuman and Yager with copies of all well logs and other information obtained in connection with the drilling of said well, but that the said attorney has not had time to furnish said information, and as a consequence, Messrs. Schuman and Yager have not had the time or the opportunity to examine such materials in order to evaluate their position in order to

determine whether or not their rights might be adversely affected by the special pool rules applied for.

4. That they know of no reason why the Pure Oil Company's rights would be prejudiced in any way by the granting of at least a 30-day continuance since there is no gas gathering system at the well and since no Federal Power Commission approval has been given to produce and transport the gas producible from the subject well.

A copy of this letter is being sent to Mr. Richard S. Morris, attorney for Pure Oil Company, in order that he may be advised of our request.

Please let me hear from you as soon as possible with respect to the request for a continuance.

Respectfully submitted,

George H. Hunker, Jr.

GHH:cd

cc: Mr. Jerald M. Schuman
Suite 1109 Petroleum Club Building
Tulsa, Oklahoma

cc: Mr. Saul A. Yager
902 Enterprise Building
Tulsa 5, Oklahoma

cc: Mr. Richard S. Morris
350 East Palace Ave.
Santa Fe, New Mexico

LAW OFFICES
GEORGE H. HUNKER, JR.
418 HINKLE BUILDING
ROSWELL, NEW MEXICO

505 622-3408

POST OFFICE BOX 2086

November 18, 1964

Mr. A. L. Porter, Jr.
Secretary and Director
New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico

Re: Case No. 3159, Pure Oil Company
640-acre spacing - Pennsylvanian

Dear Mr. Porter:

I would like to enter my appearance in the above styled case for and on behalf of the following named persons:

Mr. Jerald M. Schuman
1109 Peteoleum Club Building
Tulsa, Oklahoma

Mr. Saul A. Yager
902 Enterprise Building
Tulsa 5, Oklahoma

My clients own mineral interests in certain fee lands in Section 5, Township 26 South, Range 33 East (and other lands) south of Pure Oil Company's Red Hills Unit Well No. 1, located 330 feet from the south line and 2,310 feet from the east line of Section 32, Township 25 South, Range 33 East. My clients would like to have a continuance of the above styled case and as grounds for the continuance, state:

1. That they were not aware of the Pure Oil Company's application for the creation of a new gas pool and for special pool rules until on or about November 7, 1964 when the Commission's Chief Engineer advised Mr. Schuman concerning the same.

2. That they have not had an opportunity to examine the Pure Oil Company's application.

3. That Pure Oil Company's attorney has been asked to furnish Messrs. Schuman and Yager with copies of all well logs and other information obtained in connection with the drilling of said well, but that the said attorney has not had time to furnish said information, and as a consequence, Messrs. Schuman and Yager have not had the time or the opportunity to examine such materials in order to evaluate their position in order to

determine whether or not their rights might be adversely affected by the special pool rules applied for.

4. That they know of no reason why the Pure Oil Company's rights would be prejudiced in any way by the granting of at least a 30-day continuance since there is no gas gathering system at the well and since no Federal Power Commission approval has been given to produce and transport the gas producible from the subject well.

A copy of this letter is being sent to Mr. Richard S. Morris, attorney for Pure Oil Company, in order that he may be advised of our request.

Please let me hear from you as soon as possible with respect to the request for a continuance.

Respectfully submitted,

George H. Hunker, Jr.

GHH:cd

cc: Mr. Jerald M. Schuman
Suite 1109 Petroleum Club Building
Tulsa, Oklahoma

cc: Mr. Saul A. Yager
902 Enterprise Building
Tulsa 5, Oklahoma

cc: Mr. Richard S. Morris
350 East Palace Ave.
Santa Fe, New Mexico

BEFORE THE NEW MEXICO OIL CONSERVATION COMMISSION

APPLICATION OF THE PURE OIL COMPANY TO CREATE TWO NEW GAS POOLS AND TO ESTABLISH SPECIAL RULES AND REGULATIONS THEREIN, RED HILLS UNIT AREA, LEA COUNTY, NEW MEXICO.

Case No. 3128

APPLICATION

Comes now THE PURE OIL COMPANY, by its attorneys, and applies to the New Mexico Oil Conservation Commission for an order creating two new gas pools for Wolfcamp and Pennsylvanian production in the Red Hills Unit Area, Lea County, New Mexico, and establishing special rules and regulations for said pools. In support of its application The Pure Oil Company states:

1. The Pure Oil Company is the operator of the Red Hills Unit Well No. 1, located 2310 feet from the east line and 330 feet from the south line of Section 32, Township 25 South, Range 33 East, Lea County, New Mexico.

2. The Red Hills Unit Well No. 1 has been tested and found productive of gas in the Wolfcamp and Pennsylvanian formations at approximate depths of 13,500 feet and 14,400 feet respectively.

3. The Pure Oil Company proposes the creation of two new gas pools for Wolfcamp and Pennsylvanian production based upon the completion of the Red Hills Unit Well No. 1 in these formations.

4. The Pure Oil Company proposes the establishment of special rules and regulations in each of the two pools, including a provision in said special rules and regulations for 640-acre spacing units.

DOCKET MAILED

Date 11-13-69

5. Results of tests of the Wolfcamp and Pennsylvanian formations in the Red Hills Unit Well No. 1 show that in each zone one well can efficiently and economically drain and develop an area of 640 acres.

6. Approval of this application will prevent waste and will protect correlative rights.

WHEREFORE, The Pure Oil Company requests that this application be set for hearing before one of the Commission's duly appointed Examiners at the last Examiner Hearing during the month of November 1964, and that the Commission enter its order approving this application.

SETH, MONTGOMERY, FEDERICI & ANDREWS

By Richard S. Morris

350 East Palace Avenue
Santa Fe, New Mexico

Attorneys for The Pure Oil Company

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
March 17, 1965

REGULAR HEARING

IN THE MATTER OF: Application of The Pure Oil Company for the creation of a new gas pool and for special pool rules, Lea County, New Mexico.	Case No. 3158
Application of The Pure Oil Company for the creation of a new gas pool and for special pool rules, Lea County, New Mexico.	Case No. 3159
Application of Saul A. Yager, et al., for amendment of Order No. R-2827 and for special pool rules, Lea County, New Mexico.	Case No. 3207
Application of Saul A. Yager, et al., for the creation of a new gas pool, and for special pool rules, Lea County, New Mexico.	Case No. 3208

BEFORE: Honorable Jack M. Campbell
Mr. A. L. "Pete" Porter
Mr. Guyton B. Hays

TRANSCRIPT OF HEARING

DEARNLEY-MEIER REPORTING SERVICE, Inc.
ALBUQUERQUE, N. M. PHONE 243-6691
SANTA FE, N. M. PHONE 983-3971
FARMINGTON, N. M. PHONE 325-1182

dearnley-meier
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MR. PORTER: The Commission will take up next the continued cases from the February 17 Regular Hearing, Cases 3158, 3159, 3207 and 3208. Are there any additional appearances in this case other than those which were registered during the February hearing?

MR. RUSSELL: If I may make one statement at the outset. The applicants, Saul Yager, et al., at this time would like in Case 3207 to withdraw their application to amend Order R-2827 to create new gas pools for the Atoka, Strawn and Morrow zones of the Pennsylvanian formation.

MR. PORTER: Are there any objections to counsel's motion?

MR. MORRIS: We certainly have no objection and would concur in that motion.

MR. PORTER: Was that just Case 3207?

MR. RUSSELL: 3207, and I have one further --

MR. PORTER: The Commission will dismiss this Case 3207.

MR. RUSSELL: Well, dismissed insofar as our request to designate those zones as separate pools.

GOVERNOR CAMPBELL: What else does it do?

MR. RUSSELL: That is the whole thing.

MR. PORTER: I didn't see anything left.

MR. RUSSELL: I would also, for the purpose of brevity in presenting evidence, ask Mr. Morris if he will stipulate

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for the record that the interest of Saul A. Yager and Barbara A. Witten combined is approximately an undivided one-fourth interest in the North Half of the North Half and the Southeast Quarter of the Northeast Quarter of each undivided one-fourth and the South Half of the East Quarter of Section 5, 26 South, Range 33 East, Lea County, New Mexico.

MR. PORTER: Mr. Morris.

MR. MORRIS: We would stipulate that those are substantially correct. As I understand it, this is not a definitive statement of interest but just an approximation?

MR. RUSSELL: That is correct.

MR. MORRIS: We so stipulate.

MR. PORTER: There seems to be no problem there.

MR. MORRIS: Mr. Porter, at this time we have no additional appearances in this case. We want the same appearances to be reflected as last month, but I would like to just informally introduce to the Commission at this time Mr. W. K. Leewright, division manager of The Pure Oil Company, Houston, Texas and Mr. G. W. Blackburn, the operations manager of Pure Oil Company from Houston, Texas.

MR. 'PORTER: Do you have any testimony to present today, Mr. Morris?

MR. MORRIS: We concluded our case on direct testimony last month. Depending on what transpires here today

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we may wish to offer some rebuttal testimony.

MR. PORTER: Very well. Mr. Pray.

MR. PRAY: We are ready to present our case in chief at this time. We have no additional appearances.

MR. PORTER: How many witnesses do you have?

MR. PRAY: We anticipate at this time calling only one witness.

MR. PORTER: Would you have him stand and be sworn?

MR. PRAY: He was sworn for the testimony last time, or would you like to have him continue under oath or be sworn?

(Witness sworn.)

HERMAN H. KAVELER

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

DIRECT EXAMINATION

BY MR. PRAY:

Q Dr. Kaveler, you have appeared before this Commission before?

A Yes, some years ago and last month.

Q And you did qualify before the Commission at that time?

A I expressed my background, yes.

MR. PRAY: Are his qualifications acceptable or shall we have him requalified?

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MR. PORTER: No, his qualifications are acceptable.

Q (By Mr. Pray) Dr. Kaveler, have you studied all of the data and the information concerning the Red Hills No. 1 well which was made available to you by Pure Oil Company in this proceeding?

A I have.

Q Have you, based on that information, made studies, reserves calculations and economic estimates?

A Yes, I have.

Q Have you come to any conclusions concerning the request of the applicants for an exception to the statewide spacing rules in the Red Hills field?

A Yes. I have come to three conclusions which summarize the results of the study and the reserve calculations that I made.

Q Would you state those conclusions, please?

A The first conclusion I've come to is that additional wells must be drilled and tested if there is to be a reasonable basis for granting an exception to the existing statewide spacing rules, particularly if the exception to the existing statewide spacing rules is to be based on economic consideration. That is my first conclusion. I think it's tied in with the testimony that's already in the record to the effect that the information obtained in the drilling of the

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Red Hills No. 1 well was not only limited below the normal amount of information, but the information obtained involved measurements that were not as reliable as one would like due to the mechanical difficulties experienced in drilling the well.

Q What is your second conclusion?

A My second conclusion is that the exception to the statewide rule as requested by applicant cannot be regarded as a temporary rule, even though applicant represents it as a temporary rule. A 660-acre exception granted at this time with only one producing well in the newly discovered pool which requires development wells or other exploration wells to be drilled in the center of the spacing unit would involve a pooling which would in fact be permanent under 640 acres, because if subsequent drilling proves that it is to the best interest to have the present statewide rules remain into effect, would make it impossible to revert or rescind the pooled interest in the 640 and restore the parties to where they would have been had the 320-acre rules statewide been maintained into effect.

So I come to the conclusion that as a practical matter it would be impossible to grant a temporary exception, particularly when the well to be drilled in the so-called temporary 660 is to be drilled in the center of the 640 temporary so-called.

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Q What would be your third conclusion?

A My third conclusion is that Pure Oil Company's location of a well on a federal exploration unit located just ten acres away from one-lease land and from non-participating land creates a problem which in my opinion would require any well drilled in Section 5 to be drilled at a location not farther removed than 660 feet south of the north line of 5 and 660 feet east or west of the center line through Section 5 in order that the owners in Section 5 would have reasonable opportunity to protect their correlative rights.

There's no disagreement on this statement that the Red Hills No. 1 well being a ten-acre location will draw a substantial if not as much as a half of its production from the North Half of Section 5. Therefore, if the owners in Section 5 are denied the opportunity to drill a development well and they're forced to go to the center of Section 5 and drill an exploration well, then I think they're denied opportunity to protect their correlative rights.

I think that this is a practical matter beyond technology so that there are really two issues in this hearing, one involving an interpretation of the limited technical information and the other is involving a correlative rights problem created by Pure's imprudent judgment in location this wildcat well. Those are my three conclusions.

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Q Did you base your conclusions on the geological and engineering data provided by The Pure Oil Company?

A Yes, to the extent that the information obtained by Pure was made available in this proceeding.

Q Have you examined the logs which were presented by Pure and the reserve calculations which were presented by Pure?

A Yes, sir, I have.

Q Have you yourself prepared exhibits, reserves and economic calculations?

A Yes, I have. I have prepared exhibits pertaining to the reserve and economic evaluation of the Wolfcamp, the Atoka and the Devonian and expressed those reserves for each of the three pools, and also evaluated the economics of making a single Wolfcamp and dual Wolfcamp and Wolfcamp-Devonian completions.

MR. PRAY: Would you have those marked as exhibits?

(Whereupon, Exhibits 1, 2 & 3 were marked for identification.)

Q We have marked them 1, 2 and 3. No. 1 is Wolfcamp-Atoka dual and No. 2, Wolfcamp-Devonian dual and No. 3 is the Wolfcamp, is that right?

A That's the way they are pasted together. I would rather talk about the Exhibit 3 since it's a single completion.

I prepared these exhibits not because it constitutes my opinion of what constitutes prudent development of this pool, I prepared them because these are the three replicas of the exhibits that Pure introduced, and I could compare with those presented by Pure by doing it this way.

Q Turning to Exhibit 3 on the Wolfcamp Pool, would you explain the figures that you have used up here in (A) for your pool data?

A On Exhibit No. 3, the biggest difference and conclusion that I have come to is shown under pay thickness in feet; by parentheses I have shown that Pure presented an estimate of 28 feet of net pay. If I took the same criteria that they took and applied it to the entire Wolfcamp section, one could come up with a reasonable conclusion that there was at least [illegible] feet of pay. Then in respect to the average porosity it's obvious that if one took into account the entire pay interval of 80 feet, that the average porosity would be lower than the ten percent which Pure presented in their exhibit.

So I set an average porosity of seven percent for 80 feet of pay, which in my opinion is the minimum based upon present available facts as compared to ten percent porosity for 28 feet of pay which I regard as an unjustifiable minimum estimate by applicant.

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Q Are these other figures then, in fact, the figures that were presented by Pure?

A Yes. The connate water, thirty percent, I think that's too high but probably twenty percent would be a more reasonable value.

Q Is it true that Pure testified that they had found no water in the Wolfcamp?

A No water table, that's right. There's no basis whatever for establishing that the connate water would be as high as thirty percent. That's just an assumption, so rather than debate about assumptions, I adopted the thirty percent even though I questioned it.

Now, one takes that reservoir data and applies it as I do in (B) of Exhibit No. 3, one can make a calculation of the hydrocarbons in place, the reserve per acre, and the working interest reserve after 1/8th royalty, so that the 80 feet of net pay indicates at ninety percent recovery, which is a standard percent recovery for gas fields, 52,000,000 cubic feet of gas in place per acre, accreditable to 7/8ths working interest; 2,081 barrels of condensate, and then if one carries those reserve figures down into 640 and 320-acre spacing as Pure did, you have the 33,000,000 cubic feet, I should say 33,000,000,000 feet, double Mcf is off to the left there under Item (C), so it's 33,000,000,000 cubic feet of gas reserve

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attributable to a 640-acre unit; 1,331,800 barrels of condensate.

Q Could we pause at that point and make a comparison using Pure's figures? What did they come up with on their reserve per acre foot? Do you recall that?

A I don't believe Pure showed a figure of reserve per acre foot in their exhibit. I think they simply showed a reserve attributable to 640-acre spacing. I'll check.

Pure Exhibit 13 showed a reserve of 10,000,000,000 cubic feet for a 640-acre spacing, and my figure is approximately three times that much.

Q Did you by any chance compute the recovery factor which Pure must have used to arrive at their figure?

A I don't know how they got a recovery factor. The record isn't clear on that point whether they used the method that I have used here is the only reliable method available, it's called the reservoir volume method. Now if Pure attempted to use another method, the only other it could be, could be the material balance method based upon pressure cline.

Q Would that be reliable at this stage of development?

A It would not, so how Pure got this extremely low figure, I don't know. Then if we proceed with this Exhibit 3, the selling price of gas at the well head out there is current price at sixteen cents a thousand. I used $160.00 per million. I don't know where Pure got its $146.00 a million in their

Exhibit 13.

Q Isn't it true that the contract between Pure and El Paso also provides for escalation in the future and you didn't take that into account?

A That's right. Escalated up to twenty cents a thousand in the twentieth year. Then as far as condensate is concerned, Pure set a value at the well head of $2.00 a barrel in their Exhibit 13, and the going price for condensate of this quality in New Mexico today is $2.85 a barrel. I put a fifteen-cent transportation cost on there so that the well head price of the condensate is $2.70 a barrel rather than $2.00 as Pure used.

Q Is this fifteen cents transportation charge, is that reasonable or how did you arrive at that?

A That's the going transportation charge out there. I don't think that transportation charge is going to apply for very long if further development proves this pool to be as big as the geologists represent it to be.

There are too many gasoline plants within ten miles of the Red Hills field to preclude somebody laying a pipeline in there for the purpose of picking up this condensate. I think the fifteen cents a barrel will be eliminated.

Then remaining with the 640-acre spacing column, my estimate of ultimate revenue is $8,921,000. That, in my

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opinion, would have a thirty-year life. The operating expense I put in there at $500.00 a month for a single completion in the Wolfcamp, which is higher than even the federal unit agreement provides, but that to me appears to be a reasonable estimate of the cost.

Q Why did you use thirty years instead of the twenty years which was used by Pure?

A Well, in my opinion, the reserve is larger than Pure represented and also I wanted to take the most conservative approach that I could within the range of reasonable judgment. If this pool is as big as they say it is I am sure that the boys who are looking for gas reserves will be in here and provide a good market for this gas.

Q Isn't the effect of deferring it, making it a longer life and anticipating longer life really to minimize the income from it per year and thus the rate of return on the well?

A Yes, that would be the effect of using the thirty-year life. I then put a two percent production tax, which I understand is the current rate in New Mexico, and that would produce operating income of $8,563,000. In my opinion the cost of drilling and completing a Wolfcamp single completion based upon the experience of drilling the wildcat and recognizing that as development wells are drilled the drilling

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costs are always reduced because problems are overcome, I set a well and equipment investment of $600,000.

Q How does this compare with Pure's cost estimate?

A In Pure's they use $686,700. If a person wanted to struggle with this well cost, could get that $600,000 down to about $540,000. I didn't think we should have a drilling contractors' convention here and argue about cost, so I used what I think is a modest and average expectation.

Therefore, using Pure's terminology, the profit from drilling a 640-acre Wolfcamp completion would be $7,963,000. People have different measures of the value of that investment. Some people would look at the net operating income of $8,500,000 based on an investment of $600,000 and say, "Boy, that's a sixteen to one deal, or about a thirteen to one deal, that's real good, thirteen dollars back for each dollar invested."

Pure uses a profit ratio which in the instance of the example would be a profit to investment ratio of 13.2. If one took the operating income of $8,563,000 and based it upon six percent compound discount at even rate of income for thirty years, which is a conventional way to evaluate gas wells, the present worth of the $8,563,000 would be $3,761,000, so that the present worth of the profit to investment ratio would be 6.21, which means that a person would get a profit

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of $6.00 for every dollar he invested in the drilling of a Wolfcamp well based upon the 80 feet of pay thickness.

If one goes over to 320-acre picture you can see the comparable figures there, $600,000 well cost and the $180,000 operating expense applied, and so forth. On 320-acre spacing a Wolfcamp well would still have a prospect of providing $2.83 profit present worth for each dollar invested and in my opinion that would be a reasonable investment and would justify the drilling of a Wolfcamp well on 320 acres.

Q How does this compare with the present worth profit investment ratio that Pure found for their 640 acres? Compare the 640 that Pure found against your 320.

A Well, Pure's 640-acre profit to investment ratio was 1.175 and for 320 acres a mere .226, based upon twenty year life. So that very obviously this is almost a poverty situation in the Red Hills field.

Q Shall we move on to your Atoka dual completion, would that be your next one, Exhibit No. 1?

A Yes, Exhibit No. 1 would be the next in line. Without going into the details that I outlined, I used the same procedure in respect to a Wolfcamp-Atoka dual completion, and I needed to get the Atoka-Pennsylvanian reserve which I show under Item (A) of Exhibit No. 1.

In my opinion the 42 feet of net pay thickness which

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Pure presented is the very bare minimum, and using the same criteria one could find that the pay thickness in the Atoka would possibly or reasonably be 84 feet.

Q Dr. Kaveler, you refer to this finding the net effective pay, was this not shown, these additional pay zones, were they not shown on these exhibits that they presented?

A Well, Pure's exhibits showed the additional pay zones in respect to the Pennsylvanian. They did not in respect to the Wolfcamp because they showed only a couple hundred feet of the Wolfcamp interval, but on the Pennsylvanian I think their Exhibit No. 3 showed most of the Atoka section.

Q Did not they testify that they had even perforated pay in addition to that which we had called pay?

A They had perforated intervals in addition to what they regarded this pay, which intervals, in my opinion, are in fact pay.

Q But you used the same criteria in picking additional pay as they used in picking the pay which they presented, is that correct?



A Yes. Then if one looks at the dual completion Wolfcamp-Pennsylvanian --

Q Excuse me, let's go back up here to these other data that you have presented. These are the same data for

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porosity, connate water and so forth as was used by Pure?

A Yes.

Q So that the only difference in your reserve calculations is the net effective pay?

A Yes. In my opinion it would be reasonable, based upon the available facts established to regard the pay section in the Atoka to be 84 feet rather than 42, connate water in my opinion is too high, but that's relatively unimportant. One goes through the reserve estimate then, Pure in their Exhibit No. 11 I believe it was, show a Pennsylvanian reserve of only .757 triple M cubic feet or .7 of a billion, and how they got that figure, I could never ascertain that. That apparently was based on a theory that the Pennsylvanian is depleted.

The examination I made of the facts bear no evidence the Pennsylvanian is having mechanical trouble. I visited the well on the 5th of March and the Pennsylvanian tubing had pressure, it was 5,000 pounds, just what it was when the well was first brought in. It's true, as Pure witnesses testified, there's mechanical failure of one kind or another, but if the well remained shut in as it is, the gas seeps through and finally shows up at the well head at 5,000 pounds.

Therefore, I could find no evidence whatever to permit the conclusion that the Pennsylvanian reserve is depleted or it

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could possibly be as small as shown on Exhibit 11 by Pure. Therefore, I set the normal reserve per acre, based upon reservoir volume information, on 84 feet of pay thickness. I estimated the cost of drilling and completing a dual completion as $900,000, and Pure put a million one hundred thousand dollars down on their Exhibit 11, which I think is unreasonably high, so that taking the present worth profit to investment ratio, a Wolfcamp-Atoka dual completion would have a ratio of 7.2 to 1, which would be a real bonanza investment.

Q Dr. Kaveler, isn't it true that even if you used Pure's well costs you would still come out with roughly seven to one?

A Yes. The difference between nine hundred and a million one wouldn't be too big an area of disagreement. I am pretty sure that after a few more wells are drilled out there that even this $900,000-figure will be substantially reduced, and going back to our Exhibit No. 1, even on 320-acre spacing a Wolfcamp-Atoka dual would be a very attractive investment, returning $3.35 of profit for each dollar invested.



Q What would you consider to be the most likely program of development for this area? Pure advanced, as I recall, that it would be a Wolfcamp-Devonian dual completion.

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What would be your opinion on this?

A I doubt very much that one would go out there and drill a Devonian well and then complete it in the Wolfcamp and Devonian. If they did the Pennsylvanian reserve would be recoverable from that well too, so that the reserve of all three sections would be attributable to the so-called Wolfcamp-Devonian completion. That's the reason that the Exhibit 2 that I'm presenting, I don't think is particularly significant because I doubt very much that one would go out there and drill a Wolfcamp-Devonian well and not utilize that well ultimately to produce from the Pennsylvanian, but on Exhibit 2 my conclusion is that the pay thickness in the Devonian is 62 feet rather than 42 as set by Pure. There's no doubt but what there's a gas-water contact in the Devonian.

Q Again, the other data is the same data as was used by Pure?

A Comparable. I used a well investment of a million one fifty as compared to Pure's Exhibit 7, as I've got it marked, a million four hundred sixty thousand, and even if one drilled a well to the Devonian and credited only the Wolfcamp and Devonian reserves to that well, one would get four dollars present worth value for each dollar invested, which would be a very prudent investment.

On 320-acre spacing the 1.76 profit to investment ratio

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wouldn't be too attractive, but one would nevertheless not engage in that type of completion anyway. If one talks about producing the Devonian, you are going to have to take into account the substantial reserve in the Mississippian and the Atoka. I would say it's a little hard to decide today what is the prudent way of developing this field.

A number of people looking at the problem with whom I discussed it thought that due to the super pressure in the Devonian formation, the high pressure, that a prudent way to develop this field would be to drill Wolfcamp wells and produce the Wolfcamp to the extent that the pressure --

Q Excuse me, you said excessive pressure in the Devonian. Is the Devonian the high pressure?

A Pardon me, excessive pressure in the Wolfcamp. Thank you. And drill the Wolfcamp and produce it and then when the pressure gets down to normal and there's no mechanical problems presented in the drilling, one could go back into the well and deepen it to the Pennsylvanian and the Devonian. I see no merit in debating here because there have to be some additional wells drilled before a decision could be made as to what is to the best interest of all parties.

Q In view of these economic evaluations which you have made, would you be able to conclude whether a prudent operator would drill and develop on the basis of the existing

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spacing?

A Well, I would say that there's no basis for saying now that the Wolfcamp should be drilled on 160. So I would like to answer your question in what I regard as a practical problem which the industry faces in this field. The 320-acre, 160-acre statewide rule is always, I think, regarded as a temporary rule and it is my opinion this field development can go forward based upon the existing statewide rules and a well can be drilled in each section within the provisions of the statewide rules, and after four or five wells are drilled there will be enough information at hand for the Commission then to decide whether an exception should be granted to the statewide rule.

In my opinion there's nobody out there who is going to find himself in a position of drilling two or three wells to a section. Practically all this field is already placed in the one unit. There's an undivided interest. The only diversity of ownership, particularly in the area that they're asking for spacing on now, is in the North Half of Section 5. That's the only diversity of ownership; Pure and its partners have no problem of meeting obligations to drill, and in my opinion until more information is had, no one would be in the position to demand that two or three or four wells be drilled in a section of land.

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Therefore, it's my conclusion that the statewide rules can remain in effect, that people can go forward and meet their obligations, particularly the obligations in respect to the unit itself and the obligations in respect to the diversity of ownership, and there would be no waste created of any kind, and enough information would then ultimately be made available to the Commission to permit the Commission to decide whether or not an exception to the statewide rule is justified.

Q Have you read the unit agreement for the Red Hills Unit?

A Yes, it's a standard federal agreement.

Q What is the nature of this type of unit? Is it a unitized management?

A Well, we don't have enough words to really classify it, so we use the word unit, but it is not a unit formed for operating purposes. It is a unit formed for exploration, and those people who like to lay their cards on the table and say "Well, we'll gamble with you on a straight acreage basis and find out whether there's anything here," they're engaged in exploration.

Other people who decide that they're not adapted to exploration, and they decide that they'll just wait and some day find out by some means or another whether there's any hydrocarbon under their land. In this instance Pure Oil

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Company came in as close as they possibly could and proved without doubt that there's recoverable hydrocarbon in substantial quantity in the North Half of 5.

The owners in the North Half of 5 no longer have an exploration problem. Their problem is development. In my opinion they should not be forced, driven or compelled to join in further exploration of the Red Hills field, which in my opinion a granting of the exception to the statewide rule right now would impose on them. I make that statement and that conclusion particularly because I am convinced that in any event the correlative rights of the owners in the North Half of 5 cannot be protected unless a well is drilled as an exception to the pattern that the applicant is asking for.

So what is accomplished by granting a 640-acre spacing at this time? In my opinion it's a violation of the correlative rights of the owners in the North Half of 5, who without any force had their lands proven to be highly productive by an imprudent conduct of the offset operator and it would give the Commission a chance to determine whether it's in the best interest of the State of New Mexico and all parties to have this field developed on some spacing other than statewide.

Q Dr. Kaveler, have you studied Exhibit 1-A, which is the representation of seismic information that Pure had

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available to it prior to drilling the well?

A Yes. That exhibit was not a seismic. It was a geologic interpretation of the seismic data. So it's a geologic map and I'm holding up Exhibit 1-A now.

Q Does it contain any information which is not shown on Pure's Exhibit 1 which they say is their adjusted information now?

A Yes, the Exhibit No. 1 is a contour of the, I think they call it the Pennsylvanian reflection interval. There's substantial difference in the interpretation of those two exhibits because the first exhibit, 1-B, shows very major faulting running up and down the east and west side of this field. That is not relfected on the second exhibit, and I think it would be reasonable to conclude that Mother Nature wasn't kind enough to make just these two faults in this area. There's probably secondary faults on the other faults at least, and one does not know where those faults are. They might even be cross faults in the South Half of Section 5, might be south of a major fault and actually be non-productive; that could apply to other sections.



Q Would this first well have been sufficient, would it have provided sufficient information to show that these faults as shown on the exhibit prior to drilling the well were no longer in existence?

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A No. If they were drawn on the first map they certainly would have to be on the second. As far as my views are concerned, in a highly faulted area like that it is pretty hard to decide what is the productive area and what isn't the productive area.

Q The fact of the matter is, there's not sufficient information at the present time to determine whether there is or is not additional faulting or any faulting?

A That's right, or to determine the size of this pool.

Q In your opinion is the Red Hills No. 1 Unit draining substantial quantities of gas from the North Half of Section 5?

A Well, half of the gas that comes out of the tubing passes through, over, comes from the North Half of Section 5. I don't think there's any dispute on that statement.

Q Is there uncompensated drainage occurring at the present time?

A Yes.

Q Under Pure's application proposing 640-acre spacing and special field rules, would there still be uncompensated drainage occurring?



A In my opinion yes, or at least there could be a very high probability if the owners of the North Half of 5 were forced to go down and drill a wildcat in the center of 5 they might get a weak sister or they might be outside of the pool

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altogether.

Q You refer to going down and drilling a wildcat in the center of Section 5. You mean that in the technical terms of a wildcat as set forth in the rules of the Commission?

A I don't think so. If the Commission spaced six sections, that would not be a wildcat within the purview of the Commission rules, but as a matter of fact, it would be a wildcat because there's no proof that a location at the center of 5 would be productive.

Q How, then, would you distinguish between an exploratory and a development well?

A Well, I think a development well is one that is drilled on land where there's a high probability or a high reasonable expectation that it would be productive of commercial quantities. When Pure drilled a ten acre offset to 320 acres and got a real good well, I think they proved the 320 acres south of their well to be reasonably productive.

Q Would a reasonably prudent operator have drilled on such a location?

A No, sir.

Q Should they have considered orderly development when they first decided where they were going to locate their well?

A Yes, I think they should have anticipated this

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problem, particularly since Mr. Henry stated what I think was a reasonable conclusion, and that is he expected to discover a gas field here, so he expected that. I think that the drilling of the wildcat in the center of 32 would have been a much more prudent action on the part of Pure Oil Company.

Q Based on the seismic data that they had available at that time, would it have made a substantial difference had they located in the center of Section 32?

A No, sir. Seismic interpretation isn't that precise, even though one might attach significance to trivial things. There was no basis whatever for saying that this pool is exactly here.

Q What would be your recommendation for protecting correlative rights of the protestants, Mr. Schuman and Mr. Yager?

A Well, I would recommend to the Commission that they deny the request for the so-called temporary 640-acre spacing, let the existing statewide rules remain in effect, and direct that the well to be drilled in the North Half of Section 5 be located at least within 660 feet of the north line and beyond that I'd just add 660 feet east or west of the center line of 5, and by specifying that location I think the owners are given a reasonable chance to protect their correlative rights.

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Q Would this work undue hardship on the applicant?

A No.

Q Why do you arrive at this conclusion?

A Well, the applicant can have only one of two interests. He can have a very selfish interest and say "Let's increase this pool on a high profit basis. Let's get 640 now," or the applicant can go in and say, "Well, in the interest of conservation we'll go in and drill a few more wells to further define this pool," and they can do that without having the burden of drilling unnecessary wells, because about the only tract of land is the North Half of 5, a well is drilled on that, then all the leases are held and they can go off in the federal unit and drill wherever they please, subject to the United States Geological Survey approval, and everything then would be at a status quo until enough information is had so that the Commission could in good judgment decide what the spacing should be.

Q Well, if this Commission left the present rules as they are, Pure would not have to develop on 320-acre spacing within the federal unit?

A I don't know what the Director of the United States Geological Survey would say.

Q Would they be required under the unit agreement?

A No, I don't think so. I think the United States

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Geological Survey decides what's to be done, the boys who are in the unit have to submit a plan and it can be approved or disapproved.

Q Has the Director of the United States Geological Survey made a statement that he was in favor of 640 spacing?

A Yes, he made that statement. I don't know whether he analyzed the data or not.

Q One minor point, Dr. Kaveler, back some time ago you referred to the Atoka-Mississippian. Is the Atoka in fact in the Mississippian?

A No, it's Pennsylvanian. Thank you for correcting me.

MR. PRAY: I believe we have no further questions.

MR. PORTER: Do you want to offer your exhibits?

MR. PRAY: Yes, we will offer our Exhibits 1, 2 and 3 at this time.

MR. PORTER: The exhibits will be admitted.

(Whereupon, Exhibits 1, 2 and 3 were offered and admitted in evidence.)



MR. PORTER: We'll have a short recess.

(Whereupon, a recess was taken.)

MR. PORTER: The hearing will come to order, please. Does anyone have any questions of the witness?

MR. MORRIS: Yes.

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MR. PORTER: Mr. Morris.

CROSS EXAMINATION

BY MR. MORRIS:

Q Dr. Kaveler, you have stated in your Exhibits 1, 2 and 3 a pay thickness for each of the three zones which is at some variance from the figures used by The Pure Oil Company. I'm wondering if you could go through your notes as to each of these formations and tell us exactly what intervals you have picked as net pay?

A Yes, I could. And now if we start with the Wolfcamp zone --

MR. NUTTER: What log are you on, Dr. Kaveler?

A Wellex gamma ray neutron, which was a part of Pure's Exhibit 2 on the Wolfcamp zone. It was a log on the right-hand side. If we compare Pure's exhibit which they have used to estimate pay thickness, we discover that Pure dealt with about 250 feet of pay section out of the total interval which ran from 11,600 feet down through 14,300 feet. So there's 3,000 feet of Wolfcamp pay section which Pure regard as being productive only over a 200-foot interval.

Now, if one takes Pure's Exhibit 2 and the testimony of Mr. Henry, you recognize that any conclusion about pay section is limited because of the fact that all you have in the Wolfcamp zone is gamma ray neutron --

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MR. PORTER: Could we raise that exhibit a little bit?

A Sure. Pure Oil Company ran a drill stem test in the Wolfcamp -- I should have finished my other statement. These logs are limited in definition because they were made in casing and it's bad enough to have to use a gamma ray neutron curve in an open hole and low porosity limestone. Gamma ray neutron is not the best means to evaluate low porosity limestone, but nevertheless that's all we had, and furthermore, it was run through, inside a casing which also limits the definition by this zone.

So you start out with then the Pure Oil Company ran a drill stem test in the Wolfcamp down to, as I see it standing here, about 12,050 feet, which showed that that upper part of the Wolfcamp was not productive.

Then it's obvious down through the section down to about 12,900 that this is a predominantly shaly limestone, non-productive. Now, Pure Oil Company also ran a drill stem test which is set out on their Exhibit 2 covering the interval 12,940 down to 13,499, and on that drill stem test which included only seven feet of the pay that Pure said was present on their Exhibit 2, Pure picked only seven feet of pay in that interval. Yet on that drill stem test this well produced twelve million cubic feet a day. That's a little

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unusual in my opinion to find seven feet of low porosity, low permeability pay capable of producing twelve million cubic feet on drill stem test.

Q What did you pick in that area, Dr. Kaveler?

A I picked in that area, see if I can find my notes--I'll observe further that the drilling report made available to us made a show of gas at 13,500, so I picked pay interval up there which met all the criteria that Pure used in picking the 28 feet between 13,500 and 13,700.

Without getting into detail one can draw two red lines, as I have done on this chart; the line to the left on the right side is the base of the shale, the line to the right on the right side is the neutron measure attributed to dense, non-productive limestone. In between those two lines there's a variation in porosity from one percent to as high as ten percent so that one can go and count up from 13,500 and pick a thickness, which I can give you in more detail if you would like.

Q (By Mr. Morris) My original question, Dr. Kaveler, was whether you could give us the intervals in footages that you have picked in order to arrive at your total of 80 feet of net pay in this formation.

A Yes, I can. At 13,100 feet, which is in this area of this upper drill stem test, at 13,100 there's ten feet of

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pay. That bulge right there compares in every respect to the bulge down here at thirteen one and thirteen seven. At 13,180 there's five feet of pay. Between 13,400 and 13,500 which is down in the region where Pure picked seven feet, I picked a total of about seventy feet instead of seven.

All of those bulges in that interval down to thirteen five, which correspond to the bulges that Pure attributed seven feet to. Then below thirteen five, at thirteen six hundred I attributed the 22 feet between 13,600 and 13,622. At 13,640 I attributed seven feet, which is below the 19-foot mark that Pure picked there. That added altogether along with Pure's 28 feet, add up to 80.

If one wanted to go farther he could reach up into the upper part and pick sections and end up with a hundred feet if he wanted to go to the extreme.

Q So from what you have just said, Dr. Kaveler, depending on how you look at it, you could pick one hundred feet here or as you picked, eighty feet, or you could take a more conservative viewpoint perhaps and pick less, is that correct?

A And you could take an ultraconservative viewpoint and pick little.

Q Could you give us the intervals in which you picked net pay in the Pennsylvanian and Devonian formations,

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please?

A I have those marked on this exhibit.

Q Dr. Kaveler, before you take that down I wonder if you could give us any kind of a breakdown as to where you got the 70 feet of pay between 13,400 and 13,500.

A Did I say 70?

Q Yes.

A I should have said between 13,400 and 13,650. I'll give you the numbers I have. You can check my figures.

Q Dr. Kaveler, then you've got another interval from 13,600 to 13,622 that you picked 22 feet of net pay so we don't want to lap over into that area.

A Well, 13,600, 13,622, using this Wellex log, 22 feet of pay and Pure attributed 19 feet in that interval.

Q Yes, but before you got to that particular depth you had said earlier that you had picked an interval in which you found 70 feet of net pay and that that was where we had only found seven.

A I may have been trying to be too hasty. Beginning at 13,420 I'll give you the thickness that I picked.

Q Fine.

A Four feet and then two feet; four feet, that makes ten, and then eight feet is eighteen and seven feet is twenty-five, and two feet is twenty-seven, two feet is twenty-

nine, two feet is thirty-one, two feet, thirty-three, three feet, thirty-six, twenty-two feet make it fifty-eight, and seven feet at 13,640 makes it what, seventy-five?

GOVERNOR CAMPBELL: Sixty-five.

A Sixty-five, thank you. So between the interval 13,400 and 13,650 I picked 75 feet of pay.

GOVERNOR CAMPBELL: Sixty-five.

A Sixty-five, thank you.

Q (By Mr. Morris) Dr. Kaveler, where in that interval that you were just referring to is the depth of 13,471 feet?

A 13,471?

Q Yes.

A Where is it?

Q Yes, in other words, you gave us nine or ten different footages in there. Could you just tell us where in there that depth would be?

A The seven foot thickness that I mentioned?

Q Yes, sir.

A That is between 13,482 and 489, which is the interval where Pure picked about eight feet.

Q Then the eight feet immediately, that you picked immediately above that, would that be at a lesser depth than 13,471?

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A The eight feet that I picked was between 13,468 to 76.

Q Thank you.

A I would be glad to let you have this.

Q No, I think that will be sufficient, Doctor. Thank you. Could you give us the intervals in the other formations where you picked the net pay?

A Yes. In respect to the Atoka formation, using Pure's Exhibit 3, and the gamma ray neutron log on that exhibit, Pure picked a total of 42 feet of net pay, 30 feet between 14,830 and 850, which I concur in is productive pay.

Then above that point of 30 feet I picked a two-foot interval at 14,795 and then I picked about 55 feet between 14,706 and 14,762, and then at 14,680 I picked an eight foot pay section. That brought me to the point where Pure had picked a three-foot interval and a nine-foot interval below the 14,650 and 14,672, I included that in my account and I picked about 14 feet between 14,622 and 14,636, picked about 12 feet between 14,600 and 14,612, picked about four feet between 14,582 to 87; shown in red on this curve, which I'd be glad to give you.

Q What was the first interval that you picked there, Doctor?

A That was the same interval that Pure picked on

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their Exhibit 3.

Q I believe you said 14,830 to 14,850?

A There must be something wrong with my language today. The first 30 feet is between 14,830 and 14,850. Yes, in that interval.

Q That wouldn't be 30 feet, would it, though?

A I beg your pardon.

Q That wouldn't be 30 feet, that would just be 20 feet.

A Well, it's marked 30 feet on Exhibit 3 of Pure. Do you want to see it?

Q No, I'm just asking you what your picks were, that's all.

A It's marked 30 feet on Pure's exhibit, and I accepted that.

Q Adding up what you have given us here, we strike a total of 123 feet.

A If you want to squabble, I testified that the pay section in there is 82 feet.

Q Yes.

A You've asked me to read this off under kind of difficult conditions. So whatever your addition is, I do not agree with. I say 82 feet of pay in the interval I outlined to you.

Q Fine. Would you give us the interval now in the Devonian, please?

A In the Devonian I attributed pay section to the interval between 7,658 and 783, which is below the cement plug which was set, but which is above what appeared to me to be the water and gas contact and, therefore, is recoverable in this fractured limestone. Then I accepted Pure's figures of, as I go along, I picked six feet of pay at 17,634 to, pardon me, 17,624 to 17,630. I picked about ten feet of pay at 17,568 to 578. I accepted Pure's estimates on their exhibit, which was Exhibit 4. So I ended up with higher pay thickness than did Pure, 62 feet.

Q In picking the net pay in the Pennsylvanian and Devonian formations, did you attempt to correlate the sonic log and microlog to see how they confirmed each other?

A Yes, to the extent it is possible. Microlog is almost useless in this area as one would expect it to be when a microlog is used in a limestone reservoir of this quality. The sonic log is also not a very useful tool in limestone formations of this type. Therefore, we find ourselves in the position of having to rely almost entirely on the gamma ray neutron curve which itself is not taken under favorable conditions.

Q Dr. Kaveler, I believe you said on March the 5th

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that you had occasion to visit the subject well, and that you noticed 5,000 pounds of pressure on the Pennsylvanian formation?

A That's right, on the tubing at the surface.

Q At the tubing on the surface. In making that observation did you bleed off the pressure --

A No, the switcher said if you bleed it off it will go right down, it won't flow but it will build up all the time.

Q Were you aware, Dr. Kaveler, that Pure Oil Company had placed water in the tubing and had placed a pressure upon that tubing to maintain it at 5,000 pounds?

A No, I wasn't aware of that.

MR. MORRIS: I have no further questions.

MR. PORTER: Does anyone else have a question?

MR. PRAY: I have several.

REDIRECT EXAMINATION

BY MR. PRAY:

Q In the event these footages add up to be more than shown in your exhibit, would you have an explanation for what this little plus sign means on your exhibits?

A The plus on my Exhibits 1, 2 and 3 are there to show that one could go farther and attribute even more pay based upon the criteria that we're forced to use.

MR. PRAY: No further questions.

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MR. MORRIS: One further question.

MR. PORTER: Mr. Morris.

RECROSS EXAMINATION

BY MR. MORRIS:

Q In evaluating the Wolfcamp reserves, what bottom hole pressure did you use?

A I used the bottom hole pressure presented by Pure on their Exhibit 5.

Q Do you have that figure?

A 11,304.

Q Did you attribute that pressure to the entire interval that you had picked as net pay?

A Yes, because there's no evidence that it's any different.

MR. MORRIS: Thank you.

MR. PORTER: Does anyone else have a question of Dr. Kaveler? The witness may be excused.

(Witness excused.)

MR. PRAY: We have no further witnesses to present at this time, if the Commission please, and we would ask if the Commission would like to hear argument on the matter of the applications at this time.

MR. PORTER: Mr. Morris.

MR. MORRIS: We will have some rebuttal testimony

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to present, if the Commission will allow us to do so. I think we can keep it rather brief.

MR. PORTER: Mr. Morris, will you have your witness come forward?

MR. MORRIS: May I have just a minute, please?

MR. PORTER: Mr. Morris.

MR. MORRIS: We would call Mr. John Murphey, please.

MR. PORTER: Will you just have the one witness?

MR. MORRIS: Yes.

(Witness sworn.)

JOHN R. MURPHEY, JR.

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

DIRECT EXAMINATION

BY MR. MORRIS:

Q Mr. Murphey, please state your name, by whom you are employed, what position you hold and where you are located.

A My name is John R. Murphey, Junior, M-u-r-p-h-e-y. I am employed by The Pure Oil Company as District Petroleum Engineer, Midland District. I graduated from Louisiana State University with a B. S. degree in petroleum engineering in 1952. I worked with Pure Oil Company for over eleven years, of which ten of it has been in the West Texas area.

Q Are you familiar with the Red Hills Unit Well No. 1,

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Mr. Murphey?

A I am.

Q What part have you played in the drilling and operation of this well?

A I was responsible for the engineering design of the drilling program for the initial well as well as the continued engineering surveillance of the well during its drilling and completion. I spent a large amount of time on the ground at the well during the various operations that have been conducted.

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

MR. PORTER: Yes, sir.

Q Mr. Murphey, were you present in the hearing room when Dr. Kaveler testified that he applied an 11,000-pound bottom hole pressure throughout the entire interval of the Wolfcamp formation in his evaluation of the net pay in that formation?

A I was.

Q Is it significant to you that Dr. Kaveler had used 11,000 pounds throughout this interval?

A Yes, sir, it is.

Q In what way?

A In drilling of this well we were using a mud system,

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the weight of which never exceeded nine and a half pounds until we reached the depth of 13,471. The gradient or the pressure that this mud column would exert is approximately 6700 pounds. The well did not blow out on us when we were drilling these zones, therefore the bottom hole pressure in 15 foot of pay that Dr. Kaveler has utilized in his economics could not exceed the 6700 pounds or so that the hydrostatic head of the mud column exerted.

Q What was that interval that could not be considered?

A The intervals which could not be considered are those pointed out by Dr. Kaveler at 13,100 feet, 13,180 feet and then a total of ten feet in the interval of 13,400 down to 13,471.

Q Why is the depth of 13,471 significant?

A This was the point at which we encountered a drilling break and the well started kicking on us and we encountered our first high pressure gas and the porosity in the Wolfcamp.

Q Mr. Murphey, you ran several drill stem tests in the Pennsylvanian and in the Devonian formations, did you not?

A Yes, sir, we did.

Q Did any of those drill stem tests have a bearing upon Dr. Kaveler's pick of net pay in those areas?

A Yes, sir, they did.

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Q In what manner?

A That some of the -- well, one fact that we observed from drill stem testing in the Pennsylvanian was that if an interval didn't exhibit a mud cake buildup or indication of microlog separation in addition to sonic porosity, the formation would not yield gas. This was proved conclusively on three separate tests within the Pennsylvanian interval.

Q What about the Devonian interval?

A In the Devonian, the lower portion of the interval that Dr. Kaveler has stated as being productive, was in an interval that we perforated and pumped into and were unable to recover any hydrocarbons from this interval.

Q Mr. Murphey, in examining Pure Exhibit No. 13 concerning the economic calculations of a Wolfcamp single completion, Dr. Kaveler has stated that he didn't know how Pure got the figure of 10.065 billion cubic feet as the gas reserves in that formation. Could you explain how that figure was obtained?

A This was based on a volumetric estimate of the gas in place with the 11,300 plus bottom hole pressure; 28 feet of pay, 640, and with the permeability we had from the buildup test we made a prediction as to what we felt would be the recoverable gas from this interval. This ten billion is what we felt would be the recoverable gas.

Q This is not, then, the gas in place, this is your estimate of the recoverable gas?

A Yes, sir, it is.

Q Some question has also been raised, Mr. Murphey, as to how the figure of $146.00 per million cubic feet was obtained from which there has been calculated on Exhibit 13 the net gas revenue for the Wolfcamp formation. Could you explain the reason we used that figure?

A We took what we considered to be an average price over the life of the contract of 18.2 cents per Mcf for the gas produced from the field, and to this we applied the gross to net ratio of 80% and this comes up to 14.6 cents per Mcf, or $146.00 per million.

Q If you apply the 20% reduction, it wouldn't come to one forty-six. It would come to one forty-one, wouldn't it, Mr. Murphey?

A No, sir, not on the Wolfcamp.

Q Excuse me. Would you explain the reason for applying the 80% net to gross ratio?

A The basis that we did this on was that we took the 100%, subtracted from it a 12-1/2% basic royalty, subtracted from it a 4-1/2% tax burden, which is applicable to the working interest, which came up to a total of 17%. This left a total of 3% to cover the operating costs through the life of the

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well and the overrides which are on the wells in the drilling unit.

Q What is your understanding, Mr. Murphey, as to the tax burden that is on production?

A The tax burden is slightly greater, 5%, through three separate taxes, and the operating portion of this came out to 4-1/2%, or slightly above it. We rounded it off to 4-1/2.

Q If you know, Mr. Murphey, would you state how you are informed with respect to the taxes that are applicable to production?

A These were gone over with counsel and we examined the statutes and looked up the various taxes that are applicable against production and there were four taxes which are applicable against production, the burden of 2.55%, under the Oil and Gas Emergency School Tax Act, 2.5% under the Oil and Gas Severance Tax Act, .14% under the Oil and Gas Conservation Tax Act. In addition there is an Oil and Gas ad valorem production tax at different rates by the individual counties in which the production is located. We didn't utilize this in obtaining the tax burden on it. The other taxes add up to 5.19%.

Q Mr. Murphey, your Exhibit 13 shows that you've used $2.00 per barrel for the liquid revenues in the Wolfcamp. Would you care to comment on that figure?

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A Yes, sir, this was the value we assumed before we had a firm sale on these products. Since we have obtained a firm sale and have bills on it, the net which the operator gets now is $2.13 a barrel. The base price from which we start is $2.79 less thirteen cents a barrel hauling, giving a two sixty-six net to the operator, and to this we again applied our 80% net to gross ratio, which came up to a total of $2.13 net to the operators on the liquids.

Q Mr. Murphey, have you participated directly in the preparation of Exhibits 6 through 13? And to refresh your recollection I will identify those. Exhibit No. 6 was the well cost estimate of a Wolfcamp-Devonian dual completion, Exhibit 7 was the economic calculations for that type of a well, Exhibit 8 was the well cost estimate of a Wolfcamp-Devonian-Pennsylvanian triple, and Exhibit No. 9 was an economic calculation for that type of well, Exhibit 10 was a well cost estimate of a Wolfcamp-Pennsylvanian dual, and Exhibit 11 was an economic calculation for that type of well, Exhibit 12 was a well cost estimate on a Wolfcamp single completion, and Exhibit 13 was an economic calculation for that type of well. Are you familiar with those exhibits and did you participate in their preparation?

A I am and I did.

Q Can you state whether you have an opinion

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concerning the accuracy and reasonableness of the figures contained in those exhibits?

MR. PRAY: Objection. We believe this is not proper rebuttal, that this matter was not gone into in our case as to each one of the exhibits. We think it would be improper to try to bolster the testimony they presented on their direct examination.

MR. MORRIS: If the Commission please, there has been an overall attack on our economic presentation. Mr. Murphey, I hope, will have an opinion that will serve to bolster our position in that regard.

GOVERNOR CAMPBELL: You feel reasonably certain about that, do you?

A Yes, sir.

MR. PORTER: Objection overruled.

A Yes, sir, I believe that the numbers used here are reasonable.

Q (By Mr. Morris) Based upon these exhibits, Mr. Murphey, would development be justified in the Red Hills area in your opinion on less than 640-acre spacing and in the three pools under consideration?

A No, sir, it would not.

MR. MORRIS: I have no further questions.

CROSS EXAMINATION

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BY MR. PRAY:

Q Mr. Murphey, you stated that on drilling the well that you had one gradient of mud and then you had a changeover at some later date around 13,471 feet. This occurred within the Wolfcamp formation, did it?

A Yes, sir, it did.

Q So that in your opinion there are two different pressure zones within the Wolfcamp?

A I'm not sure if there were two different pressure zones. All I know is there is not sufficient porosity above 13,471 to yield any fluid.

Q Well, if there were two different pressure zones, would this then indicate that there were two separate common sources of supply in the Wolfcamp?

A If the pressures were completely different it could indicate that.

Q Well, the fact that you went from something like 9.7 pound mud to 16 pound mud, you are basing this as your conclusion that there is a different pressure up above and that this was the line of questioning that perhaps Dr. Kaveler should have used a little different pressure in dealing with these particular footages up above, wasn't that the course of testimony?

A I'm not --

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Q That there were two different pressures that he should have taken into account?

A I stated that the zone above that couldn't have had sufficient pressure or that the 11,000-pound pressure, or it would have unloaded the hole if it had had any productive permeability to it.

Q Your drill stem test No. 4, do you have that information before you?

A What was the date on that, please?

Q I don't have the date. I can give you the depths.

A That will be fine.

Q 12,650 to 13,499.

A What was that bottom depth again?

Q 13,499.

A Yes, sir.

Q Then does this interval include this upper zone, 13,100, 13,180, 13,400, which you testified as low pressure? Does this drill stem test cover this interval?

A It was open to the well bore because at the time we run the casing we were unable to get the casing below the twelve thousand some hundred feet.

Q Did you testify that this interval that you took exception with Dr. Kaveler was included in this drill stem test?

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A Yes, it is.

Q What was the final pressure on that drill stem test?

A The final shut-in pressure on Test No. 4 was 10,400 pounds on one clock in two hours, 9,915 on the other one in fifty-five minutes.

Q Would that then indicate that the pressure in the zone which was drill stem tested was the same as the pressure in the lower portion of the Wolfcamp?

A I don't think it would conclusively prove that that total --

Q But it would be a reasonable conclusion?

A No, I don't think so.

Q You don't think it's a reasonable conclusion?

A No, I don't think you could have drilled it with nine and a half pound mud.

Q I am sorry.

A I don't think you could have drilled it with nine and a half pound mud if it had that type of pressure.

Q You testified as to some sort of tests on the Pennsylvanian, you said you had three separate tests which indicated something about pressures and the productivity of some of this net pay. Would you be a little more specific? I don't know what you are talking about.

A I don't think that I stated that it indicated

pressures. I stated that there was a relationship between porosity as shown by the sonic or neutron curve and the microlog, that unless you had an indication of porosity and a buildup on the microlog, that there would not be production from that interval. We tested several of them separately and did not get gas from those that did not have a microlog buildup.

Q What were those separate tests?

A If you'll excuse me and let me get my drill stem test charts.

Q All right. You don't need to go into detail. If you would give me the numbers of your drill stem tests.

A Some of these tests may not have had a bomb in the hole because of the mechanical problems we may have encountered, we were attempting to perforate through tubing on some of them so we didn't have bombs on them, but I will give you those intervals. The lower interval we perforated was from 15,530 up to 15,442. We pumped into this formation, broke it down, bled back to zero, had water on it and we recovered no hydrocarbons.

Q Did you run a pressure bomb on that interval?

A No, sir, we did not.

Q What was the other test? Was that a numbered drill stem test?

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A No, sir, there's not a number on any of them that do not have a pressure recording on them.

Q Well, then, was that test introduced into evidence and made available to us?

A It was entered on the exhibit I believe. It was a portion of the drilling report which you had access to.

Q The daily drilling report?

A Yes.

Q We have not had the daily drilling report. Let's move on. You testified that Pure Exhibit No. 13, the economics of the Wolfcamp single completion and reserves that Pure came up with were 10.065 billion cubic feet. Is this a volumetric calculation?

A We made -- this is what we calculated to be the recoverable gas from a volumetric.

Q But it's not pure volumetric, is it?

A No, sir, it is not.

Q You testified that you made a prediction as to what you felt would be a reasonable recovery, is that true?

A We made an extrapolation of what we felt was the proper producing rate with the reservoir parameters that we had, and this was the amount of gas that we recovered from this well.

Q Mr. Murphey, at this early stage of development

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with the limited production history which you have, is it sound engineering practice to make a prediction as to the future reserve based on other than volumetric calculations?

A I think it is as sound to try to make a flow calculation approach as it is to apply flat percentage of the volumetric to it.

Q Is this what you would call a material balance type of calculation?

A No, sir, it is not. It is based upon a pressure production history, but there was no attempt to make a material balance per se.

Q What you did is you projected some sort of pressure history in the future, did you not?

A We did this.

Q Is this a usual procedure for sound engineering practices?

A I can't say that it's usual for other people. We do it for ourselves.

Q How long had this well been producing at the time that you made this calculation?

A It had not.

Q So before you even have any production history as to what the pressure is going to do, you predict what it will do over the next twenty years?

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A We had the testing data on it which indicated to us the deliverability, the permeability, the parameters that we utilized in our prediction.

Q Moving on, this $146.00 for MMcf, using your gross to net ratio, you take out the royalty at that point, is that correct, the 12-1/2% royalty?

A The value shown here has out the royalty, the operator's portion of the severance taxes or all tax burdens on it, the operating cost and the overriding royalty.

Q The operating cost?

A Yes, sir.

Q Well, then, really you wouldn't arrive at a much different figure than Dr. Kaveler has used because you see Dr. Kaveler takes out the royalty interest before he uses that figure, he takes out the operating cost below and takes out the production tax in addition to that. So really it's just a difference of how you approached setting forth your exhibit, isn't that correct?

A Well, I can't state that, sir, since I didn't have access to Dr. Kaveler's exhibit awhile ago to calculate it out. He did state, however, that he only took out a two percent production tax.

Q That is where you differ. You have four and a half, he has two. Did you not take out some three percent for

overriding royalties or some other figure?

A We took out a three percent for combination of overrides and operating cost.

Q But you see, Dr. Kaveler then below takes out operating cost additional, so it really boils down to about the same thing.

MR. PRAY: I don't believe we have any further questions.

MR. PORTER: Does anyone else have a question of Mr. Murphey? He may be excused.

(Witness excused.)

MR. PORTER: Any further testimony to be presented?

MR. MORRIS: We have no further rebuttal.

MR. PRAY: We have no further testimony.

MR. PORTER: At this time the Commission will hear whatever statements you have.

MR. RUSSELL: If the Commission please, I would like to state that we, of course, have no objection to statements being made in the case by any interested party as to the position, but in the event they get into the realm of giving testimony, we would ask that they be sworn and give it under oath.

MR. PORTER: Mr. Morris.

MR. MORRIS: May it please the Commission, a brief

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history of this well I think would be in order to fully evaluate our present situation and the decision that must be made here by the Commission in the establishment of special rules for these pools.

The Red Hills Unit area in which this well was drilled was formed in 1962, the unit agreement approved by the Commission on October the 31st of 1962 by Order No. R-2350, and as the Commission records will show, The Pure Oil Company in presenting its case to the Commission showed to the Commission that its primary objective for the Red Hills Unit Well No. 1 was the Devonian formation.

At that time we introduced into evidence a plat which has become Exhibit 1-A in this case showing our best view of the Devonian formation at that time. It shows the high point on that map as being in Section 32 where the Red Hills well was located, and Mr. Henry, in his testimony in this case a month ago, pointed out that the Red Hills Unit Well No. 1 was drilled on the highest shot point in Section 32; that the 330-foot location that we have from the south line of the section was dictated by drilling a well at the optimum point on the structure.



I don't think we have to argue too much to this Commission to point out that when you are getting ready to drill a deep well and spend the kind of money that was going

to be spent on this well that you have got to drill the well at the optimum location as a duty to yourself and to your partners. The No. 1 Well took well over a year to complete, it ran a total cost of over three million dollars. I understand that the total tabulation on this is somewhere in the neighborhood of three and a half million dollars for the drilling of this well. Certainly we don't say that this is a typical well in this area. We certainly hope we don't run into well costs of that sort in future wells, but still it is evidence of the terrific risk involved in the drilling of deep wells in this area.

I believe this was the deepest well that has ever been drilled in the State of New Mexico. Unfortunately it was not productive at total depth, but The Pure Oil Company in the drilling of the well ran drill stem tests. It logged the well, it tested the formations that were indicated to be potentially productive of commercial production and made further tests in the Devonian, Pennsylvanian and Wolfcamp.

Now, the Commission, upon the application of Pure, already has created pools for the Pennsylvanian and the Wolfcamp formations. In this hearing we are asking that the Commission create a pool for Devonian production and establish special rules and regulations in all three of the formations involved. Certainly we feel that the Commission should

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establish the Devonian pool with the same horizontal limits as the Pennsylvanian and Wolfcamp pools and that the same special rules and regulations should be established for each of these three pools. We don't really know where we are in the Pennsylvanian formation. Mr. Weyler testified a month ago concerning the difficulties that the Commission has had in the Pennsylvanian.

It started off looking pretty good but I believe it was Mr. Weyler's testimony that he is presently of the opinion that the formation has substantially depleted. He does not attribute the difficulties with the Pennsylvanian zone to mechanical difficulties. We hope in further development in this area that the Pennsylvanian will prove to be better than we think it is right now, but it is our best estimate right now of the situation that we cannot look to the Pennsylvanian for any substantial contribution in these wells. We have to go on what our best information is right now. It looks to us at this point that further development wells in this area will be Wolfcamp-Devonian dual completions.

We have presented to the Commission several alternatives in our economics including a triple completion in the event the Pennsylvanian is found to be productive, but we are treating the Pennsylvanian as a salvage zone. I don't want to go into any detailed view of the evidence that

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was presented a month ago except to remind the Commission that our geologists and our engineers did prove to this Commission and state as their unequivocal opinion that one well in each of these formations could efficiently and economically drain an area of 640 acres.

As pointed out here again today by Mr. Murphey in his rebuttal testimony, development of this acreage on 640-acre spacing is a must. 320 acres is not feasible. We fully recognize that we are presenting to the Commission very limited information in this hearing. We are not purporting to come into this Commission and say "give us permanent rules for 640-acre spacing." We are recognizing the Commission's practices and policy, however, in asking for a temporary rule that would allow development on 640-acre spacing until more definitive proof can be obtained. We have asked for a two-year temporary order. We feel that two years is necessary in order to have, we hope, two or three more wells drilled in this area and production history on the No. 1 and additional wells from which we can come back and present to the Commission something more definite.

We feel that a temporary order will serve a very definite purpose here in preventing the drilling of unnecessary wells in this area and preventing the economic waste that would be caused by the drilling of those wells. It is an old

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saw that's been argued before this Commission many times that you can't undrill a well once it's been drilled, but it's just as true today as it was the first time someone thought it up. 640-acre rules as we have proposed them would prevent the drilling of unnecessary wells and would keep us from being faced with the drilling of wells on 320 or even 160-acre spacing during this interim period.

It seems to me that we're really not so far apart from Dr. Kaveler in some of his suggestions here except that he comes to a different conclusion, that temporary order would not be justified, but still he has stated here on the stand today that he doesn't see any reason why development can't be accomplished in this pool by one well to the section. So, in effect, he seems to be agreeing with us that there would be nothing particularly wrong with 640-acre spacing.

Now, perhaps I misquoted Dr. Kaveler, but I don't think substantially.

GOVERNOR CAMPBELL: Wasn't he saying that under the terms of the unit agreement as to the unitized acreage, it could be developed on any pattern that you chose?

MR. MORRIS: That is correct, but, of course, where you have uncommitted interest within a unit--

GOVERNOR CAMPBELL: With the exception of the uncommitted interest?

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MR. MORRIS: There are other uncommitted areas and interests in this unit. We don't know what direction this pool may take. We hope that we find a very extensive reservoir here and because of the uncommitted interests that do exist in this pool, not just here in Section 5, we feel that we need the protection of special rules and regulations to avoid being compelled to drill unnecessary wells.

I would point out to the Commission that this case is really not making history or setting any precedents before this Commission, except perhaps that it is a contested spacing case. The Commission has not had many, if any, contested spacing cases.

GOVERNOR CAMPBELL: It has had some.

MR. MORRIS: It has had some. We're not breaking any new ground by establishing 640-acre spacing or establishing well location requirements that would require a well to be placed into an interior quarter section or giving an exception to the initial well drilled in an area. Now, I point the Commission's attention to the applications of Ralph Lowe --

MR. PRAY: Objection, if the Commission please. This is not on any testimony or evidence introduced in this case and is improper argument in that respect. It is not before the Commission at this time.

MR. MORRIS: If it please the Commission, this case that I was about to refer to is in the nature of a precedent that the Commission may well take into consideration in deciding what to do in this case. The Commission's policies, as implemented in previous cases before it and in previous orders that it has entered, certainly has a bearing upon what should be done in this case. The fact that this is a contested case or involves a separate area doesn't mean that we have to consider this in a vacuum.

GOVERNOR CAMPBELL: I think the Commission is aware of that, Mr. Morris, and also of its previous rulings that would sustain your position, if that's the way the Commission decides to go.

MR. MORRIS: I will forego the argument if it would obviate any problem here. I would call to the Commission's attention -- what we're requesting here in the way of special rules is not precedent setting.

GOVERNOR CAMPBELL: There's only one difference in this, as I understand the case as it has been presented, and that is the location of the initial well. That's what has created the problem.

MR. MORRIS: That has been the primary cause of the opposition that we have.

GOVERNOR CAMPBELL: Other than that there is no

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difference between that and many cases that we hear on gas spacing and orders that have been issued.

MR. MORRIS: That is correct, Mr. Chairman. I would also point out that in many of the cases that the Commission has considered, the initial well is often located closer to the line of the section than is called for by the well location requirements that are proposed. So even in that regard this is not something new to this Commission.

For the purposes of orderly development in this reservoir we firmly believe that the Commission should adopt the rules and regulations as we have proposed them, both as to spacing and as to well location requirements. If exceptions to those rules are required in a particular circumstance, this Commission can deal with the problem then and there. Now does not seem to be the time for this Commission to dwell on exceptions to special rules and regulations because the matter is just not before it.

We respectfully urge the approval of our application and the adoption of our special rules and regulations as proposed in Exhibits 13, 14 and 15.

MR. PORTER: Mr. Pray.

MR. PRAY: If the Commission please, I do not anticipate taking any longer than Mr. Morris on my statement. There is absent from the case of Pure Oil Company four words,

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protection of correlative rights. Nowhere in the evidence, nowhere in the statements is there any mention made as to how protection of correlative rights will be afforded by the application of Pure Oil Company.

Rule 1 (b) of the Commission provides for an exception to the established rules of the Commission when the granting of such exception will not result in waste but will protect correlative rights and prevent undue hardship. The granting of an exception and granting Pure temporary rules is not justified as it will neither protect correlative rights nor is there any undue hardship to be prevented in this situation.

In fact, correlative rights will be injured by the adoption of the special field rules as it would prohibit drilling closer than 1980 feet to the Red Hills No. 1 and it would permit drilling as far away as 3,960 feet. Now, Pure's testimony is replete with statements that there's insufficient information. They say as to water saturation "we have assumed, we have no data of water saturation of 30%," as to net pay, "because we did not have all the data available that we need to pin effective net pay down." As to additional locations, I don't think this well proves anything definitely, I think you'll have to have additional well control if you move a half a mile south or two miles north.

The real question is whether a well in Section 5, in the

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center of Section 5 as required under their rules would be an exploratory well or development well, and we believe the evidence is sufficiently indefinite at this time that we can't tell what would be encountered if a well were drilled in that location, and that there would be no opportunity to protect correlative rights by a well located in this position.

As Dr. Kaveler pointed out, there would be no undue hardship on The Pure Oil Company by leaving the existing rules in force, as in the area which is being spaced by the Commission, and this is the only question before the Commission at this time, is as to these sections being spaced and for adoption of rules as to the particular eight sections.

The acreage in Section 5 is the only acreage in that area which is uncommitted to the governmental unit. Thus they would not have to drill a well on each 320 or each unit in the field nor would they have to in Section 5 until such time as additional development shows that additional wells are indicated in that, so there are no unnecessary wells that will be drilled at this time or any time in the near future.

The existing rules could stay in effect and yet it would permit a well closer than 1650 feet from the north line of Section 5 which would serve to effect the protection of the correlative rights of Mr. Schuman and Mr. Yager. If they are

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forced to go 1650 feet or 3,950 feet south of the Red Hills No. 1 there will be uncompensated drainage. There is nothing in the testimony which rebuts this proposition. As to the Pennsylvanian formation, Pure has made numerous statements that it is depleted. There is absolutely no evidence whatsoever in the record to indicate that this formation is depleted.

The statement of Mr. Morris this morning that, "Dr. Kaveler, did you know that they had loaded the tubing with water in order to build up this pressure?" that's completely unsupported by any evidence in the record. There is no evidence to indicate that the Pennsylvanian is other than a productive formation rather than a salvage zone as Pure testifies that it is. This is just another indication of Pure's presentation of their case in attempting to minimize the cost--or to maximize the cost and to minimize the recoveries in order to present as dim an economic picture as is possible.

Even Mr. Murphey, who got on the stand, didn't testify that the costs or the reserves as presented by Dr. Kaveler were in error. He just simply said his costs were reasonable in establishing Pure's case.

We believe that the reasonable economics of this show that development on 320 acres, even if there was full development of the area, is justified on economics, but we don't believe the case should turn on economics. We believe

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that even assuming that the economic situations trade out, that there is not much to choose from one case to the other, even despite the fact that Pure's expert who testified as to the cost finally stated that he had no experience in well costs and he really wasn't qualified to give well costs.

Even despite this we believe that the one question to be determined by the Commission is this question of protection of correlative rights. In the first thirty days of production this well produced according to the figures presented by Pure Oil Company, approximately $100,000 in gross revenue. Dr. Kaveler's uncontradicted testimony shows that approximately one-half of this is coming from the acreage in the North Half of Section 5. This is drainage in its purest and simplest form. It is the responsibility of this Commission to prevent waste and to protect correlative rights.

This question has been before the Court here in the State of New Mexico and the Court stated that, quote: "The very definition of correlative rights emphasizes the term 'without waste.' However, the protection of correlative rights is a necessary adjunct to the prevention of waste. Waste will result unless the Commission can also act to protect correlative rights."

We believe that the case which has been presented by Mr. Schuman and Mr. Yager shows uncontravertedly that there

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will be waste because correlative rights would not be protected by Pure's application. We believe that this is the entire crux of the case before the Commission. Pure, by its own imprudent actions, has caused the imminent injury of the correlative rights of Mr. Schuman and Mr. Yager.

When the well site was selected, Pure's testimony is that they intended to go to 18,000 feet in the Devonian and they expected a gas reservoir. Despite the statements of Mr. Morris today, the testimony of Pure's geologist at the last hearing, after looking at the seismic representations on the map presently available at the time they decided the well location, is that it wouldn't have made any difference if they had moved 660 feet north, that the high point of the structure was approximately one mile east, west, north, south, and thus moving anywhere in this interval it really wouldn't have made substantial difference. But instead they chose to go 330 feet from the protestants' lands.

A prudent operator would be bound to know that a well so located would cause uncompensated drainage from the adjacent area. Pure's own witness, in response to a question by the hearing Examiner, testifying whether the well would drain in excess of 330 feet, said "Yes, sir, I think it would, considerably in excess."

Pure bases its case for adoption of 640 acres and for

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special field rules on the theory that orderly development and economics require the adoption of their plan. Orderly development was a consideration Pure should have made in contemplating the location of their well. How can they ask in good faith that a well in Section 5 be located five times further from the property line than is their well located, then in the same breath ask for an exception for their well location?

I submit that correlative rights should not be sacrificed on the altar of what Pure contemplates is orderly development, because orderly development can be achieved under the present spacing rules without sacrifice of the correlative rights of the protestants, but if the Commission adopts Pure's application, there is no way in which correlative rights of the protestants can be protected.

We urge that this Commission not adopt the 640-acre spacing and the special field rules sought by Pure Oil.

MR. PORTER: Any further statements in the case?

MR. MORRIS: May I have thirty seconds for reply?

MR. PORTER: Yes.

MR. MORRIS: We submit that the correlative rights of the protestants can be adequately protected by one of two methods; number one, it has been their choice not to join the unit and any injury to their correlative rights that they

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are suffering has been by choice. Secondly, when prudence dictates that a well be drilled in Section 5, then Pure Oil Company as a prudent operator will drill it, and under 640-acre spacing rules adopted by this Commission, each interest owner in Section 5 will be entitled to his share in his correlative rights as set forth in our statutes. We submit that the protestants will fully be protected in their correlative rights.

MR. PORTER: Mr. Pray.

MR. PRAY: Mr. Morris states that Pure Oil Company as a prudent operator will drill a well in Section 5 when it is indicated. I think the evidence and the actions of Pure Oil Company in so locating their well brings into serious question whether or not this was a prudent operator doing it.

Be that as it may, the other statement that "by their choice they decided not to join the unit," to my knowledge this is still a free country with freedom of choice to choose how one shall use his own property. Mr. Yager, Mr. Schuman have owned these interests for over thirty years and they chose not to join the unit, they chose to continue under the present ownership and there is nothing which would compel them to join such a unit, because this is an exploration unit, it is not a management unit or development unit until after full information has been obtained.

There's no reason why they should have joined this unit,

so it is not a matter of choice that they allowed this well to be drilled 330 feet from them, that had nothing to do with it whatsoever.

I will not engage in speculation as to why this well was drilled 330 feet from their land, but this is Mr. Yager's interest as the only uncommitted, unleased acreage in this area sought to be spaced. I'll leave it to the Commission's own speculation as to why the well was drilled in that location.

MR. PORTER: Does anyone else desire to make a statement? If nothing further to be offered, the Commission will take the cases under advisement. I believe we have already announced that we would dismiss the Case 3207.

The hearing is adjourned.

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STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Hearing before the New Mexico Oil Conservation Commission was reported by me; and that the same is a true and correct record of the said proceedings, to the best of my knowledge, skill and ability.

Witness my Hand and Seal this 5th day of April, 1965.

NOTARY PUBLIC

My Commission Expires:

June 19, 1967.

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BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
February 17, 1965

REGULAR HEARING

IN THE MATTER OF:	
Application of The Pure Oil Company for the creation of a new gas pool and for special pool rules, Lea County, New Mexico.	Case No. 3158
Application of The Pure Oil Company for the creation of a new gas pool and for special pool rules, Lea County, New Mexico.	Case No. 3159
Application of Saul A. Yager, et al., for amendment of Order No. R-2827 and for special pool rules, Lea County, New Mexico.	Case No. 3207
Application of Saul A. Yager, et al., for the creation of a new gas pool, and for special pool rules, Lea County, New Mexico.	Case No. 3208

BEFORE: Honorable Jack M. Campbell
Mr. A. L. "Pete" Porter
Mr. Guyton B. Hays

TRANSCRIPT OF HEARING

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MR. PORTER: The hearing will come to order, please. The Commission will take up Case 3158.

MR. DURRETT: Application of The Pure Oil Company for the creation of a new gas pool and for special pool rules, Lea County, New Mexico.

MR. PRAY: We would like at this time that Case 3158 and 3159 and Case 3207 and Case 3208 all be consolidated for convenience in this matter.

MR. PORTER: Any objection to the consolidation?

MR. MORRIS: We have no objection. At an appropriate time I would like to make a brief statement with regard to the status of the case.

MR. PRAY: If the Commission please, if these matters are consolidated, I would like to bring up one matter pending before it as a result of the last hearing.

MR. PORTER: The cases will be consolidated for the purpose of hearing. At this time let me get the appearances, please.

MR. MORRIS: I'm Richard Morris of Seth, Montgomery, Federici and Andrews, Santa Fe, New Mexico; with me, Mr. Sumner Buell of Seth, Montgomery, Federici and Andrews and Mr. Scott Rogers of Vinson, Elkins, Weems and Searls, Houston, Texas, all appearing on behalf of The Pure Oil Company in these consolidated cases.

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MR. PORTER: Mr. Hunker.

MR. HUNKER: George H. Hunker, attorney, Roswell, New Mexico. I am associated in this matter with Mr. John F. Russell, attorney, Roswell, New Mexico, and Mr. Donald E. Pray, attorney at law, Tulsa, Oklahoma, appearing on behalf of Jerald Schuman and Saul Yager.

MR. PORTER: Mr. White.

MR. WHITE: Charles White, Gilbert, White and Gilbert, Santa Fe, appearing on behalf of Tenneco.

MR. PORTER: Are there any other appearances in the case? You may proceed with your statement, Mr. Pray.

MR. PRAY: If the Commission please, at the close of the last hearing Pure made a motion and application in an informal manner for an interim rule establishing special field rules of the same nature that they had applied for before the Commission, their idea being to establish the rules during the pendency of the matters before the Commission.

We believe that this application or this request on behalf of Pure was so informal, and without evidence, and was improperly before the Commission, the Commission agreed to take notice of it, and in order to clarify the record we would request that the Commission at this time rule on this, dismissing the application of Pure for the interim order for special rules.

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MR. PORTER: Mr. Morris.

MR. MORRIS: If the Commission please, since the Commission has taken no action on our request for interim order, the matter would appear to be moot at this time since the cases that are coming on for hearing today are to present to this Commission our, Pure Oil Company's application for special rules and regulations in the Red Hills-Wolfcamp and Red Hills-Pennsylvanian Gas Pools.

I might mention that these pools have been created by previous order of this Commission; following an Examiner Hearing on November 24th by Orders R-2826 and 2827, the Red Hills-Pennsylvanian, the Red Hills-Wolfcamp Pools were created.

The matter with respect to those pools for hearing here today is on Pure's application for special rules and regulations, including provisions for 640-acre spacing. We also have before the Commission here today the applications to create a new Devonian Pool in this area, this same area, the Red Hills-Devonian Gas Pool. At the request of The Pure Oil Company we are also requesting that special rules and regulations be established for this Devonian Pool.

There's also before the Commission here today Mr. Yager's application to split the Pennsylvanian Pool previously created by this Commission into three separate pools, to split the Pennsylvanian formation down into three zones, the Strawn,

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Atoka and Morrow. In the course of our testimony here today we will show this Commission that there is no production in what might be called the Strawn and Morrow zones of the Pennsylvanian, that our production is in the interval that might properly be called Atoka, but that at the very least the application to break down these zones into different pools is premature at this time since no commercial production has been established in those zones.

We would suggest to the Commission that in the interest of orderly procedure, The Pure Oil Company be allowed to present its case for special rules and regulations in the Wolfcamp and Pennsylvanian Pools and at the same time and as part of the case to also present our case with respect to the Devonian formation. We have our exhibits prepared in this form so that the matters will not have to be presented piecemeal to the Commission. If this meets with the permission of the Commission, we are ready to proceed at this time.

MR. PRAY: Before announcing ready or making any announcement in this behalf in this matter, we understand that counsel's position on the interim order, that he takes the position it is moot and he should have no objection to the Commission's denying his request for purposes of clarifying the record. We request the Commission rule on this matter.

MR. MORRIS: Just one further word on this so that

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the Commission will not have to make a ruling, we simply withdraw our request for any type of interim order, and with the understanding that at the end of this case we might reaffirm our position or request some interim relief, but at least for the present time we withdraw our request.

MR. PRAY: That will be satisfactory.

MR. PORTER: Does that take care of the matter, Mr. Pray?

MR. PRAY: Yes. I would like at this time before moving into further matters to make a statement of position. I'm sure it is a subject of conjecture as to why my clients are before this Commission. My clients, Mr. Schuman and Mr. Yager, are the owners of approximately two hundred mineral fee acres in the North Half of Section 5, which is just 330 feet south of the well location which was drilled by The Pure Oil Company as Red Hills No. 1 Well.

Mr. Schuman and Mr. Yager each own an undivided one-half interest. Mr. Schuman's interest is leased to The Pure Oil. Mr. Yager's interest is unleased. We believe that because of the location of Pure's well in such close proximity to the lands owned by my clients, that their correlative rights are seriously impaired, and for that reason we oppose the adoption of the special field rules sought by The Pure Oil Company, as their well would be five times closer to the

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section line than would be the permitted location, under their proposed field rules.

Furthermore, we do not believe in view of the impairment of our correlative rights that one well establishes sufficient information upon which the character and the extent of the reservoirs can be practically established so as to entitle Pure to an exception to the established spacing for this area.

In addition, we believe that the information which has been withheld from the Commission and ourselves by Pure will tend to establish that a program of development on the present spacing can be economically undertaken, and it is for this reason that they have withheld it.

We are not here before the Commission on a fishing expedition to determine what information can be obtained from Pure for our own selfish purposes. We are here simply to protect our correlative rights and to assist the Commission in establishing and developing such information as may be necessary to a proper determination of these matters we have pending before this Commission, and an order has been issued on the Subpoena Duces Tecum requiring Pure to bring certain information into this hearing today.

Before going into the merits of the case we respectfully request that the Commission cause Pure to present us with the information which was set forth in the Subpoena Duces Tecum.

As I understand it, additionally they are only to produce such information as may be relevant to this case.

If the Commission please, we would put on our witness, Mr. Harry Kaveler, to establish that each of the items set forth in the Subpoena is relevant to this proceeding. As to the question of materiality, this is something which we can only determine after we have had an opportunity to examine these documents and determine whether or not they may be material to the decision; but we believe we can establish that they are relevant to the proceedings and, therefore, they should be supplied to us and that we should be given an opportunity to examine these in order that we can properly prepare our case and make an intelligent cross examination on Pure's case.

If the Commission please, we would be happy to put on Mr. Kaveler at this time to show relevancy in these matters.

MR. PORTER: Mr. Buell.

MR. BUELL: Excuse me. Would it be of any assistance to the Commission if we would state this, that in the course of our presentation we will be putting exhibits into evidence, and I think that most, or at least a great deal of the information that has been subpoenaed will come out in the course of our presentation. This would avoid the necessity of putting Mr. Kaveler on the stand at this time or going into any lengthy

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procedural harangue at this point.

MR. PRAY: I believe the most orderly way would be to dispose of all of this and any objections they have at one time.

GOVERNOR CAMPBELL: It's difficult for me to see how we can dispose of it until the question arises on the basis of some presentation by them, or after you put your case on at that time seeking the additional information that you need.

MR. PORTER: I concur in that thought. I think we are going to have to determine the need for this information as the point arises.

MR. PRAY: Do I understand, then, that as we go through the proceeding, then I'll have an opportunity to ask for these documents and they will be passed on at that time?

GOVERNOR CAMPBELL: Yes, if you can establish their materiality. Any document that is not available to you by reason of the presentation of the case, you will certainly have the opportunity to request that it be made available and have a witness to testify as to its materiality and relevancy at that time, depending on what is brought out in the case in chief here.

MR. PRAY: If this can be done without prejudice to our rights, we would agree to proceed.

MR. PORTER: The Commission will recognize Mr. Morris.

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MR. MORRIS: The Pure Oil Company will have two witnesses, Mr. William J. Henry, a staff geologist, Mr. Norman Ross, a petroleum engineer, to testify in this case. I ask that they both stand and be sworn at this time.

(Witnesses sworn.)

(Whereupon, Pure Oil Company's Exhibits Nos. 1, 2, 3 & 4 in Cases 3158, 3159, 3207 and 3208 were marked for identification.)

WILLIAM J. HENRY

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

DIRECT EXAMINATION

BY MR. MORRIS:

Q Mr. Henry, please state your name, by whom you are employed and in what capacity and where you are located.

A My name is William J. Henry. I am employed by The Pure Oil Company in Midland, Texas as a staff geologist.

Q Mr. Henry, even though you have previously qualified before one of the Examiners of the Commission, would you please give a brief resume of your education and experience in the oil industry?

A I graduated from Texas Technological College with a B. S. in geology in 1952, and immediately upon graduation was employed by The Pure Oil Company working in their District

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Office in Wichita Falls for approximately seven years, transferring from there to Roswell for approximately five to six years, and then in the last three years I have been in Midland, Texas.

Q Mr. Henry, are you familiar with the Red Hills Unit Area and the Red Hills Unit Well No. 1 in consideration in these hearings today?

A Yes, I am. I assisted in the formulation of the unit, making a recommendation to my management to drill this well. I have done field work in conjunction with the No. 1 Red Hills. I have examined the sample cuttings of the well. I have recommended and witnessed drill stem testing, and I recommended production testing. I witnessed logging and coring. I participated in the evaluation of the No. 1 Red Hills as it was drilling, and the subsequent operations. I participated in the evaluation of the Wolfcamp, Pennsylvanian and Devonian zones.

MR. MORRIS: Are the witness's qualifications acceptable to the Commission?

MR. PORTER: Yes, sir, they are.

Q Mr. Henry, if you will refer now to the exhibit which has been marked Exhibit No. 1, would you state what that exhibit is and what it shows, please?

A Exhibit 1 is a structure map at approximately

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Penn level. This is the same exhibit as Exhibit No. 1 that was submitted at the previous hearing of this case held on November 24, 1964.

Q What does the exhibit show, Mr. Henry?

A This exhibit shows a plat of the Red Hills Unit boundary outlined in red with the location of the No. 1 Red Hills Unit within the unit circled in red. The location of the No. 1 Red Hills Unit is in Section 32, Township 25 South, Range 33 East, being 330 feet from the south line and 2310 from the east line of Section 32.

Q You've been referring to the Red Hills Unit Well No. 1, is that correct?

A That's right.

Q What are the structural configurations shown on this exhibit?

A The structural configuration or structural contours which reflect our interpretation of the structure that is present in the Pennsylvanian at near the Atoka level of the Penn, which is based on seismic information, plus data from the drilling of the No. 1 Red Hills Unit.

We feel that this Penn's structure covers a sizable area. We feel also that this structure, as mapped in the Pennsylvanian, will reflect structure in the Wolfcamp, but we were unable to make a Wolfcamp map because we were unable to map a reliable

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Wolfcamp marker. Also I might mention that the Devonian, this map represents our present structural configuration of the Devonian.

Q You would refer now, Mr. Henry, to what has been marked Exhibit No. 2, will you state what that is?

A Exhibit No. 2 is a log section of the Wolfcamp pay zone in the No. 1 Red Hills Unit. I might mention that the copy of the logs shown here were also furnished at the November 24th hearing and were marked as Exhibits 2-A, 2-B, 2-C and 2-D.

Q What does this exhibit show?

A This exhibit shows the only electric logs that we have run in the Wolfcamp formation. I would like to direct your attention to the gamma ray neutron log on the left side of the exhibit which was run through one string of casing during the drilling of the well.

The gamma ray neutron on the right was run through two strings of casing for our completion. No other electric logs have been run over the Wolfcamp zone due to hole conditions while we were drilling this well.

Q You have no logging then in open hole conditions?

A We have no open hole logs over the Wolfcamp zone. I would like to direct your attention to the data on the extreme right side of the section. Drill stem test and

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production tests and perforated intervals in the Wolfcamp. The red markings on the gamma ray neutron on the right side point out the zones that are perforated.

I would like to bring your attention back to the gamma ray neutron on the left side, which we have marked an interval in green which we have assumed or believe to be net effective porosity and pay. I might also mention that during the drilling of this well that we encountered an extremely high gas pressure at a depth of 13,475 and we fought this zone for approximately ninety days. After getting the well under control we ran a drill stem test over this interval. We also cut a core and the core interval is shown about middle way down your exhibit, which was cut from 13,493 to 13,517, and it consisted mostly of black shale with some thin lime stringers.

I might also mention that a drill stem test was run in the upper part of the Wolfcamp, but we had negative results and did not recover anything of value.

I would like to point out that the well was drilled on to total depth. We have evaluated the Wolfcamp zone and assumed that we had 28 feet of net pay, and I would like to point out that on the perforated interval that there are two additional small zones above what we have called pay. We perforated them but we think they may be too small and not significant to be calculated in our reserves.

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Q Do I understand, Mr. Henry, that the intervals shown in green on the gamma ray neutron log on the left-hand side of this exhibit reflect your opinion of the net pay in this zone?

A Yes, it does. That is the only information we have available is the gamma ray neutron log.

Q How many feet of net pay do you have in this Wolfcamp zone?

A We assume approximately 28 feet of net pay.

Q Have you been able to use these logs in the computation of the porosity of the net pay intervals that are shown in the Wolfcamp?

A Yes, I have. Our porosity ranges from approximately five percent to twenty percent. We have a weighted average of about ten percent and we have assumed, which we have no data, a water saturation for this zone of approximately thirty percent. There appears to be no water in the Wolfcamp reservoir.

Q Now, Mr. Henry, you keep using the word assumed. You are giving this as your opinion of these factors, is that correct?

A That's right.

Q Is that an interpretation of the log?

A The porosity is an interpretation and that is all.

Q Mr. Henry, is there anything further you wish to

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point out on this exhibit before we pass to the next one?

A Yes. I would like to point out the potential test of the Wolfcamp which is shown down in the lower right-hand corner. This is from a four point test, it is five points shown but calculated from four, of an absolute open flow of 15.75 million cubic feet of gas per day plus approximately 40 barrels of condensate per million.

Q Is the Red Hills Unit No. 1 presently producing gas from the intervals which you have marked here as the intervals of net pay?

A Yes, it is.

Q Would you pass now to what has been marked as Exhibit No. 3 and state what that is, please?

A Exhibit No. 3 is a log section of the Pennsylvanian zone in the No. 1 Red Hills Unit.

Q What does this exhibit show?

A This exhibit shows, on the left side of the exhibit is a hole caliper and microlog which we have used to denote qualitative porosity and permeability in the Penn zone. The log on the right side is a gamma ray neutron, which is run in the cased hole through two strings of casing, and point out on the right side are the perforations and production tests of the Pennsylvanian zone. The perforations again are shown on the gamma ray neutron log for easy identification by red

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and what we feel is effective net pay in green on the microlog on the left-hand side of your exhibit.

Q Does the interval shown in green on the log on the left-hand side of this exhibit reflect your opinion as to the net effective pay in this well?

A Yes, it does.

Q How many feet of net pay are shown?

A 42 feet.

Q Will you relate the events that occurred in this Pennsylvanian zone during the drilling of this well?

A Yes, sir, I will. In drilling the Penn zone, no drill stem test or cores were taken due to high pressure gas zone that we had experienced back up in the Wolfcamp. It plagued us while we were drilling the Pennsylvanian zone. We had a blowout to occur through the drill stem pipe at approximately 14,844 feet.

This well was uncontrolled for three or four days and flowing an estimated twenty million cubic feet of gas per day through the drill pipe.

Q That blowout interval is indicated on this exhibit?

A Yes, it is marked between the two logs approximately two-thirds of the way down from the top.

Q After this well was drilled to total depth, what evaluation was made of this Pennsylvanian zone?

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A After reaching total depth we evaluated the Pennsylvanian section from open hole logs which have previously been furnished to the Commission as exhibits. In our production testing we started at the lower part of the Pennsylvanian, which is not shown on this section, but I would like to point out that at a depth of 15,442 to 15,530 and an interval from 15,034 to 15,138 was perforated and production tested.

These perforations exhibited negative results and, therefore, the lower part of the Pennsylvanian was squeezed off. We moved up to the blowout zone and this zone also was evaluated from electric logs and we picked the total of 42 feet of net pay. This may be conservative, because we did not have all the data available that we really need to pin the net effective pay down.

From my log calculations the porosity ranged from five to fourteen percent, with a weighted average of about 9.2% porosity and the water saturation of 32.2%.

Q Mr. Henry, I note that you have some perforations shown on the log on the right-hand side of this exhibit and yet you have no net effective pay shown opposite those perforations on the log on the left-hand side of the exhibit. Could you comment on that situation, please?

A Yes. In addition to zones that could be

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substantiated by the microlog and the sonic log it was felt that the sonic log exhibited some additional zones which might contribute to the well bore, so, therefore, it is felt that as we had no water approximately in these zones that we would perforate additional zones and, therefore, they might increase the productivity of this well, but they are not included in the 42 feet of net pay.

I would like to point out on the right side of your log the perforations in the Pennsylvanian in the lower portion which were perforated from 14,840 to 14,864, which is our approximately blowout zone. This zone was acidized with 2,000 gallons and it flowed at different rates, 1.36 million and another flow test of 2.2 million and a third flow test of 2.3 million.

Then we moved up and tested the interval from 14,607 to 14,788 and this zone on a production test flowed 7.65 million cubic feet of gas, and another flow test, this same zone, flowed 10.67 million cubic feet of gas, with an average of six to eleven barrels of condensate per million.

I would like for you to look down in the lower right-hand corner of your exhibit is our potential test of the Wolfcamp zone. The four point tests are shown and the calculated open, absolute open flow is calculated to be 26.5 million cubic feet of gas per day.

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Q Mr. Henry, in the evaluation of the Pennsylvanian formation, did you look for potential productivity not only in what you might call the Atoka portion of the formation, but also in the Strawn and Morrow zones?

A Yes, we did. I previously testified that we tested the Morrow and we moved up and we production tested the Atoka zone, so-called, which was successful. We moved on up and tested the top of the Penn, we perforated from 14,350 to 14,494. We acidized these perforations with 2,000 gallons of acid and we had negative results. These perforations were subsequently squeezed off as being non-productive.

Q At the present time is this well actually producing in the Pennsylvanian zone?

A Yes. The Pennsylvanian is producing in the No. 1 Red Hills from the Atoka zone. No other production was indicated in the Strawn or Morrow zones of the Pennsylvanian formation.

Q Mr. Henry, is it your opinion that this interval of net pay, as shown on this exhibit, is the interval that would be the productive interval in this Pennsylvanian formation?

A Yes, it is.

Q Is Pure actually at this time producing from this zone?

A Actually at the present time the well is not producing. It has produced previously but has been plugged

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off by shale particles.

Q Is there anything else you wish to cover with respect to this Exhibit No. 3 before we talk about the Devonian formation?

A I believe we have covered the Pennsylvanian section.

Q Referring next to what has been marked Exhibit No. 4, will you state what that exhibit is?

A Exhibit No. 4 is a log section of the Siluro-Devonian pay zone in the No. 1 Red Hills Unit.

Q What does this exhibit show?

A This exhibit shows, and I direct your attention to the left side of the exhibit, is a microlog which was run in open hole and the log on the right side is a gamma ray neutron which is run in cased hole and which we have perforated through the casing from this gamma ray log.

I would like to also direct your attention to the perforations that are shown on the gamma ray neutron log on the right side of your exhibit, and I would also like to point out that there were three drill stem tests run over the Devonian interval, and I would like to point out a brief point about each one of these drill stem tests.

The three drill stem tests recovered a small amount of water on each drill stem test. The Devonian was also cored and I direct your attention to the coring interval which is

located between the two logs, starting with Core No. 2 and ending with Core No. 7.

Q Mr. Henry, you have the perforations on the log on the right-hand side of the exhibit colored in red, but I notice that there's some perforations at the bottom of that log that are not colored in red. Was there a reason for that?

A Yes, there was. During the drill stem testing I mentioned previously that there was some water recovered. We felt that possibly this lower zone might be water-bearing; therefore, we perforated this zone first, and I'll direct your attention to the testing of this zone. We perforated from 17,663 to 17,684 and conducted production tests across these perforations. We acidized with 3,000 gallons.

We had a very small flow of gas, which was too small to measure, and we recovered no fluid of any kind. We felt that this zone was too tight to produce after acidation; therefore, we squeezed these perforations.

Q After you squeezed the perforations, then you went up the hole and what did you do with respect to these other two perforated intervals shown?

A We moved up the hole to the next best-looking porosity zones and perforated these zones. I'll direct your attention to the zones that were perforated and tested from 17,476 to 17,492 and from 17,523 to 17,544. We acidized these

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perforations with 5,000 gallons of acid and two flow rates, the first one being 7.8 million cubic feet of gas, the second one being 10.4 million cubic feet of gas, with no water recovery on this production test.

From this flow test we calculated an open flow based on a two point test of approximately 25 million cubic feet of gas per day. This is a dry gas.

Q It's a dry and a sour gas, is that right?

A Yes. The Devonian is a very sour gas and will necessitate a sweetening equipment before it could be sold.

Q Are these perforations shown in red presently open in the well bore?

A No. Due to the high sulphur content, these perforations are squeezed off. This gas is very corrosive.

Q And the Devonian gas is not being produced at this time, is that correct?

A No. The Devonian gas is sour and there is no available market presently for the sour gas, so the Devonian perforations are squeezed off at the present time.

I would like to point out too, which I might have hurriedly gone over, on the microlog I have picked 42 feet of net pay from the Devonian. This may be optimistic or it could be conservative. We do not have complete data to say that it is or is not definite net pay, but from perforation and

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production testing we recovered no water; therefore, we do not know if there is a water level existing around the No. 1 Red Hills.

Q Is it your opinion, Mr. Henry, that the green interval shown on the left-hand log on this exhibit microlog accurately reflects to the best information available at this time the effective net pay in this formation?

A Yes, it does. As I mentioned before, there was a total of 42 feet of net pay. We have an average weighted porosity of 4.91%, and our water saturation of 24.4%.

Q In evaluating the porosity of this zone, to what degree did the porosity vary?

A The porosity ranged from three and a half percent to approximately seven percent.

Q May I ask you to re-examine your figures on that, is it three and a half to seven or three and a half to five percent?

A Well, originally the porosity ranged from three and a half to seven. This is a weighted average out of that, which is three and a half to five percent, depending on where you want to calculate it, with the weighted average 4.91%.

Q Mr. Henry, the Commission has already created new gas pools in this area for the Wolfcamp and Pennsylvanian zones. As you know, there is an application pending before this

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Commission to break down the Pennsylvanian zone into three separate pools, the Morrow, the Atoka and Strawn. Would you have an opinion concerning the advisability of the approval of that application at this time?

A Well, the Pennsylvanian only has one zone that is capable of producing.

Q That is the Atoka zone?

A That is the Atoka zone of the Pennsylvanian.

Q Suppose, Mr. Henry, that in additional wells to be drilled in this area someone might be more fortunate and find production in either the Atoka, I mean the Strawn and the Morrow and the Atoka zones of the Pennsylvanian. Would it be your recommendation that the Pennsylvanian formation be continued to be called one pool or would you advocate that it be broken down into separate pools?

A Well, I would advocate that the Pennsylvanian, if there was additional production there's a possibility in New Mexico that there is oil production from the Strawn and, therefore, it would have to be broken down, but there's also a possibility that the three zones could produce gas, which is normally in this part of the Deep Basin, would probably be gas and be one zone.

Q Then, if I understand you correctly, the Strawn, Atoka and Morrow together might be considered a common source

of supply and properly designated as a Pennsylvanian pool?

A Yes, it could be possible.

Q We're asking the Commission here today to create a new Devonian pool, which I assume would be called the Red Hills-Devonian Gas Pool. Do you have any recommendations to make concerning the vertical and horizontal limits of that pool?

A Yes. I would recommend that the vertical limits of the Devonian be considered and the horizontal limits would be the same as we have advocated for the Wolfcamp and Pennsylvanian.

Q Were Exhibits 1, 2, 3 and 4 prepared by you?

A Yes, they were.

MR. MORRIS: At this time we offer Pure Oil Company's Exhibits 1, 2, 3 and 4 into evidence.

(Whereupon, Pure's Exhibits 1, 2, 3 and 4 were offered into evidence.)

MR. PRAY: We would object at this time to the acceptance of these exhibits into evidence for the following reason: He has testified as to many facts which are shown on these exhibits which are not introduced into evidence here today. Take, for example, the matter of the open flow potential tests which are reflected on here without the basic data which goes to the calculation of the open flow potentials.

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I believe it is necessary that these facts and figures be adduced prior to any acceptance that this is the absolute open flow potential and that this is a true representation.

Further, we would seek to have introduced into evidence copies of the drill stem test reports which a summary is reflected upon these exhibits. So that at this time, until we do have this information available, we would object to the introduction of any of these exhibits until basic facts upon which they are made have been introduced into evidence before this body.

GOVERNOR CAMPBELL: Doesn't that go to the weight of the evidence rather than its admissibility?

MR. PRAY: We believe it does not go for weight. We believe it goes to admissibility, while an expert can testify as to his opinion to certain matters, foundationary facts must be established in order that we have a proper opportunity to cross examine on these facts and to determine whether or not in fact they are true or correct. We believe this is the very basis of the matter as to whether they are admissible.

MR. PORTER: Mr. Morris.

MR. MORRIS: As I understand Mr. Pray's position, he is, in effect, calling for the potential tests and the drill stem test reports that would serve as backup data for the opinions that Mr. Henry has given in his testimony. At this time, if

we may have a moment's recess, we will furnish to Mr. Pray the data that he has requested concerning Wolfcamp, Pennsylvanian and Devonian formations. May we have a moment's recess to do that?

MR. PORTER: The hearing is recessed briefly.

(Whereupon, a recess was taken.)

MR. PORTER: The hearing will come to order, please.

MR. MORRIS: At this time, and in response to request of counsel, we will furnish the following data with respect to the Wolfcamp, Pennsylvanian and Devonian formations: The tabulation of the drill stem test reports from the Pure Oil Company files. Also --

MR. PRAY: If the Commission please, this is not what I requested.

GOVERNOR CAMPBELL: Let's wait and see what he's going to offer at this time. Then you make your objections when he gets through. You are not offering it in evidence, you are just furnishing it to them?

MR. MORRIS: That is correct, we are not offering this data into evidence, but we are merely furnishing this at the request of counsel.

GOVERNOR CAMPBELL: What's this first document now?

MR. MORRIS: This is a drill stem test report which also has attached to it drill stem test charts. I may have

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this out of order. Excuse me. The total data that we are furnishing also includes seven different drill stem test reports with charts attached, and I believe the first document that I handed to Mr. Pray was a tabulation of the potential tests on the zones involved. We reaffirm our motion that the Exhibits 1 through 4 be accepted by the Commission.

MR. PRAY: If the Commission please, we have requested certain data which counsel now furnishes to us. Of course, we cannot make a cursory examination to determine whether or not it contains the information which we have requested. We would like to reserve the right to have an opportunity to fully examine this material and to see if in fact it does contain this material, and we would like to have the Commission withhold its ruling on the admission of the documents until such time as we can determine whether these are all the matters we have requested.

Counsel has interpreted for me what my request was and, in fact, he has furnished me some of the information which we have requested. There are other items of information which we have not yet been furnished; if I might be permitted to take these exhibits, exhibit by exhibit, and proceed with cross examination we might be able to point out to the Commission other materials which are necessary and relevant to the proceeding.

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MR. MORRIS: If the Commission please, as the Chairman pointed out, we feel that this entire argument goes to the weight rather than the admissibility of the exhibit that we have offered into evidence. We would ask that the Commission admit the exhibits into evidence at this time. Certainly Mr. Pray has the right of cross examination and we yield the witness for cross examination at this time.

MR. PRAY: If the Commission please, I might take an opportunity -- I am sorry.

GOVERNOR CAMPBELL: Do you have something further to say on this motion?

MR. PRAY: Mr. Commissioner, I have one quote from the Supreme Court of the United States which has been adopted by the Supreme Court of New Mexico regarding such situation. I thought it might be helpful. If the Commission doesn't desire it --

GOVERNOR CAMPBELL: Go ahead.

MR. PRAY: "Manifestly there is --" and this is from an administrative proceeding, "Manifestly there is no bearing where the party does not know what evidence is offered and considered and is not given an opportunity to testify, explain or refuse. All parties interested must be given opportunity to cross examine witnesses, to inspect documents and to offer evidence in explanation. In no other way can a party

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maintain its rights or make its defense and in no other way can it test the sufficiency of the facts to support a finding."

We believe that unless we know that the exhibits are properly supported by facts, then they're not proper for the consideration of the Commission in making its decision.

MR. PORTER: The Commission will withhold the ruling on it as to the admission of the exhibits until after the cross examination has been concluded. You may proceed with your cross examination.

CROSS EXAMINATION

BY MR. PRAY:

Q Mr. Henry, I would like to call attention now to your Exhibit No. 1 which purports to be a structure map on the Pennsylvanian formation. This is entitled "Adjusted Reflex Seismograph Map." Would you please tell me exactly what that title means?

A This map is constructed from seismic information and data that we got from the drilling of the well, and additional information from additional seismic work that we have conducted since the well was drilled.

Q Do you have with you today copies of this seismic information upon which this map was constructed?

A No, sir, I do not.

Q Do you have a copy of the map which was made on the

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original seismograph work which was introduced at the hearing on application for the unit?

A Yes, I did.

Q Would you please present that at this time? Is this a copy of that map?

A It is.

Q Would you please state for the record just exactly what this purports to show?

A This is a Devonian seismic structure map.

Q It is based on what?

MR. MORRIS: May I suggest that we have this marked as an exhibit and that it be placed in evidence?

(Whereupon, Pure's Exhibit 1-a was marked for identification.)

Q (By Mr. Pray) Mr. Henry, would you please examine this exhibit and state for the record where the Devonian high is indicated from this seismic structure map?

A The majority of the high is in Section 32 of 25, 33.

Q Would you be more specific and say in what quarter of Section 32? Would you say that it is predominantly in the Southeast Quarter of Section 32, the Northeast Quarter of Section 5, Township 26 South, Range 33 East?

A The high is in the Southwest Quarter of the Southeast Quarter of Section 32 by shot point from which we

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located the original well, the No. 1 Red Hills Unit.

Q Is that what is reflected here?

A It is not shown here.

Q What is shown here?

A The structural configuration of the Devonian as we map it.

Q May I call your attention to the Southeast Quarter of Section 32. Does this map show that the Southeast Quarter of Section 32 is approximately as high as the North Half of the Northeast Quarter of Section 5?

A This is a matter of interpretation, and it does.

Q It does show that?

A This is a matter of interpretation.

Q I'm asking you does this map show that?

A Yes, sir, it does.

Q You state that by your Exhibit 1 you have adjusted this from further seismograph work. Do you have any information available which would show this adjustment?

A This is adjusted to subsurface work. This is a map of conjunction of both seismic and subsurface.

Q Then on the basis of this Red Hill No. 1 Well, this one well, you have made an adjustment in the original configuration?

A The adjustment is on this map on the Pennsylvanian

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horizon.

Q But it is based on the information gained from this one well?

A That's right.

Q Have you any well control in the North Half of this structure as you show it on your Exhibit No. 1?

A No, I do not.

Q Then this well which has been drilled does not furnish you any additional information as to the limits of this structure?

A Information was gained through velocity control, use of the sonic log and velocity control in making this map from our previous seismic records and other data.

Q I'll ask you my question again. Can you further determine the areal limits of this pool by this information gained on one well?

A No. There will have to be other wells drilled.

Q As a general proposition would you agree that the further you move away in any direction from a well which has established a pool the less likely it would be to be proven productive? You understand my question?

A No, I would like for you to clarify it, please.

Q All right, let me give you a specific example. First, to move two miles north of the well drilled in Section

32, would it be less likely that that spot was productive than is the area in the South Half of 32?

A I don't think you would know until you drilled a well.

Q But it would be less likely as a general principle?

A No, I don't think it would be less likely. Your porosity and permeability may increase on top of your structure to the north.

Q But you don't know, do you?

A No, I said I don't know.

Q Without any additional information it would be less likely that this well proves a location two miles away?

A Would you repeat that statement?

Q It would be less likely that a location which was further removed is proven productive by this well than is a location which is half a mile removed?

A No, I would not --

Q Proven by this well.

A I don't think this well proves anything definitely. I think you'll have to have additional well control if you move a half mile south or two miles north.

Q We would agree that there needs to be additional well control. Let me phrase my question more specifically then. Is it not true that this well more likely establishes the North Half of Section 5 to be productive than it does

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establish the North Half of 32 which is further removed by half a mile than the North Half of Section 5?

A I do not agree with you. No, I don't believe that it does.

Q Let me direct your attention now to Exhibit No. 2, which is the logs run on the Wolfcamp. This is a gamma neutron on the left through one string and on the right through two strings, is that correct?

A That is right.

Q This exhibit shows that you ran drill stem tests in this area, Drill Stem Test No. 4, is that correct?

A That is correct.

Q I presume that is in the group of exhibits which has been handed to us but we are unable to determine at this time, but you show on here certain cores. This information has not been made available to us as yet. Do you have this core information with you at the present time?

A Yes, I do.

Q Would you please present it?

MR. PRAY: I'll ask for this on all the other zones if you want to produce it at this time.

A This covers all zones.

MR. PRAY: If the Commission please, for the purpose of the record I would like to reserve the right to make full

examination of the material which has been handed us, as it would take some time to make an evaluation.

Q (By Mr. Pray) Let me ask you this question, Mr. Henry. You spent a good deal of time in evaluating this well, examining the logs and core analyses, have you not?

A Yes.

Q Approximately how long do you think it would take to go in and make an examination of the logs to determine net pay, examine the cores and make your correlations in order to determine the matters which you have presented today? Would it take more than an hour?

A I don't think so.

Q In other words, you believe that in an hour's time you could sit down, take all of the logs, all of the core analyses, which amounts to a good number of pages, correlate with the drill stem test and you could do this in an hour's time? You are under oath.

A I would like to explain my position. I have more or less lived with this well from the spudding date. The exact time, I don't think it would take me as long, because a lot of this is memory.

Q You misunderstand, I am saying how long would it take someone who is not as familiar as you are?

A Well, I would have no opinion on that. It would be

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hard to say.

Q It would be hard to say, yes. On this you have made your net pay picks based on the gamma neutron. Did you use any information in determining the net pays other than the gamma neutron?

A Other than looking at samples.

Q You did look at samples in connection with this?

A I looked at samples in most of the wells.

Q Do you have with you any reports on these samples which would make it easy to make the pay picks?

A I have a commercial sample log and gas analysis that we employed on this well that I have with me that you could use.

Q Would you please present this at this time?

MR. MORRIS: At the request of counsel I hand to him at this time a document entitled "Mud and Cuttings Maps for The Pure Oil Company" with respect to this well.

MR. PRAY: Again reserving our rights to fully examine this, we accept this tender from counsel.



Q (By Mr. Pray) In order that I may clarify this a little bit, Mr. Henry, do I understand that all of these things must be considered in order to arrive at a final conclusion in evaluating this well, is that correct?

A I think you have to have all available data to

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evaluate a zone.

Q Getting back to your net effective pay picks, you stated that you assumed as to the Wolfcamp that you have 28 feet net pay. Is it difficult to calculate from these type of logs the net pay?

A Yes, it is very difficult from a gamma ray neutron as the only log that you have.

Q What is your basis for making the net pay picks?

A The porosity from the neutron log.

Q And porosity is a direct reading from this log?

A That is right.

Q Did you have any commercial assistance in determining net effective pay picks?

A No, I did not.

Q You made them all yourself?

A That's right.

Q Did Pure Oil have any commercial assistance?

A No, sir.

Q You also assume a water saturation of 30%. Why was it necessary to make this assumption?

A To calculate the reserves.

Q This is one of the factors important in the reserves?

A That is right.

Q Can the porosity be accurately computed from a log

of this type?

A No, but it was the only tool that we have and it was the best data that is available. There is no other data available.

Q If you were drilling another well, not this well, what tool would you use to best show you the porosity and give you the net effective pay picks?

A It would be cored. There are all types of electric logs run in a hole, open hole logs.

Q In other words, in this field in order to accurately determine the net effective pay and the amount of porosity, you would need additional development in order to provide this information?

A That is right.

Q Let me direct your attention now to the potential test which is shown here on the bottom of the exhibit. Do you have with you the basic data upon which this open flow potential was calculated?

A No, I'm a geologist and I would refer you to Mr. Norman Ross who will testify as to the engineering data.

Q All right, you are unable to testify as to that. Going now to Exhibit No. 3, on the Pennsylvanian zone. Looking to the left-hand portion of this, which is the microlog portion, would you consider that this is a good quality

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microlog?

A I would say that it was the best that could be run under the hole conditions that we had in the No. 1 Red Hills Unit at that time.

Q Would it be more desirable to have a better quality if it were possible to run it in the hole?

A It appears to me to be a fairly good log.

Q Well, by "fairly good" do you mean accurate quantitative?

A I would say qualitative.

Q Qualitative. But quantitative goes to the calculation, does it not?

A Right.

Q So that it is really not an accurate quantitative measurement of the exact porosity which is present in this zone, is that correct?

A That's right.

Q You say that, in your direct testimony that no drill stem test or cores were run in this Pennsylvanian zone. Do I understand that in the entire Pennsylvanian section or is this limited now to the Atoka only?

A This is while the well was being drilled open hole there were no drill stem tests run or cores taken.

Q All right, sir. You state that your net effective

pay is 42 feet. Do you feel that this is a conservative estimate?

A It can be conservative. We do not have enough data to definitely pin down that it is, that this would be a definite figure.

Q But you did perforate additional zones?

A We did perforate additional zones.

Q So that you were hedging your bets, so-to-speak, by perforating what was possibly additional net pay?

A That is right.

Q As a geologist on this well, and you testified that you virtually lived with this well, that you did all the testing, you were present when the logs were run and you examined the samples, would you please tell me the nature of this Pennsylvanian formation? Is it a sand formation or a lime or fracture, vugular?

A Samples were very poor, as you can see from the log. This is mostly a carbonate section. There are a few sands in it.

Q Is there any separation between your sections, any shale or any impervious barriers?

A Yes, there are shales between the perforations.

Q I direct your attention now to a point that this log, it really doesn't show what is the top of the Pennsylvanian

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zone.

A If my memory serves me right, I believe the top of the Pennsylvanian is 14,350.

Q Would it be of assistance to have the full logs before you? I am going to ask you as to the tops of the Strawn and the Morrow.

A No, because my logs that I used to correlate with all the tops are in the office.

Q There are logs that have been introduced into evidence previously to the Commission which did show those, would these be of assistance?

A I don't know if the tops were picked on them or not.

Q In your opinion, is there any lithologic difference between the Strawn, the Atoka and the Morrow?

A Would you clarify that?

Q Is there any difference in the nature and the character of the rock which makes up the Pennsylvanian formation, as you keep referring to the Strawn, the Morrow and the Atoka, are these in fact three different zones at three different ages?

A That's right.

Q In other words, they are identifiable geologic strata?

A Yes, we picked the tops, right.

Q Is there some separation between the three formations

in your opinion from the samples or from the logs?

A What -- would you clarify what is your separation?

Q Well, is there some barrier which might prevent flow from one strata to another, either a shale or hard portion with no porosity?

A It would be hard to say in the general area that it's not all connected up, because you have facies change and breaks, fingering in, and it's possible that it could.

Q You testified on direct examination that if it became possible in the area that oil was produced from the Strawn, and you testified that you know of areas where this is true, that then in that case the Strawn and the Atoka would have to be separate zones, is that correct?

A I believe so.

Q And you testified then that if gas were found, then they could all be produced together?

A I believe there would be a common reservoir.

Q Do you know the definition of a pool under the New Mexico rules and regulations, or what is sometimes referred to as a common source of supply?

A I don't believe so.

Q Are you familiar with this definition?

A No.

Q Then you wouldn't be able to say whether or not it

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would be a common pool?

A Well, just my opinion.

Q You stated on direct that the well is not presently producing in the Pennsylvanian because of shale something, and I didn't catch the word. Would you explain?

A Well, really this is an engineering feature, but to my knowledge the well has plugged itself off with shale particles, the tubing is plugged up. The perforation is plugged or something, the well is not flowing. That's all I know about it.

Q It's in the tubing rather than the perforations being plugged off?

A I do not know, the well is plugged up.

Q Are you going to take steps to correct that?

A That's an engineering feature and I am a geologist.

Q But in your opinion it will be necessary in order to flow this zone that the tubing will have to be pulled and the well reworked?

A I feel that it would. Yes, possibly.

Q You state that on production tests the Strawn and the Morrow tested negative results. Would you please elaborate a little so that I may determine what a negative result is?

A Well, we had no recovery of anything in any appreciable amounts. I believe that data has been furnished on those

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testings of those intervals.

Q I'm not aware. We have not had an opportunity to examine it, but it didn't produce any quantitites of hydrocarbons?

A No, it did not.

Q If, in fact, this well is only completed in the Atoka zone, how would it affect you to establish the Atoka as a common source of supply, or should I say how would it detrimentally affect you to just limit the Pennsylvanian to being an Atoka formation common source of supply?

A I don't believe I understand you clearly. Would you clarify it?

Q If you are producing from only one strata in the Pennsylvanian would there be any detrimental effects from limiting the vertical extent of this reservoir to just that zone which is producing?

A I don't believe it would be detrimental.

Q Let's go on now to Exhibit No. 4. This is a log section of the Siluro-Devonian in which three drill stem tests were run during the drilling of the well, is that correct?

A I believe that's correct, yes.

Q Do you, of your own knowledge, know whether I have been furnished with copies of the drill stem test?

A I believe they're in that group, yes.

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Q You also did coring in the Devonian. Have these core analyses been presented to me, to the best of your knowledge?

A It is on the core analysis furnished by the Core Laboratories, who did the work.

Q Again I direct your attention to the microlog contained on the left portion of this. Would you consider that this microlog is of good, fair or poor quality?

A I would say it was fair.

Q Did you use anything besides this microlog to determine your net effective pay picks?

A Yes, we used a sonic log.

Q Sonic log, which is shown at the right-hand side of the scale?

A No, that's gamma ray neutron.

Q Where is the sonic log which you used in this?

A It's in Midland that I worked this from.

Q Do you have a copy of the sonic log with you today?

A Yes, we do.

MR. PRAY: Excuse me, Mr. Morris. I believe those have been presented, or are in the Commission files, is that correct?

MR. MORRIS: I would have to check to see if that particular log is available. I understand that it is

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available, has been furnished to the Commission previously.

MR. PRAY: Of course, we'll take care of that and make our own examination.

Q (By Mr. Pray) On this you stated that you computed the effective porosity and you made this further statement, that it was a weighted average of 4.91% depending on the way you want to calculate it. Just what did you mean by this?

A Well, using a sonic log on your micro-velocity, fluid velocities and averaging up the whole zones and working with it.

Q In other words, that calculates one way, the microlog would calculate maybe something different?

A No. We took our actual porosity number from the sonic log.

Q During the course of drilling this well were there other formations other than the Pennsylvanian, the Devonian and the Wolfcamp which were tested?

MR. MORRIS: I'll object to that question on the grounds that what The Pure Oil Company did with respect to other zones in this well is not an issue before the Commission in this hearing.

MR. PRAY: We respectfully submit to the Commission that all matters pertaining to this well are relevant and material to the determination by the Commission of the proper size and spacing. We believe there are two matters

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involved here today, first the protection of correlative rights; secondly, the determination as to what is the proper size of the spacing unit, and this necessarily involves an economic evaluation based on the reserves and on the cost of drilling the well and the market available.

We cannot determine the economics of a well from one zone when others are commercial or potentially commercial. I don't think that we could limit our determination as to the economics and the proper spacing to say the Wolfcamp and ignore the Devonian or Pennsylvanian.

If the Commission please, it was upon our application Pure decided to come in and have the Devonian created as a separate pool. Their initial application was for the Wolfcamp and Pennsylvanian. We are now asking that we determine if there are any other zones which should be created as gas pools and that this is material and relevant to the Commission's determination.

GOVERNOR CAMPBELL: Is Pure taking any position in this case seeking action by the Commission based upon economic factors?

MR. MORRIS: Yes, Governor, our engineer, engineering witness will present some data to the economics of this well and we figured it various different ways. Our evidence will show it comes out bad each way.

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MR. PORTER: Since there is a statement that economics will be injected in this case we feel that the information, that the question is relevant and that the witness should answer. The objection of Mr. Morris is overruled.

Q (By Mr. Pray) Mr. Henry, I would repeat the question then. Were there other zones other than the ones that I named, the Pennsylvanian, Wolfcamp and Devonian, which were either tested during the drilling of the well or production tested?

A Yes, they were drill stem tested.

Q May we start from the top of the hole and proceed downward? Would you describe the zone and the test?

A I don't have that information available and I couldn't remember all that stuff.

Q Do you have it present in your records here today?

A I have the drill stem tests, yes.

Q Would you please make that available?

A I believe you have a copy of them.

MR. MORRIS: The information requested by counsel has previously been submitted to him in response to an earlier request, but Mr. Henry has a copy of that information before him at this time.

MR. PORTER: In relation to what zone, Mr. Morris, all of them?

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MR. MORRIS: The witness could answer this better than I.

A It's from top to bottom.

MR. PORTER: I see.

A Do you wish me to read the whole drill stem test?

Q (By Mr. Pray) No, sir, that won't be necessary. Could you tell me what formation this was made on?

A Drill Stem Test 1 was made in the Delaware Cherry Canyon. Drill Stem Test No. 2 was made in the Bone Springs, Drill Stem Test No. 3 in the Wolfcamp, Drill Stem Test No. 4 was in the Wolfcamp. Drill Stem Test 5 was in the Devonian, Drill Stem Test No. 6 was in the Devonian, Drill Stem Test No. 7 was in the Devonian, No. 8 was in the Fusselman, No. 9 in the Ellenburger, No. 10 in the Ellenburger, and No. 11 in the Ellenburger.

Q Starting back at the top, the Fusselman I believe was the first formation -- the Cherry Canyon. What were the results of this test?

A Would you like for me to read the whole test?

Q No, let me rephrase my question. Were any hydrocarbons produced at all on this test?

A No oil or gas was recovered in Test No. 1.

Q Test No. 2 was taken in what zone?

A Bone Springs.

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Q Were any hydrocarbons recovered upon this test?

A There was 80 feet of heavy gas and slightly oil-cut mud. One hundred feet of heavy oil and gas-cut mud. No water.

Q Was there any gas flowed to the surface?

A Yes, we had a gas flow to the surface of 7500 cubic feet.

Q Have I been presented with copies of that Drill Stem Test No. 2?

A I believe you have.

Q I believe then the other tests down to No. 8 cover the formations which we have previously discussed today, is that correct?

A Yes.

Q No. 8 is Fusselman?

A No. 8 is the Fusselman.

Q Was there any hydrocarbon recovery either on surface flows or from the test?

A Gas to surface too small to measure, and I believe that is the only recovery other than 16,625 feet of salt water.

Q As to any other drill stem tests made, has there been any hydrocarbon recovered?

A Yes. There was some gas recovered in the other three, I believe, if my memory is right.

Q We do have copies of all three of these tests,

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together with the gas flows.

MR. PRAY: We ask that if we do not, we reserve the right to have these made available.

GOVERNOR CAMPBELL: Well, do they or don't they?

MR. MORRIS: No, they do not have copies at this time.

GOVERNOR CAMPBELL: Are you seeking those?

MR. PRAY: Yes, we are.

GOVERNOR CAMPBELL: Do you have them available?

MR. MORRIS: Yes.

GOVERNOR CAMPBELL: You will furnish them?

MR. MORRIS: Yes, let's furnish them now. At this time in response to the request of counsel we furnish Drill Stem Test reports numbers 8, 9, 10 and 11, which together with reports 1 through 7 previously furnished constitute all of the drill stem tests taken in this well.

Q (By Mr. Pray) Mr. Henry, have you now presented to us all of the evidence, all of the materials which you considered in making your evaluation of this well?

A I believe that you have been furnished with everything, yes.

Q You testified in your qualifications that you had the responsibility among other things of the formulation and the recommendation of drilling this well, is that correct?

A I recommended it, yes.

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Q I ask you to look at Exhibit 1-a, this is the representation of the seismic picture which was presented at the application for approval of the unit, is that correct?

A I believe that's right, yes.

Q Is this the information which was available to you prior to the time you drilled the well?

A Of course, this information to make this map available to me, yes.

Q Was it based upon this map and the knowledge which is represented by this map that you drilled this well?

A We picked the highest point and drilled the well there, which also coincided with the high point of this structure.

Q But this high point exists over a broad area, does it not?

A The high point that we drilled is higher than the contour that is shown.

Q But at the time that you drilled the well, the picture is that this high area covers north to south and east to west approximately one mile, is that correct?

A We drilled at the highest shot point.

Q Excuse me, would you say it is correct it is approximately one mile from north to south and east to west as depicted on this map?

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A Yes, that is correct.

Q Then just exactly why is this well located only 330 feet from the lands of my clients?

A This decision, I mean this matter was discussed and it was felt by my company to spend a million and a half dollars for an exploratory well, that we had to drill the highest point on the structure.

Q Would, in your opinion, it have made any difference had you moved this location either north or east 660 feet?

A I can't answer that.

Q Based on the picture as represented by this map, would it have made any difference?

A It probably would not have made a lot of difference.

Q Thank you. One more question. During the drilling of this well was a directional survey run?

A Yes, I believe there was.

Q At what depth was this directional survey run?

MR. MORRIS: Excuse me, we're headed into a line of questioning here that at some point we will have an objection coming, so I'll make it now.

MR. PORTER: What was the question?

MR. PRAY: I asked him if he ran a directional survey and he said "Yes." I asked him what were the depths at which the directional survey was run.

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MR. MORRIS: We suggest to the Commission that the directional survey on this well is relevant only to the extent that it covers the zones which are producing zones in this well. At the present time we will offer to make available to counsel a directional survey taken in this well insofar as it covers the Devonian formation.

Actually the directional survey that was run does not cover all of the Devonian. It starts in the Devonian and goes deeper, but insofar as it can have any relevance to this hearing here today, the portion of the survey that would show the survey of the well through the Devonian formation, which is the deepest formation in issue here, will be made available to opposing counsel.

MR. PRAY: If the Commission please, the nature of the directional survey is such that you need to have the entire thing in order to arrive at any conclusion from it at all. We believe that this matter is relevant to the hearing, and rather than going to the matter of spacing, it now goes to the protection of correlative rights.

They have located their well 330 feet from the line as to the surface. The question now becomes, where is this well located, where are each of these zones, are they in fact still 330 feet from the line or is it possible they have varied closer to the line or is it possible, in fact, that they have

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crossed the line. I would like to call the attention of the Commission to the exhibit which was submitted by Pure Oil Company to the Commission which purports to be a true, certified copy of all deviation surveys run in the well.

I'm sure that the Commission is aware that a deviation survey shows angles of inclination from the vertical without direction. A directional survey shows angles of deviation from the vertical and the direction in which it moves. I would further like to call the attention of the Commission to the fact that from the depth of 14,700 feet to 19,900 feet there were no deviation surveys submitted.

The regulations of the Commission require that they be submitted every 500 feet unless there is an extenuating circumstance, at which time they may be run the next time the bit is run. At the time the deviation surveys ceased, the angle of inclination is two and a quarter degrees. At the time they commence again it's 14 degrees. It goes on from there and becomes even greater in deeper formations. There's no way of telling from this where this great deviation began and at what point.

We think it's a serious consideration in this matter just exactly where is this well located. We believe that we are entitled, and we believe the Commission is entitled to make this inquiry itself and to seek all directional surveys

which have been run on this well, and even then we may not have the answer.

MR. MORRIS: The only possible relevance that the directional surveys might have would be with respect to where the deepest production in this well is coming from. The location of the Devonian formation in this well, the bottom hole location of the well in the Devonian may well be relevant to the issue of correlative rights, but the location of any portion of the well that is not furnishing production can certainly have no bearing on the correlative rights of anyone in a spacing case of this type.

We respectfully request that the Commission in this regard make a ruling which would recognize the relevancy of this directional survey as being limited to the producing horizons.

I would also submit, and this is also an aside, that any attempt to obtain information concerning other zones in this well with respect to the directional survey would be nothing more than purely and simply a fishing expedition, because it can have no possible relevance to the issues before this Commission.

MR. PORTER: Mr. Morris, this survey that is being offered, does it show the Wolfcamp and the Pennsylvanian and the lower part of the Devonian?

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MR. MORRIS: As I understand it, let me check my figures, the directional survey was commenced at a depth of --

A 17,000.

MR. MORRIS: 17,000 feet?

A That's right.

MR. MORRIS: Which is a point within the Devonian?

A Mississippian.

MR. MORRIS: Excuse me, within the Mississippian above the Devonian, and then it runs down through the Devonian and goes deeper. This is the only directional survey that there is on the well. There's not one above that point.

GOVERNOR CAMPBELL: If that is the only one there is, well, that's it.

MR. MORRIS: That's the only one there is.

GOVERNOR CAMPBELL: What are we arguing about, if that is the only one there is? You couldn't furnish the other anyway.

MR. MORRIS: We offer to furnish the directional survey from where it started in the Mississippian down through to the base of the Devonian formation, but no deeper.

GOVERNOR CAMPBELL: Well, you have made a directional survey deeper than this?

MR. MORRIS: That is correct.

GOVERNOR CAMPBELL: We are talking about the

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Ellenburger, what is below the Devonian, Fusselman?

MR. MORRIS: That is correct. Therefore, there is no production or no issue in this hearing here today.

GOVERNOR CAMPBELL: What's your answer to that?

MR. PRAY: My answer to that is that all we're requesting is the directional survey in order for us to determine the Devonian. This is, in fact, the only established, to this date, producing zone.

MR. MORRIS: And we offer to give them that.

GOVERNOR CAMPBELL: It looks to me like that's it.

MR. PORTER: The hearing will recess until 1:30.

(Whereupon, a recess was taken.)

AFTERNOON SESSION

(Whereupon, the hearing was resumed at 1:30 o'clock P.M.)

MR. PORTER: The hearing will come to order, please. Mr. Pray, have you concluded your cross examination?

MR. PRAY: Practically. We still are desirous of the directional survey which has not been tendered as yet.

MR. MORRIS: At this time, in response to the request of counsel, we tender the directional survey through the Devonian formation.

Q (By Mr. Pray) Have you had an opportunity to examine this directional survey?

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A Yes, I have.

Q Is this a true and correct copy of the directional survey which was run on this well?

A It is a true Xerox copy.

MR. MORRIS: May I ask that it be marked for identification?

(Whereupon, Pure's Exhibit 1-b was marked for identification.)

Q (By Mr. Pray) Mr. Henry, was there a dip meter survey run on this well?

A Yes, sir, there was.

Q Do you have a copy of that dip meter survey?

A No, we do not.

Q Not with you?

A Not with me, no.

Q Where is that survey?

A It's in Midland.

MR. PRAY: We request that you make that available to us in order that we might examine it for whatever information it might provide us.



Q I believe you did testify that this was one of the matters you considered in making this adjusted map which is Exhibit No. 1?

A No, sir, I did not testify to that. The dip meter has

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no bearing to that map whatsoever.

Q Did you say that adjusted transit times from the sonic log, and I believe I understood you to say that the calculations of pipe obtained from dip meter survey?

A No, sir, I did not. I did not say that.

Q What does a dip meter show, Mr. Henry?

A The dip meter shows the dip of the beds.

Q It would tend to establish what?

A Dip of the beds.

Q From this well?

A At that bore hole.

MR. PRAY: We would request that copies of this be made available to us, Mr. Morris.

MR. MORRIS: Mr. Henry has just testified that this did not enter into his considerations at all. He previously has testified that we have furnished all of the information upon which he has based his opinions that he has presented in his testimony here. We would think that it has no bearing upon Mr. Henry's opinions in this case.

MR. PORTER: We feel that the witness has testified to everything that he has used and that the information requested is not necessary in this case.

MR. PRAY: I'll abide by the Commission's decision and reserve an exception to the ruling.

MR. PORTER: The exception will be noted.

Q (By Mr. Pray) Mr. Henry, do I understand correctly that production tests and the basic data with the open flow potential will be introduced by the next witness?

A I believe that's correct.

MR. PRAY: Then we would have no further questions of this witness. However, at this time we would like to reserve the right after we have had an opportunity to evaluate this data which has been furnished to us, that we may again further examine as to these materials which have been submitted.

MR. MORRIS: If the Commission please, this is a matter largely within the discretion of the Commission, but it is irregular that the right of cross examination be continued, prolonged to a later time. We would ask that Mr. Pray finish his cross examination at this time. We furnished the information that he has requested and we don't think it would be in order for any great continuance to be allowed by the Commission.

MR. PRAY: If the Commission please, this would not have had to occur had Pure furnished us with this information in advance of the hearing. Inasmuch as it will take considerable time to evaluate this, I asked our expert, Dr. Kaveler, how much time he estimates it would take to go over and evaluate this data. He said it probably would take a

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two-week period of concentrated work, and he couldn't devote two weeks to it, so it will take over a period of two weeks to a month.

GOVERNOR CAMPBELL: Let's proceed with the case. If you are through with the witness at this time you can request that he be recalled and we'll rule on it at that time.

MR. PORTER: Does anyone have any questions of the witness?

MR. MORRIS: I have one or two questions, Mr. Porter.

REDIRECT EXAMINATION

BY MR. MORRIS:

Q Mr. Henry, would you direct your attention to Exhibit 1-a, which was the structure map of the Devonian introduced by Pure Oil Company at the hearing for application of the Red Hills Unit? Is the location of the Red Hills Well No. 1 shown on that exhibit?

A No, it is not.

Q It's not?

A It's not shown.

Q What considerations other than the information shown upon this exhibit entered into the location of this well?

A Well, the things that entered into the location was that we preferred to drill the highest point of the structure with our investment which was originally estimated to cost a

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million five hundred thousand dollars. We felt like that if we drilled the crest of the structure that we would have the best position on this structure to fully evaluate this structure.

Q What was the primary objective of your Red Hills Well No. 1?

A It was primarily projected to the Devonian.

Q Was the Well No. 1 drilled at the highest point on this structure?

A Yes, the No. 1 Red Hills was drilled at the highest point at that time with all the information we had, it was drilled at the highest shot point on the structure.

Q Was the location of the Well No. 1 based upon seismic information?

A Yes, it was.

Q To what degree was it based on seismic information with respect to the exact location that the well was drilled?

A Well, it was located near a shot point which we had datum on.

Q Was that shot point the highest point on the structure?

A That's right.

Q Mr. Henry, you have stated that in the Pennsylvanian formation there is an effective net pay of 42 feet. Although we have engineering testimony coming along, from what you know

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of the production history in this formation, does that production history bear out the 42 feet of net pay?

A No, it does not. The 42 feet that I picked may be a very optimistic figure in light of our present production history that we have on this well.

Q The most that can be said, Mr. Henry, is this a fair statement, that 42 feet is very optimistic for the Pennsylvanian?

A It may be, yes, very optimistic.

Q In the event of further development wells in this area, would you expect to take a close look at all of the zones of the Pennsylvanian formation?

A Yes, we would.

Q That would include not only the Atoka that is present in this well, but also the Strawn and the Morrow?

A Yes.

Q If you should be fortunate enough to have any production in commercial quantities in the Strawn or the Morrow, either in addition to the Atoka or existing separately, what would be your opinion concerning the establishment of separate pools for those zones?

A Well, I would combine them all and have one Pennsylvanian pool.

Q Would it be detrimental to Pure Oil Company's position if all of these zones were not combined into one pool?

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A It is my opinion that it would be.

Q For what reason?

A Well, it would be uneconomical to triply complete three zones together in one well when chances are they may be a common reservoir.

Q Mr. Henry, is it your opinion or is it not your opinion that these zones of the Pennsylvanian are a common reservoir?

A It is my opinion that they are.

Q Upon what do you base that opinion?

A Well, from various information that I have arrived at from various production that's in Southeast New Mexico in the Delaware Basin.

Q Do you feel that lithologically in this area the Pennsylvanian should be considered a common source of supply?

A Yes, I do.

MR. MORRIS: Those are all the questions we have on redirect of Mr. Henry, and at this time we would again move the introduction of our Exhibits 1, 2, 3, 4 and 1-a and 1-b.

MR. PRAY: If the Commission please, I have a few questions on recross.

GOVERNOR CAMPBELL: Do you have any objection to the admission of the exhibits?

MR. PRAY: I would not object to the admission

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of these exhibits into evidence provided I will have a later opportunity to further cross examine the witness.

GOVERNOR CAMPBELL: You have no objection?

MR. PRAY: Reserve the right to cross examine later.

MR. PORTER: The exhibits will be admitted.

(Whereupon, Pure's Exhibits 1, 2, 3, 4, 1-a and 1-b were reoffered and admitted in evidence.)

MR. PORTER: You may proceed with your recross examination.

MR. PRAY: All right.

RECROSS EXAMINATION

BY MR. PRAY:

Q Mr. Henry, you testified that this well in Section 32 was, in your opinion, drilled upon the crest of the structure and that this was based on seismic interpretation. How many shot points were made in Section 32?

A I don't recall off-hand, but quite a few.

Q Was there a shot point made in the center of Section 32?

A My memory is not that good, but I would just say that there were quite a few within this section, whether the exact center, I don't know, but there were lines drawn criss cross across this area.

Q How many lines?

A I don't have that information with me and I couldn't tell you.

Q Do you have the information available as to the difference in elevation between a shot point in the center of 32 and the one that was actually drilled that you stated this well was located near a shot point?

A That information is probably in Midland, yes.

Q But you don't of your own knowledge know?

A I don't have it with me.

Q How much higher could it be on the structure according to this seismic interpretation?

A I don't have that information with me and I would not recall from memory.

Q Well, what are the contour intervals on that map?

A This contour is minus 100, it is 15,100 at the highest point, and it goes down to fifteen one or fifteen two.

Q There are one hundred-foot intervals?

A That is right.

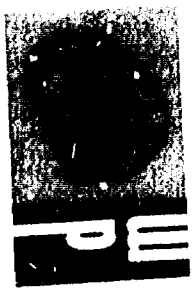
Q So the most it could have been in elevation would be 100 feet higher, is that correct?

A Yes, that's probably right.

Q So it's probably somewhere between a hundred and zero, but you don't know exactly?

A No, I don't have the figure with me.

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Q You state on the production history and formation that it appears that perhaps your effective net pay of 42 feet was optimistic. Would you please explain to me how you can tell net effective pay change by production history?

A I believe that Mr. Norman Ross, our engineer, has more information on that. I would rather for him to testify.

Q But you did testify to this, did you not?

A Repeat your question.

Q But you did testify that in your opinion it did now appear that there was perhaps a less optimistic picture of net effective pay due to the production history?

A That's right, it didn't appear to be as good as we anticipated.

Q Do you, of your own knowledge, know any correlation between determination of net effective pay and production history?

A Correlation, what do you mean?

Q Any way by which one varies in proportion to the other.

A Well, if you only had one foot of net effective pay I don't believe you would have much of a production history. We, from the logs and calculations it looked like this could be very good, but our production history has not borne this fact out.

Q How long a production history have you had?

A I believe it started producing on the 26th of December and I don't recall, it's been, I mean it plugged itself off, I don't know exactly, it's a couple of months I believe. I believe it made something of 200,000 cubic feet, if my figure is right, it's just from memory.

Q 200,000 cubic feet?

A Two hundred million, excuse me. I'm taking these figures from memory.

Q Let me pose a hypothetical to you, then, with your background and experience, if you had a one-foot thick reservoir which covered a hundred square miles, and you produced that, could you tell whether or not in fact you had one foot or a hundred feet covering only one square mile?

A No, I couldn't.

Q In relation to the separation of the Atoka, Strawn and the Morrow, earlier I asked you if you knew the Commission's definition, or the definition contained in the rules and regulations as to the common source of supply, and you said no, you didn't. Again you now testify that you believe that these are a common reservoir. I ask you this question, how do you determine whether or not you have a common reservoir?

A Well, it's just my opinion that they are a common reservoir.

Q But you don't really have the facts available to

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determine whether or not there is a common reservoir, do you?

A I don't have all the facts, no.

MR. PRAY: No further questions.

MR. PORTER: Does anyone else have a question of the witness? He may be excused.

(Witness excused.)

(Whereupon, Pure Oil Company's Exhibits 5 through 16 in Cases 3158, 3159, 3207 and 3208 were marked for identification.)

NORMAN ROSS

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

DIRECT EXAMINATION

BY MR. MORRIS:

Q Mr. Ross, please state your name, by whom you are employed and in what capacity and where you are located.

A I am Norman Ross, and employed by The Pure Oil Company as a reservoir engineer in their Midland District Office.

Q Would you please state briefly your education and education in the oil business?

A Yes, sir, I graduated in May of 1960 from Texas A & M College with a B. S. Degree in petroleum engineering. I worked for seventeen months for Honolulu Oil Corporation as

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a petroleum engineer in Lavaland, Texas. I went to work for The Pure Oil Company November 1st, 1961 as a field engineer in the Dollarhide Unit. In October of 1963 I was promoted to petroleum engineer in charge of engineering in the Dollarhide Unit. November the 1st, 1964 I was transferred to the Midland District Office and promoted to reservoir engineer.

Q Are you familiar with the Red Hills Unit area and the well under consideration here today?

A Yes, I am.

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

MR. PORTER: Yes, they are.

Q What type of work have you done on the Red Hills Unit Well No. 1?

A I have made reservoir and economic calculations based on flow data, drill stem test data and production data on this well.

Q Referring to what has been marked as Exhibit No. 5, would you state what that exhibit is and what it shows?

A Exhibit No. 5 is a reservoir rock and fluid properties for the Red Hills Unit No. 1. Mr. Henry has calculated or has testified to the average porosity, the porosity range and the connate water saturations that are shown on Exhibit 5.

We have the three reservoirs listed here, and the first

item here, or the third item rather, would be the average permeability in millidarcy feet. For the Devonian we calculated 6.7 millidarcies, for the Pennsylvanian we calculated 12.3 millidarcies, and for the Wolfcamp we calculated .94 millidarcies.

Skipping the connate water saturation and coming to the reservoir pressure in psia, for the Devonian we have 7,632 pounds; for the Pennsylvanian, 7,863 pounds, and for the Wolfcamp, 11,304 pounds per square inch absolute. These pressures are the initial reservoir pressures as determined by drill stem test and early production tests on this well.

Next we have the gas compressibility which was calculated based on the gravity of the gas. For the Devonian it is 1.206, for the Pennsylvanian it is 1.229, and for the Wolfcamp it is 1.596. The gas gravity shown here is a calculated value at reservoir conditions. It's .58 for the Devonian and the Pennsylvanian. We have calculated a gravity of the gas of .766 in the Wolfcamp. This is taking into consideration the liquid production from the Wolfcamp.

The stock tank liquids shown here are zero for the Devonian and the Pennsylvanian and 40 barrels per million for the Wolfcamp. These values were also measured.

It is my opinion, based on presently available data, that one well will effectively drain 640 acres in the Wolfcamp,

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Pennsylvanian and Devonian zones of the Red Hills Unit No. 1. Of course, further development drilling should furnish more data concerning the drainage of all three of these reservoirs. At this time I would like to go into the history of this Pennsylvanian zone a little bit, if I may.

Q Go ahead.

A Initially the Pennsylvanian zone looked very good to us. As Mr. Henry has testified, we placed this well on production December the 26th, 1964 and we flowed until January the 13th when we plugged up in the tubing, we feel that it's in the tubing, we can't be sure, with shale particles. During this time we had noticed a very rapid decline in the flowing pressure of this Pennsylvanian zone.

We also ran, previous to the plugging of the zone, some short term shut-ins. In other words, we would shut the well in for two or three hours and the surface pressure would only build to 3,700 pounds and would stop. Previous to this when we initially put the well on in the last part of December the pressure would jump to approximately 58 or 59 hundred pounds within, oh, an hour of shut in.

We do not feel like that the reserves in the Pennsylvanian now are as prolific as we did initially. Now, due to the fact that we're plugged up in the tubing, there is a possibility that all of our data is erroneous, but this is only a slight

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possibility.

Q Taking into account the probabilities of the situation, Mr. Ross, what do you think your experience is going to be in the Pennsylvanian zone of this well?

A You mean the future operation?

Q Yes, as far as the future is concerned.

A This will depend basically on some future tests in the Wolfcamp. First of all, to do anything to this Pennsylvanian zone we will have to squeeze off these Wolfcamp perforations with cement due to the high pressure in the Wolfcamp. We hate to put cement back on the Wolfcamp again if we can keep from it.

Q What is the present status of the Pennsylvanian?

A The present status is that it is plugged with shale particles and we're not producing the well.

Q It has produced reasonably prolifically for a short period of time, hasn't it?

A This well, as Mr. Henry testified earlier, has produced approximately two hundred million cubic feet of gas.

MR. PORTER: From the Pennsylvanian?

A From the Pennsylvanian zone. We initially began flowing this well, just from memory, we flowed rates out of the Pennsylvanian 12 to 15 million per day. It was very prolific.

Q Do I gather from your testimony then, Mr. Ross, that the Pennsylvanian formation in this well is probably gone or

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just about gone?

A That would be my opinion as far as the Pennsylvanian zone is concerned, is that there is very little gas left to be recovered from the Pennsylvanian zone.

Q Your Wolfcamp is producing at this time?

A In the Red Hills No. 1.

Q In the Red Hills No. 1. I believe Mr. Henry testified earlier that the Devonian zone is plugged off and is not producing at this time?

A That is true.

Q All you have producing right now in this well is the Wolfcamp?

A That is correct.

Q As far as the future of this one well is concerned, would you expect to produce the Devonian formation at some later time?

A Really, I would hesitate to say, due to the fact I'm a reservoir engineer and this falls in the line of operational decisions.

Q Let's talk about a development well then. Let's say that a development well is to be drilled in this Red Hills Unit area. What type of a well would be the most probable ultimate completion?

A As I understand, now, we would try for Devonian-

Wolfcamp dual completion now.

Q How much money did The Pure Oil Company and the participants in the Red Hills Unit spend on their Well No. 1?

A It is my understanding that they spent approximately three million dollars on the Red Hills No. 1.

Q Do you believe that this will be a typical cost of further development wells in this area?

A No, I do not.

Q You've said that a typical well might be expected to be a Wolfcamp-Devonian dual completion. Have you an exhibit showing the well costs of such a dual completion?

A Yes, I do. Exhibit No. 6 for the Red Hills Unit is a well cost estimate for Wolfcamp-Devonian dual.

Q Would you go through that exhibit and just point out the major items contributing to the well cost?

A As you can see, the first major item contributing to the cost of the well is the contract rig time. This estimation here, if there's any change more than likely this will be higher, the price will be higher due to unexpected conditions in the hole.

Q This is what you would hope the rig time would be for a typical well of this type?

A For a typical well. If we ran into any difficulties the cost would be higher. The next one is the drilling mud.

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Again, if we run into difficulties drilling the well this price will be increased considerably.

Q Do you have any idea what your mud bill was on the No. 1 well?

A It was my understanding that the mud bill on the No. 1 well was right at a million dollars or maybe slightly over a million dollars.

MR. PRAY: Objection, he's testifying as to hearsay. He keeps saying "I understand" rather than "It is my information based on thus and so." I believe this is improper consideration for testimony on what the expenses of the No. 1 well were unless they put someone on who knows what the costs were.

MR. MORRIS: I'll withdraw that question.

Q (By Mr. Morris) Would it be your opinion, Mr. Ross, that the price for mud in the Wolfcamp-Devonian dual completion might be in excess of the $230,000 that you have put into the computation here?

A It very easily could be in excess of $230,000.

Q Would those be the two major items that would be subject to fluctuation?

A Yes, sir, these would be the two major items.

Q Turning now to what has been marked Exhibit 7 in this case, would you state what that exhibit is and what it shows?

A Exhibit No. 7 is the economic calculations for a

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Wolfcamp-Devonian dual well. The Devonian reserves have been calculated for 640-acre spacing and also for 320-acre spacing. We have the two columns of figures that represent the two different spacing patterns. From the reserves we have calculated the net gas revenue. Now, to calculate this average price of $141.00 per million for the Devonian, we assumed an 80% net to gross ratio. This would take care of royalty, overriding royalty, and operating cost.

We should also point out that these figures are before federal income tax. We have also assumed there would be a price escalation in the gas price which is subject to F.P.C. approval. For the Devonian the total net revenue for 640-acre spacing is $1,635,600. For 320-acre spacing it is $817,800.

Next we have the Wolfcamp reserves, both gas reserves and liquid reserves listed for the 640-acre spacing and the 320-acre spacing. The total net revenue for the Wolfcamp for 640-acre spacing is $2,274,290. For 320-acre spacing it is $1,137.145.

The total net value of production from both zones for 640-acre spacing is $3,909,890, for the 320-acre spacing it is $1,954,945. Subtracting the investment from this net value of production we arrive at the profit. For 640 acres we have $2,449,890 and for 320 acres we have $494,945.

We have calculated a profit to investment ratio, which for

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640-acre spacing is 1.68 and for 320-acre spacing it's .328. Immediately below this we have taken the value of the total production from both zones and discounted it with a 6% discount factor. For the 640-acre spacing it is $2,569,200. For the 320 it is $1,465,000. Subtracting the investment from this number leaves us a profit at a 6% discount for 640-acre spacing of $1,109,200, for 320-acre spacing, $5,000.00. This gave us a profit discounted at 6% to investment ratio of .76 for the 640-acre spacing and .0034 for the 320-acre spacing.

Q Mr. Ross, you have testified that this Wolfcamp-Devonian dual completion for which you have just given an economics calculation would be the type of well you would expect for additional development wells in the Red Hills area. But have you also taken some alternatives into account in the event that those additional wells might prove to be productive in the Pennsylvanian formation or other alternatives?

A Yes, we have. Exhibit No. 8 is the well cost estimated for a Wolfcamp-Devonian-Pennsylvanian triple completion.

Q I won't ask you to go through this in any detail except to just sort of compare this with the well costs that you had for the Wolfcamp-Devonian dual and explain the difference in well cost.

A The difference between this well and the previous

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well is $75,000.00. This is primarily due to the casing sizes that will be required to make a triple completion.

Q Referring then to Exhibit No. 9, would you explain your economic calculations of what a Wolfcamp-Pennsylvanian and Devonian triple completion would be?

A Exhibit No. 9 is the economic calculation for this triple completion. Again we have calculated the total net revenue for each one of the zones based on 640-acre spacing and also 320-acre spacing.

Q Now, Mr. Ross, I won't ask you to go through and in the same detail as you did for the Wolfcamp-Devonian dual, but would you just point out the features of this exhibit?

A Yes, I will. The net value of the production from all three zones based on 640-acre spacing is $4,020,390. When we subtract our investment from this and obtain a profit, it is $2,485,390. This is for 640-acre spacing. The profit to investment ratio is 1.62. For 320-acre spacing our net value of production is $2,010,195, which gives us a profit of $475,195 and a profit to investment ratio of .31.

I would like to point out now that when we discount the net value of the production and subtract the investment from it we end up for 640-acre spacing with a profit of $1,106,800, and a profit discounted at 6% to investment ratio of .72.

This is for the 640-acre spacing. If we have 320-acre spacing we will not show a profit, if we discount the value of the production at 6%.

Q Mr. Ross, have you also taken into consideration that one possible variation of the theme here might be a Wolfcamp-Pennsylvanian dual completion?

A Yes, we have. Do you have well costs and economic calculations with respect to such a completion?

A Yes, we do. Exhibit No. 10 is the estimated well costs for Wolfcamp-Pennsylvanian dual well. The total cost for this well is $1,100,000.

Q As shown on your Exhibit No. 10?

A Correct.

Q Referring next to Exhibit 11, would you point out the features of your economic calculation on that exhibit?

A Yes, I will. This is the economics for a Wolfcamp-Pennsylvanian dual again calculated based on 640-acre spacing and 320-acre spacing. The net value of the production for both zones on 640-acre spacing is $2,384,790, which gives us a profit of $1,284,790, and a profit to investment ratio of 1.17 to 1. This is for 640-acre spacing.

For 320-acre spacing the net value of the production is $1,192,395. The profit is $92,395, which gives us a profit to investment ratio of .077 to 1.

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When the net value of the production is discounted at 6%, we see that our profit at 6% discount for 640 acres is only $469,000, which gives us a profit discounted at 6% to investment ratio of .30 to 1. On the 320-acre spacing, when we discount the net value of our production at 6%, we do not make money. We show a loss as far as the profit is concerned.

Again, all of these values we assumed an 80% net to gross ratio. This is before federal income tax.

Q Mr. Ross, in your present well, the Well No. 1, the Wolfcamp production, at least so far, has appeared to be the substantial producing formation, is that right?

A Yes, that is true.

Q Have you made an estimate of the cost and the economics involved in the drilling of a single completion to the Wolfcamp formation?

A Yes, I have. Exhibit No. 12 is the well cost for an estimated Wolfcamp single completion. The total cost here is only $686,700. This is quite a bit cheaper than our estimated well costs due to the fact that we're using smaller casing, one string of tubing, contract rig and the drilling mud costs are also lower on this single well.

Q Have you figured the economics of drilling a single Wolfcamp completion?

A Yes, I have.

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Q Would you refer to Exhibit 13 in that regard?

A Exhibit 13 is the calculated economics for this single Wolfcamp completion. This is also calculated on 640-acre spacing and 320-acre spacing. The total revenue for 640-acre spacing is $2,274,290. Subtracting investment from this we arrive at a profit of $1,587,590 for 640-acre spacing. This gives us a profit to investment ratio of 2.31.

For the 320-acre spacing our total revenue is $1,137,145, which gives us a profit of $450,445, and a profit to investment ratio of .655 for 320-acre spacing.

The net value of the production has again been discounted as 6%, the investment subtracted from it, to arrive at a profit discounted at 6%. For 640-acre spacing this is $807,700, and a profit discounted at 6% to investment ratio of 1.175. For 320 acres the profit discounted at 6% is $155,500, which gives us a profit discounted at 6% to investment ratio of .226.

Again, this same assumption was made on this calculation as on the previous calculations.



Q Mr. Ross, referring back to Exhibit No. 7 for a moment, which were your economic calculations on the Wolfcamp-Devonian dual, am I correct in saying that this exhibit reflects the economics of the type of well that you would expect as a further development well in this Red Hills Unit?

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A Yes.

Q From this economic calculation, or any of the other economic calculations that you have made and presented here as an exhibit, what conclusions have you reached concerning the economics of further development in the Red Hills Unit with regard to the spacing in this area?

A Well, it's my opinion that the future development drilling will have to be on 640-acre spacing or the economics seem to point or justify this in all of these calculations that we have made.

Q You have previously testified, Mr. Ross, that in your opinion one well can efficiently drain and develop an area of 640 acres in each of the Wolfcamp, Pennsylvanian and Devonian formations in this area, is that correct?

A That is correct, based on our present information.

Q Do you have special rules and regulations for each of these pools that would reflect the conclusions that you have just stated?

A Yes, I do.

Q Are those marked as Exhibits 14, 15 and 16 with respect to the Wolfcamp, Pennsylvanian and Devonian Pools respectively?

A They are.

Q Are they identical except as to the pool designation?

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A They are.

Q Would you refer to Exhibit 14 and read Rule No. 1 of your proposed rules and regulations?

A Yes, I will. Rule No. 1: "Each well completed in the Red Hills-Wolfcamp Gas Pool or in the Wolfcamp formation within one mile of the Red Hills-Wolfcamp Gas Pool, and not nearer to or within the limits of another designated Wolfcamp pool, shall be spaced, drilled, operated, and produced in accordance with these Special Rules and Regulations."

Q Now would you read Rule 2?

A Rule 2: "Each well completed in the Red Hills-Wolfcamp Gas Pool shall be located on a standard unit containing 640 acres, more or less, consisting of a single governmental section."

Q Would you read Rule 3?

A Rule 3: "Each well completed in the Red Hills-Wolfcamp Gas Pool shall be located no nearer than 1650 feet to the outer boundary of the section and no nearer than 330 feet to any governmental quarter-quarter section line. Any well drilled to or being completed in the Red Hills-Wolfcamp Gas Pool is granted an exception to the well location requirements of this rule."

Q With the change in designation of the pool, then, with respect to the Pennsylvanian and Devonian, in each case

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do these rules that you have just read reflect your recommendations for special rules in the pools under consideration?

A They do.

Q Do you have any recommendations to make to the Commission concerning the length of time that these rules should be in effect and whether they should be temporary or permanent rules?

A I would request that these rules be temporary rules, as shown in Exhibits 14, 15 and 16, and be applied for two years. These temporary rules would allow for obtaining more reservoir information and data to further define the effective drainage radius of each one of the wells in each one of the reservoirs.

Q What plans does The Pure Oil Company or the Red Hills Unit have for further development in this area?

A We will drill a wildcat well approximately two and a half miles northeast of our present well in the near future.

Q These are your present intentions, is that correct?

MR. PORTER: Did you say two and a half miles northeast?

A That is correct.

Q Would additional wells be contemplated during the two years that these temporary rules would be in effect under

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your recommendation?

A I really don't know about other wells other than this one well.

Q How long does it take, or would it take, to drill a Wolfcamp-Devonian dual completion?

A It is my estimation that to drill a Wolfcamp-Devonian well and to complete the well would take approximately twelve months.

MR. MORRIS: If the Commission please, at this time we offer into evidence Pure Oil Company's Exhibits 5 through 16 inclusive.

(Whereupon, Pure's Exhibits 5 through 16 were offered in evidence.)

MR. PRAY: If the Commission please, I would respectfully like to request that ruling be withheld until such time as we have had an opportunity to examine this witness as to some of the foundationary matters contained in the exhibit and ask the Commission to reserve its ruling until the completion of his testimony.

MR. PORTER: The Commission will reserve the ruling until the completion of the witness's testimony.

CROSS EXAMINATION

BY MR. PRAY:

Q You stated that you are a reservoir engineer in the

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Midland District. Approximately how long have you been employed in that capacity?

A As a reservoir engineer in Midland?

Q Yes.

A Since the first of November, 1964.

Q Approximately three and a half months?

A That's true.

Q Have you had any experience in computing well costs of wells such as this deep Red Hills Unit No. 1 in the past?

A No, sir, I have not.

Q I call your attention to Exhibit No. 5, particularly as to the column denominated the Pennsylvanian. This is the exhibit which is entitled "Reservoir Rock and Fluid Properties," reflects an average porosity of 9.2 and certain other data. You calculated the average permeability. How did you calculate permeability?

A Permeability was calculated from a build-up test that was obtained in October of 1964 on the Pennsylvanian. We went in and flowed the Pennsylvanian and then ran a build-up, pressure build-up test on it, and from this information the permeability was calculated.

Q Do you have a copy of that build-up test with you?

A No, I do not.

Q Will you make it available?

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A Yes, we can. This information is in Midland and we can shoot a copy of it and make it available to you.

MR. PRAY: We request that this be done.

Q (By Mr. Pray) Do you have any other pressure build-up tests which went into the computation of the Wolfcamp and the Devonian permeability?

A In the Wolfcamp, yes, we ran a pressure build-up test on the Wolfcamp January 18th, some 70 hours of build-up. From this we have calculated the permeability.

Q We would request that you make copies of this and any other pressure build-up tests that you have in these three formations.

GOVERNOR CAMPBELL: Do you have any objection, Mr. Morris?

MR. MORRIS: No, Mr. Chairman. We will furnish that information. However, we do not think that it should affect the admissibility of our exhibits, since it would go merely to the weight.

Q (By Mr. Pray) On the Pennsylvanian you reflect the figure of zero condensate or zero stock tank liquids in barrels per MMCF. Is that a true and correct figure?

A We have found that during some of the early tests there was some condensate, but after we started flowing the well into the line we found that there was very negligible

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amounts that for all practical purposes it was zero barrels per million.

Q Do you have available with you the information obtained during the producing period beginning December 27, 1964 for the Pennsylvanian?

A What exactly, exactly what information?

Q The daily flows of gas and condensate.

A I have some of my figures that have been called in from the field and they are on a columnar piece of paper. I could read these figures for you. I do not have them typed up or ready for presentation.

Q That will be perfectly all right. I think they will prove to be valuable to the Commission in its decision on this matter. We will also ask that you have that for Wolfcamp if it is available.

MR. PORTER: We'll take a short recess.

(Whereupon, a recess was taken.)

MR. PORTER: The hearing will come to order. Mr. Pray.

Q (By Mr. Pray) Do you have with you now, Mr. Ross, the tabulation of the production history on the Wolfcamp and Pennsylvanian from the Red Hills No. 1?

A I would like to make a point or two about this. The calculated values here were calculated in the field by sometimes an engineer, sometimes a production foreman, and

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called into Midland and we just roughly jotted them down. Now, how accurate they are I really can't say.

Q In other words, you are not vouching for their accuracy?

A No. I would like to bring up one other point, in the Pennsylvanian we do show a small amount of condensate. I said before that I considered this amount of condensate, it didn't make much difference. It was about a barrel or slightly over, and it looked like to us that this was decreasing the longer we flowed the well. Consequently we didn't use revenue for condensate for the Pennsylvanian zone because we felt like it didn't make any difference anyway.

Q May I see it, please?

A Yes.

MR. PRAY: I ask this be marked Exhibit 1-c.

(Whereupon, Pure's Exhibit 1-c was marked for identification.)

Q Mr. Ross, I ask you now to examine Exhibit 1-c as pertains to the Pennsylvanian zone and would you give the Commission the cumulative production of condensate for that well for the period of time involved, which is approximately how many days, fifteen days?

A Yes, approximately.

Q What was the total cumulative condensate shown?

A 288.7 barrels.

Q I direct your attention now to the date shown here, I believe is January 13th, is that the last full day of production from the Pennsylvanian zone before it became plugged off?

A I cannot say that it was a twenty-four-hour day. There was some production during this day. Whether or not it was twenty-four hours I cannot say exactly.

Q What is the gas production figure reported for that day?

A 8.3 million cubic feet.

Q Turning your attention now to the economic calculations in each case where you have shown a Pennsylvanian completion, whether it be dual, triple or single, what have you shown as the revenue from the Pennsylvanian, net gas revenue?

A That is correct.

Q What is that figure?

A For 640-acre spacing this is $110,500.

Q What is the price of gas in this area? Let me rephrase that, let me be more specific. What is the contract price of gas for this well?

A I do not know.

Q Where did you obtain your information with which to make the calculation on gas revenue?

A When I made the calculation I had it written down in front of me what the price was now.

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Q Do you know who the purchaser is on this well?

A Yes, I do.

Q Who is the purchaser?

A El Paso Natural Gas.

Q There is a contract between El Paso and Pure?

A I do not deal with the gas contracts. I assume there is because we're selling gas to them.

Q I believe you testified that approximately two hundred million cubic feet had been produced from the Pennsylvanian during the period of time which it produced, which was from December 27 to January 13th?

A That is correct.

Q Based on the price which you used as your net figure per MMCF, $146.00, could you give me a rough estimate of the revenue from two hundred million cubic feet?

A Two hundred million cubic feet?

Q Yes, that's what you have testified approximate production.

A Times the $146.00 per MMCF, is that correct?

Q Yes.

A I can multiply that. My multiplication says it will be $29,200.00.

Q That's for eighteen days of production. And you say that the 288 barrels is a negligible amount of condensate and

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you didn't take that into consideration in your economic evaluation?

A What was the question again?

Q The 288 barrels of condensate production for this eighteen-day period, you didn't take that into account?

A No, we didn't.

Q If this were a thirty-day period and at the same approximate rate of condensate production, wouldn't that in fact amount to, oh, roughly 400 barrels a month?

A If you maintained the previous rate--

Q Yes.

A --of condensate production per MCF, this would be close.

Q Where did you get the amount shown here of two dollars a barrel for net liquid revenue?

A This number was arrived at by taking a price for the condensate. I do not have the figure with me.

Q You do not know of your own knowledge what the price is?

A It's approximately $2.86 a barrel, somewhere in this range. We took that, took out -- again used our 80% net to, no, no, on the condensate we took this, took out the royalty and then allowed so much for a hauling charge.

Q Would there be a hauling charge throughout the life

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of this well?

A I really do not know whether there will be definitely or not.

Q You testified that in this eighteen-day period that the gas alone would have produced $28,000?

A No, sir, $29,200.

Q Thank you. I appreciate your exactness, it helps me. Then you've shown on here a total net revenue for the Pennsylvanian in each case of $110,000. Is this $110,000 computed by taking the figures on Exhibit 5 for the Pennsylvanian formation, an average porosity of 9.2%, the reservoir pressure of 7,863 pounds, and did you, using those figures, compute the reserves for the Pennsylvanian in order to establish this $110,000 figure?

A I used part of this information -- well, actually no on the Pennsylvanian I didn't. On the Pennsylvanian, due to this decline in bottom hole pressure, these reserves have been calculated using a material balance type of calculation.

Q Does this show a consistent decline in the rate of production from the Pennsylvanian during that eighteen-day period?

A Consistent decline in gas --

Q Let me be more specific. Over the first few days what was the rate of production from the Pennsylvanian?

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A Approximately fourteen million per day.

Q On down seven or eight days later what was it on the 4th of January?

A 16.4 million.

Q On the 8th day of January what was it?

A 14.7 million.

Q On the 9th of January?

A 15.7 million.

Q And yet you believe that it now appears that the Pennsylvanian is not productive?

A It isn't.

Q It has declined?

A It is my opinion that there is very little gas left in the Pennsylvanian to be recovered.

Q And yet the last day this well produced, it did produce 8.3 million cubic feet of gas?

A That's what the information says that we have.

Q Wouldn't it be more --

A It would be approximately correct.

Q Excuse me, I'm sorry. Wouldn't it be more probable, Mr. Ross, that the entire formation has declined, that the explanation is that this is a mechanical failure, that it is shaled off over the perforations that are in the tubing, and that is the reason it has ceased to produce, and therefore, the

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reserve figures do not accurately reflect the amount of reserves in the Pennsylvanian formation in this well or any subsequent well?

A I cannot agree with that. In my opinion the rate was still fairly high, this eight million a day, but the pressures, indicated pressures were lower.

Q Do you have that pressure information?

A I do not have it with me. From memory, though, we shut the well in for approximately two and a half hours and the tubing pressure built up to only 3700 pounds.

Q Changing now to a little bit different consideration, let's consider now the Wolfcamp formation. Does this exhibit summarize the amount of production which has been obtained from the Wolfcamp in any place on it?

A Does it summarize --

Q Does it summarize the total production? Does it have a column which is cumulative production gas, cumulative production condensate?

A It does.

Q I ask you to read for the Commission the cumulative production which is reported for the 30th day of January for gas.

A That is 300.7 million.

Q What is it for total condensate production?

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A 15,316.7 barrels.

Q What period of time does this cover?

A This covers from the 26th of December to the 30th of January.

Q Approximately thirty-four or thirty-five days, is that correct?

A That is correct.

Q Would you again make an estimate of what the revenue, using your figure for total net revenue of $146.00 per MMCF, give me the net revenue from the gas?

A That would be approximately $43,800.00.

Q Using your two dollar figure that you used for your net liquid revenue, what would be the net revenue from the condensate?

A Approximately $26,632.00.

Q Would you total those two figures for me, please?

A What is that figure? Approximately $70,432.00.

Q That's for thirty-four days' production from the Wolfcamp. And this, together with the eighteen days production from the Pennsylvanian would amount to approximately how much?

A Approximately $100,000.00.

Q If your well cost was, and not acceding that it would cost this much, but if your well cost is as you have found in

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some of these cases to be a million five hundred dollars, at this rate of production approximately how long would it take to achieve payout?

A Oh, I would have to --

Q Would it be with this $100,000.00 over roughly a thirty-day period; considering the reduction for the Pennsylvanian it would be approximately fifteen months, would it not?

A Yes, sir, I believe that is correct.

Q I would like to call your attention now to Exhibit No. 6. This is a well cost estimate. My questions will not only go to this but it will go to all the well cost estimates which you have prepared. Direct your attention to the contract rig cost figure. How did you determine this figure?

A Oh, determination of these costs, I did not determine these figures by myself. I had the aid of the drilling engineer in the Midland District Office and also the aid of Mr. John Murphy, the district engineer.

Q Are those gentlemen present today?

A No, they are not.

Q On what data did they base their cost determination?

A This rig time, as I understand, was based --

Q You do not know of your own knowledge?

A I do not know.

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Q I direct your attention, then, to the mud cost. On what was this item based?

A I would suppose it would be based on experience in this area.

Q Let me repeat a question then. You are really not experienced in the field of estimating these costs, is that correct?

A That is correct.

MR. PRAY: If the Commission please, we would ask that all of these exhibits on the well cost estimates be stricken from the record for the reason they are not based on his own knowledge and information, they are based on hearsay. We are unable to establish the basis of cost.

Further, I would ask that the Commission strike all the exhibits which purport to reflect the economics of the Pennsylvanian zone for the reason that they are not based on the information which was set forth in Exhibit No. 5 and the reservoir analysis, but based on some reason that he thought the reservoir was now depleted rather than the fact that it was a mechanical failure, because in a subsequent well we would not have the mechanical failure problem, and we believe the Pennsylvanian would be present as is shown by the current production history.

GOVERNOR CAMPBELL: What do you have to say, Mr.

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Morris?

MR. MORRIS: Mr. Chairman, as is so often the case where exhibits of this sort are prepared in the offices of a major oil company, it's a team effort rather than purely the effort of any one individual. Should it be necessary we will put the operations manager of the Midland Office on the stand to corroborate these figures, but Mr. Ross has testified that he participated in the preparation of these exhibits and they were prepared by him working under the direct supervision of his superior, and I think that while he can't perhaps go into detail on it, he can vouch for the general authenticity of the well costs shown on all of these exhibits.

With respect to the other matter that counsel has raised concerning the Pennsylvanian formation, should the Commission think it necessary to go into more detail on that, or should the Commission desire additional evidence as to what has actually happened in the Pennsylvanian and want to go behind what Mr. Ross has testified to, again we have Mr. Weyler, who is the operations superintendent of the Midland Office of Pure Oil Company, and upon the conclusion of the cross examination of this witness we'll be glad to put him on the stand.

GOVERNOR CAMPBELL: That's your decision. It's your case. You'll have to make that decision. It seems to me that here again your objection is directed more to the weight

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than to the admissibility of this evidence. I don't know, as far as I am concerned, I think the evidence ought to be admitted. The Commission will certainly take into consideration in all evidence the weight and validity and that sort of thing.

MR. PRAY: If the Commission please, we would like to take exception to this ruling. I do have other questions of the witness at this time.

Q (By Mr. Pray) In testifying as to the economic evaluations which you have made in these various exhibits, you stated that this was made after deducting the overrides. What were the amount of overrides which you deducted?

A I don't believe I quite made that statement, and if I did I didn't mean that. I meant that the 80% net to gross ratio that we used was to take care of the royalty and any overrides, if they were there. This is what I was trying to convey.

Q In other words, you don't know if there are in fact overrides which are involved in this?

A I know there is some overrides in this area in the Red Hills.

Q But you do not know of your own knowledge what they are?

A I do not know exactly how much they are or exactly where they are located.

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Q But you did reduce the gross revenue, which is shown to Pure, for purposes of computing profit and payout by the amount of some unknown override?

A Would you repeat that?

Q All I am saying is that you did make some reduction, whether it was in the exact amount of the known overrides or whether it was just to take care of any contingencies?

A We made this reduction to take care of contingencies which would cover overrides and operating costs.

Q So the reduction is not directly related to any particular override?

A No.

Q You stated on direct that the next well would be two and one-half miles north of Section 32, is that correct?

A I stated that it would be approximately two and one-half miles northeast of the present well.

Q Would this be within the area which has been created as a pool by this Commission in the previous hearing and for which you seek the special field rules? Do you know what area has been created as a field?

A Not exactly.

Q Well, the tier of sections along the north of Section 32, three sections, the three sections including Section 32 as the center one on each side, the three sections

below with Section 5 as the center and the one on each side. In other words, a nine-section block around Section 32. Would this well be located within that nine square mile designation if it were two and a half miles northeast?

MR. MORRIS: If the Commission please, just to set the record straight here, I think it was a six-section block rather than a nine-section.

MR. PRAY: All right. What are the sections?

MR. MORRIS: Sections 31, 32 and 33 of 25 South, 33 East, Sections 4, 5 and 6 of 26 South, 33 East.

Q (By Mr. Pray) Sections 31, 32 and 33 of 25 South, 33 East, Sections 4, 5 and 6 of 26 South, 33 East, would this well location, this two and a half miles away from 32 be outside of that area which is established?

A Yes, it would.

Q Then it would not be subject to the special field rules which you propose?

A I do not know.

Q Well, if it is outside the area and the rules are only established for this area, then it would not be subject to the special field rules, would it?

A That would seem reasonable.

MR. PRAY: No further questions.

MR. PORTER: Does anyone else have a question of

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Mr. Ross?

MR. MORRIS: May I have just a moment?

MR. PRAY: Again I would like to reserve the right at some later time after we have had an opportunity to examine these exhibits and the materials submitted and taken into evidence to further examine this witness at a later date.

I believe I made an oversight. I didn't ask for the production tests which would complete our obtaining information from them.

MR. MORRIS: I thought that information had already been furnished to you.

MR. PRAY: I don't believe so. We have the drill stem test.

MR. MORRIS: Let me check quickly.

MR. PRAY: We also want the build-up pressure test.

MR. MORRIS: Yes. What was the other item?

MR. PRAY: The production, the perforations and the acidization tests and so forth.

MR. MORRIS: Unless I am mistaken, the production data on the Pennsylvanian and Wolfcamp formations has previously been submitted to you. The data on the Devonian formation is complete as shown on the Exhibit 5 which has been introduced into evidence of the log section of the Devonian.

MR. PRAY: This is a true and complete copy of all

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tests which have been made?

MR. MORRIS: That's my understanding. Just in the event you don't have it, I have been furnished and now I furnish to you a complete tabulation of the production tests on the zones, at least on the Wolfcamp, Pennsylvanian and Devonian.

MR. PRAY: All right.

GOVERNOR CAMPBELL: Do you have all the information you need and want?

MR. PRAY: Yes, sir, insofar as we know we do.

GOVERNOR CAMPBELL: We have to reach a point at some stage where we have to go ahead or decide that we are going to go ahead. Do you feel that you have what you requested in your Subpoena to the Commission?

MR. PRAY: Yes, I believe we do.

MR. MORRIS: I have no further questions of this witness.

MR. PORTER: Does anyone else have a question of the witness? He may be excused.

(Witness excused.)

MR. MORRIS: At this time, Mr. Commissioner, we would like to point out here that we had intended to present today as our witness, as our engineering witness, Mr. John Murphy, who at the last minute was unable to come because he

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was taken down with the flu. Some of the confusion that we may have had here with Mr. Ross not having personal information is in large part due to the shortness of time that he had to prepare himself for this hearing. That is not meant to detract at all from the fact that he participated directly in the preparation of all of these exhibits.

At this time we would call for a brief testimony of Mr. Jack Weyler, if we could be permitted to do so.

(Witness sworn.)

MR. MORRIS: At this time we would move the introduction of Exhibits 5 through 16 and 1-c into evidence.

MR. PRAY: We would object to the introduction of all these exhibits except 1-c, which we will agree to have admitted.

MR. PORTER: The exhibits will be admitted.

MR. PRAY: I'll take an exception, Mr. Commissioner.

MR. PORTER: Yes, sir.

(Whereupon, Pure's Exhibits 5 through 16 and 1-c were offered and admitted in evidence.)

JOHN R. WEYLER

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

DIRECT EXAMINATION

BY MR. MORRIS:

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Q Mr. Weyler, would you state your name, by whom you are employed, in what capacity and where you are located?

A My name is John R. Weyler, W-e-y-l-e-r. I am district operations superintendent for The Pure Oil Company in Midland, Texas. This is the Red Hills well in Lea County, New Mexico is under my direct supervision. I have been operations superintendent in Midland since August of 1963. The drilling of the well was under my supervision and so is the present operation.

Q Mr. Weyler, have you participated directly in the drilling and completion and operation and production of the Red Hills Unit Well No. 1?

A Yes, sir. It was not only under my supervision, but I spent considerable time on the location during the drilling, completion and production of the well.

Q Have you kept yourself familiar with the progress of the hearings on the special rules and regulations for the Wolfcamp, Pennsylvanian and Devonian formations and kept yourself familiar with the preparation of the exhibits that have been presented here today?

A Yes, sir, I have.

Q I neglected to ask you at the outset to state briefly for the Commission your educational and practical experience in the oil business. Would you do that briefly?

A Yes. I'm a graduate petroleum engineer, graduating from Colorado School of Mines in 1950 as a petroleum engineer; was employed at that time by The Pure Oil Company, worked as a field engineer and an engineer doing reservoir work and operational work, unitization work in other matters for ten years until 1960. For three years thereafter I was supervisor of economics and technology in Denver, Colorado in our division office, till 1963 when I was transferred to Midland as district superintendent.

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

MR. PORTER: Yes, they are.

Q (By Mr. Morris) Mr. Weyler, would you elaborate upon the present status of the Pennsylvanian formation in the Red Hills Unit Well No. 1, and give us your opinion of the reasons for the present status of that well?

A Yes, sir, I will. I would like to also refer to the record which is the daily drilling report at least for certain numbers, which I think will help clarify what The Pure Oil Company, what I think, I think we think is the present situation, particularly with respect to the Pennsylvanian zone.

If I could, please, I would like to also refer to that Exhibit 1-c which came out of my file a few minutes ago. We

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did commence producing the Pennsylvanian zone as well as the Wolfcamp zone on December 26, 1964. Just to set the record straight, all of these dates here are actually the date of reporting, so the production was for the previcus twenty-four hours.

The Pennsylvanian zone produced until January 12, 1965, at which time it plugged off for the second time. The Pennsylvanian tubing pressure as measured on December 24, 1964 was 5794 pounds per square inch.

I would like to refer to a flowing tubing pressure on a flow period which was from December 29th, 1964 to December 30, 1964, and I'm quoting from our drilling report, Pennsylvanian, twenty-four hours flowed at the rate of 14.1 MMCF per day on a 24/64 choke, tubing pressure 4,000 pounds per square inch. On January 11th, 1965 following some of our plugging troubles the well was flowing again after having been plugged off at one time.

The Pennsylvanian shut-in tubing pressure on that date was 3700 pounds per square inch, stabilized as reported from the field, not only one time, but three times during that twenty-four-hour period. At each time the well was shut-in and stabilized at 3700 pounds.

Granted that was a relatively short shut-in time, but it was substantially stable and I doubt very much if it would

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have increased very much more than that, remembering that for many days before it was flowing at the rate of over 14 million cubic feet per day at 4,000 pounds per square inch.

We have lost approximately one-third, or I believe in excess of one-third of our flowing tubing pressure of our shut-in tubing pressure while producing only 192 million cubic feet of gas. There is no question in our mind that this is a small reserve. I believe that volumetrically this will coincide or corroborate the reserves that have been previously presented to the Commission.

We do not have a bottom hole pressure since we commenced producing the Pennsylvanian zone, but on the basis of our tubing pressure, which is the best evidence we have, we know we are dealing with a limited, a very limited reserve.

The rate of production did not decline, but this in itself is no measure of the decline of a reservoir. On the basis of our measured pressures we know it was declining and declining very, very rapidly. The previous witness was not in the field. I do not know if he was acquainted with some of the pressures that we actually measured. I might, if I may, counselor, go into some of our plans here to clarify this with respect to the Pennsylvanian.

Q Yes, I would like for you to state, Mr. Weyler, what your prospects are for the Pennsylvanian in this well and

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what you would expect to find as far as the Pennsylvanian is concerned in additional development wells in this area.

A Well, we think we are dealing with a reservoir of extremely limited value, at least it's found in the Red Hills No. 1. It does not warrant rework at this time.

We have a gas contract with El Paso Natural Gas which commenced December 15th, 1964. The price we are receiving for the gas is sixteen cents per thousand. El Paso, in cooperating with us so that we can evaluate the reservoirs, have allowed us to produce twenty million feet a day to El Paso for a three-month period ending March 15, 1965 at a price of sixteen cents per thousand.

As of that date the rate of production will decrease by contract to two million feet a day per producing zone, until January 1st, 1966. At that date the reserves will be agreed upon between El Paso and Pure and our contractual rates will be one million cubic feet of gas per day for eight billion cubic feet of reserves.

Under the terms of this contract and because we want to fully evaluate the one good zone we have, namely the Wolfcamp, we do not choose, it would not be profitable at all, it would be foolhardy in fact to attempt recompletion of the Pennsylvanian at this time. We estimate this would cost us in excess of $100,000 to go in and pull all the equipment out

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and repair the Pennsylvanian zone. We do not know the exact extent of the damage in the casing or in the tubing to the Pennsylvanian section. We do know that the Pennsylvanian tubing is plugged, very tightly plugged with shale and other debris. We worked on it for a number of days trying to unplug it. We did unplug it once but our attempts since that time have been unsuccessful.

If we were to go in now and pull all that equipment out, even if it were economically profitable, in our judgment we would lose all of the time that we have to evaluate the Wolfcamp, which we feel is very important to all of us. To see if we have a substantial Wolfcamp reservoir, the high rates of production will allow us during the ninety-day period to evaluate the zones. We want to do them on the basis of pressure. We will take out as much gas as we can and measure the reduction in tubing and reservoir pressure, and therefore establish reserves.

We, therefore, will have in this very short period of time we think a reasonably good evaluation of these two reservoirs and we, of course, we have the Devonian, since it is not producing we cannot evaluate in this manner. That is the present status of our Pennsylvanian-Wolfcamp well and our plans for it.

Q In view of your comments, Mr. Weyler, would you

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have an opinion concerning the validity of the economic studies that have been presented by Mr. Ross?

A Yes, sir. I have reviewed these economic calculations and believe that they are valid. Referring to the Pennsylvanian and noting that the engineers did not give any value to the liquid reserves for the Pennsylvanian, this is reasonable. Our liquid ratio was declining at the time during the final few days of flow. These are pretty rough figures, these field figures, but the Pennsylvanian liquids were declining, that was drying up. At best we had a little over a barrel per million. It's a dry gas reservoir.

As we know, these reservoirs get dryer. We could flow in a barrel or two barrels and it doesn't affect materially the economics. We'd be glad to do it. It isn't going to change the answers materially.

As far as the rest of the economics, I think they are very reasonable. The well costs shown here on the basis of what we have found in this area are very reasonable. The well we drilled did cost over three million dollars, our mud bill was in excess of a million and a half dollars. It's a very tough area to drill and complete wells in. We're lucky to actually get the well to bottom and get it completed. We're having one blow-out during the drilling.

Q Mr. Weyler, Mr. Ross, in the presentation of his

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economic picture, stated, and it is shown on each of the economic calculations, that he considered the values as net to operator assuming 80% net to gross ratio and before federal income tax. The 20% mark down was justified on the basis of royalty interest, overriding royalty interests and operating costs.

MR. PRAY: Objection, unless this witness is able to establish that he knows of his own knowledge about these reductions.

MR. MORRIS: I was about to ask the witness if he was familiar with the reason for using this 80% net gross ratio and of the extent of the overrides in this area.

A Yes, sir, I do, because I sat in on the decision to use this number. It's a reasonable number. We can move it up, do the economics over again, and here again it's not going to materially affect the results of the calculation. There are overrides on most of the properties in the area. These overrides vary from five percent to twelve and a half percent.

We figured, believe that to show to the Commission a single computation that we would reduce the average well seven and a half percent over the normal 1/8th royalty and this would be a reasonable computation, but here again, we can make them over again and forget the overrides and the answers are going to be substantially the same.

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Q Does that take, that extra seven and a half percent take into account not only the overriding royalty interest but your lifting and operating costs?

A No. This was a gross to net reduction -- well, I don't want to get off here and say something wrong, but I believe this was simply for royalty and overrides, that the other costs of operation were excluded in other parts of the computations.

MR. MORRIS: That's all I have of this witness.

MR. PORTER: Any questions?

CROSS EXAMINATION

BY MR. PRAY:

Q Mr. Weyler, as superintendent of the district operation of Pure, it is your responsibility for the completion of this well and the successful carrying out of the development program of the Red Hills Unit, is that correct?

A Yes, sir.

Q You stated that the Pennsylvanian tubing is definitely plugged?

A That is correct.

Q This means that nothing can go into the Pennsylvanian tubing, does it not?

A That is correct.

Q If the tubing is plugged, then there can't be any

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pressure within that tubing, is that correct?

A Not from the bottom, that is correct.

Q Even if this tubing weren't plugged, if the formation were causing plugging of the perforations, would we not also have a reduction of flow and pressures across the perforations?

A This is a possibility. We don't believe it's occurring. We have a restriction in the tubing that is very small at one point and this is the point at which we are getting the shale accumulation and which is plugging, we are sure of that, because when we unplugged that one point before, that's when we re-established good production.

Q But you cannot be absolutely certain until such time as you are able to rework this well whether or not it is in fact a plugging condition or whether it is the fact that the formation is depleted, isn't that true?

A We have both things going on and we know that. We know we have depletion because when it was unplugged we measured the 3700 pounds shut-in tubing pressure when it was unplugged.

Q When the tubing was unplugged?

A That is correct.

Q So it could be plugging of the casing, though, could it not?

A Well, hardly, because when we unplugged the tubing

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that one time we re-established excellent production, and I know all of those perforations aren't plugged.

Q You re-established production the first time, is it possible that you could re-establish production the second time?

A We tried.

Q But it is possible --

A We'd love to re-establish it if we can.

Q I am sure.

A We have been in it with wire liner tools and it's an extremely hazardous operation.

Q You stated that there is a gas contract with El Paso Natural Gas and you testified to a number of provisions. This twenty million a day, isn't that the guaranteed take, the minimum guaranteed take, isn't the two million a day after this testing period a guaranteed minimum take? Could they not, in fact, take more if they so desired?

A They may, but we can't count on that because that's up to El Paso, it's in all gas contracts. You are correct. That's what we are anticipating.

Q Do you have a copy of this contract with you?

A No, I don't.

MR. PRAY: We would ask that this contract be produced at some time for our files and ask it be introduced into

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evidence. We think it is one of the necessary factors in this matter and that is what is their contract, what is the price and what are the terms and conditions?

Q (By Mr. Pray) Is there not, in fact, a second contract involving El Paso, perhaps one other major oil company, Shell Oil Company, involving this area and the market?

A What contract?

Q I am asking is there not another contract in addition to this one contract on this one well. Is there not an overriding contract as to the area, maybe even affecting other areas of the state?

A Not with respect to this area.

Q Not with respect to the Red Hills area?

A That is correct.

Q I don't want to belabor this at all, but on this burden of overriding royalty, is this not in addition to the ordinary royalty? Isn't the overriding royalty given for acquiring leases or for farmouts, in other words, wasn't something obtained in return for giving this overriding royalty?

A These overriding royalties were given by people certainly other than me. I'm not in exploration or land. They happen to be a fact. We have them on the properties.

Q May I try to rephrase my question then? Is not the

overriding royalty a burden on the working interest so that in order to compute the gross revenue to working interest we must ignore the overriding royalties? This is the burden that the working interest carries?

A That is correct.

Q So it is not, in fact, proper to reduce the income to the working interest by the amount of the overriding royalty interest which amounts to seven percent, which in itself would be a fair profit?

A Seven percent of what?

MR. MORRIS: Objection, I think the Commission is well aware that we're talking about the difference between the gross to the operator and the net to the operator.

Q Are you familiar with this contract between Pure and El Paso?

A I am familiar with many of the terms of it, yes, sir.

Q Do you recall in this contract a definition of recoverable reserves?

A Yes, but I couldn't state it for you.

MR. PRAY: No further questions of this witness.

MR. PORTER: Does anyone else have a question of the witness? Mr. Nutter.

MR. NUTTER: Yes, sir.

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CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Weyler, this six percent discount on the profit, over how many years was the six percent discounted?

A This six percent discount factor was applied during the life of the production to the income.

Q What was the expected life of the three zones?

A I can't give you the actual life. We do have a decline curve. We do have these yearly, these production rates by years, but I don't have that information. This is a summary of the economics.

Q So actually you don't know how many years this is applicable to?

A No, sir, I don't, but that could be supplied.

MR. MORRIS: I understand it was right at twenty years.

MR. NUTTER: That's all.

MR. PORTER: Any further questions of the witness? Mr. Morris?

MR. MORRIS: We have no further questions and that completes our case.

MR. PORTER: Does anyone else desire to present testimony?

MR. PRAY: If the Commission please, we would like to at this time ask for a continuance of this matter in order

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that we can assimilate this ream of material which we have obtained today, and I would like to put Dr. Kaveler on the stand at this time to testify as to approximately how long it would take him to assimilate this material and render his opinion in order that we may present our case in chief.

MR. MORRIS: Excuse me, before Dr. Kaveler goes to the trouble of testifying, I would suggest that regardless of the length of time that would be involved we would strongly oppose any continuation of this case. We have presented our case in chief and we have made a great deal of information available prior to the hearing.

I would call the Commission's attention to the fact that on January the 8th we furnished summary of drill stem tests taken in the Wolfcamp and the Pennsylvanian, our gamma ray neutron, gamma sonic and lateral micrologs, radiocativity logs, our Topco surveys, summary of flow tests taken prior to final completion in the Wolfcamp and Pennsylvanian formations, and the structure map which was our Exhibit 1-a today.

Then following our application for the Devonian on February the 4th, we submitted to the Commission a summary of our drill stem test data taken in the Devonian formation, summary of our production tests taken in the Devonian

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formation, and an analysis of the Devonian gas, so that while our opposition perhaps didn't have all the information that they wanted, certainly they didn't have all the information that we have brought in here today, we feel that they did have sufficient information from which they could have prepared their basic statement of position and be able to take a position in this hearing today.

This matter started in November, 1964, we've had I think four separate hearings on this. This is the fourth one, of one degree or another, and we would be very much against any further delay in the establishment of special rules and regulations in these pools. Any further delay may well hinder Pure Oil Company and the participants in the Red Hills Unit from formulating their plans for further development; as testified to by Mr. Ross, it would take about a year to drill a well once it is even started.

GOVERNOR CAMPBELL: Isn't that correct that you've also testified that you don't presently contemplate drilling any more wells within the pool limits, or within a mile of the pool limits?

MR. MORRIS: At the present time, Mr. Chairman, we are faced with demands that have been made upon us by our opposition here today. Mr. Schuman, Mr. Yager and interests associated with them with respect to the drilling of a well in

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Section 5 immediately south of the No. 1 well. The decision that Pure Oil Company must make with respect to these demands that have been made upon us will be greatly influenced by the adoption of the special rules and regulations. To that extent we have the further need for the adoption of these rules and regulations at an early date.

GOVERNOR CAMPBELL: What is the position that you have in this case now, other than wanting a delay?

MR. PRAY: If I may, we have tried continually from the time in November to get this information so we would proceed, so that this could reach an orderly conclusion at the earliest date. It is Pure which has refused to supply it, delayed, argued the Motion to Quash, and so apparently they're not too concerned about the time factor in this matter.

The matter of whether there is a demand for additional development in the adjacent section is a matter which really is not within the jurisdiction or the purview of the Commission as to whether or not they will have time. This is a matter, I think, between Pure and the parties themselves.

We believe that in order to protect correlative rights in this matter, which is the material thing, and to prevent waste, that the Commission must have certain facts before it. We have just today gotten these facts. We believe in order to present our case it will take a reasonable length of time

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in which to evaluate this, that it would be impossible and I am sure Mr. Morris would concede it would be impossible for us to make a cursory examination of this and continue on with this case in a few hours or even a few days. We are not trying to stall the matter, Your Honor. We want to proceed at every instance if we can obtain the information.

GOVERNOR CAMPBELL: Is there litigation pending in this matter?

MR. PRAY: No, sir, there is not.

MR. MORRIS: I might add, Mr. Chairman, that from the letters that we have received, even very recently from our opposition, I don't know how much longer we can say that --

GOVERNOR CAMPBELL: The pressure is building up?

MR. MORRIS: The pressure is building. As late as February 11 we received, Pure Oil Company received additional demand letters that a well be drilled in Section 5.

GOVERNOR CAMPBELL: In the light of your desire to have a period of time to prepare yourselves to present your case, would you be willing to agree that the matter would be held in the status quo until at least such time as the case can be completed?

MR. PRAY: May I have just a second to confer with our client?

GOVERNOR CAMPBELL: You have kind of got us in a

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bind here.

MR. PRAY: If the Commission please, I would like to point out one factor and then I will answer directly the question. Of course, Mr. Kaveler is not a party to this demand. Mr. Schuman, who has his interest leased to Pure, and I believe it's recognized that drainage is now occurring, Mr. Schuman has agreed, however, that in the interest of proceeding in an orderly manner, in order that we may have time to evaluate this, that he would not file a lawsuit within the period of thirty days, which we believe would be the time necessary to evaluate this data.

MR. MORRIS: For even the more reason, we respectfully request that the Commission at this time take the case under advisement and issue an order as promptly as it can.

GOVERNOR CAMPBELL: Let me ask you this, Mr. Pray, you have an application pending here also in one of these cases in which you have the burden of proof with regard to the definition of the Pennsylvanian formation. Are you prepared to proceed on that?

MR. PRAY: No, sir, this again involves materials which were in the bosom of The Pure Oil Company. It was our belief that this was something that needed to be brought to the Commission's attention and that the information that would be produced at this hearing would be necessary to go

forward on that matter. If the Commission please, this matter of drainage and this matter of demand is not of our creating, this is a matter that Pure created when they located this well.

GOVERNOR CAMPBELL: Well, we are aware of that, the circumstances that led up to the problem. We don't want to unreasonably delay continued development of this area. Our interest should be the same as the participants in this litigation as far as that part of it is concerned.

MR. PRAY: If Your Honor please, we don't believe that we're standing in the way of development, that they may proceed under the existing rules without any jeopardy. That is, I say, not standing in the way of other development at all. It is for this reason that we're presenting our case, to show that there is no reason they can't develop their property on the present and existing spacing rules, and this is our position.

GOVERNOR CAMPBELL: How much time are you seeking?

MR. PRAY: I would like to put Dr. Kaveler on to find out.

GOVERNOR CAMPBELL: Can't he tell you?

MR. PRAY: Dr. Kaveler, how much time would you need?

MR. KAVELER: I would need two weeks at a minimum, and I would like to have a month because I don't spend all my

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time on this project. I can't.

GOVERNOR CAMPBELL: The Commission has decided to permit you, in view of the fact that there is no discovery procedure in administrative cases in New Mexico, to proceed to prepare your case and we will continue this case until the regular hearing of the Commission in March.

While it's quite true that the Commission has no jurisdiction to tell you what or what not to do in connection with your private contractual arrangements, the Commission would be quite disappointed if we had a lawsuit pending at the time we had to make the decision on this case.

MR. PRAY: If nothing further, we understand the position of the Commission. That would be the regular hearing, do you have the date?

GOVERNOR CAMPBELL: March 17.

MR. PORTER: Since the other cases on the docket have already been heard, the hearing is adjourned.

MR. MORRIS: There are some interested parties here that have statements of position.

MR. PORTER: Do they want to make them at this time? The Commission will hear any statement that anyone has to make concerning the cases.

MR. WHITE: Charley White. Based upon the testimony and the evidence that has been presented in Cases 3158, 3159,

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3207 and 3208, Tenneco Oil Company supports the application for 640-acre spacing and the proposed special rules.

GOVERNOR CAMPBELL: Any other statements?

MR. PORTER: Mr. Anderson.

MR. ANDERSON: John Anderson, Geological Survey. This case is of considerable interest to us inasmuch as all of the land that we are talking about and certain other lands are included in the Red Hills Unit area which was approved by the Director of the Geological Survey, and also by the State Land Commission, and also by the Oil Conservation Commission.

We, of course, are familiar with the well that has been drilled and we have had some tentative discussions with representatives of Pure Oil Company, the unit operator, about the plan of development to be filed for the Red Hills Unit, which this plan of development is to provide for the wells to be drilled in the calendar year 1965, and also for their location and the formations to be tested.

In addition, we have had some tentative discussions with the unit operator in the matter of a participating area for the Devonian and the Pennsylvanian and the Wolfcamp. In all of these discussions we, in the Survey, have had no ideas other than 640-acre spacing for Wolfcamp and the Pennsylvanian and the Devonian.

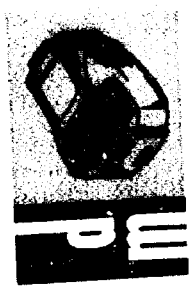
At this stage of the information that we have we feel

that the spacing should be 640 acres on a temporary basis as requested by Pure until we have additional wells drilled and have sufficient reservoir information on which to base a spacing program. We can always go to 320-acre spacing if the information that we will get from drilling the further wells would indicate that this is proper.

So we feel that waste would be occurring if we started out on 320 acres at this stage of the game. We would recommend to the Commission that the application of Pure for 640-acre spacing and the field rules be approved.

MR. PORTER: Anyone else have a statement to make? The case will be continued to March 17 regular hearing. The hearing is adjourned.

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STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Hearing before the New Mexico Oil Conservation Commission was reported by me; and that the same is a true and correct record of the said proceedings, to the best of my knowledge, skill and ability.

Witness my Hand and Seal this 24th day of February, 1965.

Ada Dearnley
NOTARY PUBLIC

My Commission Expires:

June 19, 1967.

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BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
January 13, 1965

REGULAR HEARING

IN THE MATTER OF:

Application of the Pure Oil Company for the creation of a new gas pool and for special pool rules, Lea County, New Mexico.

Case No. 3158

Application of the Pure Oil Company for the creation of a new gas pool and for special pool rules, Lea County, New Mexico.

Case No. 3159

BEFORE: Mr. A. L. "Pete" Porter
Mr. Guyton B. Hays

TRANSCRIPT OF HEARING

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MR. PORTER: We will call next Case 3158.

MR. DURRETT: Application of the Pure Oil Company for the creation of a new gas pool and for special pool rules, Lea County, New Mexico.

If the Commission please, you might also desire to call the next case, as I believe they are interrelated.

MR. PORTER: Case 3159.

MR. DURRETT: Application of the Pure Oil Company for the creation of a new gas pool and for special pool rules, Lea County, New Mexico.

MR. MORRIS: If the Commission please, I'm Richard Morris, Seth, Mont_..ery, Federici and Andrews, Santa Fe, New Mexico, --

MR. PORTER: Mr. Morris.

MR. MORRIS: -- appearing for the applicant in these two cases, the Pure Oil Company. With me in the case is Mr. Sumner Buell, also of Seth, Montgomery, Federici and Andrews, and Mr. Scott Rogers of the Houston, Texas law firm of Vinson, Elkins, Weems and Searls.



MR. PORTER: Do we have other appearances? Mr. Hunker.

MR. HUNKER: I am George H. Hunker, Junior of Roswell, New Mexico, appearing in behalf of Jerald Schuman and Saul Yager of Tulsa, Oklahoma.

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MR. PORTER: How do you spell Mr. Schuman's name?

MR. HUNKER: J-e-r-a-l-d S-c-h-u-m-a-n and Mr. Saul, S-a-u-l Y-a-g-e-r. I'm joined in this matter by John F. Russell, an attorney from Roswell, New Mexico and Mr. Donald E. Fray, attorney at law, Tulsa, Oklahoma.

MR. PORTER: Mr. White.

MR. WHITE: Charles White of Gilbert, White and Gilbert, Santa Fe, appearing on behalf of Tenneco.

MR. PORTER: Tenneco?

MR. WHITE: Yes, sir.

MR. TROTT: James I. Trott, T-r-o-t-t.

MR. PORTER: James I.?

MR. TROTT: Yes, sir, appearing in behalf of George T. Aboll.

MR. PORTER: Mr. Trott, are you an attorney?

MR. TROTT: No, sir.

MR. PORTER: Are there any other appearances in the case? These cases were originally scheduled before an Examiner and as a result of the Examiner Hearing the Commission, or as a result of a request after the Examiner Hearing the Commission issued subpoenas for certain information and continued the cases to be heard before the full Commission and at this time. We had a Motion to Quash filed by the applicant, and at this time we will hear the arguments on the

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Motions to Quash. Mr. Morris.

MR. MORRIS: If the Commission please, I have a memorandum prepared in support of our motion that I would like to present at this time. If the Commission please.

MR. PORTER: Mr. Morris.

MR. MORRIS: It's with some reluctance that I would appear before a Commission that has issued a subpoena, has already taken action, and ask that that Commission rescind its action, but in this instance I have perhaps less reluctance because of the knowledge that the Commission has issued its subpoena without a hearing on whether the subpoena should have been issued, recognizing that proper procedure would be to hear a Motion to Quash to determine the legality of that subpoena.

I want to say at the outset that we recognize fully that the Commission has broad subpoena powers given to it under Section 65-3-7 of the New Mexico Statutes, including the power to require the production of documents in a proceeding before the Commission so long as those documents are relevant to the proceeding.

In our Motion to Quash the subpoena that has been issued by the Commission and directed to certain employees of the Pure Oil Company asking for the production of certain documents concerning the Red Hills Unit Well No. 1, the

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Commission we feel has gone beyond the powers given it by statute in requiring that the production of documents be made for the purposes of prehearing discovery and inspection by parties adverse to the Pure Oil Company in these cases.

In short, we feel that the Commission, while it has subpoena powers, does not have the power to require us to make discovery prior to a hearing. Our position is supported by the authority of Mr. Davis in his Treatise on Administrative Law, and I might mention that Mr. Davis is perhaps the leading authority in his writings on administrative law and he, in his treatise, he comments on the power of an administrative agency, particularly he was referring to a federal administrative agency, but the problem is the same with a state agency.

He comments on the power of an administrative agency to require prehearing discovery, saying this: "The Administrative Procedure Act," here he's referring to the Federal Administrative Procedure Act which contains provisions for subpoena, "contains no provision for pretrial discovery in the administrative process and, of course, the provisions of the Federal Rules of Civil Procedure for discovery do not apply to administrative proceedings. Therefore, in absence of special statutory provision, and in absence of special administrative regulation, no procedure for discovery is normally available

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in a Federal administrative proceeding."

In sum, what he is saying is that you need specific statutory authority before you can require discovery. We submit that this Commission does not have that authority under the statutes of this state, nor has it sought to recognize or expand its authority in any way by promulgating rules and regulations to cover this situation.

So, as our point number one in support of our Motion to Quash the Subpoena, we submit to the Commission that it has no authority to require the pretrial or prehearing production of documents, which it has afforded to require by its Subpoena Duces Tecum.

Perhaps more fundamental and less technical an argument, however, is raised by our second point in support of our Motion which concerns the relevancy of the documents that have been subpoenaed. Here we need to bear in mind just what is the matter pending before this Commission. As a result of previous hearings in this case the Commission, by Orders Nos. R-2826 and R-2827 issued on December 7, 1964, has created two gas pools, one being the Red Hills-Wolfcamp Gas Pool, the other the Red Hills-Pennsylvanian Gas Pool. By those orders the hearing was continued with respect to the establishment of special rules and regulations for these pools.

The important point is that the pools have been

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established and the matter now pending before this Commission is the establishment of special rules and regulations for the Wolfcamp and the Pennsylvanian.

Now let's look at the scope of the subpoena that was issued by the Commission. Is it limited to matters dealing solely with the Wolfcamp and Pennsylvanian formations? A quick glance at the subpoena certainly shows that it is much broader than that and asks for information which could have no relevancy to the establishment of special rules and regulations for these two formations.

At this point I would like to mention that on January 8, 1965, the Pure Oil Company submitted to the Commission certain information pertaining to the Pennsylvanian and Wolfcamp formations in this well, and by submitting that information we feel that we have complied fully with the matters requested insofar as are relevant to these proceedings. Looking at the Subpoena Duces Tecum, Item No. 1 calls for "Copy of all drill stem test reports made of each formation tested and the surface flows, if any, on each test."

The call of the subpoena is not limited to the Pennsylvanian or Wolfcamp formations, but on January 8, 1965 the Commission was furnished with a summary of drill stem tests taken in the Wolfcamp and Pennsylvanian formations. We respectfully submit that any other tests taken on any other

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formations are completely irrelevant to these proceedings.

Item No. 2 called for by the subpoena, "Copies of the core analysis made on each of the 14 cores cut from the subject well." To begin with, there was no core analysis made in either the Wolfcamp or the Pennsylvanian formations. There was no core cut in the Pennsylvanian. There was one core cut in the Wolfcamp, but there was no analysis made of that core. So as to the Wolfcamp and Pennsylvanian formations, there's no core analysis available to be produced and any core analyses on other formations would be irrelevant to these proceedings.

Item No. 3 called for by the subpoena, "Copy of all sample analyses made on any of the products which have been tested on the subject well." At the hearing of these cases on November 24, 1964 we introduced into evidence and furnished our opposing counsel with copies of sample analyses made on products from the Wolfcamp and Pennsylvanian formations. Again we submit that any analyses made of products from other formations would be irrelevant to these proceedings.

Item No. 4 called for by the subpoena, "Copy of all well logs, including lateral logs, gamma neutron logs, sonic logs, micro logs and the porosity and saturation calculations from these logs which have been furnished to Pure by the logging company." The logs on the subject well were furnished both

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at the hearing on November 24, 1964 and a full set of logs was furnished to the Commission also on January 8, 1965. There were no porosity and saturation calculations furnished to Pure by the logging company.

Number 5, "A copy of the directional survey made on the well from 16,954 feet to 21,000 feet and any other directional survey made at any time during the drilling of the well." Wolfcamp formation in the subject well occurs in the interval from 11,643 feet to 14,310 feet. The Pennsylvanian formation occurs from the interval from 14,310 to 15,614 feet. No directional surveys were made on the well in these intervals. Any other directional survey made at any other depth would be irrelevant to these proceedings.

Number 6, "A copy of the report which is approved by the Commission detailing the deviation survey of the 'Totco' type." This report was furnished to the Commission on January 8, 1965.

Item No. 7 called for by the subpoena, "The depth of any perforations, the treatment of any perforations and test flows recorded from such perforations in each of the following horizons: Bone Springs, Wolfcamp, Strawn, Atoka, Morrow, Devonian, with the tops listed." On January 8th, 1965 we furnished to the Commission a summary of these flow tests together with information concerning the treatment and the depth of perforations as to the Wolfcamp and Pennsylvanian

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formations. This data, with respect to any other formations, would be irrelevant at this proceeding.

Finally, No. 8, "Copy of the seismic structure map introduced into evidence at the hearing on the application for unit approval," of the Rod Hills Unit. This map was furnished to the Commission on January 8, 1956. We submit to the Commission that we have complied with the relevant portions of its subpoena and certainly should not be required to furnish to this Commission or to our opposition any information not relevant to these proceedings.

Certainly these proceedings should not be a discovery device for the use of the industry or any particular party to gain information not relevant to these proceedings.

Finally, our third point, and I wish to mention this briefly, but I don't want to treat it lightly, is our point that much of the data that the Commission has subpoenaed is what you would call the work product of experts, of technical people hired by and paid by the Pure Oil Company to prepare technical reports and make technical evaluations which are held by the Pure Oil Company in utmost secrecy and are treated as confidential.

Some of this information, it's true, has been made available to other participants in the Red Hills Unit Agreement, but this information is tightly held and it is confidential

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and especially the processes by which engineers and geologists evaluate their reservoirs and compute their reserve estimates are truly secret processes.

Now, even if the Federal Rules of Civil Procedure or the equivalent in New Mexico were applicable in this proceeding, which they are not, but those rules provide for broad discovery, but even under those rules we submit that the discovery of these secret processes would not be allowed, because under Rule 30(b) of the Federal rules and also of our rules here in New Mexico it is specifically recognized that the court may grant a protective order to avoid the discovery of secret processes.

The fact that these reserve calculations and methods of evaluating reservoirs are confidential processes is a matter well known in the petroleum industry. I don't need to put a witness on the stand to tell the Commission that. It's common knowledge and it's a matter of which this Commission can certainly take administrative notice.

In summary we ask that the Commission quash in its entirety the subpoena that has been issued to Mr. Murphey, Mr. Fish and Mr. Tyner, all employees of the Pure Oil Company, on the grounds, first, that the Commission has no authority to require the prehearing discovery; but aside from that point and getting to perhaps something more basic, that the

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matters called for are irrelevant, and in any event much of it is confidential information constituting the secret processes of the Pure Oil Company. We respectfully request the Commission to quash the subpoena.

MR. PORTER: Mr. Russell.

MR. RUSSELL: If the Commission please, I too have a brief which I will furnish to the Commission for their examination. Since this hearing was initially before an Examiner I feel it well to give a little of the factual background to this Commission.

Pure Oil Company is the operator of the Red Hills Governmental Unit located in Lea County, New Mexico. Mr. Yager and Mr. Schuman are owners of mineral interests in the North Half of Section 5, Township 26 South, Range 33 East, which is immediately to the south of this initial well. I would like to point out that this initial well was drilled 330 feet from the section boundary line.

In their application they are asking that a 640-acre tract be distributed to each well in this pool, and if we come before the Examiner they recommend in their rules that such tract be a single governmental section and that no well be drilled closer than 1650 feet to a boundary line.

Prior to the hearing on November 24, Mr. Yager and Mr. Schuman, through counsel, asked Pure to furnish them with

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such information as they felt was necessary to intelligently evaluate the application and determine what effect it would have upon their rights to enable them to protect their correlative rights if it seemed that that was necessary. I believe it was on the evening prior to the hearing Pure did furnish the Applicants the electric and radioactive and sonic well logs, sample analyses and calculated open flow potentials from the Pennsylvanian and Wolfcamp formation, but this information was not sufficient to adequately evaluate the merits of the application, and at the time of the hearing these Applicants continued to request this additional information in order to permit a full and fair hearing, and the Commission did continue the hearing on the establishment of special pool rules until today.

Then the Applicants asked for a Subpoena Duces Tecum to issue in order for them to get the information which they felt was necessary to properly evaluate the application and their position, feeling that if we got it in advance of the hearing that it would be to the convenience and advantage of the Commission for this reason, that when this technical information is introduced it is necessary that another technical engineer, or whatever expert is necessary, look at and evaluate that information before you can intelligently cross examine the witness or determine what your position

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would be. Therefore, at the hearing we would have to, as we did, ask for a continuation to give sufficient time in which to do that.

Now, the first point which has been raised in the Motion to Quash, I would like to point out a few factors in connection with the power of the Commission. Section 65-3-7 gives the following power to the Commission: "...to subpoena witnesses, to require their attendance and giving of testimony before it, and to require the production of books, papers, and records in any proceeding before the Commission...Provided that nothing herein contained shall be construed as requiring any person to produce any books, papers, or records, or to testify in response to any inquiry, not pertinent to some question lawfully before such Commission or court for determination."

Now, this subpoena power is a necessary tool given to the Commission in order to enable them to properly carry out the statutory duty which has been placed upon it. I have some cases from other jurisdiction, I find none in New Mexico, covering the power of this Commission or other administrative agencies of the state in connection with subpoenas. I will not bother giving the full citations of these cases because they'll be in the brief and you can check them, but in the New York Edison case involving rate making, the court said, among other things: "And it is quite apparent that the

defendant, unless it can have an inspection and discovery, cannot prepare its case for trial." Which is what we're contending here.

In this present matter before the Commission Pure has applied for affirmative relief in the nature of special rules for the development of this field, and we feel that it is necessary in order to evaluate our position and for the Commission to evaluate the application, that it is necessary that all information available be made available to the Commission and not held back behind a desk.

In a Supreme Court case, which was United States versus Bryan, the court said: "On the other hand, persons summoned as witnesses by competent authority have certain minimum duties and obligations which are necessary concessions to the public interest in the orderly operation of legislative and judicial machinery. A subpoena has never been treated as an invitation to a game of hare and hounds, in which the witness must testify only if cornered at the end of the chase. If that were the case, then, indeed, the great power of testimonial compulsion, so necessary to the effective functioning of courts and legislatures, would be a nullity. We have often reiterated the importance of this public duty, which every person within the jurisdiction of the Government is bound to perform when properly summoned."

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We can't understand why Pure objects to the production of these documents. In this hearing to grant an exception to an established rule covering spacing of a particular area, the following information is in our opinion necessary in order that the Commission may be fully advised before rendering a decision.

One, the name and depth of all formations which may possibly produce hydrocarbons.

Two, the nature and extent of these formations insofar as known.

Three, all data which might tend to aid in evaluation of the commercial potential of these zones.

Four, information as to the costs of drilling a comparable well.

These items are necessary in order that the economics of drilling on the proposed spacing can be compared with the economics of drilling on the established spacing. Surely Pure cannot in good faith argue that the Commission must look only to the Wolfcamp and Pennsylvanian formation in determining economics, if in fact there are other commercial horizons penetrated by the well. In fact, at the hearing before the Examiner the witness for Pure testified that gas can be flowed at commercial rates not only from the Wolfcamp and Pennsylvanian, but also from the Devonian formation, but they

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don't want any information put in in connection with the Devonian formation.

In the case of Hart versus Ogdensburg, "I can see no good reason why a party should be permitted to withhold from the knowledge of his adversary documentary evidence affecting the merits of the controversy, only to surprise him by its production at the trial, unless, for some satisfactory reason, to be made apparent to the court, each party ought to be required, when it is desired, to disclose to the other any books, papers, and documents within his power which may contain evidence pertinent to the issues to be tried."

I will skip some of this in the interest of brevity, since you will have copies of it. Pointing out a similar situation I believe was in a 1963 case before the Texas Railroad Commission which later went to court, and I'll refer to it as the L & G Oil Company, in that case the Railroad Commission ordered a survey made of a well and the corporation owning the well contended that the Commission had no power of discovery prior to the filing of an action in the courts. The discovery and investigative powers of the Commission were upheld. The court said:

"The legislature has delegated to the Railroad Commission broad and extensive powers to regulate and control the drilling for and production of oil and gas to the end that these natural

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resources be conserved and that the interest of the public as well as individual operation be protected....Surely the Commission invested with all of these powers and responsibilities, is not required to bring a suit each time that it seeks to make an investigation or inspection as to whether its rules and regulations are being enforced. Such a requirement has, so far as we know, never been urged before and if adopted would cripple the Commission and incapacitate it from carrying out and performing the duties imposed upon it by legislative command."

The New Mexico Oil Conservation Commission has the same duties and responsibilities as does the Texas Railroad Commission. Now to go to another point in connection with the relevancy of the documents that we asked for, I contend that their contention is wholly without merit.

Now I, in my opinion the pertinent provision of the New Mexico statutes covering this information is Section G5, I think it's Section G5-3-14(b):

"...the Commission shall consider the economic loss caused by the drilling of unnecessary wells, the protection of correlative rights, including those of royalty owners, the prevention of waste, the avoidance of the augmentation of risks arising from the drilling of an excessive number of wells, and the prevention of reduced recovery which might

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result from the drilling of too few wells."

Now, before an economic picture can be projected to determine whether or not a reasonable operator, prudent operator could develop this area on 640, 320 or 160, you must know what the anticipated reserves are, you must know what it will cost to drill the well and what your return will be in the form of production. Well, I will agree that if a well was drilled as their Red Hills well was drilled, and there was only one zone capable of producing gas in commercial quantities, then your economics would say in all probability that to go less than 640 would result in the field not being properly developed and that a reasonable, prudent operator would not drill another well in the pool; but that goes out the window if you can show that there are four or five zones that may be produced from that well, because that has an entirely different picture from the economic standpoint whether you get five times or one time the amount of gas that will be allocated.

It certainly has a tremendous effect upon the economic picture, and Pure does not want to give you any information, or us either, as to whether there are any zones capable of production of gas in commercial quantities other than the Wolfcamp and the Pennsylvanian. I say that you cannot carry out your statutory duty without having this information

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available to make your determination as to the size of the unit which may be attributed to the well. They have referred, in effect, to the privileged nature of the documents which we have requested, and I would like to make a few points in connection with that. Unless these documents are legally privileged, then the fact that they may contain confidential material is of no legal significance.

The privilege accorded certain relationships by law such as the doctor-patient relationship, husband-wife, attorney and client, are strictly construed and they're limited to these particular relationships. The documents submitted here are subject to no such relationships. This type of argument advanced by Pure has been considered by the Supreme Court of the United States in the United States versus Bryan wherein the court said:

"Certain exemptions from attending, or having attended, giving testimony are recognized by all courts. But every such exemption is grounded in a substantial individual interest which has been found, through centuries of experience, to outweigh the public interest in the search for truth. Dean Wigmore stated the proposition thus: 'For more than three centuries it has now been recognized as a fundamental maxim that the public has a right to every man's evidence. When we come to examine the various claims of exemption, we start with

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the primary assumption that there is a general duty to give what testimony one is capable of giving, and that any exemptions which may exist are distinctly exceptional, being so many derogations from a positive general rule.'"

And also in the McMann case the court said: "Therefore, although we assume, as we do, that the conduct of investigations under these statutes is subject to the same testimonial privileges as judicial proceedings, it will not serve McMann; he must erect a new privilege ad hoc. The suppression of truth is a grievous necessity at best, more especially when as here, the inquiry concerns the public interest; it can be justified at all only when the opposed private interest is supreme."

Also in that same case the court said: "But the very fact that testimonial privileges are based upon specified confidential relationships is proof that they do not extend to all, and it hardly needs to be said that nobody by contract, express or implied, can abridge public duties. So far as the principal's rights may be classed as "property" at all, they are subject to this condition."

Then it was referred to as the work product. There are cases on the work product, not we found in New Mexico, but in other jurisdictions, and I would like to read a few excerpts from some of those cases.

The first one is the Greyhound Corporation case where

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the court said: "Work product" doctrine which protects attorneys' work product from disclosure is based upon theory that one attorney may not take undue advantage of adversary's efforts, and doctrine is, in essence, form of statutory privilege which should not be extended by judicial fiat."

In the case of Caruso versus Moore McCormack Lines, Inc., the court said: "Statement of a witness taken by an attorney is not clothed in the mantle of "work product," and is not exempt from production in an admiralty action on such theory."

And in the case of the United States versus Certain Parcels of Land: "Where factual information contained in document sought to be discovered in condemnation proceeding had been gathered for Government by third persons under supervision of Government's attorneys, supervision or acquisition by Government's attorneys did not convert the result into the "work product" of a lawyer, and, therefore, there was not any privilege which would prevent defendant landowners from pursuing the usual purpose of a pre-trial discovery to obtain such facts."

In closing, I would like to say that it appears to me that Pure has taken the position before this Commission that in determining what size spacing acreage should be alloted in a particular pool or to a particular well, that Pure will tell the Commission what testimony, what evidence, what

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information they must base their decision on. We are not going to give you all of the information that you feel may be necessary. We're going to give you only what we think is necessary.

We will make the evaluation and determine as a result of it what evidence is necessary before you in order for you to determine whether their application does protect correlative rights and also prevent waste.

We submit that the Motion to Quash filed on behalf of Pure should be overruled. At this point I would like to offer to put on two witnesses, one Mr. Jerald Schuman, in order to establish for the record what his interest is in this case, and number two, an expert in the field to testify as to his opinion why the documents we requested and were not furnished are necessary for a proper determination by the Commission of their statutory duty in declaring the size and the nature of the rules.

If the Commission has no objection, I would like to put them on at this point.

MR. PORTER: Mr. Morris.

MR. MORRIS: If the Commission please, it seems that a determination by the Commission of the points that we have raised in our Motion to Quash might well obviate the necessity of any testimony concerning why Mr. Schuman and Mr.

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Yager feel that they need this information. I would like to, without belaboring the issues presented here by our motion or by Mr. Russell, in his response, I would merely like to comment at this time that we are here ready to put on evidence in support of our application. We think that the evidence that we put on before this Commission will support our application.

If our opposition wants to put on some evidence, they're certainly entitled to. If they want to cross examine our witnesses and the work that they have done and put forth as testimony here, they're entitled to do that. We are here, we have our witnesses here, we are ready to go on the merits of this case.

There are a number of other interested parties here that are interested in the merits of this case. We respectfully request that the Commission will dispose of the Motion to Quash the Subpoena without the necessity of taking evidence, but merely as a matter of law and as to what Mr. Schuman's interest is, I am sure we could reach a stipulation on that.

MR. PORTER: Mr. Russell, could you state Mr. Schuman's interest so that we may determine here as to whether or not it can be stipulated as to what his interests are?

MR. RUSSELL: I'm not certain whether it is set out

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in the -- It is in the brief that he is the owner of a royalty, an overriding royalty interest in minerals in the North Half of Section 5, Township 26 South, Range 33 East, which is directly offsetting the well drilled by Pure, which interest I would like to add is under lease to Pure Oil Company, and there are other mineral interests in other sections, if you would like to have that also, but, of course, this one in the North Half of 5 is the most critical at this point, 140 mineral acres under the North Half of Section 5.

MR. PORTER: Mr. Morris, would you agree to stipulate to this interest?

MR. MORRIS: We would certainly stipulate that those facts are correct. We would ask that we might reach a more specific stipulation on just what Mr. Schuman's interest is, and I think I can pose the stipulation that would be acceptable.

From the information that I have, Mr. Jerald M. Schuman owns the following interest in the East Half of the East Half of Section 5, 4.66919% royalty interest, and then others connected with Mr. Schuman, Avrome Schuman owns 0.27466% royalty interest in that same land. Mr. J. Harold Schuman owns a like interest, 0.27466% royalty. Mr. Earl Schuman has a like interest, 0.27466%. Then in addition to the royalty interest, still referring to the East Half of the East Half

of Section 5, Jerald M. Schuman owns an overriding royalty interest of 1.86768%; Avrome Schuman, 0.10986%; J. Harold Schuman, 0.10986%, and Earl Schuman, 0.10986%, all of those being overriding royalty interests.

Then with respect to the North Half of the Northwest Quarter and the Northwest Quarter of the Northeast Quarter of Section 5, Mr. Jerald M. Schuman owns a 4.98047% royalty interest; Avrome Schuman, 0.29297% royalty; J. Harold Schuman, 0.29297% royalty, and Earl Schuman, 0.29297% royalty interest.

In those same tracts, that is the North Half of the Northwest Quarter and the Northwest Quarter of the Northeast Quarter of Section 5, Jerald M. Schuman owns 1.99219% overriding royalty interest; Avrome Schuman, zero, I can shorten, Avrome J., Harold and Earl each own 0.11719% overriding royalty interest.

MR. RUSSELL: I haven't any idea whether that's correct or not. All I can say is that Mr. Schuman owns 140 mineral acres less 4% subject to Pure's lease, and the acreage is the North Half of the North Half, the Southeast of the Northeast and the East Half of the Southeast of Section 5, and that Mr. Jerald Schuman owns 85% of that interest. I just don't know on those figures whether they're correct or not. If we can't get a stipulation it probably would be quicker to

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put him on and ask him what it is.

MR. MORRIS: I don't think there's any conflict between what Mr. Russell said and what I have said. I think that the record will reflect that they are the same. Certainly we can stipulate that Mr. Schuman and those associated with him own the royalty and overriding royalty interest in the North Half of Section 5, and I don't believe what Mr. Russell said or what I have said will contradict each other.

MR. PORTER: Well, the stipulation is what you are seeking, isn't it?

MR. RUSSELL: I just felt that the Commission would prefer to have a stipulation of his interest rather than the testimony, so if my stipulation is acceptable --

MR. MORRIS: Yes, it will be acceptable.

MR. PORTER: Then, Mr. Russell, the Commission will allow you to call your expert witness, but to be sure that you limit your questions to the relevancy in his opinion of these matters subpoenaed as far as these cases are concerned.

(Witness sworn.)



HERMAN H. KAVELER

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

DIRECT EXAMINATION

BY MR. RUSSELL:

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Q Will you please state your name, residence and occupation?

A My name is Herman H. K-a-v-e-l-e-r. I am a resident of Tulsa, Oklahoma. My occupation is that of a petroleum engineer and management consultant.

Q Dr. Kaveler, will you give a brief resume of your educational background in the field, the degrees that you hold, any offices you have held in any professional societies, papers that you have written and of the nature of the work since you have engaged in it?

MR. MORRIS: If it would shorten it any, we would certainly stipulate as to the witness's qualifications.

MR. RUSSELL: If the Commission please, I prefer to qualify the witness.

MR. PORTER: Go ahead and qualify.

A Well, I'm a graduate --

MR. PORTER: Mr. Kaveler has testified prior to this before this Commission. You may proceed.

A I'm a graduate engineer and taught at various universities for about twelve years after 1927. I went to work for Phillips Petroleum Company November 1st, 1936, worked for Phillips for sixteen years in various capacities in research, Department of Economics, Department of Oil and Gas Production; terminated my employment with Phillips as

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Assistant Vice President in charge of Crude Oil Production.

I entered the consulting business in Tulsa, Oklahoma November 1st, 1952, have been engaged in oil and gas property evaluation for bank loans, sale and other purposes. I have, since 1954, been retained by the Government of Saskatchewan, Canada as advisor to the Oil and Gas Board of that province; Osage Indians as advisor on mineral matters to that tribe. I have served in various other capacities, which I think is a long enough account of my experience.

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

MR. PORTER: The Commission considers the witness qualified.

Q (By Mr. Russell) Are you familiar with Pure's application in these two cases and what they are seeking?

A Generally, yes.

Q Are you familiar with the request for a Subpoena Duces Tecum directed to Pure?

A Yes.

Q Did you examine the request as to the instruments which were listed therein?

A Yes.

Q Are you familiar with the Motion to Quash which was filed by the Pure Oil Company, the nature of it?

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A Yes.

Q Are you familiar with the documents which Pure Oil Company has tendered to the Commission?

A Yes.

Q In order for the Commission to determine a proper spacing for this particular pool and to make a determination of whether the granting of the application would prevent waste and protect correlative rights, in your opinion is it necessary that the Commission have the documents listed on the request which have not been furnished?

A Yes, in my opinion it is.

Q Would you please explain to the Commission the reason on which your opinion is based?

A It is not possible to simply take electric logs and draw conclusions about the reserves of any one horizon, nor all of the horizons. The intelligent interpretation of electric logs, if that's possible at all, is based upon the experience in drilling the wells. Drill stem testing, core analyses, perforations and testings are all very vital to an understanding of the interpretation that one attempts of electric logs.

Therefore, without the information requested by Mr. Schuman and others, it would be impossible for anybody to draw any reasonable conclusions, if conclusions are possible, with

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the information available about the reserves that would be attributable to any well drilled in the Red Hills Pool.

Therefore, in my opinion no one could evaluate the spacing, the correlative rights, the conservation program, the public interest of the State of New Mexico, without having all this information available.

Q Dr. Kaveler, in your opinion, to determine the economic return which a well may obtain, is it necessary in your opinion to know all of the zones that well penetrates which may have reasonable success of production of gas?

A Yes. Any productive zone penetrated by the well, regardless of what formation it is initially completed in, is gas available to the ultimate recovery from that well. Therefore, all available gas must be appraised in determining the economics attributable to any spacing program.

MR. RUSSELL: I have no further questions of this witness.

MR. PORTER: Mr. Morris.

MR. MORRIS: I have just one or two questions.



CROSS EXAMINATION

BY MR. MORRIS:

Q Dr. Kaveler, you are certainly a well respected man in this field and your qualifications concerning spacing in oil pools and gas pools is beyond question. In your experience

I'm sure that you are familiar that in some applications an applicant seeks permanent rules and in that regard needs very definitive evidence, and in other cases the applicant is only seeking temporary rules based upon perhaps very sketchy information. Would that be correct?

A Well, I suppose that assumption would apply to circumstances, yes. Whether it applies to this one or not, I don't know. I don't have the information.

Q Are you familiar with the fact that Pure Oil Company, in these applications, is seeking merely temporary rules and regulations?

A No, I'm not familiar with that fact.

Q Would it be fair to state that in making an evaluation of a reservoir from the information available from only one well that sometimes limited information such as merely information shown by logs and drilling reports can be used as some basis for the establishment of temporary rules and regulations?

A Well, it's hard for me to answer that question because I don't see how this Commission or any other Commission can look at the Red Hills field and assume that it is proven to the extent where some final conclusion can be reached about how this field should be developed. There has to be some more exploration drilling out there to further define this field

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before, in my opinion, this Commission can draw any conclusions about what constituted the reasonable economic further development. We are not to the development stage. We are still in the exploration stage.

Q Dr. Kaveler, would you happen to be familiar with the applications of Mr. Ralph Lowe to create Pennsylvanian and Morrow Pools in the Indian Hills area of New Mexico?

A No, I'm sorry, I'm not.

Q You would not then be familiar with the limited amount of information that was presented in support of that application?

A No, I don't know what action the Commission is going to take either.

Q Dr. Kaveler, I wouldn't argue with your basic conclusion that to make a definitive study of a reservoir you need all the information that you could possibly get your hands on, but I ask you if it would be possible to make at least an analysis of the reservoir and form at least a preliminary opinion as to the ability or the effectiveness of one well to drill 640 acres, based solely upon well logs and drill reports?



A Well, it's difficult for me to answer your question, counsel, it's too general. One can take information and draw conclusions, sure, but I don't know whether I could say to

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this Commission that those conclusions drawn would have value at all, because the drilling of a second or third or fourth and a fifth well in that field will immensely add to the knowledge.

Now, it seems to me that this Commission, in prudence, has contemplated the situation that counsel has placed to me in his question by setting up fieldwide general rules which apply in the absence of any final decision concerning the well spacing to be imposed. I would say that the statewide rules that the Commission has would be no reason why they wouldn't apply to this situation or any other situation to cover the further exploration period until enough information is at hand to reach a conclusion.

MR. MORRIS: I have no further questions.

MR. RUSSELL: I have no further questions of this witness, but I would like to make one statement. That is, I have just reread the application of Pure and I see no statement in there asking for temporary rules.



MR. MORRIS: There may be no statement in the application reflecting that the rules we request would be temporary, and if there is not, I will state for the record at this time that we propose, when we are heard on the merits, to propose special rules and regulations to be temporary for a two-year period, during which time additional development

we would hope would give us the data to come back to the Commission for the establishment, definitively, of permanent rules.

MR. PORTER: Does anyone have a question of the witness? He may be excused.

(Witness excused.)

MR. PORTER: The Commission will take a short recess.

(Whereupon, a recess was taken.)

MR. PORTER: The hearing will come to order, please. Gentlemen, the Commission fully recognizing the full importance of the decision that we have to make in connection with the arguments for the Motion to Quash the Subpoena are going to take the arguments under advisement to give it more study and consideration and to apprise the other member of the Commission who is not here of the proceedings and give him a chance to see the record of the proceedings.

We are going to take the arguments under advisement and continue the cases involved to the Regular Hearing, which I believe is on February 17, 1965, and prior to that date the Commission will render a decision or make a ruling on the Motion to Quash and anyone interested will be supplied with the copy of that ruling. We would like for you to leave your name and address with Mrs. Rodriquez, our secretary, if you

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desire a copy. Mr. Morris.

MR. MORRIS: If the Commission please, one other matter should be brought to the Commission's attention before this case is adjourned or continued, and in a sense this involves a problem that is Pure Oil Company's problem, but in a larger sense I think it also involves the orderly development of the Red Hills Unit Area.

The Pure Oil Company has been served with a demand by Mr. Jerald Schuman, our opposition in this case, that a well be drilled upon his acreage in Section 5, lying immediately south of the Red Hills Unit Well No. 1 as a protection well. Such a well, we feel, if it is drilled in Section 5, should be drilled in conformity with the special rules and regulations which we are proposing for these two pools.

We realize that the Commission can't help us decide our particular problems in that regard, but we would ask that the Commission enter an interim order to the effect that no location will be approved for drilling to the Red Hills Wolfcamp or Red Hills Pennsylvanian Gas Pools except as those might be in conformity with the well location requirements that we are proposing in our temporary special rules and regulations for these two pools.

Those special rules and regulations were made a matter of record with this Commission at the hearing on November 24,

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1964. We feel that such an interim order or some protection in that regard would be necessary to insure orderly development in these two reservoirs.

MR. RUSSELL: If the Commission please, in order to clarify what Mr. Morris has said, and to more efficiently prepare for hearing, I would like to direct a question to Mr. Morris and ask him if it is the position of Pure that they are requesting that all of Section 32 be dedicated to their present well?

MR. MORRIS: Yes. In the event the special rules and regulations that we propose are adopted by the Commission then all of Section 32 would be, we would propose to dedicate all of Section 32 to that well and any further development in Section 5 would cause all of Section 5 to be dedicated to that well.

MR. RUSSELL: Then I think we would object to this request for the interim order of well spacing on 1650 feet in that a well drilled in that location could properly protect the correlative rights of our people in Section 5 due to the location of Pure's well. Frankly, I don't think anyone is going to jump in and start drilling any wells while this matter is pending. I think it is unnecessary.

MR. MORRIS: I might make one further observation, that certainly we don't want to jump in and drill another well while this matter is pending either, but we have been served

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with a demand to do so. While we feel it would be unreasonable and certainly not acting as a prudent operator to drill a well while this proceeding is pending and not yet settled, we have been served with that demand, and we would respectfully ask the Commission for an interim order assuring orderly development in accordance with our proposed temporary rules and regulations, assuming that they at least might be adopted by the Commission.

MR. NUTTER: Does the demand specify the location of the well?

MR. MORRIS: The demand that we have specifies that a well be drilled upon Mr. Schuman's acreage in the North Half of Section 5. Mr. Schuman's acreage comprises the North Half of the Northwest Quarter and the Northwest Quarter, Northeast Quarter and the East Half, East Half of Section 5 with some additional acreage in Section 8.

To quote from the letter that we have received from Mr. Schuman dated December 4, 1964, "This letter shall serve as notice and demand to you for the following matters: No. 1, this letter is notice to you that any delay rentals which will become due to the aforementioned lease will not be accepted by us. No. 2, to protect our interest from substantial drainage by your Red Hills No. 1, demand is hereby made on your company to commence drilling a well within thirty days

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from the receipt of this letter on the part of your lands now under lease to your company lying in the North Half of Section 5, Township 26 South, Range 33 East, Lea County."

That is a portion of the letter that Pure Oil received from Mr. Schuman.

MR. NUTTER: In other words, the land that you described would not permit a location which would conform with the locations that you have proposed in your pool rules?

MR. MORRIS: That is correct.

MR. NUTTER: I just wanted to confuse the issue some more.

MR. RUSSELL: I don't want to belabor the point. I just want to make one statement, that is, that I concur with Mr. Morris that it is not the problem of the Commission to solve the contractual problems of the company and Mr. Schuman.

MR. MORRIS: We would not ask the Commission for a ruling upon this matter at this time, but we would ask that the Commission at least consider an interim order as proposed and based upon the considerations of insuring further orderly development in these reservoirs.

MR. PORTER: Mr. Morris, the Commission will take notice of your request concerning the interim location of the wells and we will continue the cases until the regular February hearing.

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STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Hearing before the New Mexico Oil Conservation Commission was reported by me; and that the same is a true and correct record of the said proceedings, to the best of my knowledge, skill and ability.

Witness my Hand and Seal this 18th day of January, 1965.

Ada Dearnley
NOTARY PUBLIC

My Commission Expires:

June 19, 1967.

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BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
January 13, 1965

REGULAR HEARING

IN THE MATTER OF:

Application of the Pure Oil Company for the creation of a new gas pool and for special pool rules, Lea County, New Mexico. Case No. 3158

Application of the Pure Oil Company for the creation of a new gas pool and for special pool rules, Lea County, New Mexico. Case No. 3159

BEFORE: Mr. A. L. "Pete" Porter
Mr. Guyton B. Hays

TRANSCRIPT OF HEARING

MR. PORTER: We will call next Case 3158.

MR. DURRETT: Application of the Pure Oil Company for the creation of a new gas pool and for special pool rules, Lea County, New Mexico.

If the Commission please, you might also desire to call the next case, as I believe they are interrelated.

MR. PORTER: Case 3159.

MR. DURRETT: Application of the Pure Oil Company for the creation of a new gas pool and for special pool rules, Lea County, New Mexico.

MR. MORRIS: If the Commission please, I'm Richard Morris, Seth, Montgomery, Federici and Andrews, Santa Fe, New Mexico, --

MR. PORTER: Mr. Morris.

MR. MORRIS: -- appearing for the applicant in these two cases, the Pure Oil Company. With me in the case is Mr. Sumner Buell, also of Seth, Montgomery, Federici and Andrews, and Mr. Scott Rogers of the Houston, Texas law firm of Vinson, Elkins, Weems and Searls.

MR. PORTER: Do we have other appearances? Mr. Hunker.

MR. HUNKER: I am George H. Hunker, Junior of Roswell, New Mexico, appearing in behalf of Jerald Schuman and Saul Yager of Tulsa, Oklahoma.

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MR. PORTER: How do you spell Mr. Schuman's name?

MR. HUNKER: J-e-r-a-l-d S-c-h-u-m-a-n and Mr. Saul, S-a-u-l Y-a-g-e-r. I'm joined in this matter by John F. Russell, an attorney from Roswell, New Mexico and Mr. Donald E. Pray, attorney at law, Tulsa, Oklahoma.

MR. PORTER: Mr. White.

MR. WHITE: Charles White of Gilbert, White and Gilbert, Santa Fe, appearing on behalf of Tenneco.

MR. PORTER: Tenneco?

MR. WHITE: Yes, sir.

MR. TROTT: James I. Trott, T-r-o-t-t.

MR. PORTER: James I.?

MR. TROTT: Yes, sir, appearing in behalf of George T. Aboll.

MR. PORTER: Mr. Trott, are you an attorney?

MR. TROTT: No, sir.

MR. PORTER: Are there any other appearances in the case? These cases were originally scheduled before an Examiner and as a result of the Examiner Hearing the Commission, or as a result of a request after the Examiner Hearing the Commission issued subpoenas for certain information and continued the cases to be heard before the full Commission and at this time. We had a Motion to Quash filed by the applicant, and at this time we will hear the arguments on the

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Motions to Quash. Mr. Morris.

MR. MORRIS: If the Commission please, I have a memorandum prepared in support of our motion that I would like to present at this time. If the Commission please.

MR. PORTER: Mr. Morris.

MR. MORRIS: It's with some reluctance that I would appear before a Commission that has issued a subpoena, has already taken action, and ask that that Commission rescind its action, but in this instance I have perhaps less reluctance because of the knowledge that the Commission has issued its subpoena without a hearing on whether the subpoena should have been issued, recognizing that proper procedure would be to hear a Motion to Quash to determine the legality of that subpoena.

I want to say at the outset that we recognize fully that the Commission has broad subpoena powers given to it under Section 65-3-7 of the New Mexico Statutes, including the power to require the production of documents in a proceeding before the Commission so long as those documents are relevant to the proceeding.

In our Motion to Quash the subpoena that has been issued by the Commission and directed to certain employees of the Pure Oil Company asking for the production of certain documents concerning the Red Hills Unit Well No. 1, the

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Commission we feel has gone beyond the powers given it by statute in requiring that the production of documents be made for the purposes of prehearing discovery and inspection by parties adverse to the Pure Oil Company in these cases.

In short, we feel that the Commission, while it has subpoena powers, does not have the power to require us to make discovery prior to a hearing. Our position is supported by the authority of Mr. Davis in his Treatise on Administrative Law, and I might mention that Mr. Davis is perhaps the leading authority in his writings on administrative law and he, in his treatise, he comments on the power of an administrative agency, particularly he was referring to a federal administrative agency, but the problem is the same with a state agency.

He comments on the power of an administrative agency to require prehearing discovery, saying this: "The Administrative Procedure Act," here he's referring to the Federal Administrative Procedure Act which contains provisions for subpoena, "contains no provision for pretrial discovery in the administrative process and, of course, the provisions of the Federal Rules of Civil Procedure for discovery do not apply to administrative proceedings. Therefore, in absence of special statutory provision, and in absence of special administrative regulation, no procedure for discovery is normally available

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in a Federal administrative proceeding."

In sum, what he is saying is that you need specific statutory authority before you can require discovery. We submit that this Commission does not have that authority under the statutes of this state, nor has it sought to recognize or expand its authority in any way by promulgating rules and regulations to cover this situation.

So, as our point number one in support of our Motion to Quash the Subpoena, we submit to the Commission that it has no authority to require the pretrial or prehearing production of documents, which it has afforded to require by its Subpoena Duces Tecum.

Perhaps more fundamental and less technical an argument, however, is raised by our second point in support of our Motion which concerns the relevancy of the documents that have been subpoenaed. Here we need to bear in mind just what is the matter pending before this Commission. As a result of previous hearings in this case the Commission, by Orders Nos. R-2826 and R-2827 issued on December 7, 1964, has created two gas pools, one being the Red Hills-Wolfcamp Gas Pool, the other the Red Hills-Pennsylvanian Gas Pool. By those orders the hearing was continued with respect to the establishment of special rules and regulations for these pools.

The important point is that the pools have been

established and the matter now pending before this Commission is the establishment of special rules and regulations for the Wolfcamp and the Pennsylvanian.

Now let's look at the scope of the subpoena that was issued by the Commission. Is it limited to matters dealing solely with the Wolfcamp and Pennsylvanian formations? A quick glance at the subpoena certainly shows that it is much broader than that and asks for information which could have no relevancy to the establishment of special rules and regulations for these two formations.

At this point I would like to mention that on January 8, 1965, the Pure Oil Company submitted to the Commission certain information pertaining to the Pennsylvanian and Wolfcamp formations in this well, and by submitting that information we feel that we have complied fully with the matters requested insofar as are relevant to these proceedings. Looking at the Subpoena Duces Tecum, Item No. 1 calls for "Copy of all drill stem test reports made of each formation tested and the surface flows, if any, on each test."

The call of the subpoena is not limited to the Pennsylvanian or Wolfcamp formations, but on January 8, 1965 the Commission was furnished with a summary of drill stem tests taken in the Wolfcamp and Pennsylvanian formations. We respectfully submit that any other tests taken on any other

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formations are completely irrelevant to these proceedings.

Item No. 2 called for by the subpoena, "Copies of the core analysis made on each of the 14 cores cut from the subject well." To begin with, there was no core analysis made in either the Wolfcamp or the Pennsylvanian formations. There was no core cut in the Pennsylvanian. There was one core cut in the Wolfcamp, but there was no analysis made of that core. So as to the Wolfcamp and Pennsylvanian formations, there's no core analysis available to be produced and any core analyses on other formations would be irrelevant to these proceedings.

Item No. 3 called for by the subpoena, "Copy of all sample analyses made on any of the products which have been tested on the subject well." At the hearing of these cases on November 24, 1964 we introduced into evidence and furnished our opposing counsel with copies of sample analyses made on products from the Wolfcamp and Pennsylvanian formations. Again we submit that any analyses made of products from other formations would be irrelevant to these proceedings.

Item No. 4 called for by the subpoena, "Copy of all well logs, including lateral logs, gamma neutron logs, sonic logs, micro logs and the porosity and saturation calculations from these logs which have been furnished to Pure by the logging company." The logs on the subject well were furnished both

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at the hearing on November 24, 1964 and a full set of logs was furnished to the Commission also on January 8, 1965. There were no porosity and saturation calculations furnished to Pure by the logging company.

Number 5, "A copy of the directional survey made on the well from 16,954 feet to 21,000 feet and any other directional survey made at any time during the drilling of the well." Wolfcamp formation in the subject well occurs in the interval from 11,643 feet to 14,310 feet. The Pennsylvanian formation occurs from the interval from 14,310 to 15,614 feet. No directional surveys were made on the well in these intervals. Any other directional survey made at any other depth would be irrelevant to these proceedings.

Number 6, "A copy of the report which is approved by the Commission detailing the deviation survey of the 'Totco' type." This report was furnished to the Commission on January 8, 1965.

Item No. 7 called for by the subpoena, "The depth of any perforations, the treatment of any perforations and test flows recorded from such perforations in each of the following horizons: Bone Springs, Wolfcamp, Strawn, Atoka, Morrow, Devonian, with the tops listed." On January 8th, 1965 we furnished to the Commission a summary of these flow tests together with information concerning the treatment and the depth of perforations as to the Wolfcamp and Pennsylvanian

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formations. This data, with respect to any other formations, would be irrelevant at this proceeding.

Finally, No. 8, "Copy of the seismic structure map introduced into evidence at the hearing on the application for unit approval," of the Red Hills Unit. This map was furnished to the Commission on January 8, 1956. We submit to the Commission that we have complied with the relevant portions of its subpoena and certainly should not be required to furnish to this Commission or to our opposition any information not relevant to these proceedings.

Certainly these proceedings should not be a discovery device for the use of the industry or any particular party to gain information not relevant to these proceedings.

Finally, our third point, and I wish to mention this briefly, but I don't want to treat it lightly, is our point that much of the data that the Commission has subpoenaed is what you would call the work product of experts, of technical people hired by and paid by the Pure Oil Company to prepare technical reports and make technical evaluations which are held by the Pure Oil Company in utmost secrecy and are treated as confidential.

Some of this information, it's true, has been made available to other participants in the Red Hills Unit Agreement, but this information is tightly held and it is confidential

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and especially the processes by which engineers and geologists evaluate their reservoirs and compute their reserve estimates are truly secret processes.

Now, even if the Federal Rules of Civil Procedure or the equivalent in New Mexico were applicable in this proceeding, which they are not, but those rules provide for broad discovery, but even under those rules we submit that the discovery of these secret processes would not be allowed, because under Rule 30(b) of the Federal rules and also of our rules here in New Mexico it is specifically recognized that the court may grant a protective order to avoid the discovery of secret processes.

The fact that these reserve calculations and methods of evaluating reservoirs are confidential processes is a matter well known in the petroleum industry. I don't need to put a witness on the stand to tell the Commission that. It's common knowledge and it's a matter of which this Commission can certainly take administrative notice.

In summary we ask that the Commission quash in its entirety the subpoena that has been issued to Mr. Murphey, Mr. Fish and Mr. Tyner, all employees of the Pure Oil Company, on the grounds, first, that the Commission has no authority to require the prehearing discovery; but aside from that point and getting to perhaps something more basic, that the

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matters called for are irrelevant, and in any event much of it is confidential information constituting the secret processes of the Pure Oil Company. We respectfully request the Commission to quash the subpoena.

MR. PORTER: Mr. Russell.

MR. RUSSELL: If the Commission please, I too have a brief which I will furnish to the Commission for their examination. Since this hearing was initially before an Examiner I feel it well to give a little of the factual background to this Commission.

Pure Oil Company is the operator of the Red Hills Governmental Unit located in Lea County, New Mexico. Mr. Yager and Mr. Schuman are owners of mineral interests in the North Half of Section 5, Township 26 South, Range 33 East, which is immediately to the south of this initial well. I would like to point out that this initial well was drilled 330 feet from the section boundary line.

In their application they are asking that a 640-acre tract be distributed to each well in this pool, and if we come before the Examiner they recommend in their rules that such tract be a single governmental section and that no well be drilled closer than 1650 feet to a boundary line.

Prior to the hearing on November 24, Mr. Yager and Mr. Schuman, through counsel, asked Pure to furnish them with

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such information as they felt was necessary to intelligently evaluate the application and determine what effect it would have upon their rights to enable them to protect their correlative rights if it seemed that that was necessary. I believe it was on the evening prior to the hearing Pure did furnish the Applicants the electric and radioactive and sonic well logs, sample analyses and calculated open flow potentials from the Pennsylvanian and Wolfcamp formation, but this information was not sufficient to adequately evaluate the merits of the application, and at the time of the hearing these Applicants continued to request this additional information in order to permit a full and fair hearing, and the Commission did continue the hearing on the establishment of special pool rules until today.

Then the Applicants asked for a Subpoena Duces Tecum to issue in order for them to get the information which they felt was necessary to properly evaluate the application and their position, feeling that if we got it in advance of the hearing that it would be to the convenience and advantage of the Commission for this reason, that when this technical information is introduced it is necessary that another technical engineer, or whatever expert is necessary, look at and evaluate that information before you can intelligently cross examine the witness or determine what your position

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would be. Therefore, at the hearing we would have to, as we did, ask for a continuation to give sufficient time in which to do that.

Now, the first point which has been raised in the Motion to Quash, I would like to point out a few factors in connection with the power of the Commission. Section 65-3-7 gives the following power to the Commission: "...to subpoena witnesses, to require their attendance and giving of testimony before it, and to require the production of books, papers, and records in any proceeding before the Commission...Provided that nothing herein contained shall be construed as requiring any person to produce any books, papers, or records, or to testify in response to any inquiry, not pertinent to some question lawfully before such Commission or court for determination."

Now, this subpoena power is a necessary tool given to the Commission in order to enable them to properly carry out the statutory duty which has been placed upon it. I have some cases from other jurisdiction, I find none in New Mexico, covering the power of this Commission or other administrative agencies of the state in connection with subpoenas. I will not bother giving the full citations of these cases because they'll be in the brief and you can check them, but in the New York Edison case involving rate making, the court said, among other things: "And it is quite apparent that the

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defendant, unless it can have an inspection and discovery, cannot prepare its case for trial." Which is what we're contending here.

In this present matter before the Commission Pure has applied for affirmative relief in the nature of special rules for the development of this field, and we feel that it is necessary in order to evaluate our position and for the Commission to evaluate the application, that it is necessary that all information available be made available to the Commission and not held back behind a desk.

In a Supreme Court case, which was United States versus Bryan, the court said: "On the other hand, persons summoned as witnesses by competent authority have certain minimum duties and obligations which are necessary concessions to the public interest in the orderly operation of legislative and judicial machinery. A subpoena has never been treated as an invitation to a game of hare and hounds, in which the witness must testify only if cornered at the end of the chase. If that were the case, then, indeed, the great power of testimonial compulsion, so necessary to the effective functioning of courts and legislatures, would be a nullity. We have often reiterated the importance of this public duty, which every person within the jurisdiction of the Government is bound to perform when properly summoned."

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We can't understand why Pure objects to the production of these documents. In this hearing to grant an exception to an established rule covering spacing of a particular area, the following information is in our opinion necessary in order that the Commission may be fully advised before rendering a decision.

One, the name and depth of all formations which may possibly produce hydrocarbons.

Two, the nature and extent of these formations insofar as known.

Three, all data which might tend to aid in evaluation of the commercial potential of these zones.

Four, information as to the costs of drilling a comparable well.

These items are necessary in order that the economics of drilling on the proposed spacing can be compared with the economics of drilling on the established spacing. Surely Pure cannot in good faith argue that the Commission must look only to the Wolfcamp and Pennsylvanian formation in determining economics, if in fact there are other commercial horizons penetrated by the well. In fact, at the hearing before the Examiner the witness for Pure testified that gas can be flowed at commercial rates not only from the Wolfcamp and Pennsylvanian, but also from the Devonian formation, but they

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don't want any information put in in connection with the Devonian formation.

In the case of Hart versus Ogdensburg, "I can see no good reason why a party should be permitted to withhold from the knowledge of his adversary documentary evidence affecting the merits of the controversy, only to surprise him by its production at the trial, unless, for some satisfactory reason, to be made apparent to the court, each party ought to be required, when it is desired, to disclose to the other any books, papers, and documents within his power which may contain evidence pertinent to the issues to be tried."

I will skip some of this in the interest of brevity, since you will have copies of it. Pointing out a similar situation I believe was in a 1963 case before the Texas Railroad Commission which later went to court, and I'll refer to it as the L & G Oil Company, in that case the Railroad Commission ordered a survey made of a well and the corporation owning the well contended that the Commission had no power of discovery prior to the filing of an action in the courts. The discovery and investigative powers of the Commission were upheld. The court said:

"The legislature has delegated to the Railroad Commission broad and extensive powers to regulate and control the drilling for and production of oil and gas to the end that these natural

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resources be conserved and that the interest of the public as well as individual operation be protected....Surely the Commission invested with all of these powers and responsibilities, is not required to bring a suit each time that it seeks to make an investigation or inspection as to whether its rules and regulations are being enforced. Such a requirement has, so far as we know, never been urged before and if adopted would cripple the Commission and incapacitate it from carrying out and performing the duties imposed upon it by legislative command."

The New Mexico Oil Conservation Commission has the same duties and responsibilities as does the Texas Railroad Commission. Now to go to another point in connection with the relevancy of the documents that we asked for, I contend that their contention is wholly without merit.

Now I, in my opinion the pertinent provision of the New Mexico statutes covering this information is Section G5, I think it's Section G5-3-14(b):

"...the Commission shall consider the economic loss caused by the drilling of unnecessary wells, the protection of correlative rights, including those of royalty owners, the prevention of waste, the avoidance of the augmentation of risks arising from the drilling of an excessive number of wells, and the prevention of reduced recovery which might

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result from the drilling of too few wells."

Now, before an economic picture can be projected to determine whether or not a reasonable operator, prudent operator could develop this area on 640, 320 or 160, you must know what the anticipated reserves are, you must know what it will cost to drill the well and what your return will be in the form of production. Well, I will agree that if a well was drilled as their Red Hills well was drilled, and there was only one zone capable of producing gas in commercial quantities, then your economics would say in all probability that to go less than 640 would result in the field not being properly developed and that a reasonable, prudent operator would not drill another well in the pool; but that goes out the window if you can show that there are four or five zones that may be produced from that well, because that has an entirely different picture from the economic standpoint whether you get five times or one time the amount of gas that will be allocated.

It certainly has a tremendous effect upon the economic picture, and Pure does not want to give you any information, or us either, as to whether there are any zones capable of production of gas in commercial quantities other than the Wolfcamp and the Pennsylvanian. I say that you cannot carry out your statutory duty without having this information

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available to make your determination as to the size of the unit which may be attributed to the well. They have referred, in effect, to the privileged nature of the documents which we have requested, and I would like to make a few points in connection with that. Unless these documents are legally privileged, then the fact that they may contain confidential material is of no legal significance.

The privilege accorded certain relationships by law such as the doctor-patient relationship, husband-wife, attorney and client, are strictly construed and they're limited to these particular relationships. The documents submitted here are subject to no such relationships. This type of argument advanced by Pure has been considered by the Supreme Court of the United States in the United States versus Bryan wherein the court said:

"Certain exemptions from attending, or having attended, giving testimony are recognized by all courts. But every such exemption is grounded in a substantial individual interest which has been found, through centuries of experience, to outweigh the public interest in the search for truth. Dean Wigmore stated the proposition thus: 'For more than three centuries it has now been recognized as a fundamental maxim that the public has a right to every man's evidence. When we come to examine the various claims of exemption, we start with

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the primary assumption that there is a general duty to give what testimony one is capable of giving, and that any exemptions which may exist are distinctly exceptional, being so many derogations from a positive general rule.'"

And also in the McMann case the court said: "Therefore, although we assume, as we do, that the conduct of investigations under these statutes is subject to the same testimonial privileges as judicial proceedings, it will not serve McMann; he must erect a new privilege ad hoc. The suppression of truth is a grievous necessity at best, more especially when as here, the inquiry concerns the public interest; it can be justified at all only when the opposed private interest is supreme."

Also in that same case the court said: "But the very fact that testimonial privileges are based upon specified confidential relationships is proof that they do not extend to all, and it hardly needs to be said that nobody by contract, express or implied, can abridge public duties. So far as the principal's rights may be classed as "property" at all, they are subject to this condition."

Then it was referred to as the work product. There are cases on the work product, not we found in New Mexico, but in other jurisdictions, and I would like to read a few excerpts from some of those cases.

The first one is the Greyhound Corporation case where

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the court said: "Work product" doctrine which protects attorneys' work product from disclosure is based upon theory that one attorney may not take undue advantage of adversary's efforts, and doctrine is, in essence, form of statutory privilege which should not be extended by judicial fiat."

In the case of Caruso versus Moore McCormack Lines, Inc., the court said: "Statement of a witness taken by an attorney is not clothed in the mantle of "work product," and is not exempt from production in an admiralty action on such theory."

And in the case of the United States versus Certain Parcels of Land: "Where factual information contained in document sought to be discovered in condemnation proceeding had been gathered for Government by third persons under supervision of Government's attorneys, supervision or acquisition by Government's attorneys did not convert the result into the "work product" of a lawyer, and, therefore, there was not any privilege which would prevent defendant landowners from pursuing the usual purpose of a pre-trial discovery to obtain such facts."

In closing, I would like to say that it appears to me that Pure has taken the position before this Commission that in determining what size spacing acreage should be alloted in a particular pool or to a particular well, that Pure will tell the Commission what testimony, what evidence, what

information they must base their decision on. We are not going to give you all of the information that you feel may be necessary. We're going to give you only what we think is necessary.

We will make the evaluation and determine as a result of it what evidence is necessary before you in order for you to determine whether their application does protect correlative rights and also prevent waste.

We submit that the Motion to Quash filed on behalf of Pure should be overruled. At this point I would like to offer to put on two witnesses, one Mr. Jerald Schuman, in order to establish for the record what his interest is in this case, and number two, an expert in the field to testify as to his opinion why the documents we requested and were not furnished are necessary for a proper determination by the Commission of their statutory duty in declaring the size and the nature of the rules.

If the Commission has no objection, I would like to put them on at this point.

MR. PORTER: Mr. Morris.

MR. MORRIS: If the Commission please, it seems that a determination by the Commission of the points that we have raised in our Motion to Quash might well obviate the necessity of any testimony concerning why Mr. Schuman and Mr.

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Yager feel that they need this information. I would like to, without belaboring the issues presented here by our motion or by Mr. Russell, in his response, I would merely like to comment at this time that we are here ready to put on evidence in support of our application. We think that the evidence that we put on before this Commission will support our application.

If our opposition wants to put on some evidence, they're certainly entitled to. If they want to cross examine our witnesses and the work that they have done and put forth as testimony here, they're entitled to do that. We are here, we have our witnesses here, we are ready to go on the merits of this case.

There are a number of other interested parties here that are interested in the merits of this case. We respectfully request that the Commission will dispose of the Motion to Quash the Subpoena without the necessity of taking evidence, but merely as a matter of law and as to what Mr. Schuman's interest is, I am sure we could reach a stipulation on that.

MR. PORTER: Mr. Russell, could you state Mr. Schuman's interest so that we may determine here as to whether or not it can be stipulated as to what his interests are?

MR. RUSSELL: I'm not certain whether it is set out

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in the -- It is in the brief that he is the owner of a royalty, an overriding royalty interest in minerals in the North Half of Section 5, Township 26 South, Range 33 East, which is directly offsetting the well drilled by Pure, which interest I would like to add is under lease to Pure Oil Company, and there are other mineral interests in other sections, if you would like to have that also, but, of course, this one in the North Half of 5 is the most critical at this point, 140 mineral acres under the North Half of Section 5.

MR. PORTER: Mr. Morris, would you agree to stipulate to this interest?

MR. MORRIS: We would certainly stipulate that those facts are correct. We would ask that we might reach a more specific stipulation on just what Mr. Schuman's interest is, and I think I can pose the stipulation that would be acceptable.

From the information that I have, Mr. Jerald M. Schuman owns the following interest in the East Half of the East Half of Section 5, 4.66919% royalty interest, and then others connected with Mr. Schuman, Avrome Schuman owns 0.27466% royalty interest in that same land. Mr. J. Harold Schuman owns a like interest, 0.27466% royalty. Mr. Earl Schuman has a like interest, 0.27466%. Then in addition to the royalty interest, still referring to the East Half of the East Half

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of Section 5, Jerald M. Schuman owns an overriding royalty interest of 1.86768%; Avrome Schuman, 0.10986%; J. Harold Schuman, 0.10986%, and Earl Schuman, 0.10986%, all of those being overriding royalty interests.

Then with respect to the North Half of the Northwest Quarter and the Northwest Quarter of the Northeast Quarter of Section 5, Mr. Jerald M. Schuman owns a 4.98047% royalty interest; Avrome Schuman, 0.29297% royalty; J. Harold Schuman, 0.29297% royalty, and Earl Schuman, 0.29297% royalty interest.

In those same tracts, that is the North Half of the Northwest Quarter and the Northwest Quarter of the Northeast Quarter of Section 5, Jerald M. Schuman owns 1.99219% overriding royalty interest; Avrome Schuman, zero, I can shorten, Avrome J., Harold and Earl each own 0.11719% overriding royalty interest.

MR. RUSSELL: I haven't any idea whether that's correct or not. All I can say is that Mr. Schuman owns 140 mineral acres less 4% subject to ure's lease, and the acreage is the North Half of the North Half, the Southeast of the Northeast and the East Half of the Southeast of Section 5, and that Mr. Jerald Schuman owns 85% of that interest. I just don't know on those figures whether they're correct or not. If we can't get a stipulation it probably would be quicker to

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put him on and ask him what it is.

MR. MORRIS: I don't think there's any conflict between what Mr. Russell said and what I have said. I think that the record will reflect that they are the same. Certainly we can stipulate that Mr. Schuman and those associated with him own the royalty and overriding royalty interest in the North Half of Section 5, and I don't believe what Mr. Russell said or what I have said will contradict each other.

MR. PORTER: Well, the stipulation is what you are seeking, isn't it?

MR. RUSSELL: I just felt that the Commission would prefer to have a stipulation of his interest rather than the testimony, so if my stipulation is acceptable --

MR. MORRIS: Yes, it will be acceptable.

MR. PORTER: Then, Mr. Russell, the Commission will allow you to call your expert witness, but to be sure that you limit your questions to the relevancy in his opinion of these matters subpoenaed as far as these cases are concerned.

(Witness sworn.)

HERMAN H. KAVELER

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

DIRECT EXAMINATION

BY MR. RUSSELL:

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Q Will you please state your name, residence and occupation?

A My name is Herman H. K-a-v-e-l-e-r. I am a resident of Tulsa, Oklahoma. My occupation is that of a petroleum engineer and management consultant.

Q Dr. Kaveler, will you give a brief resume of your educational background in the field, the degrees that you hold, any offices you have held in any professional societies, papers that you have written and of the nature of the work since you have engaged in it?

MR. MORRIS: If it would shorten it any, we would certainly stipulate as to the witness's qualifications.

MR. RUSSELL: If the Commission please, I prefer to qualify the witness.

MR. PORTER: Go ahead and qualify.

A Well, I'm a graduate --

MR. PORTER: Mr. Kaveler has testified prior to this before this Commission. You may proceed.



A I'm a graduate engineer and taught at various universities for about twelve years after 1927. I went to work for Phillips Petroleum Company November 1st, 1936, worked for Phillips for sixteen years in various capacities in research, Department of Economics, Department of Oil and Gas Production; terminated my employment with Phillips as

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Assistant Vice President in charge of Crude Oil Production.

I entered the consulting business in Tulsa, Oklahoma November 1st, 1952, have been engaged in oil and gas property evaluation for bank loans, sale and other purposes. I have, since 1954, been retained by the Government of Saskatchewan, Canada as advisor to the Oil and Gas Board of that province; Osage Indians as advisor on mineral matters to that tribe. I have served in various other capacities, which I think is a long enough account of my experience.

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

MR. PORTER: The Commission considers the witness qualified.

Q (By Mr. Russell) Are you familiar with Pure's application in these two cases and what they are seeking?

A Generally, yes.

Q Are you familiar with the request for a Subpoena Duces Tecum directed to Pure?

A Yes.

Q Did you examine the request as to the instruments which were listed therein?

A Yes.

Q Are you familiar with the Motion to Quash which was filed by the Pure Oil Company, the nature of it?

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A Yes.

Q Are you familiar with the documents which Pure Oil Company has tendered to the Commission?

A Yes.

Q In order for the Commission to determine a proper spacing for this particular pool and to make a determination of whether the granting of the application would prevent waste and protect correlative rights, in your opinion is it necessary that the Commission have the documents listed on the request which have not been furnished?

A Yes, in my opinion it is.

Q Would you please explain to the Commission the reason on which your opinion is based?

A It is not possible to simply take electric logs and draw conclusions about the reserves of any one horizon, nor all of the horizons. The intelligent interpretation of electric logs, if that's possible at all, is based upon the experience in drilling the wells. Drill stem testing, core analyses, perforations and testings are all very vital to an understanding of the interpretation that one attempts of electric logs.

Therefore, without the information requested by Mr. Schuman and others, it would be impossible for anybody to draw any reasonable conclusions, if conclusions are possible, with

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the information available about the reserves that would be attributable to any well drilled in the Red Hills Pool.

Therefore, in my opinion no one could evaluate the spacing, the correlative rights, the conservation program, the public interest of the State of New Mexico, without having all this information available.

Q Dr. Kaveler, in your opinion, to determine the economic return which a well may obtain, is it necessary in your opinion to know all of the zones that well penetrates which may have reasonable success of production of gas?

A Yes. Any productive zone penetrated by the well, regardless of what formation it is initially completed in, is gas available to the ultimate recovery from that well. Therefore, all available gas must be appraised in determining the economics attributable to any spacing program.

MR. RUSSELL: I have no further questions of this witness.

MR. PORTER: Mr. Morris.

MR. MORRIS: I have just one or two questions.

CROSS EXAMINATION

BY MR. MORRIS:

Q Dr. Kaveler, you are certainly a well respected man in this field and your qualifications concerning spacing in oil pools and gas pools is beyond question. In your experience

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I'm sure that you are familiar that in some applications an applicant seeks permanent rules and in that regard needs very definitive evidence, and in other cases the applicant is only seeking temporary rules based upon perhaps very sketchy information. Would that be correct?

A Well, I suppose that assumption would apply to circumstances, yes. Whether it applies to this one or not, I don't know. I don't have the information.

Q Are you familiar with the fact that Pure Oil Company, in these applications, is seeking merely temporary rules and regulations?

A No, I'm not familiar with that fact.

Q Would it be fair to state that in making an evaluation of a reservoir from the information available from only one well that sometimes limited information such as merely information shown by logs and drilling reports can be used as some basis for the establishment of temporary rules and regulations?

A Well, it's hard for me to answer that question because I don't see how this Commission or any other Commission can look at the Red Hills field and assume that it is proven to the extent where some final conclusion can be reached about how this field should be developed. There has to be some more exploration drilling out there to further define this field

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before, in my opinion, this Commission can draw any conclusions about what constituted the reasonable economic further development. We are not to the development stage. We are still in the exploration stage.

Q Dr. Kaveler, would you happen to be familiar with the applications of Mr. Ralph Lowe to create Pennsylvanian and Morrow Pools in the Indian Hills area of New Mexico?

A No, I'm sorry, I'm not.

Q You would not then be familiar with the limited amount of information that was presented in support of that application?

A No, I don't know what action the Commission is going to take either.

Q Dr. Kaveler, I wouldn't argue with your basic conclusion that to make a definitive study of a reservoir you need all the information that you could possibly get your hands on, but I ask you if it would be possible to make at least an analysis of the reservoir and form at least a preliminary opinion as to the ability or the effectiveness of one well to drill 640 acres, based solely upon well logs and drill reports?

A Well, it's difficult for me to answer your question, counsel, it's too general. One can take information and draw conclusions, sure, but I don't know whether I could say to

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this Commission that those conclusions drawn would have value at all, because the drilling of a second or third or fourth and a fifth well in that field will immensely add to the knowledge.

Now, it seems to me that this Commission, in prudence, has contemplated the situation that counsel has placed to me in his question by setting up fieldwide general rules which apply in the absence of any final decision concerning the well spacing to be imposed. I would say that the statewide rules that the Commission has would be no reason why they wouldn't apply to this situation or any other situation to cover the further exploration period until enough information is at hand to reach a conclusion.

MR. MORRIS: I have no further questions.

MR. RUSSELL: I have no further questions of this witness, but I would like to make one statement. That is, I have just reread the application of Pure and I see no statement in there asking for temporary rules.



MR. MORRIS: There may be no statement in the application reflecting that the rules we request would be temporary, and if there is not, I will state for the record at this time that we propose, when we are heard on the merits, to propose special rules and regulations to be temporary for a two-year period, during which time additional development

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we would hope would give us the data to come back to the Commission for the establishment, definitively, of permanent rules.

MR. PORTER: Does anyone have a question of the witness? He may be excused.

(Witness excused.)

MR. PORTER: The Commission will take a short recess.

(Whereupon, a recess was taken.)

MR. PORTER: The hearing will come to order, please. Gentlemen, the Commission fully recognizing the full importance of the decision that we have to make in connection with the arguments for the Motion to Quash the Subpoena are going to take the arguments under advisement to give it more study and consideration and to apprise the other member of the Commission who is not here of the proceedings and give him a chance to see the record of the proceedings.

We are going to take the arguments under advisement and continue the cases involved to the Regular Hearing, which I believe is on February 17, 1965, and prior to that date the Commission will render a decision or make a ruling on the Motion to Quash and anyone interested will be supplied with the copy of that ruling. We would like for you to leave your name and address with Mrs. Rodriquez, our secretary, if you

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desire a copy. Mr. Morris.

MR. MORRIS: If the Commission please, one other matter should be brought to the Commission's attention before this case is adjourned or continued, and in a sense this involves a problem that is Pure Oil Company's problem, but in a larger sense I think it also involves the orderly development of the Red Hills Unit Area.

The Pure Oil Company has been served with a demand by Mr. Jerald Schuman, our opposition in this case, that a well be drilled upon his acreage in Section 5, lying immediately south of the Red Hills Unit Well No. 1 as a protection well. Such a well, we feel, if it is drilled in Section 5, should be drilled in conformity with the special rules and regulations which we are proposing for these two pools.

We realize that the Commission can't help us decide our particular problems in that regard, but we would ask that the Commission enter an interim order to the effect that no location will be approved for drilling to the Red Hills Wolfcamp or Red Hills Pennsylvanian Gas Pools except as those might be in conformity with the well location requirements that we are proposing in our temporary special rules and regulations for these two pools.

Those special rules and regulations were made a matter of record with this Commission at the hearing on November 24,

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1964. We feel that such an interim order or some protection in that regard would be necessary to insure orderly development in these two reservoirs.

MR. RUSSELL: If the Commission please, in order to clarify what Mr. Morris has said, and to more efficiently prepare for hearing, I would like to direct a question to Mr. Morris and ask him if it is the position of Pure that they are requesting that all of Section 32 be dedicated to their present well?

MR. MORRIS: Yes. In the event the special rules and regulations that we propose are adopted by the Commission then all of Section 32 would be, we would propose to dedicate all of Section 32 to that well and any further development in Section 5 would cause all of Section 5 to be dedicated to that well.

MR. RUSSELL: Then I think we would object to this request for the interim order of well spacing on 1650 feet in that a well drilled in that location could properly protect the correlative rights of our people in Section 5 due to the location of Pure's well. Frankly, I don't think anyone is going to jump in and start drilling any wells while this matter is pending. I think it is unnecessary.

MR. MORRIS: I might make one further observation, that certainly we don't want to jump in and drill another well while this matter is pending either, but we have been served

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with a demand to do so. While we feel it would be unreasonable and certainly not acting as a prudent operator to drill a well while this proceeding is pending and not yet settled, we have been served with that demand, and we would respectfully ask the Commission for an interim order assuring orderly development in accordance with our proposed temporary rules and regulations, assuming that they at least might be adopted by the Commission.

MR. NUTTER: Does the demand specify the location of the well?

MR. MORRIS: The demand that we have specifies that a well be drilled upon Mr. Schuman's acreage in the North Half of Section 5. Mr. Schuman's acreage comprises the North Half of the Northwest Quarter and the Northwest Quarter, Northeast Quarter and the East Half, East Half of Section 5 with some additional acreage in Section 8.

To quote from the letter that we have received from Mr. Schuman dated December 4, 1964, "This letter shall serve as notice and demand to you for the following matters: No. 1, this letter is notice to you that any delay rentals which will become due to the aforementioned lease will not be accepted by us. No. 2, to protect our interest from substantial drainage by your Red Hills No. 1, demand is hereby made on your company to commence drilling a well within thirty days

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from the receipt of this letter on the part of your lands now under lease to your company lying in the North Half of Section 5, Township 26 South, Range 33 East, Lea County."

That is a portion of the letter that Pure Oil received from Mr. Schuman.

MR. NUTTER: In other words, the land that you described would not permit a location which would conform with the locations that you have proposed in your pool rules?

MR. MORRIS: That is correct.

MR. NUTTER: I just wanted to confuse the issue some more.

MR. RUSSELL: I don't want to belabor the point. I just want to make one statement, that is, that I concur with Mr. Morris that it is not the problem of the Commission to solve the contractual problems of the company and Mr. Schuman.

MR. MORRIS: We would not ask the Commission for a ruling upon this matter at this time, but we would ask that the Commission at least consider an interim order as proposed and based upon the considerations of insuring further orderly development in these reservoirs.

MR. PORTER: Mr. Morris, the Commission will take notice of your request concerning the interim location of the wells and we will continue the cases until the regular February hearing.

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BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
January 6, 1965

EXAMINER HEARING

IN THE MATTER OF:

APPLICATION OF THE PURE OIL COMPANY FOR THE CREATION OF A NEW GAS POOL AND FOR SPECIAL POOL RULES, LEA COUNTY, NEW MEXICO

Case No. 3158

APPLICATION OF THE PURE OIL COMPANY FOR THE CREATION OF A NEW GAS POOL AND FOR SPECIAL POOL RULES, LEA COUNTY, NEW MEXICO

Case No. 3159

BEFORE:

DANIEL S. NUTTER

TRANSCRIPT OF HEARING

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MR. NUTTER: The hearing will come to order. The first case to be called this morning will be Case Number 3158 and also Number 3159.

MR. DURRETT: Application of The Pure Oil Company for the creation of a new gas pool and for special pool rules, Lea County, New Mexico.

MR. NUTTER: That is the style of both cases, Mr. Durretti?

MR. DURRETT: That is the style of both cases, Mr. Examiner.

MR. NUTTER: I'd like to inform anyone who may be interested that the Commission has received a request for certain information regarding the application of The Pure Oil Company in these two cases. Subpoenas duces tecum have been issued for the data requested; motions to quash the subpoenas have also been filed. The cases are hereby continued to the Commission hearing on January 13, 1965, at which time motions to quash will be heard, and also the cases will be heard.

* * *

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, Elizabeth K. Hale, Notary Public and Court Reporter, do hereby certify that proceedings in Cases Number 3158 and 3159 were taken and transcribed by me, and that the foregoing

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transcript is a true and accurate record of proceedings to the best of my knowledge, skill and ability.

IN WITNESS WHEREOF, my hand and seal this 13th day of January, 1965.

Notary Public

My commission expires

May 23, 1968.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 3158-3159 heard by me on 1/6, 1965.

Examiner
New Mexico Oil Conservation Commission

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Hearing before the New Mexico Oil Conservation Commission was reported by me; and that the same is a true and correct record of the said proceedings, to the best of my knowledge, skill and ability.

Witness my Hand and Seal this 18th day of January, 1965.

Ada Dearnley
NOTARY PUBLIC

My Commission Expires:

June 19, 1967.

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BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico

May 18, 1966

REGULAR HEARING

IN THE MATTER OF:

Application of Union Oil Company of California to reopen Case No. 3158, Lea County, New Mexico.

Case No. 3158

BEFORE: Honorable Jack M. Campbell
Mr. A. L. "Pete" Porter
Mr. Guyton B. Hays

TRANSCRIPT OF HEARING

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MR. PORTER: The next case on the docket is Case 3158. The Commission would like to call for appearances in Case 3158.

MR. HINKLE: If the Commission please.

MR. PORTER: Mr. Hinkle.

MR. HINKLE: Clarence Hinkle and Sim Christy of Hinkle, Bondurant and Christy, and Mr. Bob Humphrey, division counsel for Union, Midland, appearing on behalf of Union Oil Company.

MR. HUNKER: If the Commission please, George Hunker, Roswell, New Mexico. I'll be associated in this matter with Mr. Don E. Pray of the firm of Schuman, Pray and Doyle of Tulsa, Oklahoma, and I would like for the Commission to meet Mr. Hal Rucker, who is counsel for Kermit Oil Company. We are representing Kermit Oil Company and Messrs. Schuman and Yager.

MR. PORTER: How do you spell that name?

MR. HUNKER: Hal Rucker, H-a-l R-u-c-k-e-r,

MR. PORTER: Would anyone else like to make an appearance in the case? We have some correspondence from some other interested parties in the file and notice will be taken of this correspondence at the time that we take statements in the case. Mr. Hinkle.

MR. HINKLE: If the Commission please, I would like

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to make a very brief statement before putting on our testimony. This matter has been before the Commission a number of times in a number of cases, that is the Red Hills Unit and the problems which have grown out of the discovery well. Originally the Commission approved the Red Hills Unit agreement in Case No. 3157. At that time the Pure Oil Company was a proponent of the unit and was the unit operator. Since that time the Union Oil Company has acquired the interest of the Pure Oil Company and they are the unit operator at the present time.

Case 3158, which is the case we have before us today here, was for the adoption of special field rules for the Wolfcamp formation. The discovery well was discovered in the Wolfcamp, the Pennsylvanian and also in the Devonian, and it was dually completed in the Wolfcamp and the Pennsylvanian formation. The Case No. 3159, which was consolidated with 3158 at the previous hearings, was for the adoption of special field rules for the Pennsylvanian formation.

You will notice that we are not asking for the adoption of special field rules for the Pennsylvanian at this time, only for the Wolfcamp, due to the fact that the well has ceased to produce from the Pennsylvanian formation. We do not know, and the evidence we're not going into in detail, but

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it will show that we do not know whether the Pennsylvanian has been completed or whether it is due to mechanical trouble. We have, we feel, new evidence to present to the Commission. We don't want to take any more time of the Commission than we have to. We're not going into the old evidence that was introduced in the previous hearing in connection with this case, but the new evidence we have consists of a core analysis of the Wolfcamp formation.

During the previous hearing it was brought out that there was a core taken of the Wolfcamp formation, but there was no core analysis. We have recently had a core analysis made and it has afforded a new tool, so-to-speak, to evaluate the producing formation of the Wolfcamp. At the time of the original hearings here there was very little production from the discovery well. Since that time there has been considerable production and we now have considerable pressure production history which we believe will give the Commission entirely new evidence in that respect.

We think that we will be able to show that 640-acre spacing will better protect correlative rights than smaller spacing units. We also will show that the Union, as unit operator, is aware of the problems which exist with respect to the non-committed fee acreage in Section 5, 26, 33, which have not been committed to the unit agreement, and they

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will propose or submit a proposal for the protection of the correlative rights of the owners of the fee lands in Section 5.

We have altogether five witnesses and a number of exhibits and we will try to put them on as fast as we can and take as little time of the Commission as we possibly can. Our first witness is David Dunn.

MR. PORTER: Mr. Hunker.

MR. HUNKER: If the Commission please, we represent Kermit Oil Company, Jerald Schuman and Saul Yager and we object to the reopening of this case. Certainly some new and substantial evidence must be produced. Some of this information has been furnished to us; we do not believe that it is of such a substantial nature as to cause the case to be reopened.

I think it is incumbent on me to advise the Commission that this is somewhat of a precedent-setting matter. I don't think that the Commission wants a proliferation of hearings with respect to this business; we feel that the information that has been adduced by Union taking three pressure tests is not sufficient to reopen the case. We have not seen the proposed exception that they care to make with regard to the mineral owners in Section 5, although we have asked for this we have not seen one.

The information that Mr. Hinkle mentioned with regard to

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the Wolfcamp formation, the core had been taken at the time of the previous hearings and there were three or four months that went by after the core was taken that the core could have been analyzed and the Commission could have been furnished with the information that the core showed.

We feel that you may be setting a rather dangerous precedent in opening this case on the meager matters that Mr. Hinkle has mentioned, but we'll let the Commission proceed. Thank you.

MR. HINKLE: I would just like to make one or two additional remarks. This is a very important case as far as the Union Oil Company is concerned. This is in an area where the wells, even the Wolfcamp formation is a deep formation approximately 13,500 feet and costs in excess of $500,000 to drill each Wolfcamp well, so it is very important and we feel that the previous order of the Commission setting 160-acre spacing has resulted in a situation where correlative rights are not going to be protected, and that by fixing a larger spacing unit that they will be protected, and we believe we will be able to point that out clearly to the Commission that that is the case.

It's true that the core was available at the previous hearings, but there had been no core analysis and it's very important that there has been a core analysis because that

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affords a new means to evaluate the pay section of the Wolfcamp formation and gives an entirely new picture as far as the reservoir is concerned.

MR. PORTER: The Commission will hear the case as advertised.

MR. HINKLE: We can have all our witnesses sworn now or one at a time.

MR. PORTER: How many witnesses do you have?

MR. HINKLE: We have five.

MR. PORTER: Suppose we have all your witnesses, Mr. Hinkle. You have five, that's enough to enter at one time. Stand, all you witnesses stand and have the attorney swear you in at this time.

(Witnesses sworn.)

DAVID DUNN

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

DIRECT EXAMINATION

BY MR. HINKLE:

Q Your name is David Dunn?

A Yes, sir.

Q You are employed by the Union Oil Company?

A Yes, sir.

Q In what capacity?

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A I'm assistant manager of exploration for the Union Oil Company at the Central Division Office in Midland, Texas.

Q Have you previously testified before the Commission?

A I have.

Q And your qualifications as a petroleum geologist are of record with the Commission?

A That is correct.

Q Have you made a study of the Red Hills Unit area and of the initial test wells which has resulted in production?

A Yes, sir, I have. As assistant manager of exploration in the combined operation of the Union and Pure, I was called on in December of 1965 to examine Pure's proposal for additional exploration in the Red Hills Unit. Although the merger was effective in July of '65, the Exploratory Department was not combined in such a way that the operation was consolidated prior to December.

At this time I examined all of the evidence, seismic, well information, and reports that had been submitted on the Red Hills Unit and examined in detail all of the information that had gone into the recommendation to drill an exploratory well. I was also charged with making a development analysis. Now this development analysis pertained only to the Wolfcamp formation.



Q Before going into your study there, have you

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prepared, or has there been prepared under your direction a plat showing the ownership of the acreage immediately surrounding the initial test well?

A There has.

(Whereupon, Union's Exhibit No. 1 was marked for identification.)

Q Refer to Union's Exhibit 1 and explain to the Commission what this shows.

A Exhibit No. 1 shows a portion of the Red Hills Unit area and is a land ownership map. It shows the location of the Pure No. 1 Red Hills Unit well which is located 330 feet from the South Line and 2310 feet from the East Line of Section 32, Township 25 South, Range 33 East. It also shows by a block the participating area that was set up and approved by the Director of the United States Geological Survey, the Commissioner of Public Lands for the State of New Mexico.

Q That's Sections 32, 33 and Sections 4 and 5?

A That is correct. The land that is colored on this plat is all land that is within the Red Hills Unit area. It does not include all of the land within the Red Hills Unit area. The acreage within the participating area is all firmly committed, effectively committed to the unit with the exception of the North Half of the North Half of Section 5,

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the East Half of the Southeast Quarter and the Southeast Quarter of the Northeast Quarter of Section 5. Of this described acreage, this 280 acres, Union controls the working interest on one-eighth, and this one-eighth is committed to the unit operation. Mineral interests under the leases that Union control, one-sixteenth is effectively committed to the unit area and one-sixteenth is not committed.

Q Now, as a result of the investigation which you have already testified to, did you make any recommendations to your company with respect to further development of the unit area?

MR. HUNKER: If the Commission please, it sounds to me like they are reopening the entire case and I object to this line of questioning.

MR. HINKLE: This is just leading up to the information that was turned over by the Union Oil Company to independent engineers to make this survey, and we want to show that he did make an independent investigation, make recommendations to his company, and the information which he came up with was turned over to an engineering firm for an independent survey. Just connecting it up.

MR. HUNKER: If the Commission please ---

MR. HINKLE: I'm not going into the previous evidence.

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MR. HUNKER: -- in their application, Union has said that there is new and independent evidence which has been obtained, and so far this line of testimony does not show anything new at all to the Commission. We object to the line of questioning.

MR. HINKLE: It will.

MR. DUNN: I might state, sir, that one new condition exists; at the time of the previous hearing, Union did have under lease a larger interest in the acreage than I have described and had committed it to the unit.

GOVERNOR CAMPBELL: What is the question again, what are you seeking?

Q (By Mr. Hinkle) What recommendations did you make to your company, the Union Oil Company, after you had made this investigation that they had requested you to make, with respect to further development of the unit area?

MR. HUNKER: Just a minute--

A I recommended two lines --

MR. HUNKER: -- the Commission hasn't ruled on my objection.

MR. PORTER: No.

GOVERNOR CAMPBELL: Are you asking him to express his independent, expert opinion now, in effect, by referring to his recommendations on the whole matter from the beginning

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of the original case?

MR. HINKLE: No, Governor, all I am asking him is to -- let me go back a little ways here. This was taken over from the Pure Oil Company by Union. Union employees and officials, and so forth, did not know very much about it, they wanted their own employees to investigate it and make a recommendation to them as to what they should do. All I am asking him is after he had made his investigation, what recommendations he made to Union Oil Company with respect to further development of the unit area.

GOVERNOR CAMPBELL: You mean the development --

MR. HINKLE: Whether they should go ahead and develop on one hundred --

GOVERNOR CAMPBELL: From this time forward --

MR. HINKLE: -- one hundred sixty.

GOVERNOR CAMPBELL: -- in the light of the existing circumstances?

MR. HINKLE: Yes, and in the light of the Commission on the previous order for 160-acre spacing.

GOVERNOR CAMPBELL: As I understand it, you are seeking here to present to the Commission evidence that has been made available to Union since the time of the original order?

MR. HINKLE: We're leading up to that. We're going

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to connect this up and show that after he made his recommendation there was a recommendation that there be an investigation by an independent engineering firm, and he turned all this information over to the engineering firm to make this independent investigation, and then the next two witnesses --

GOVERNOR CAMPBELL: He's not expressing his opinion about the investigation or the nature of it or anything else?

MR. HINKLE: He's expressing his opinion as to the conclusion he arrived at from his investigation, yes, as to whether or not under the circumstances they should be further developed. If the Commission please, this is leading up to this new evidence which I mentioned in the opening statement of how it came about that the core analysis and also the evaluation of the pressure and production history --

GOVERNOR CAMPBELL: If it is an effort simply to show how the new evidence came about, that's one thing. If it is an effort to bolster old evidence that the Commission has already ruled upon, that is entirely different. That's what we are concerned about.

MR. PRAY: We believe it's irrelevant how they got to get the new evidence.

GOVERNOR CAMPBELL: I can see where they might feel that the Commission had been delinquent in some way in not

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getting the information. To that extent I would think the Commission might like to know, but if that's the purpose of it--

MR. HINKLE: Just laying a predicate for the other witnesses.

GOVERNOR CAMPBELL: Let's let the witness answer this question and see where we go.

Q (By Mr. Hinkle) Go ahead.

A I think I am lost on the question.

MR. PORTER: Would you restate the question?

A I believe I was asked what my recommendations were as a result of my study. As a result of that study, I recommended to my company that they do not do any additional drilling on the basis of 160-acre spacing. I recommended that they drill additional Wolfcamp development wells if we could secure voluntary pooling of 640-acre or 640-acre spacing was established. I recommended that we continue exploration, but that is not a part of this case.

Q Did you make any recommendation to your management with respect to the employment of an independent engineering firm?

A I did.

Q To study the situation?

A Yes, sir.

Q Whom did you recommend that they employ?

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A I recommended that the company employ H. J. Gruy and Associates in Dallas.

Q That's H. J. Gruy, G-r-u-y --

A G-r-u-y, that is correct.

Q -- and Associates. Did you contact Gruy and Associates yourself?

A I contacted Gruy and Associates on April 28th in Dallas, Texas.

Q Did anything grow out of that meeting with respect to the evaluation of the Wolfcamp formation?

A Yes, sir. I discussed with both their geological staff and engineering staff the information that we had on this well. I explained to them that there was considerable controversy about the commercial nature of it and the distribution of the Wolfcamp pay. I explained to them that I had independently worked the information and had selected 24 feet of pay with 6-1/2% porosity and our engineers had made a calculation based on that. I asked them if they thought they could improve on our calculations with the equipment and the experience and the personnel they had. They informed me, I should state, specifically, Mr. Martin Ford informed me that he thought --

MR. PRAY: Objection. I don't think this is proper to have him state what they informed him.

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GOVERNOR CAMPBELL: Mr. Ford is here and will testify?

MR. HINKLE: He's the next witness.

GOVERNOR CAMPBELL: That should be sufficient, then, Mr. Hinkle.

MR. HINKLE: Okay.

Q (By Mr. Hinkle) Was there anything said with respect to the core that was mentioned at the previous hearing, that's the core of the Wolfcamp formation?

A Yes, sir.

MR. HUNKER: This calls for hearsay testimony too, Mr. Hinkle. Of course, the witness has already answered. Who said this, Mr. Dunn?

MR. DUNN: Mr. Ford and myself discussed it.

MR. HUNKER: It's hearsay. It's objectionable and we move it be stricken.

Q (By Mr. Hinkle) Was any determination made --

GOVERNOR CAMPBELL: Wait. Mr. Hinkle, will you withdraw the previous question?

MR. HINKLE: Yes.

GOVERNOR CAMPBELL: Strike that from the record.

Q (By Mr. Hinkle) Was any determination made as to having the core analyzed, the core of the Wolfcamp formation?

A There was.

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Q Did you take any steps toward having it analyzed?

A Yes, I did. I delivered the core to the Core Laboratories on April 29th, where they ran a core-gamma correlation and inspected the core. On May the 3rd Mr. Morton, with Gruy and Associates, and myself, selected portions of the core to be analyzed. This selection was made to give a complete analysis of the cored section with particular attention paid to each change in lithology in the cored interval.

Q When was the core analysis obtained from Core Lab?

A On May the 5th.

Q Do you have a copy of the core analysis?

A I do.

(Whereupon, Union's Exhibit No. 2 was marked for identification.)

Q Refer to Union's Exhibit No. 2 and explain to the Commission what it shows.

A This exhibit is in three parts; the first part is simply a numerical listing at the depth at which plugs were cut for analysis, the permeability measurements that were made on these plugs, the porosity measurements that were made on the plugs, the grain density measurements that were made on the plugs, and the lithologic description as furnished by Core Laboratory. The second part is a core-gamma correlation

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that was run on the slabbed core, and on this core-gamma correlation is a graphic plot of the porosity and permeability. On the third part we have the completion coregraph where the same information is repeated and the lithologic description is plotted in graphic form.

MR. HUNKER: If the Commission please, Union's application in this hearing was filed on the 23rd of March, 1966. At that time they said that they had new and substantial evidence. All of this material has been developed since the application was filed. I think that you are being less than candid with the Commission in coming in here with new evidence that you have developed in the last several days, and I object to this line of testimony.

I think they're trying to reopen the entire case and they're trying to get their foot in the door with this particular information. I object to it being considered and discussed by this witness. I think that this phase of the matter shouldn't be included.

MR. HINKLE: If the Commission please, we did have new evidence at the time that the application was filed as far as the pressure production history is concerned. That's true we did not have the core analysis at the time it was filed. We didn't even then know it was going to be made, but in this investigation we determined that it should be made and

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it is now presented as new evidence.

GOVERNOR CAMPBELL: Will your subsequent testimony reflect the additional new information that you had at the time that you filed the application?

MR. HINKLE: That's right, it will.

MR. HUNKER: If the Commission please, I would like to make one further comment. If you permit further testimony with regard to this core analysis you are going to open up the amount of pay that's in this particular well in the Wolfcamp formation. You are going to open up the matter of permeability of this particular pay, you are going to open up Pandora's box to an entirely new hearing on a matter that the Commission has hashed over a year ago and made a decision about.

You denied Pure's application at that time for 640 acres; they have not shown anything substantial to show that they're entitled to reopen this case, and we object to any further testimony with regard to this core analysis. They're trying to get their foot in the door, trying to go some place where they have no right to go.

MR. HINKLE: The purpose of this new evidence is to show that there is a complete new evaluation of this reservoir which the Commission did not have at the original hearing, and which in our opinion shows that it is an entirely different

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situation than the Commission had under consideration originally, and that it is necessary that this be considered now in order to protect correlative rights and see that this area is properly developed.

MR. PORTER: Mr. Hinkle, there was no core analysis introduced at the previous hearing?

MR. HINKLE: There was not. There was no core analysis made of the Wolfcamp core at that time.

MR. PORTER: Objection overruled.

MR. HUNKER: Will you note an exception?

MR. PORTER: Let the record show that Mr. Hunker noted an exception to the ruling.

Q (By Mr. Hinkle) Mr. Dunn, do you have the last question?

A No, sir. Was that in connection with Exhibit 2?

MR. HINKLE: Would you read the question, Ada?

REPORTER: (Reading) "Refer to Union's Exhibit No. 2 and explain to the Commission what it shows."

A I believe I completed my answer in connection with Exhibit 2.

Q Do you have any other analysis made in connection with any core after the core analysis which has been referred to as Exhibit No. 2?

A Yes, I do. I had the Residue Research Laboratory

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in Midland, Texas make a residue analysis. They were requested to make an analysis opposite each of the core plugs that had been cut and analyzed by Core Laboratory. They were asked to make additional analysis so that the complete examination would illustrate in fact the complete expression of the lithology of the core involved. This analysis simply consisted of taking a selected sample of the core, grinding it into a fine mesh, dissolving it in acid to remove all of the soluble carbonate material, and then examining microscopically the reamining residue to determine the percentage of shale in each individual sample, and the percentage of chert sand and other insoluble material.

This residue analysis was furnished us in graphic form, plotted on a log stripe; there was furnished a color code to explain the material that was analyzed. Exhibit No. 3 is a photostat of the log strip and a photostat of the symbol chart that was furnished to me by Residue Research Laboratory. This information was furnished to me and copies of it were sent to Mr. Ford of Gruy.

Q Did you turn over any other information in your possession to Gruy and Associates?

A Yes, sir, I did. I turned over the entire transcript of the previous hearing, I turned over all of the well information so that they may be able to utilize it in

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their examination of all the facts. I turned over to them the chips cut from the end of the plugs taken by Core Laboratory in order that they might make further investigation of them; in other words, I furnished all of the information that would be required for a competent geologist or engineer to make a complete analysis of this situation.

Q Are you familiar with the status of the Unit No. 1 well insofar as the Pennsylvanian production is concerned?

A I am.

Q What is the status of the well with respect to Pennsylvanian production?

A The well is not producing from the Pennsylvanian section. It is, in the opinion of everyone concerned, plugged mechanically in some manner so that gas is not coming to the string of tubing. Attempts have been made to check the tubing to the Pennsylvanian perforations, and they cannot get through the tubing below a depth of approximately 12,000 feet. There is no gas coming from the Pennsylvanian side and the well is not producing from this interval.

(Whereupon, Union's Exhibit No. 3 was marked for identification.)

Q And it's only producing from the Wolfcamp formation at the present time?

A That is correct.

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MR. HINKLE: That's all the direct examination.

CROSS EXAMINATION

BY MR. PRAY:

Q Mr. Dunn, on what date did you say that you employed Gruy engineers?

A I did not say, sir, what date I employed Gruy engineers. I stated that I visited Gruy engineers on April, the afternoon of April 28th.

Q What year?

A 1966.

Q Approximately how long was this after the filing of the application for reopening of this case?

A I don't believe I have the date of the application, sir, but it must have been three weeks.

Q It could have been March 23, 1966?

MR. PRAY: Does the secretary have the date of the filing of the application? We don't have a file-stamped copy.

MR. PORTER: The case file should reflect the date.

A To further answer Mr. Pray's --

MR. PRAY: Excuse me.

MR. PORTER: The application for this particular hearing, Mr. Pray, was received in this office on March 25th.

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It was filed --

MR. PRAY: I believe the date it was received would be sufficient for our purposes.

MR. PORTER: I was trying to find the letter of transmittal.

Q (By Mr. Pray) The date of March 25th will be sufficient. That's approximately one month, Mr. Dunn, after your filing application that you talked with Gruy about making this study, is that correct?

A That is correct.

Q Mr. Dunn, do you have any knowledge of approximately when this well was cored in the Wolfcamp formation?

A I would like to refer to the well log, if you would like for me to obtain the exact date.

Q Would you do so?

A This core was cut on the 8-26th to 27th of 1963.

Q And what document are you reading from?

A I'm reading from the Core Laboratory mud log report on the Pure Oil Company No. 1 Red Hills Unit.

Q Approximately how long after that core was cut did you have it analyzed?

A Oh, approximately three years.

Q Could it have been analyzed prior to the date of the previous hearing?

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A It certainly could have.

Q But it was not, was it?

A No, sir.

Q How many feet of correction did you have to make in correcting this from the reported depth on the driller's log to the depths that you now show on this analysis?

A The depths that we now show on that analysis are the driller's depths.

Q Would you read me the depths that were cored from your report there, just the beginning and ending depth?

A Core No. 1, from 13,475 feet to 13,498 feet.

Q All right. The method you stated that these analyses were madc were from plugs, is that correct?

A That is correct.

Q And these were not whole core analyses, is that correct?

A That is correct.

Q I direct your attention to the bottom of your Exhibit No. 2. "No permeability measurement made-plug fractured."

A That is correct.

Q Would this, then, mean that the entire core would have been fractured also?

A No, sir. It doesn't mean that the entire core

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would have been fractured also. It means that on these particular plugs which were in an extremely shaly section, in the process of cutting the plugs there were minute fractures in them and the Core Laboratory could not take permeability measurements.

Q You say it was in a very shaly section?

A That is correct.

Q In your opinion is this section representative of the entire Wolfcamp zone?

A No, sir.

Q Mr. Dunn, how was the core preserved for storage?

A The core was slabbed, placed in boxes.

Q Would you explain? I don't understand.

A It is common practice to cut a vertical cut along a core from one to two inches in thickness, to box it, in the length and in the manner in which it was originally taken from the well bore and placed in storage. We call this a slabbed core.

Q Was it sealed in any type of cans or any type of plastic container?

A It was not.

Q It was open to the atmosphere?

A That is correct.

Q Would the condition of the core at the time of the

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analysis accurately represent the condition of the core when it was freshly cut?

A For the properties that have been analyzed, yes.

Q What properties were analyzed?

A The porosity, the permeability and the grain density. We did not attempt to make fluid analysis.

Q Mr. Dunn, did you furnish myself, Mr. Hunker, or any of the people with Kermit, Mr. Schuman and Mr. Yager, with copies of these core analyses?

A I did not.

Q Did you furnish us with copies of your residue study, Exhibit 3?

A I did not.

Q Did you furnish us with any copies of any studies made by Gruy?

A I did not.

Q Have you at any time made a statement to either myself or Mr. Hunker or the Kermit people that you were going to operate at this time under a procedure of full disclosure?

A This statement of operating under a full disclosure was prior to and when I had hopes that we could jointly get together and drill a 640-acre location in Section 5.

Q Has it been your unwavering position that 640 acres is the only way in which you wanted to proceed?

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A That is correct.

MR. PRAY: We respectfully request that all of the testimony shown on Exhibits 2 and 3 and all of his testimony pertaining to these exhibits be stricken from the record, for the reason that they had a full opportunity to present this same information at the time of the last hearing. For some reason they did not choose to do so. A period of almost three years has passed since this core was taken and now just a few days before this hearing they decided to have it analyzed, and one month after the application has been filed.

We submit that this does not constitute new evidence and, therefore, we ask that this be stricken. We believe that this is an attempt to rehabilitate the case they presented at the last hearing. They are trying to do now what they didn't properly do before. Apparently they're concerned about their testimony of last time, and we ask that it be stricken.

MR. HINKLE: Of course, the original case was put on by the Pure Oil Company. The Union has taken over the Pure, we have an entirely different set of attorneys, different personnel and so forth. Why they didn't have the core analyzed at the original hearing, we do not know. It was only after the engineer's suggestion that it be analyzed that it was analyzed. Now the opposition knew that the core was there because it was referred to in the previous hearing, and they

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could have had it analyzed as well as we could.

MR. PRAY: If the Commission please, I would ask Mr. Hinkle if they are now stating that Union Oil Company does not stand in the shoes of Pure.

MR. HINKLE: No, I am not saying that at all.

MR. PRAY: Then you stand in the shoes of Pure Oil Company for all purposes?

MR. HINKLE: I think we do, but I am explaining the circumstances here which we have entirely different personnel. We do not know why they did not have the core analysis made.

GOVERNOR CAMPBELL: Let's address our conversation to the Commission. It will be a little more orderly.

MR. PRAY: I would like to suggest that they do stand in the shoes of Pure Oil Company and that it's not legal grounds that there has been a change in management to reopen this case.

GOVERNOR CAMPBELL: Gentlemen, it seems to me that by the very nature of this Commission's activities and by specific language in all of their orders we retain continuing jurisdiction over matters brought before the Commission. I suppose that Union Oil Company could have filed a new application here and started from scratch without any legal objection. Here, they're simply saying that they have additional evidence they wish to offer. It seems to me the

Commission should hear that evidence.

The reasons for it not being offered previously are pertinent here. I'm sure the Commission is interested in it. You will recall that the order in Case 3158 was based entirely upon a finding that the applicant then had not established that the proposed spacing would afford each operator the opportunity to produce his just and equitable share of the oil and gas. I think the Commission should hear what evidence there is to be offered, and if there are circumstances now that were not available then, that the Commission can, under its order, consider them.

We could spend a couple or three days arguing about each piece of testimony, as to whether it is new or old, and I think the Commission is just going to have to use its judgment and discretion in connection with how much weight we'll attach to any evidence that's offered here, just as we would do in any other case.

I would like to suggest, of course, the counsel should preserve their legal objection and right here, perhaps we can do it on a continuing basis, and then let the Commission go ahead and proceed with the case. You may have made sufficient objections up to now, but it's up to you, but we're going to have to decide somewhere along the line whether we are going to go ahead or whether we are not going to go ahead, and I feel we are obligated to go ahead.

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MR. HINKLE: We would like to offer in evidence Union's Exhibits 1, 2 and 3.

(Whereupon, Union's Exhibits 1, 2 and 3 were offered in evidence.)

MR. HUNKER: If the Commission please, we object to the admission of these exhibits, well, not to Exhibit No. 1, but we object to the admission of Exhibits 2 and 3 on the ground of the arguments here in this matter --

MR. PORTER: And for the reasons --

MR. HUNKER: -- as stated previously. I would like to make one further comment, if I may, so the Commission doesn't fall into a trap. In a case closely resembling the present one, the Supreme Court of New Mexico held that a second order of the Oil Conservation Commission which modified the original spacing order was void on the grounds that the Commission was without jurisdiction to enter the second order, Simms versus Mechem, 282 Pacific 2d, 183, a 1963 case.

The basis for the court's decision was that the Commission could not enter an order changing the existing spacing inasmuch as there was nothing in evidence tending to support a finding of waste or the prevention of waste by the forming of a spacing unit sought in the second order.

GOVERNOR CAMPBELL: I have some hazy recollection

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of that case.

MR. PORTER: If there are no further objections to the admission of the evidence, the Commission will admit the Exhibits 1, 2 and 3 into the record. Your objections are overruled.

(Whereupon, Union's Exhibits 1, 2 and 3 were admitted in evidence.)

MR. HUNKER: Will you note an exception?

GOVERNOR CAMPBELL: I might say also, if there had been any circumstances occurring with regard to the rights of the other parties since the entry of the other order, this also would be quite pertinent.

MR. HINKLE: We would like to call Mr. Ford.

MR. PORTER: At this time let's take a short recess.

(Whereupon, a recess was taken.)

MR. HUNKER: If the Commission please, in his opening statement Mr. Hinkle stated that this case was not designed to rehash the previous cases heard and determined by the Commission. We object to any testimony relating to the recent core analysis that Union has had made. Mr. Dunn has testified that the core was not representative of the Wolfcamp formation, consequently any further testimony regarding the core analysis should not be heard by the Commission at this time. It is wholly irrelevant, it is

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immaterial, and I don't believe the Commission should hear it.

GOVERNOR CAMPBELL: Will you please, I missed a sentence there, your objection to the core analysis as related to the Wolfcamp formation, I didn't get that.

MR. HUNKER: My statement was that we object to any further testimony relating to the core analysis which Union has had made since the filing of this case, for the reason that Mr. Dunn has testified that the core samples which were taken were not representative of the Wolfcamp formation; therefore, any further testimony with regard to the core analysis, since the samples were not representative, it seems to me the evidence is wholly immaterial, it is incompetent and should not be considered by the Commission as being some-thing substantially new, at least for the reopening of the case.

We have no objection to them producing testimony with regard to the pressure surveys that have been taken, we have no objection at all to their making a suggestion to the Commission as to an exception with regard to the mineral owners in Section 5, but we would like to make a continuing objection without having to jump up every moment or two and interrupt the witness. We would like to make a continuing objection to any further testimony with regard to the core analysis, as we feel that it is wholly immaterial to the

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matter under consideration by the Commission.

MR. HINKLE: Regardless of Mr. Dunn's testimony; I don't recall that he said just what Mr. Hunker said he did, but the core analysis speaks for itself, and Mr. Ford, the next witness, will show the relevancy of the core in determining the net pay in the Wolfcamp zone.

GOVERNOR CAMPBELL: Your objection is overruled and the record will show that the objection goes to any and all testimony to the core analysis referred to in Exhibits 2 and 3.

MR. HUNKER: Will you note an exception?

MR. PORTER: Mr. Hinkle.

MARTIN E. FORD

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

DIRECT EXAMINATION

BY MR. HINKLE:

Q State your name and by whom you are employed and your residence.

A My name is Martin E. Ford. I am employed by H. J. Gruy and Associates, petroleum consultants, as a log analyst. I reside in Dallas, Texas.

MR. PORTER: Would you spell that name for us, please?

A M-a-r-t-i-n E. F-o-r-d, like the car.

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MR. PORTER: Thank you, Mr. Ford.

Q (By Mr. Hinkle) Mr. Ford, have you previously testified before the New Mexico Oil Conservation Commission?

A No, sir, I have not.

Q Are you a graduate geologist?

A Yes, sir, I'm a graduate of the University of Cambridge in England, and I have an Honors Degree in geology.

Q In what year?

A I obtained the Bachelor of Arts Degree in 1948 and a Master of Arts Degree in 1954.

Q Have you practiced your profession as a geologist since your graduation?

A Yes, sir. Since my graduation I have been employed continuously as a geologist.

Q Would you give a brief history of your employment and the positions that you have held in recent years?

A From 1949 to 1951 I was employed by the Golden Base Metal Mines, Nguru, Nigeria, as an exploration geologist. From 1951 to 1955 I was employed as a subsurface water geologist by the Department of, Water and Irrigation of the Northern Rhodesia government. From 1955 to 1959 I was employed by the Ohio Oil Company, as it then was, it's now called Marathon Company, as a subsurface and as a well-site geologist, and was engaged part of my time in log analysis at

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that stage.

I left the Marathon Company and joined Kemp Petroleum Exploration, an oil company, and was employed as a well-site geologist, as a subsurface geologist, and as a log analyst. I left the Kemp Petroleum Exploration, their Dallas branch, in 1962 and joined H. J. Gruy and Associates and have been employed since that time by H. J. Gruy and Associates principally as a log analyst.

Q Have you attended any special schools with respect to teaching or studying electrical logs?

A Yes, sir, I have. I attended a Schlumberger logging school in 1957. In 1959 I attended a two-week course on formation evaluation given by Dr. Pierson and Mr. Jack Greenberg, they are both recognized experts in the field of formation evaluation, using log analysis, and have given this course in many places throughout the United States, Canada and the rest of the world.

In 1964 I attended a two-week course given by Dr. Hamilton in Tulsa. Dr. Hamilton is a very well-known and respected expert in log analysis. Late in 1964, H. J. Gruy and Associates prepared a manual of log interpretation for the instruction of some of their clients, and using this manual gave courses to clients in Bogota, Columbia, and in 1965, in Kuwait, in the Middle East, to instruct clients in the use of



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well logs, to interpret formation characteristics.

Q Was your company requested by the Union Oil Company to make a survey or study of the Red Hills Unit No. 1 Well?

A Yes, sir, they were. I was called into a meeting, if my recollection is correct, it was on April 28th of this year, at which a discussion took place regarding the charactersof a log which we were shown on the Red Hills, the Pure Red Hills Unit No. 1 Well in Lea County, New Mexico; and discussion took place on this log and on pressure time information that was also presented to us at that time.

Q As a result of your study, have you prepared certain exhibits to show the results of your study?

A Yes, sir, I have.

MR. HINKLE: If the Commission please, we have placed on the wall Union's Exhibits 4, 5, 6 and 7, --

(Whereupon, Union's Exhibits 4, 5, 6 and 7 were marked for identification.)

MR. HINKLE: -- which I'll ask Mr. Martin to refer to in any order that he would like to refer to them.

GOVERNOR CAMPBELL: Mr. Ford.

MR. HINKLE: I mean Mr. Ford. I would like for him to give the Commission the result of his study.

MR. PORTER: You have a pointer there, Mr. Ford, which we would like you to please use in explaining your

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exhibits.

A Thank you. After Union Oil Company had decided to employ us in this case, we requested all information that would have a bearing on the study that we were to make. In connection with this study I would like to say at this point that we have looked at the well logs that were available, that is logs recorded by the Schlumberger Log Corporation and Welex, and these were gamma ray neutron logs. We have looked at the gravity log and core-gamma logs recorded by Core Lab, we have looked at samples by Core Lab at the time the well was being drilled. We have looked at the residue after solution of the samples of the core in acid, we have looked at the slab core and at plugs cut from it, we have had thin sections made and have examined those.

Now, I would like to take a little of your time running over the characteristics of this log. I appreciate all that has been said previously about the testimony being introduced, but I do think it's relevant to what I have to say, and if you will allow me to do so, I would like to go through the characteristics of this log now.

Exhibit No. 7, which we have introduced, is a Schlumberger gamma ray neutron log on the Red Hills Pure No. 1 in Lea County, New Mexico, and this log was recorded on October 22, 1963. The principal features of this log are two

traces or curves, one in the left-hand track is a depth track, marking the depth at which a particular response was recorded, and then in the right-hand track there is a neutron curve. The curve on the left-hand side represents the response of a detector sensitive to natural gamma radiation.

The natural gamma radiation results from the spontaneous disintegration of naturally occurring radioactive materials, and these materials, we have found from experience in this type of rock, occur principally associated with shales. The log shows excursions to the right and to the left; the excursions to the right show increasing natural gamma radiation as shown by the detector. The excursions to the left show decreasing.

The detector is on a logging string at the end of the cable and is inside whatever casing is present in the well and between it and the formation where the natural gamma radiation originates is such material as the cement which was run into the well to secure the casing.

An important point to note about this curve is that it is a record of a naturally occurring series of events, and in common with most other natural phenomena that we observe there is considerable variance, so even were we to hold the logging tool stationary opposite some point in the well bore, we would still see some variation because there is a randomness about this disintegration and we never can predict precisely

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how much disintegration will take place at any one time. We refer to this as a stick variation.

In interpreting this log we need to log at average levels of response in order to attach significance to the curve, perhaps in the amounts of shale present.

On the right-hand side is the curve that records the response of a detector, which is sensitive again to gamma radiation, but in this case it's sensitive to a much higher level of gamma radiation, which results from the bombardment of the formation with neutrons. A neutron source is carried in the logging tool, the neutrons move out from that source into the well bore environment, through everything that is associated with the environment, including the mud in the bore hole, the cement in the casing, through the formation, and the results of this bombardment is eventually the production of gamma radiation.

In order to have quite clear in our minds the significance of the extent of the excursions, it's important to consider the intermediate stage that occurs before the final capture, as it's called, which is attended by induced gamma radiation. Most of the capture, or the probability of capture, let's say, is very much greater when the level of energy of the neutrons is somewhat reduced, and this reduction depends principally on the amount of hydrogen present in the formation. So what

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we should think of is that this curve measures the amount of hydrogen in the rock. If there is no shale present in the rock, most of the hydrogen will occur in the fluids which are in the pore space. So if we could rule that there was no shale present we could argue, and if also we could rule that the bore hole environment remains substantially constant, we could argue this is a measure of porosity because it measures the amount of hydrogen which is present in the pore space; but when shales are present it's necessary to make a correction to the measured response in this curve in order to arrive at a value for the amount of hydrogen that is in the pore space and, therefore, to infer the amount of pore space.

As a means of interpreting this log, the logging companies provide interpretation charts which show the relationship between porosity and the response of the log; but because, as we've said, the response depends on the whole bore hole environment, there must be a separate chart for each bore hole condition, so if we have one size bore hole it will have a different response from the same rock in another size bore hole. So each chart has to lay out clearly what are the conditions to which it applies.



In this case here, there is no interpretation chart that closely proximates to these conditions, and consequently some other method must be devised for interpreting this

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response as porosity.

It has been found by experience and recorded by R. E. Bush of the Lane Wells Company that the response of the neutron log has a linear relationship to the log rhythm of porosity, so that if we plot the neutron log excursion against the log rhythm of porosity we can expect that there will be substantially a straight line. Whenever we have the straight line relationship it's only necessary to establish two points on the straight line to define the position of that line. So that if in this case we could establish some end points for the porosity neutron deflexion relationship, then we would be able to interpret the intermediate levels of neutron response in terms of porosity.

In terms of porosity, that is if we can make a correction for the amount of hydrogen which is present in the shale portion of the rock. Fortunately we have on the left-hand side of Exhibit No. 7 a curve which we have argued is principally dependent on the characteristics and amount of the shale. If, as is very generally the case, through a sequence of this kind the shale doesn't very materially change its character, then we can argue that this curve can be used to measure the amount of shale present, the apparent porosity due to the shale, and this can be subtracted from the total apparent porosity, which includes the effects of the shale on the right-hand side, the neutron curve in Exhibit 7, we can

subtract the shale effect from the total effect and arrive at an estimate of the pore space. This would be the best, in most cases, method of interpretation of a log of this kind.

We would be disinclined to place any great reliance in that kind of an interpretation unless there was some supporting evidence to show that our estimates were within a correct order of magnitude. In this case, after discussion with our clients, we decided that such supporting evidence was essential and we asked what core there was for this well, we were told that there was a section of core from 13,475 to 13,499, and we requested that this be analyzed. We requested also, in order that we might evaluate the characteristics of the shale, to determine what sort of representative effect -- allow me to correct myself, what sort of representative apparent porosity would be associated with it, we asked that we should make a residue analysis on the sections of the core.

We also, in order to determine estimates of the amount and character of the other minerals in the core, made thin sections. Before we could use the core to check our measurements, to check our calibration of the neutron curve in terms of porosity, we had to determine what position on the depth scale recorded in the Schlumberger gamma ray neutron log, Exhibit No. 7, what position it should occupy. That is, we had to make a depth correlation between the core depths,

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which were driller's depths, recorded at the time the well was being cored, and the log depths which were recorded by the logging company.

One method of doing this is to make a record of this natural characteristic of the rock, the natural gamma radiation level, and this can be done by Core Laboratories, and they call their record a core-gamma correlation, and two such records are shown, Exhibits 5 and 6.

Exhibit 5 is a core-gamma which was recorded on the whole core at the time very s-ortly after it was removed from the well. The dates of this record is shown on the heading, and I cannot read it from this position, but each of you, I believe, has a copy of this record, and if you consider that relevant, would you refer to the heading on that log?

This response, this natural gamma radiation should be considered an identifying characteristic of the rock. It might almost be considered the rock's signature, it is something that is also associated with it, but the actual form of this response does depend to some extent on the recording instrument, so this you might think of as the sort of natural variance that occurs from one signature to another.

There is also, of course, the additional variance that is due to the random nature of this radioactive process. So here we have signatures, and by comparing them we might be

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able to decide whether it is very probable that these are the same pieces of rock, that is that there was no substantial rearrangement of the core between the time it was cut and the time at which we looked at the slab section of it.

Q May I interrupt you a minute? State to the Commission when the core-gamma shown by Exhibit No. 6 was made. You explained that 5 was made at the time the core was taken from the well, but when was No. 6 made?

A The date shown on the record, which is Exhibit No- 6, and is the core-gamma correlation on the slabbed core, is 5--5-66. We may then compare the characteristics of the core, of the natural gamma radiation of the core in order to decide if there has been any substantial rearrangement of this core.

We are confident on the advice of the Core Laboratories' personnel, that no such rearrangement has occurred, because the original core carried depth identification marks, and some of these were still visible on the core, but this is additional information which serves to confirm that point.

Now, I have here a replica of the core-gamma curve recorded on the slabbed core. You can see that this is a precise copy of the curve part of Exhibit No. 7, and shows the principal depth point.

If you will now allow me to lay this beside the

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core-gamma curve for the whole core, which is Exhibit No. 5, and you can see that there is good correspondence between the two, that the principal features which are a leftward excursion, the natural gamma radiation in the upper part down to the section at 13,484, that shows a leftward excursion, and the lower part shows a right one or increased level of natural gamma radiation.

GOVERNOR CAMPBELL: How do you determine -- obviously there have been changes. They are obviously not identical. How do you determine the magnitude and significance of those changes?

A The amount of the variance is a function not only of the rock but also of the measuring instrument. There is normally very little space between the recording instrument and the whole core when the response recorded in Exhibit No. 5 is made; but since the slabbed core is much smaller in cross section and can't be brought as close to the instrument, then the instrument is, in effect, less sensitive, so that we would expect to see less prominent features, less clearly-defined in the case of the slabbed core response than we would in the case of the whole core. But we would also remember that this is a natural-occurring phenomena and that there is an unpredictable variation due to this fact.

Now, taking this signature of the slabbed core and applying it to Exhibit No. 7, which is the gamma ray neutron

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log --

GOVERNOR CAMPBELL: Is it your opinion that the differences reflected on those two correlations do not indicate significant changes in the composition of the core--

A No, sir.

GOVERNOR CAMPBELL: -- during the period of time involved?

A No, sir.

GOVERNOR CAMPBELL: You think you can make a fair comparison at the time the core was taken and the core in May 1966?

A Yes, sir, this is something, as I tried to describe in the analogy with the signature. This is something which stays with the rock and unless you remove from it some of that part which is principally responsible for the natural gamma radiation, then it will retain the characteristics.

GOVERNOR CAMPBELL: Forever?

A This undergoes a very gradual decline in intensity, the rate at which this occurs is described as a half life, and this may be as long as thousands of years within which the intensity of the radiation will decrease, but even when it decreases in that way there still will be the relative differences between the various parts which contain greater and lesser amounts of shale.

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MR. PORTER: You are talking about a decrease in the bombardment of your gamma ray?

A Yes, sir, this is the natural disintegration of those unstable minerals that we refer to as radioactive minerals.

GOVERNOR CAMPBELL: It doesn't make any difference if it is in a box or tin can?

A No, sir.

GOVERNOR CAMPBELL: Sealed or unsealed?

A No.

GOVERNOR CAMPBELL: Submerged or dry?

A The only thing that would make the difference would be if some of the shale contents were removed from the rock. On inspection we had no fact to believe this had taken place because it was a well-impacted, well-contained cemented rock. We also found as a result of the residue analysis that the shale was quite calcareous, the whole core has a carbonate content of the order of 30%, 20 to 30%, and this made it well-cemented type of rock which was not likely to disintegrate in the core analysis. It certainly didn't have the appearance of disintegration when we looked at it.



The core was, in fact, broken up in places, but this is almost inevitable in the process of withdrawal of the core from the core barrel, the very process of cutting the core, which

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subjects it to unusual stresses, and the process of cutting the slab. Unfortunately these boxes are likely to be dropped, so this will further break up the core.

This core will exhibit, the slab core, exhibit a number of fractures in the final stage that we were able to look at it. It is my opinion that just as one man's signature from time to time may differ, visually, and sometimes it takes an expert to determine if that signature has differed from time to time. It is my opinion there's no evidence here to suggest that the response recorded in Exhibit No. 5 is not comparable and compatible with the level of responses shown in Exhibit No. 6.

Now, taking the replica of Exhibit No. 6, the core-gamma on the slabbed core, and applying it to the curve on the left-hand side of Exhibit No. 7, which is the natural gamma radiation curve recorded by Schlumberger, in the well bore we see that this is corresponding, and whereas when comparing Exhibits 5 and 6 we saw that there were basically the same type of features, that there was the movement to the left in roughly the same place and the movement to the right, allowing for the natural variance that is the characteristic of this disintegration process. When we look at the correlation without any depth correction on Exhibit 7, we see that the features are, in fact, directly opposed, that when the gamma curve

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indicating increased level of radiation on the Schlumberger log is moving to the right, the other curve is moving, the curve representing the natural gamma radiation for the slabbed core is moving to the left.

We could move this core up a bit on the assumption which has been indicated to us by our experience as a very reasonable one, that there won't be precise correspondence between the depths recorded by the logging company and the depths recorded by the driller at the time the core was being cut.

The logging company's depths are measured by odometer, which is operated by the logging cable as it runs on to the reel, and considerable precaution is taken to insure that this very closely corresponds to controls to calibration standards that are applied by the logging company.

The depth as measured by the driller is made with the drilling string and it is measured in stands as it comes out of the well with a tape, and it is not at all surprising that with this type of measurement some small differences crop up and, in fact, are almost invariably found, so that it is not a matter of any great surprise to us on the basis of our experience that we should have to make a correction between the two depth scales.

We could move the log upwards and find that we have the

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agreement in the upper part, down to 13,484 on the core-gamma, but below that we see a fairly constant variation, so that we could draw a representative line which would be fairly straight through that section, but we couldn't draw a representative straight line through the remainder of the natural gamma radiation curve on this Schlumberger log. So we would argue from that lack of disagreement that probably that's not the correct correlation in depth.

If we move this down so 13,475 of the core-gamma on the slabbed core, Exhibit No. 6 corresponds with 13,480 on the Exhibit No. 7, the Schlumberger gamma ray neutron log, then we see that there is a fairly good agreement that the strong movement to the left, indicating decreased level of gamma radiation, is found also on the schlumberger log as well as on the slabbed core-gamma, and we find that the rather indiscriminate variation, the rather indefinite variation of the core-gamma in the lower part below 13,484 at its driller's depth corresponds to somewhat similar features on the Schlumberger natural gamma radiation curve; so that we feel that the correlation of the slabbed core to the depth as measured in the Schlumberger gamma ray neutron curve would require an addition of five feet to the depth measurements of the core.



When we make this correction and have located the position

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of the core as now being from 13,480 to 13,504, using the depth scale of the log, we can check whether our empirical interpretation of porosity from the gamma ray neutron log is a reasonable one or is not. And on the basis of this comparison we found that our interpretation was a reasonable one.

Q (By Mr. Hinkle) Mr. Ford, have you indicated the proper location of the core on Exhibit No. 7, is that the part that you have shown in blue?

A The section marked in blue on Exhibit No. 7 is the correct position of the core as referred to the depth reference on that Schlumberger gamma ray neutron log. Now we feel that this correlation is a good and reliable one, but we are fortunate in having some additional information. We recollect that the response of the gamma ray curves, both the induced curve as indicated by the neutron, the right-hand curve in the gamma ray neutron log and the natural gamma radiation, the left-hand curve, do depend on the bore hole environment, and if we find a consistent and persistent change in this environment we might look for and expect to find such a change in the level of response of these curves.

Now, if you'll look again at Exhibit No. 7 you will see that such a change in the level does occur. We would expect to find this change most noticeable in that part of the

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rock which has fairly consistent and predictable characteristics as regards this particular property, the natural gamma radiation, and so we would look at the shale and we would look at the average level towards the maximum amount of shale or the minimum excursion on the neutron curve, the maximum excursion on the natural gamma radiation curve, and try to decide whether such a change in average level does occur.

Looking down this curve we find that such a change does occur between 13,468 and 13,480, and on the gamma ray side we find that there is also a change of the average level of natural gamma radiation, and this in turn can serve as a means of determining where the core should be located, because the records show that the bore hole size was changed at the time that the core was cut.

If you will now look at Exhibit No. 4, this records this information, and Exhibit No. 4 shows that the bit size down to a driller's depth of 13,475 was 12-1/4 inches and the final size of the hole beyond that point was 9-1/2 inches. There is, therefore, a change of hole size at the driller's depth of 13,475, and we are able to locate on the gamma ray neutron curves shown in Exhibit No. 7 that such a change should occur between 13,468 and 13,480. A placement of the core at 13,480 to 13,504 is therefore confirmed by this additional

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observation. With the placement, correct placement of the core, with the agreement between the predicted levels of porosity and those found in the core, we feel that our interpretation of the neutron curve in terms of porosity is a reliable one, as reliable as this type of log will permit. This type of log in these circumstances.

We, therefore, feel justified in applying a similar method of calibration to the upper section of the log, which has a different hole size, a different environment, and therefore, can be interpreted with the same calibration as the one in the lower part below the 13,475 driller's depth.

We feel justified in applying the same system to make the calibration in the upper part. As a result of this type of investigation it is our opinion that the porosities which we have measured are the most reasonable that can be derived from this record. The gamma ray neutron curve, if it is the only record in the bore hole, cannot lead us to the determination of what is potential reservoir rock from which hydrocarbons can be recovered and what is not. There is no method by which we can determine what is the character of the pore fluids with this log combination in these circumstances.



So we must use other criteria for deciding what is the net pay and what is not. The records show that while the well

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was being drilled with a relatively light mud of the order of 9.5 pounds per gallon, which would exert a hydrostatic pressure at the depth of 13,400 to 13,500, of the order of let's say 6,700 pounds while the well was being drilled, under these conditions no very appreciable quantity of hydrocarbons was produced, that despite the fact that pressures abnormally high for this depth of the order of 11,300 pounds was subsequently measured in the formation which was found to produce.

Because of the close association of this section that I have exhibited in Exhibit No. 7 with the producing section, and because it seems to be a fairly uniform geologic environment, we feel justified in inferring that pressures of the reservoir rocks capable of producing hydrocarbons in commercial quantities are likely to be comparable.

We feel it reasonable to infer that we should expect pressures of the order of 11,300 throughout this section and, therefore, we should expect that during the drilling of the upper part of the section from 13,250 to 13,475, during which time the mud weight was of the order of 9.5 pounds, we think there should be a considerable excess pressure in any potential reservoir rocks, and that, therefore, their contents should move under this considerable excess pressure into the bore hole and that the well under these conditions would be likely to

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blow out of control. In fact, this didn't happen until a depth of 13,471, and we would, therefore, infer from this information that there are no commercial reservoir rocks above 13,471. The well was drilled on down to 13,475, at which time it very nearly went out of control, and steps were taken to regain control by increasing the mud weight, and from that time onwards a much heavier mud exerting a much greater pressure at the formation face was used; and we can't use the same criteria, that is the absence of movement of fluids from the formations into the bore hole, to infer what is effective reservoir rock and what is not.

What we have to do is to look at the general characteristics of the rock as indicated by the log response and decide whether it is similar to other types of rock which we have been able to evaluate by this other criteria. On these bases we have picked the sections which are marked in red on this exhibit as being those which are most likely potential reservoir rocks. The total thickness of that section that we have selected is 25 feet, and on the basis of our calibration of the neutron log we estimate that its porosity is of the order of 4.8%. We do not have any way of measuring the level of saturation in the pores, but our experience leads us to expect that in this type of rock it will vary from 20 to 30% water saturation, and that 25% water saturation is a

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reasonable and representative figure for that parameter.

Q Mr. Ford, are your conclusions with respect to the net pay different from those which were previously made?

A Yes, sir. I have looked at some given previously and I find figures as high as 80 feet given as the net pay for this well. My figure, as I have shown, is different from that.

Q Could you find anything in your study which would substantiate any greater porosity and permeability zones than you have shown?

A No, sir, this is our best opinion of what is the net pay in this well.

MR. HINKLE: We would like to offer in evidence our Exhibits 4, 5, 6 and 7.

(Whereupon, Unions' Exhibits 4, 5, 6 and 7 were offered in evidence.)

MR. PRAY: Object to the introduction of these exhibits for the reason that they are based on information which was available at the last hearing but not adduced. We would further object to the introduction as being an attempt to rehabilitate that information, that he has used the same data, the same logs which were presented at that time and is trying, in fact, to impeach the testimony which they presented at the last hearing themselves. We would object to the

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introduction.

MR. PORTER: The objection will be overruled and the exhibits will be admitted to the record.

(Whereupon, Union's Exhibits 4, 5, 6 and 7 were admitted in evidence.)

MR. HUNKER: Will you note our exception?

MR. PORTER: Yes, your exception is noted. Mr. Hinkle.

Q (By Mr. Hinkle) Just one other question of Mr. Ford. Do you have the plugs that were cut from the core on account of which this analysis was made available for examination?

A Yes, I have.

MR. HINKLE: That's all the direct examination.

MR. PORTER: Mr. Pray, the witness will be made available for examination. At this time I think we should take a recess for lunch. We'll recess until 1:15.

(Whereupon, a recess was taken.)

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AFTERNOON SESSION

MR. PORTER: The Hearing will come to order please. Mr. Ford is now available for cross examination. Does anyone have a question?

MR. PRAY: I have a question, if it please the Commission.

CROSS EXAMINATION

BY MR. PRAY:

Q Mr. Ford, I direct your attention to your Exhibit Number 7, is it correct that you have not picked any pay opposite what core interval you show there?

A That is correct.

Q In other words, there is no pay shown opposite the core?

A Correct.

Q Is the core then representative of any of the pay section in this well? Yes or no, if you please.

A No.

Q Mr. Ford, do I understand your testimony to be that you have picked no pay above the depth of 13,468 feet?

A You refer to the logging depth?

Q I refer to the depth shown on your Exhibit 7.

A That's correct.

Q In other words, there is nothing in the upper part

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of the Wolfcamp which you have picked as pay above that depth?

A There is nothing.

Q Do you happen to know what the top of the Wolfcamp is as picked by Pure Oil Company geologists?

A No, sir.

Q Mr. Ford what, in your opinion, is the porosity of the pay zone which you have picked there as shown on your Exhibit 7 from 13,468 to 13,473? Is that the pay zone you have picked there shown in red?

A Yes, sir.

Q What is the porosity of that zone?

A It is about five to six per cent porosity.

Q Five to six per cent porosity. What is the permeability of that pay section?

A I have no way of knowing.

Q You have no way of knowing?

A I should add on the basis of the examinations I have made.

Q Would you have any estimate at all?

A No, sir, but I believe an estimate might be made.

Q How would that be made?

A I think it would have to be made on the basis of pressure studies.

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Q Are you aware that there was a drill stem test run in the Wolfcamp zone from the depth of 12,938 to 13,499?

A Yes, sir.

Q Where would that bottom depth be on your chart, would you point that out, please? 13,499?

A 13,499 would be 13,504.

Q How much pay does that include in that zone?

A Five feet as picked by me.

Q Five feet?

A Yes.

Q You haven't picked any other pay above that?

A No, sir.

Q Do you know what the rate of flow was on that drill stem test?

A I don't recollect the precise rate but I believe it was of the order of 12,000,000 cubic feet a day.

Q That's correct; and that, you say, came all from that five foot zone?

A Yes, sir.

Q In your opinion?

A Yes, sir.

Q What sort of permeability would this result in for this pay zone if you were to compute it,based on the pressures from this test and the rate of flow and the thickness of

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your pay?

A I didn't use that information. I didn't make such a calculation.

Q Could you?

A I believe I could, yes, sir.

Q How long would it take you?

A An hour or so.

Q You are familiar with the type of core analysis which was performed on this core?

A Yes, sir.

Q Did you actually perform the analysis or was it performed by another independent service?

A It was performed by Core Laboratories.

Q You didn't participate in that?

A No.

Q Isn't it correct that the type of core analysis that was performed would measure only the matrix porosity and would not measure any fracture porosity or any fracture permeability?

A In as far as the presence of major factors might result in the disintegration of the core, that's correct.

Q Isn't it just correct that the type of analysis which you made wouldn't take into account any formation fractures insofar as determining the porosity or the

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permeability from those fractures?

A It would take into account the hairline fractures in the core.

Q But the minute fractures?

A Yes.

MR. PRAY: No further questions.

MR. PORTER: Did anyone else have a question of the witness?

MR. HINKLE: I have one more question.

REDIRECT EXAMINATION

BY MR. HINKLE:

Q Based upon the evidence to which you have testified today, could the top of the core be below 13,480 feet on Exhibit Number 7?

A Below that depth, no, sir, I believe that the point at which we have it is the best position. The reason I say no is because we have this change of hole size and with it, associated with it is the change of level of natural gamma radiation associated with the shales. So, we see that change in general level between 13,468 and 13,480, so that we would have to place the top of the core somewhere in that interval.

MR. HINKLE: That's all.

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RECROSS EXAMINATION

BY MR. PRAY:

Q In connection with the existence or nonexistence of pay zones above 13,468, did you have the opportunity to examine the so-called Core Lab grapholog, or sometimes referred to as the mud log,on this well?

A Yes, sir. I did look at that.

Q Did you happen to notice whether or not there were any kicks on this log indicating the presence of gas at zones above 13,480?

A Yes.

Q Yet you still pick no pay?

A No, sir.

MR. PRAY: No further questions.

REDIRECT EXAMINATION

BY MR. HINKLE:

Q Why is that?

A Why did I not pick any?

Q Yes.

A Because the well still remained substantially under control even though we would expect a very excessive pressure in the formation.

GOVERNOR CAMPBELL: Do you base your conclusion that there was no pay, is no pay above that point entirely

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upon the response of the well during the drilling process, is that correct, that it didn't blow out at a higher zone?

A Yes, sir.

MR. PORTER: Anyone else have a question?

MR. HINKLE: That's all of this witness.

MR. PORTER: The witness may be excused.

(Witness excused.)

MR. PRAY: For the purposes of the record, I would like to move that all the testimony and all his exhibits be stricken as he has testified that the core analysis is not representative of any of the pay zones and we think that all of his testimony is therefore irrelevant, immaterial and has nothing to do with pay picks.

GOVERNOR CAMPBELL: He has testified it is in the Wolfcamp?

MR. PRAY: He certainly has.

MR. PORTER: Your motion is overruled, Mr. Pray.

MR. HUNKER: We would like to note an exception.

MR. PORTER: Your exception will be noted.

MR. HINKLE: Our next witness is Forrest Garb and he is also with the Gruy Engineering Firm, and he will also deal with some new evidence in the pressure build up and the production history.

(Whereupon, Exhibits 8, 9, and 10 marked for identification.)

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F O R R E S T G A R B, a witness herein, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. HINKLE:

Q Your name is Forrest Garb?

A Yes, sir.

Q Have you previously been sworn?

A Yes, sir.

Q Where do you live, Mr. Garb?

A I live in Dallas, Texas.

MR. PORTER: Will you spell your name for us?

A Yes, sir, F-o-r-r-e-s-t G-a-r-b, Garb.

MR. PORTER: That's what I thought he said.

Q (By Mr. Hinkle) By whom are you employed, Mr. Garb?

A Union of California came to our -- Oh, you mean by whom am I employed?

A Yes.

A I work for H. J. Gruy and Associates, Incorporated, a Dallas consulting firm.

Q Are you one of the officers in that company?

A Yes, sir, I am Executive Vice-president.

Q Have you ever testified before the Oil Conservation Commission of New Mexico?

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A Not in the State of New Mexico, no, sir.

Q Are you a graduate engineer?

A Yes, I am.

Q What school, what degree?

A I graduated from Texas A and M University in 1951 with a B.S. in petroleum engineering, and I hold a professional Master's degree from Texas A and M University in 1963.

Q Have you practiced your profession since graduation?

A Yes, sir.

Q In what capacities have you served, with what company have you been associated?

A Upon graduation I spent two years in fuels and lubricant research for United States Air Force. Upon leaving the Service, I joined Socony-Mobil International and was assigned to their off-shore production in off-shore Louisiana and was eventually assigned to their Eastern Venezuelan operations. I spent some off and on eleven years in Venezuela with the Mobil. I joined Mr. Gruy in 1957 and was made an officer in the firm in 1960, and Executive Vice-president of the firm in 1961.



Q What has your work with your firm consisted of since 1957?

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A Since joining Mr. Gruy, I have principally been involved in reservoir engineering and in digital computer applications to petroleum engineering problems.

Q Have any of the properties which you have made a study of been in New Mexico?

A Yes, sir. I was in charge within our shop of the study that was prepared for the Pan American properties in New Mexico when they were sold. I was in charge of the study in our shop for all of Delhi-Taylor, New Mexico properties when they were sold, and I was in charge of the study in our shop during the study for Texas Pacific Oil Company's properties in this State.

Q Were you requested by the Union Oil Company to make a study to determine the gas initially in place in the Red Hills Pool, the Wolfcamp Pool?

A Yes, sir, we were so commissioned.

Q Did you make such a study?

A We have prepared, to the best of our ability, the study of your estimates.

Q Of what does that study consist?

A Basically, we have performed analyses of pressure production data available for this one well and have prepared on the basis of these analyses, a material balance for estimating the gas initially in place in this reservoir.

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Q As a result of your study, you have prepared a number of exhibits which are shown on the wall; eight, nine, and ten?

A Yes, sir. We have prepared these exhibits.

Q What method have you used in determining the amount of gas in place in the reservoir?

A We have assumed this to be a finite reservoir and have made an effort to analyze pressure transient tests to conclude what the average reservoir pressure in the reservoir after several production periods was, as indicated by these transient tests and then by relating these pressures to the withdrawal from the reservoir, have estimated the initial gas in place in the classic pressure divided by gas deviation factor versus cumulative production technique.

Q The method that you speak of, has it been generally accepted by the industry?

A Yes, it has. Of course, the pressure cumulative production technique is a very old accepted procedure. Build-up curve analyses have, since 1951, been more and more accepted till today they have reached general acceptance in our industry.



Q Would you explain to the Commission this pressure build-up method briefly and concisely?

A I'll try. With the Commission's permission, this

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subject of pressure transient testing, I think I can best describe it perhaps, through the use of an analogy. The data we use to make this calculation is obtained by placing a pressure recording instrument on a well, either at bottom hole or wellhead, much preferably at bottom hole, and recording the pressure profile at the wellbore during a period of production as the well is opened up, or by recording the pressure buildup in the wellbore during a shut-in period after a period of production. By analogy, changing the production in the well causes pressure transients to move outward, away from the wellbore into the reservoir, just as if when you throw a brick into the swimming pool, ripples would move away towards the boundaries of your swimming pool.

These ripples move through the formation at a speed that is determined by the permeability of the formation and the fluids contained therein, the viscosity and basic. If we know then the pressure profiles as we have observed them with these recording instruments, and we know the mathematical representation for fluid flow through a porous media, we can compute rock properties if we have a reasonable approximation for fluid properties.

Moving to a plot then, of the actual data, the normal and classic procedure is to plot for gas wells the square of the pressure observed versus the log of a time

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function and this time function is the time the well has been shut-in. These are all build up curves, there are no draw-downs here, so we'll talk about only build up and only gas.

Q Will you please refer to the Exhibits?

A Yes, sir. All of the Exhibits are plotted similarly. The time function is the time shut-in divided by a psuedo-time flowed plus the time shut-in. For this time function, then, to equal one, one would have to have the time shut-in value equal to infinite, thereby, if one takes a short period of build-up in a classic example, determines the slope and extrapolates it to a value of one on any of the Exhibits, he theoretically would be shutting in the reservoir, or seeing what the reservoir would result if it were shut-in an infinite period of time.

This is particularly useful in low permeability zones where it is not economic to shut-in a well, for instance, in the San Juan Basin, over a year in order for that well to stabilize. You can then, within reasonable lengths of time, derive some data with which you can do engineering calculations. From this type of plot, then, we would expect a profile and we hope we would be able to determine from that profile certain meanings; the mathematics of this fluid flow through a porous media indicates that a straight line would be achieved with the reservoir an ideal reservoir, that is, constant thickness,

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homogeneous, radial pattern, the ideal reservoir that everyone likes to work with and we never have.

Any deviation from this straight line portion has meaning, and if we are fortunate, we can determine what this meaning is. For instance, if I may, I would like to show you what some of the meanings might be. The theories and equations tell us that the straight line would be an ideal reservoir, and the longer that the time we observed in our testing, the further out would be our ripple in the swimming pool; so therefore, the further away from our wellbore our pressure transient is investigating, if you would like to say, and if an irregularity occurs and we see this on our curve, again through the equations we can solve how far out that ripple was, and conclude with some accuracy how far away from us that irregularity or discontinuity was.

Furthermore, experience and theories have shown us how to evaluate some of the profiles to determine just what that irregularity is. If I may, I'll show you some of the classic irregularities, and then we'll try to explain the specific ones that we have observed in this well. If we will recall, if it is straight line, we had an ideal; if it continues out to one, with no straight line with no bend-over as is observed from D to E on Exhibit 8, it would represent an infinite reservoir. If, in the early stages of the well



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there is a belly downward, this is referred to as a concave upward belly before a straight line portion as is observed from A to B on Exhibits 8, 9, and 10; one can conclude that that is the closest area to the wellbore and if it is lower than the straight line portion, having a steeper slope, this represents a poorer permeability in the vicinity of the wellbore, and is generally considered to be either damage in the vicinity of the wellbore due to completion practices, or is afterflow into the wellbore due to the fact that we are unable to close the well in most of the time at the bottom of the hole, but rather close it in at the top of the well, and the formation doesn't immediately close in, continues to bleed into the wellbore, until such time as the wellbore pressure is significantly the same as the sand face pressure at the bottom of the hole, discounting for gradient.

Therefore, one can conclude if he observes a belly downward before a straight line portion, there is damage and afterflow; if the well had exhibited a line above the straight line portion, it would have shown that the well had been acidized, or fractured, or enhanced.



Now, classicially, the equations show us that if the reservoir is bounded, and that we have depleted a portion of the energy in the reservoir instead of continuing on a straight line it gradually bends downward as is shown on B to

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E in Exhibit Number 8. This would represent a bounded reservoir, one which our ripples in the swimming pool had reached all areas, all four walls of our swimming pool, if you like. Furthermore, our theories tell us that if the ripples, we threw the brick closer to one edge of our swimming pool than the other, and the ripples hit the boundary and are reflected backwards, you've seen the ripples hit the pool and then they start going back out again, when they get to the wellbore they cause this curve to kink again. This time, the curve which reflects a transient reached on one side only, not completely surrounded will cause the curve to have an inflection upwards, if, as in the case of the swimming pool, the fault is a straight line having no curvatures, or if the boundary is a straight line in the instance of a permeability pinchout, rather than a fault, you would find that the mathematics tell us that slope should be exactly twice the slope of the curve prior to being affected by the boundary.

If we hit a second boundary, the slope again will double. Other things we can tell from this profile, if we hit an interface between two fluids, for instance, we are dealing in a gas reservoir, were we to observe on water contact or a gas-oil rim, or, in the case of oil, an oil-water contact, for that matter, against the transmissibility, the ability of this wave to go through the formation will be

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altered, and this alteration will reflect itself in the profile of this plot. The slope will change roughly in accordance with the change in viscosity of the fluids at the interface. Actually, it's the mobilities, the permeability over the viscosity, but it will be roughly in the order of, say, eight to ten times the slope change as a fault, or a boundary reflects two times the slope change.

All of this theory, gentlemen, that we have just talked over, is for a homogeneous, ideal reservoir; if we have a layered, stringered heterogeneous reservoir, as is the case, and as reflected by Mr. Ford's previous testimony, there are other considerations to take, and these considerations have been published.

There are several technical articles by Matthews, Brons, Hazebroek of Shell Development Company, by Lefkovitz, et al of Shell Development Company, by Miller, Dyes, Hutchinson of the Atlantic, by Dr. Norman Lamont, previously of the Atlantic and now with Texas Pacific Oil Company. The work that these gentlemen have published indicate that in a two-layered system, such as we have interpreted the zone, one would normally expect a profile to reflect the two-zone nature. Though I have previously mentioned that bottom-hole analyses are greatly preferred, in this instance the analysis or the transient test that we have with the longest



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duration was the test number three that is reflected in our Exhibit 8 performed 8-7-65 to 8-31-65, we have performed a calculation to transfer the wellhead pressures to the bottom-hole pressures and have plotted it, because we believe the profile that it presents describes the characteristics of the profiles that we would see were we to have bottom-hole tests of this duration. However, we have leaned more heavily on the bottom-hole calculations in forming our opinions, allowing the wellhead test to merely describe the family curve to define what we think these anomalies are. These technical articles that we have mentioned tell us that in a two-layered zone as we have evaluated the Wolfcamp in this well, one should expect either from zero to A as is reflected in Exhibit 8, the immediate vicinity of the wellbore, a period of A to B when both zones, both stringers are in unsteady state of flow. This means the rings going outward from the brick for both zones have reflected no boundaries. They are not seeing a bounded case, and you recall now, we have thrown a brick which simultaneously has gone into two swimming pools, and we have two sets of transients moving outward in what we interpret to be two separate zones, and they are going outward, possibly at different speeds because they have different permeabilities.

This is shown in our analysis both from Mr. Ford's

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previous mention and also in this pressure analysis. They support one another. We see the straight line portion from A to B, which represents this unsteady state from both zones. At point B, we detect a downward deflection which represents the point where the zone with the greatest transmissibility is feeling the boundaries. It gradually then flows less and less percentage of the total flow rate into the bottom of the hole, until such time as the tighter zone, or the zone with the lower transmissibility is generating the majority of the energy which is reflected at point C, and thereafter the pressure buildup is basically from C to D, basically attributable to the tighter zone, and it is masked for calculation purposes to a large degree by the fact that during the production, the better zone produced more of the gas, drew down further, had a lower average pressure.

When we shut the well in, now that the tighter zone is beginning to yield its energy, it not only fills back the wellbore, but it possibly begins to recharge the other zone which has been depleted to a larger extent. At point D, which was the termination of the test, we have made calculations that indicate the other zone probably would begin to feel the reflection of the boundary and it should yield a theoretical profile as we have presented from D to E on Exhibit 8.

I will support that in a moment. Using this

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information as our general family curve, we found almost an exact duplicate in literature. We have placed that duplicate that is entitled "Theoretical Buildup Pressure Curve for a Two-Layer Reservoir", and have marked it in a similar fashion. This Exhibit is taken from a paper by Lefkovitz, et al. "A Study of the Behavior of Bounded Reservoirs Composed of Stratified Layers" published in the transaction of AIME in 1961, Volume 222, Page 43.

Q The insert you referred to is in connection with Exhibit Number 8?

A Yes, sir. It is attached to Exhibit Number 8. These gentlemen are with the Shell Development Company. And the similarity between the curves we have presented and the ones in the literature are obvious. Based upon these calculations, or based upon these theories, we attempted with four separate transient tests made available to us, to evaluate the average pressure within this reservoir at the several dates of testing.

We have mentioned that we can see the anomalies but we also should mention that this procedure enables us to estimate an average pressure in the reservoir, and we attempted with two bottom hole pressure transient tests, and two wellhead transient tests to make average pressure determinations. The results of our calculations are in Exhibit 11.

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(Whereupon, Union's Exhibit 11 marked for identification.)

A Before undertaking to describe the results of our calculations, I would like to point out that Exhibits 9 and 10 are bottom-hole transient tests, Number 10 is the latest one, and because there has been the most information available to us due to chronologically it being the latest test, we have selected the test represented in Exhibit 10 for our sample calculations.

MR. PRAY: Excuse me, could I ask you to identify for me Exhibits 8 and 9? What tests are they?

A This is Test Number 3; this is Test 1, the first bottom-hole pressure test taken --

Q (By Mr. Hinkle) That's Exhibit 9?

A Exhibit 9 is Test 1. Test 2 was a wellhead pressure test of shorter duration, which we used only for average pressure determination. I do not have a large exhibit on Test 2. Test 3, due to its length of test, we felt would make a proper Exhibit Number 8, Test 3, Number 8, to describe the character of the curve, and the fourth and last test is presented as Exhibit 10.

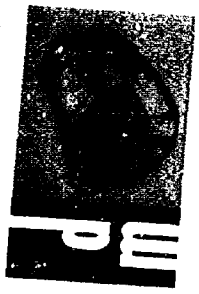
Q What was the date of the last test shown on Exhibit 10?

A It's shown on Exhibit 10 as being from 2-2-66 to 2-7-66. With these theories in mind then, we undertook

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to analyze each of the tests.

In order to obtain average pressures as are indicated from these tests, there are two techniques available to us, one is described in the technical papers aforementioned as the fall-off curve analogy, or the fall-off curve concept whereby through trial and error the engineer assumes an average pressure in the reservoir, solves a pressure function which is the difference between his estimate and the pressure observed during the test, plots this difference versus the time of the test and looks at the profile of the resulting plot. If he has estimated a pressure that is too low, the resulting plot will be concave downward. If he has plotted or assumed a curve, an average pressure too high, it will be concave upward and the theory is that if you are in semi-steady state, we can be alternating, selecting average pressures and plotting this for the test, we can conclude with reasonable accuracy a proximation of the average pressure of the system that yielded this pressure transient profile.



The second concept available to us for average pressure determinations was developed and published by Matthews, et. al., with the Shell Development Company again. It is, "Determining the Average Pressures in Bounded Reservoirs" is the title of the paper. But, this paper presupposes that we have a knowledge of the reservoir radius. We choose not to

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base our calculations on this technique, however, we did, after we had come to some conclusions on radius, we did present one example of this for checking and comparative purposes. It should be mentioned that in addition, there is one other check available from this before we go into the individual tests, some work done by the Magnolia Field Research Laboratory when it was still the Magnolia Field Research Laboratory, now Mobil, by Aronofsky and Jenkins, furthered by Miller, Dyes, Hutchinson with the Atlantic, and furthered still further by Dr. Lamont now with Texas Pacific, indicated that if a person knew that he had a profile from a well, that profile had to have been generated by a hydrocarbon volume of a fixed volume, and that every hydrocarbon volume, every reservoir volume would yield a signature profile. This, we could run out and take a test and come in and if we had an infinite number of these graphs to lay side by each and look one over the other, we could conclude the volume of that reservoir from its pressure transient test.

Again, this theory assumes an ideal reservoir but it does serve as a valid check. Furthermore, it was concluded that no one could have an infinite number of graphs in his desk to make this comparison. So, some mathematicians borrowed some theory from heat transfer, we suspect, and they lumped all of the unknowns of these systems

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into something called dimensionless variation; and through the use of this higher mathematics have worked all curves down into two curves, one which assumes an infinite reservoir and the second of which assumes a bounded reservoir. In nature, we find some reservoirs which are not defined by use of these curves but which fall somewhere between them with the curve serving as limits. We therefore can use these curves as check points to establish minimum and maximum performance estimates.

So, we have another check to fall back on, that if we will take this curve and through the dimensional concepts solve for it, it should again yield for us an estimate of the hydrocarbons associated with that profile.

Now, gentlemen, if I may refer to our Exhibit 11; Exhibit 11-A is merely a summary of what this handout contains. Exhibit 11-B contains basic data which one would have to have in order to check our calculations. These are not in general assumptions, they are data available in all of the files, and completion records on this well. Exhibit 11-C is a plot of the gas deviation factor for the hydrocarbons in this well. It is a reproduction of a graph presented in a Pure Oil Company report number 65-469 dated September 14th, 1965. The following 11-D is a summary of the calculations that follow and is for your consideration later. Transient Test Number 1, which is represented by Example Number 9, or Exhibit 9, was performed January 15th, 1965 through January 18, 1965. It

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was a 74.5 hour build-up test taken when the well had produced 193.4 million cubic feet of wet gas and because the extrapolation to infinite time indicated that little, if any, depletion had occurred in the reservoir, the pressure at the outer boundary of 11,376 pounds absolute was assumed in our further calculations as the pressure representing the reservoir pressure at that date.

Exhibit 11-F is the raw data for that test. Exhibit 11-G is a computer printout where that raw data has been processed to the variables we have had to plot. The computer program also directs an online, or a piece of equipment, a piece of hardware called a plotter which moves that data into a graphical form. Exhibit Number 11-H, is a copy of that form and is exactly equivalent to Exhibit 9 in the large form.

Gentlemen, this is not hand plotted, this is the data as it is solved for mechanically. Exhibit 9 is a blow up of that original. It is also not hand plotted because the portions for our analysis of the curve A, B, and B to a little portion of C, the slope of those two portions are necessary in our calculations, they were least square fitted by the computer and the resulting fit is given to you as Exhibit 11-I and 11-J.

The standard deviation of the fit is also presented for those interested in how well these data do fit a straight

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line.

Transient Test 2, which was a wellhead transient test and it is not represented by a large exhibit, is a 344 hour build up test. That's 14.3 days after the well had produced 1.0998 billion cubic feet of gas.

GOVERNOR CAMPBELL: What is that figure?

A 1.0998 billion, or 1099.8 million.

GOVERNOR CAMPBELL: When was that?

A This was April 17, 1965 through May 2nd, 1965.

GOVERNOR CAMPBELL: That's the total volume it had produced up to that time?

A In wet gas, yes, sir.

Exhibit 11-L is the raw data for that test. 11-M is again the computer printout converting it to the data plotted and 11-N is a sample of the fall-off trial and error calculation we made to determine the average pressure in the reservoir, and this average pressure at this date was calculated to have been 9,500 pounds.

A presentation of test number 2 is given in Exhibit Number 11-O, a plot of the fall-off curve is presented as Exhibit Number 11-P, since this was a wellhead curve and since our theories are best applied to bottom hole curves, the data was translated from wellhead to bottom hole through the computer using a technique published and accepted, it's

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published by Cullender and Smith, entitled, "Practical Solution of Gas Flow Equations for Wells and Pipelines with Large Temperature Gradients", transactions AIME Volume 207, 1956, page 283 through 286.

This technique presented to us Exhibit 11-R. I might mention, gentlemen, that the program resulted in a last bottom-hole pressure of 9291.6 pounds. This corresponds to 9287 pounds measured at that point with an actual bottom-hole gauge. In other words, the pressure transient was taken, the profile of pressures was taken with wellhead gauges but before the test was terminated, a bomb was put into the hole to record the terminal point.

This terminal point compares with our calculated point to that degree. I might mention that this pressure range, the bombs used for bottom-hole pressures and which are reported to have only one-half of one per cent accuracy would have approximately a 45 pound tolerance or degree of accuracy, so you see our conversion is well within the accuracy of the equipment we use for bottom hole pressures, anyway.

The third transient test was run August 7th, 1965 through August 31st, 1965. This was a 574.17 hour wellhead pressure test, 23.9 days. This was after 1.935 billion cubic feet had been produced from the well. Exhibits 11-T, -U, -V, -W, -X, -Y, -Z, -AA correspond to the exhibits previously given

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for the previous transient tests. The results of our analysis on test number 3 indicated an average pressure in the reservoir at this time of approximately 9,000 pounds, and this was used in our future determinations. Transient test 4 executed from February the 2nd, 1966 to February 7th, 1966 was 122.75 hour build up, 5.1 days after a cumulative production of 2.845 billion cubic feet of wet gas. Again, we have presented for your consideration Exhibits -CC through -JJ as being similar representations as previously described but for transient test 4.

The solution of this calculation yielded an average reservoir pressure of 7,770 pounds and an interesting side piece of information based on this test, was that we concluded that approximately 48 days would be required to fully stabilize this well to that pressure at this time.

Based on the average pressures then solved from the four pressure tests and the gas deviation curve which was presented as 11-C, a classic P over Z versus wet gas cumulative curve was prepared and is Exhibit 11-KK. To eliminate the human error in casting a line through these points, again, this curve was least squares fit with a computer, the equation is presented on the graph and this graph indicated that the gas initially in place within this reservoir was approximately 26.54 billion cubic feet.

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Exhibit 11-LL is based upon Transient Test Number 4 shown in Exhibit 10, and presents some of the individual calculations for total effective permeability. This resulted in a combined two-layer effective permeability of approximately 1.56 millidarcies, and an approximation of radius of investigation for a one-way transient, that is, how far out this ripple might have been, and it's only an approximation -- due to the fact that it is a layered system, we do not present it as any more than an approximation -- showed 1,634 feet.

We do, however, find an interesting check in this dimensionless build-up theory that we were talking about earlier, looking for what hydrocarbon volume would have yielded the pressure transient build-up that we're looking at in Test Number 4. The calculations as shown in Exhibit MM, that is, 11-MM, reflect that approximately 28.099 billion cubic feet remained in the reservoir as of that test, that summed with 2.845 billion cubic feet wet gas production to that date, reflect an initial in place volume of 30.944 billion based explicitly on transient testing at Test Number 4 with no weight given to any of the other tests.

MR. PORTER: 2.8 was cumulative to what date?

A To the date on Test 4 which was February 2nd, 1966.

GOVERNOR CAMPBELL: What you are saying is that at that date, one-tenth of all the gas in this reservoir had

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already been produced.

A We're saying that approximately one-tenth of the gas in the reservoir had been produced by that date.

GOVERNOR CAMPBELL: Out of one well?

A Yes, sir. This is supported to some degree by the fact, too, that an extrapolation of the transient tests to time would not reflect lower boundary pressures, the extrapolation goes to a lower pressure successively as the tests proceed which indicates that the pressure at the boundary, at least as far as the transient tests reflect, has been depleted or reduced.

Following this are some additional individual calculations showing gas initially in place per acre foot, using an initially indicated gas in place of 589.39 mcf per acre foot, and assuming the minimum volume of gas indicated that's the 26.54 billion, we computed from the least squares of all pressures, this would result in an estimated 45,030 acre feet of reservoir space based upon our interpretation of porosity and water saturation. If we assume a 25 foot average thickness as was presented by Mr. Ford in his testimony, this would result in a total area of 1801.2 acres. Again, if we were to assume an ideal radial pattern, this would yield a radius of 4998 feet.

Now, as mentioned before, there is a second way to

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check this using the Shell Development Company's average pressure concept and we undertook to do so assuming a radius then of drainage of 4998 feet. Based on this calculated theoretical radius and using the published techniques, we calculated a 7812 psia, or pounds per square inch absolute, average reservoir pressure. This corresponds to the 7770 determined through the fall-off technique. A straight line determination of gas initially in place then based on the decline in pressure over gas deviation factor between the initial pressure of 11376 and the calculated by Matthews technique of average pressure of 7812 yielded an indicated gas in place of 27.67 billion cubic feet.

Gentlemen, each of these three procedures are independent and though depending to some degree on interlacing data, are summarized in Item 7 on Exhibit 11-PP showing a range of from 26.5 to 30.9 billion cubic feet initially in place; acre feet in the vicinity of from 45,000 to 52,000 acre feet; an area of from 1800 to 2100 acres and a possible radial radius of from 5,100 to 5400 feet.



Q (By Mr. Hinkle) What was your figure on acres?

A Approximately 1800 to 2100.

Q Mr. Garb, on Exhibit 11-PP, part 7, which is the summary of gas in place, the area shown means number of acres, does it not?

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A Yes, sir.

Q What conclusion, if any, have you made from your study and calculations with respect to the drainage area of the Number 1 Red Hills Unit Well?

A Because the family curve represented by Exhibit 8 did not definitely show that we were in a bounded condition to that time, subsequent, or I should say sequential, transient testing did show the completion at the boundary. We concluded that we were in a bounded reservoir, that we were in fact with the one well lowering the average pressure in producing the entire reservoir, and that we therefore must conclude, based on the other calculations, that this well is draining in excess of 640 acres.

Q Is it your opinion, then, that this well would drain the complete pool or reservoir?

A This well, on the basis of our calculations, not considering any other factors, is indicated that it is draining the entire reservoir and given sufficient time, could drain the entire reservoir. I can not predict that it could do so economically.

Q Do you feel that your calculations are reasonable with all the information available and will actually work out in production history performance along these lines?

A Yes, I feel that this is a resonable interpretation of the data that we were able to gather.

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Q You feel that this is a conservative figure that you have shown in each instance, or a liberal?

A I feel that this is a conservative estimate for one basic reason. We have based most of our calculations on the 26.5 billion cubic feet, which is the minimum we calculated from any of the techniques; yet to derive that minimum we used the fall-off curve concept for estimating average pressures. This fall-off curve concept reflects the average pressure within the transient flushing that flow. If the production prior to that transient was -- Let me rephrase that to correct myself. If the transient from the test was not long enough to be in what is technically termed as semi-steady state, the resulting average reservoir pressure would be lower than actual, therefore, the successive points plotted on our P over Z versus cumulative production graph would have a steeper slope and would yield a lesser amount of gas in place.

However, that, we could support and we have presented it as a minimum and I believe the 26.5 to be a reasonable but possibly conservative estimate.

Q If the total volume goes up, or as it goes up, the areal extent would increase accordingly, would it not?

A Would you rephrase that?

Q If you calculate a larger volume in place under

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these calculations, the areal extent, area of drainage would go up?

A Yes, since we based our area of calculation upon the amount of gas in place. If the resulting gas in place were to improve with additional data, the area we have calculated would go up.

MR. HINKLE: We would like to offer in evidence Exhibits 8, 9, 10, and 11.

(Whereupon, Union's Exhibits 8, 9, 10, and 11 were offered in evidence.)

MR. HUNKER: If the Commission please, the tests which were run, the pressure build up tests were not properly authenticated by this witness, no proper foundation has been laid for the admission of these Exhibits and we ask the Commission not to accept 8, 9, and 10.

MR. PORTER: You object to Exhibits 8, 9, 10, and 11?

MR. HUNKER: 8, 9, 10, and 11.

GOVERNOR CAMPBELL: All except one, all except Number 1 up to now?

MR. HUNKER: May I explain the basis for my motion? This man has not testified that any of the work was done under his supervision or under his authority. I don't think that the tests have been properly authenticated.

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MR. HINKLE: If the Commission please, that objection only goes to the weight of the evidence, not the admissibility of it.

GOVERNOR CAMPBELL: You want to leave the record like it is on that point?

MR. HINKLE: I think so.

MR. PORTER: The objection overruled and the Exhibits will be admitted.

MR. HUNKER: Will you note our exception?

MR. PORTER: The exception will be noted.

(Whereupon, Union's Exhibits 8, 9, 10, and 11 admitted in evidence.)

MR. PORTER: We'll take a very short recess.

(Whereupon, the Hearing was recessed.)

(Whereupon, the Hearing was resumed.)

MR. PORTER: The Hearing will come to order, please. Does anyone have a question of this witness?

MR. PRAY: I would like to ask a few questions if I might.

MR. PORTER: MR. PRAY.

CROSS EXAMINATION

BY MR. PRAY:

Q I would like to ask the witness, Mr. Garb, directing

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your attention to Exhibit Number 8, point D. At point D and prior to that time, you have for some span a relatively straight curve, do you not?

A From C to D, E?

Q Not quite from C, but from there on up, yes.

A It mathematically has a slight concave upward.

Q It has the appearances of being fairly straight?

A My red line shows it this way, (indicating). I can only advise you that in checking it on other calculations it is slightly concave up.

Q Upon what basis did you decide to bend that curve over to point E?

A To E; from the fall-off curve concept of calculating with the average pressure in the bounded area.

Q Is this fall-off curve concept?

A Yes, which is the way we computed the average pressure within the bounded area.

Q Why didn't you take a straight line?

A From here on out?

Q Yes.

A This would give you a pressure which is P star, a pressure at the boundary but not the average pressure within the entire drainage radius. In order to compute what the difference would be if allowed geologic time to stabilize

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so those zones above that pressure could bleed the energy into the "S" zones below average pressure, then the resulting profile will be in actuality in this configuration and this is presented in the literature.

Q Isn't the purpose of this curve to compute static pressure?

A Static stabilized pressure.

Q Equilibrium pressure?

A Yes. That would be calculated by calculating the average pressure, not the pressure at the boundary.

Q Do I understand that you used this pressure from the literature to show this is the proper thing to do?

A No, sir, we used the fall-off curve calculation, which you have in the hand-out, in order to calculate what E would be.

Q This is a mere calculation, this is not measured?

A It is not measured.

Q It's an extrapolation based upon your opinion and judgment about the type of calculation to be used?

A No, sir. It is a trial and error calculation.

Q It's trial and error. That's sufficient.

A Whereby you calculate until you get to the straight line.

Q You state that you have the opinion that this

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is a two-layered system?

A Yes, sir, a two familied layered system, or more than one family.

Q I would like to request that you try to limit your explanation as much as possible because, as I understand, we are going to proceed until we complete this Hearing. I realize some explanation is necessary but let's do our best to limit it.

In a two-layered system, does this mean that perhaps you have two zones contributing to the build up and pressure?

A Yes, sir.

Q Could it also be due to fracturing in the formation?

A It can be resulting from fracturing and matrix, yes.

Q Let's suppose it is due to a two-layered system, and I believe you stated in your opinion that it was two-layered?

A This is collaborated by our log interpretation and other means, yes, that supports a two-layered system.

Q Is it possible that there are other separate layers in this reservoir which are not open to the bore hole?

A It is obviously possible, yes. The indications are that it fits the family of two.

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Q All right, and then would your curve show in the reservation, indicate the reservation in these unopened zones?

A Two that are not open to the wellbore?

Q That's right.

A No, sir, it would not.

Q It would not show that. Do your studies indicate the amount of gas which would be contained in any given acre foot of the reservoir?

A In a single acre foot we have calculated the gas in place.

Q Based on these curves?

A No, not based on these curves.

Q That's my question.

A Just based on the initial pressure and the fluid properties.

Q But these fluid properties are from other testimony of other witnesses, is that correct?

A Actually, no, sir. I presented to you a gas deviation factor curve in there which is one of the, which is the item that would be under consideration.

Q What do you use to compute the gas in place in any given acre foot?

A Porosity, permeability, water saturation, pressure, gas deviation factor.

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Q All right, these curves give you anything other than pressure?

A Just the pressure.

Q And in addition, you have worked up the gas deviation?

A Yes, I have, many times. I presented to you the other testimony that had not been previously given.

Q So that these curves really don't change or affect the amount of gas in place in any given acre foot of the reservoir, do they?

A No, sir, they do not.

Q Do your studies with all of your computers average --

A Pardon me, may I ask a question?

Q I would rather not, if you don't mind.

GOVERNOR CAMPBELL: If he's trying to clarify a question.

A I am not sure I understood you properly. I hope you meant an initial gas in place per acre foot?

Q (By Mr. Pray) Yes, that's right. Can you predict from your study the location of the boundary of this reservoir?

A No, sir. We did not see a bounded situation other than can be volumetrically calculated from the gas in place.

Q I would like to direct your attention to your

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pressure plot on Exhibit 9, I believe it is, is that the initial one?

A Yes, sir, this is the initial one.

Q What was your pressure from that?

A May I get my material, I'm sorry, I left it.

Q Sure.

A As I recall, it was 11376.

Q This was taken after there had been production from the well?

A A very small amount.

Q Do you recall what the pressure was from the drill stem test of the Wolfcamp Zone as the initial pressure?

A It was recorded at 11400.

Q Do you have that report?

A Yes, sir, I believe I have. Yes, sir, I have it.

Q May I see it? What is this report?

A These are some data that were mailed to us during the period of our study representing the drill stem tests and the completion tests taken during the completion of the well.

Q You have not seen the drill stem test data, personally?

A I personally have not.

Q I will ask you if you have seen this letter and the information that it is attached to?

A I believe I did see this, yes, sir.

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Q I ask you what it appears to be?

A This is a letter containing some field information that was prepared for presentation to you and your staff, containing some pressures and indicated flow rates as factors, static reservoir pressures, the times of stabilization, and on the basis of this data a graph was plotted to indicate something in excess of 39,000,000,000 cubic feet of gas in place.

MR. HINKLE: If the Commission please, this letter will be offered in evidence by the next witness.

MR. PRAY: I have a purpose in asking him this.

Q (By Mr. Pray) The date of the letter?

A The date is February 22, 1966.

Q Who is it from?

A Mr. Charles W. Browning.

Q District Engineer?

A District Engineer.

Q For Union Oil Company? It doesn't say. I will ask you what the drillstem pressure is reported on the data attached to this letter.

A DST, it's listed here as 11,306.

Q Is that less than the pressure which you compute at some later date after there has been production?

A Yes, sir, it is.

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Q You stated that you computed the areal coverage of the reservoir. How did you arrive at that areal amount, what factors did you use? I believe you said 1800 acres, is that correct?

A If one assumes the 26.5 billion in place, one would compute 1,798 acres.

Q What is necessary to compute that number of acres?

A This is based upon an average thickness of 25 feet, the porosity of 4.8 per cent, water saturation of 25 per cent, as was testified to by Mr. Ford.

GOVERNOR CAMPBELL: And permeability?

A Permeability is not in the calculation.

Q (By Mr. Pray) What would be the result if this 4.8 per cent porosity were in fact 10 per cent porosity as submitted by Pure Oil Company, our Exhibit Number 5 in the last Hearing. What would be the effect, actually of doubling the porosity?

A It would reduce the area.

Q By what extent?

A It would be a linear reduction; we can compute it for you.

Q Would it be one-half, approximately?

A Approximately.

Q So that you would have only 900 acres, is that

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correct, being drained by this well?

A Counselor, this is your calculation.

Q I'm asking you if this were the prosity which was used, would the resultant be approximately 900 acres?

A Approximately.

Q Would you have any idea where this 900 acres most likely would be?

A No, sir.

Q You assumed for the purposes of your study that it was substantially circular, did you not?

A Yes, sir.

Q So if it were reduced to 900 it would still be substantially circular, would it not?

A One could make this assumption.

Q Have you had an opportunity to view any structure maps of this area?

A No, sir.

Q You have not seen anything submitted by Union Oil Company?

A I have seen one structure map on a different horizon and only casually, and I saw that since my arrival here in Santa Fe.

Q Did you compute a permeability based on your pressure surveys?

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A We computed a combined permeability for a layered system, yes.

Q What did you arrive at?

A 1.56 millidarcies.

Q Were you present in the Hearing Room when the last witness, Mr. Ford, was on the stand?

A Yes, sir.

Q And you heard him testify that there was a five foot layer of reservoir open that he called pay open to the drill stem test made in the Wolfcamp?

A Yes, sir.

Q If you use this five feet of pay, and 1.56 millidarcies, what would you come up with as a resultant flow, using your initial pressure in the reservoir?

A I have not made this calculation.

Q How long would it take you?

A As long as it takes, I don't know.

Q Five minutes?

A It would take a few minutes.

Q Well, I would like to ask you to take that time and do it and I would then like to recall you.

A All right, sir.

GOVERNOR CAMPBELL: You are sure you understand what he's asking?

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A Yes, sir.

Q (By Mr. Pray) Did I understand you to say that from Exhibit 8, which is the August, 1965 pressure survey, that it didn't show a bounded reservoir?

A We can't be sure. We can't be sure because there is a layover at point D on the last point, but whether the last point or so is sufficient to make that determination or not is questionable.

Q And yet, did I understand you to say that subsequent tests show that it is bounded?

A We interpret it to be this, yes, sir, because extrapolation to the boundary pressure to the P stars show successive depreciation which is characteristic of the bounded reservoir.

Q What subsequent tests did you have after the August test?

A Each successive test has shown here -- In other words, tests subsequent to the first one; we had one test subsequent to the Test Number 3 that continues to show that same tendency.

Q It shows that it is bounded or is not?

A It shows that the pressure at the boundary is still continuing to deplete, or appears to be depleting, which continues the trend we have seen from Test 1 to 2, 2 to 3 and

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3 to 4.

Q Well, I apparently don't understand you. I thought you said that on Exhibit 8 it didn't show any tendencies of being bounded but that on subsequent tests it did show it to be bounded?

A I'll try to explain that. The configuration of Exhibit 8 alone is difficult to attribute to a bounded case unless one does so on the basis of the last pressure read. However, because from Test 1 to 2, and on successive tests, the pressures as indicated from each successive transient test showed a marked reduction in the boundary, in the calculated boundary pressure; we therefore concluded that it was a bounded reservoir.

Q Yet the subsequent test was approximately one-fourth the duration of the test shown on Exhibit 8?

A It doesn't matter.

Q It doesn't matter. The period of extrapolation doesn't enter into it, then?

A Yes, it does, of course, in the accuracy in which you can extrapolate, but the amounts in which these tests show difference would allow a great tolerance of error.

Q Would you say a test that had been shut-in 500 hours was more reliable than a test that had been shut-in 120?

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A Certainly.

Q Which point did you use in drawing the P over Z curve the longest shut-in or the last point.

A We least square fitted all of them. In turn, however, we calculated an answer from the first to just the last as well.

Q I would like to call your attention to your Exhibit KK, would you get it, please?

A Yes, sir. The first --

Q The first point that is shown as we move from the left margin at approximately 7,000, how many hours was that pressure test for?

A This would be pressure test number 1, that was a 74.5 hour test.

Q The second point?

A 344 hours.

Q The third point?

A Was 500 and -- it was 574 hours.

Q And the final point?

A 122.75 hours.

Q If you used the second and third points, which represents a shut-in time approximately three to four times as great as either of the other two, what would have been the result of your line? Would it have flattened the decline of

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your line?

A It would have, sir. It would have thrown away bottom hole pressure and used only wellhead converted pressures.

Q But you would have used pressures which were substantially longer, is that correct?

A Yes, sir.

Q Did you not testify that your bottom hole pressure and your surface pressure compared very favorably within a few pounds?

A We think that we have a reasonable conversion.

Q Well, then, why wouldn't you use these two points which are favorable in conversion and yet exhibit substantially greater shut-in periods?

A We have used them but in context with the other two bottom hole pressures as well.

Q You let the other two pressures substantially affect the slope of the curve?

A We let them slope off the bottom hole.

MR. PRAY: I have no further questions. I ask that you make the calculation which I have asked you.

MR. PORTER: Does anyone else have any further questions? The witness may be excused. He may be recalled to answer the question that was asked on circulation.

Will you call your next witness?

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BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico

REGULAR HEARING

IN THE MATTER OF:

Application of Union Oil Company of California to reopen Case No. 3158 Lea County, New Mexico.

Case No. 3158
(Continued)

BEFORE: Honorable Jack M. Campbell
Mr. A. L. "Pete" Porter
Mr. Guyton B. Hays

TRANSCRIPT OF HEARING

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MR. PORTER: You may proceed.

* * *

S L O A N J. B L A C K, a witness, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. HINKLE:

Q State your name, please?

A Sloan Black, S-l-o-a-n J. B-l-a-c-k.

Q Where do you reside and by whom are you employed?

A I reside at Midland, Texas, and am employed by the Union Oil Company of California.

Q In what capacity?

A Reservoir Engineer in the District Office.

Q Have you ever testified before the Oil Conservation Commission?

A No, sir.

Q Are you a graduate engineer?

A Yes, sir, I am. I graduated from the University of Oklahoma in 1958 with a Bachelor of Science Degree in Petroleum Engineering.

Q Have you practiced your profession since graduation?

A Yes, sir.

Q What positions have you held?

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A Upon graduation in 1958 I went to work for the Humble Oil and Refining Company in Houston, Texas and worked there one year at their Research Laboratory; was transferred a year later to South Texas and worked for the Humble Oil and Refining Company in the Stratton District Office in that area. In October, 1963 I began work for Pure Oil Company and worked for Pure as a Reservoir Engineer until their merger last year, and have worked for their successor since, Union Oil of California.

Q You have been employed continuously with Union?

A Yes.

Q What has your work consisted of with Union?

A Reservoir engineering.

Q Entirely?

A Well, not entirely. I have taken on projects of a mechanical nature or --

Q Has part of your time been devoted to the valuation of properties in New Mexico --

A Yes, sir.

Q -- as a Reservoir Engineer?

A Yes, sir.

Q Have you made a study of the Red Hills Unit Area --

A Yes, sir.

Q -- and of the Number 1 Well?

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A Yes, sir.

Q Have you made a study of the production, pressure production history of the well?

A Yes, sir.

Q Have you also made an economic study --

A I have.

Q -- based upon the production history and pressure?

A I have.

Q What figures have you used in making those studies?

A Well, I've used my own reserve determinations.

Q You did make reserve determinations, yourself?

A Yes, sir, I've also used reserve determinations as testified to by Gruy and Associates. I have developed economics for both reserves.

Q Have you prepared any exhibits which reflect these studies you have made and these calculations you have made, as far as economics are concerned?

A Yes, sir.

(Whereupon, Union's Exhibit Number 12 marked for identification.)

Q Refer, first, to Union's Exhibit Number 12 and explain to the Commission what this is and what it shows.

A Exhibit Number 12 is in two parts. The first part is a letter written by myself and directed to Mr. R. S. Cooke,

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the Division Engineer. It is -- was reviewed and signed by my supervisor, Mr. Charles W. Browning, District Engineer. It was written by myself to convey to Mr. Cooke my reserve determinations. And the second part of the exhibit is a plot of P/Z versus cumulative gas produced, and illustrates my reserve determinations.

Referring back to the letter part, I mentioned the data -- in the first paragraph of the letter I mentioned the data that is available and can be used in determining a reserve.

In the second paragraph of the letter I report my original gas in-place determination of 39.4 billion cubic feet. I also say that of this reservoir vapor, 1,717,000 barrels of condensate have an equivalent vapor volume of 1.6 billion.

In the third paragraph I say that an abandonment pressure of 1,000 pounds, 82.02 percent of the original reservoir vapor in-place will be produced as separator off gas, and that 48.29 percent of the condensate in-place will be produced as stock tank liquids.

The fourth paragraph deals with pay based on the reserve.

The fifth paragraph recalls reserve determinations on my part, and the final paragraph offers me as further assistance.

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The plot that is a part of this Exhibit Number 12, tabulates data used in this reserve determination and illustrates the reserve determined.

Q Is this the letter which the attorney for the opposition referred to in the preceding testimony?

A Yes, it is.

Q Can you explain the descrepancy which he referred to?

A He referred to a descrepancy between the reserve as determined by Gruy and Associates and the reserve that I have determined here. As I recall, he also brought up a pressure point different, but I don't remember the nature.

MR. HUNKER: Drill stem test pressure.

A The drill stem test pressure is -- is not plotted on this.

MR. HUNKER: But the drill stem pressure is?

THE WITNESS: Yes, sir, one of the bottoms in the hole recorded a lower pressure. Another one at another time recorded a pressure higher.

MR. HUNKER: Which one did you use? I think I probably should wait.

Q (By Mr. Hinkle) Mr. Black, referring to Union's Exhibit Number 12, what net number of feet from the pay

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section of the Wolfcamp did you use making these calculations, also your water saturation and porosity?

A Sire, in the calculations that I did here, I know the quality of the pay and relied entirely upon the pressure and reduction history. It's a volumetric balance.

(Whereupon, Union's Exhibit Number 13 marked for identification.)

Q Refer to Union's Exhibit 13 and explain what that is and what it shows?

A Union's Exhibit Number 13 is in two parts. The first part is headed, "Remaining Reserves and Economic Factors, Red Hills (Wolfcamp) Field, Lea County, New Mexico", and I have listed certain of the reserve parameters and certain of the economic parameters.

The second part is headed, "Estimated Cost for 14,200' Red Hills Wolfcamp Test, Lea County, New Mexico, Intangibles and Tangibles".

Referring back to the first part of Exhibit 13, I have entered an exhibit and testified to the fact that my reserve determination of 39.4 billion cubic foot of reserve vapor-in-place, that have this original gas-in-place, some 1,717,000 barrels of condensate would be produced. I've reduced those numbers to recoverable hydrocarbons and this is 1C on Exhibit 13, by use of a recombined fluid analysis that

Pure Oil Company's Research Laboratory performed as a service and reported back to the District Office. And these numbers are established in that fluid analysis that have the gas-in-place. 82.02 percent of the original gas-in-place will be produced as separator off gas and 48.29 percent of the original condensate-in-place will be produced as stock tank liquids. And I have also included on the first part of Exhibit 13, a sales gas estimate that I think, based on current production, will be the cumulative gas produced at 1-1-67, that's 4.9 billion. And the condensate produced as of 1-1-67 will be 618,400 barrels.

Part two in the tabulation is Economic Factors. "A" of the Economic Factors is the gas price that the company receives. This pirce was arrived at through a discussion between myself and our Division Gas Manager, who told me that at the current time we were receiving 16-1/2 cent per MCF based on the FPC area price for new gas. That in addition to the 16-1/2 cents we were receiving a BTU adjustment for gas with BTU content in excess of 1050 BTU per MCF at 0.01190 MCF, gas price of 17.60 cents per MCF. He informed me not to use any other gas price because he couldn't predict that we would, even under the terms of the contract, receive any escalation.

On condensate we have a base price of $2.79 a barrel. We have a trucking charge that is netted off of the base price

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of the condensate before a division of the production of .13 cents a barrel, leaving a net price for the division of interest of $2.66.

State and local taxes are tabulated on the first part of Exhibit 13 under C, IIC. Included is the severance tax, emergency school tax, conservation tax, and Ad Valorem tax. State and local taxes totaled 6.54675 percent of the gross value after royalties, insofar as the working interests are concerned.

I have also estimated from our accounting records, that the annual operating cost of a Red Hills Unit Well in dollars per well per year, is approximately $7,200.00 a month -- a year.

The second part of Exhibit 13 is itemized well cost estimate for a total amount of $539,900.00.

Q That's your completion in the Wolfcamp?

A That is for a completed well.

Q In the Wolfcamp formation only?

A Yes, sir. In addition to this amount I would estimate that the surface facilities, in order to place the well on production, would cost $30,000.00, for a total cost on a development well of $569,900.00.

(Whereupon, Union's Exhibit Number 14 marked for identification.)

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Q Mr. Black, refer to Union's Exhibit Number 14 and explain what it shows.

A Exhibit Number 14 is titled, "Red Hills Unit Development Economics for 14,200-Foot Wolfcamp Well, Union Oil Company of California Reserve Estimate, Red Hills (Wolfcamp) Field, Lea County, New Mexico". Tabulated beneath that heading is my reserve of gas-in-place of 39.4 billion cubic feet; a calculated number of surface or aerial acres of 2,200 acres; a porosity upon which this aerial extent was calculated of 6.5 percent; water saturation of 30.0 percent; thickness of 24 feet in net pay, which results in a unit reserve of 624.2 MCF per acre foot. These volumetric parameters tabulated at the top of this Exhibit 14 were given to me by our Division Geological Staff and have been used to make this set of economics.

Now, the tabulation beneath that is Assumed Spacing and I have assigned to 2,200 aerial acres the entire recoverable reserve of 32.3 billion, and have developed a set of economics and economic parameters on that reserve and its associated condensate.

The gross gas revenue is $5,713,900.00; the gross condensate revenue is $2,206,200.00 for a total gas and condensate revenue from a 2,200 acre Red Hills Well, of $7,920,100.00.

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I've based my economics assuming working interests, royalty, and overriding royalty. This is the royalty and overriding burdens for the 9 section drilling unit action. The amount of those royalties expressed in a percent, is 19.51098. The royalty burden that will be born by the working interest, is $1,545,300.00.

After royalty I've applied the State and local tax percent that we developed earlier in the State and local taxes. This will amount to $417,300.00. Then I've developed an operating cost based on an MCF take of 1,000,000 per day for each 8 billion reserves, which results in a producing life of 22 years, and this is the method that I have used to arrive at 22 years for an operating life, and the operating cost is $158,400.00. Total taxes and operating costs are $575,700.00, which leaves an operating income of $5,799,100.00. And for pay-out purposes I have developed a number here which is the annual operating income, $263,600.00. Investment was testified to before, in the amount of $569,900, which leaves a net profit before net income tax and before the working interest overhead, of $5,229,200.00. Pay-out is calculated to be 2.2 years. Profit to investment ratio is 9.2:1.0. And I have developed here two other economic yardsticks used to compare investment opportunities; one is the present value profit of 10 percent,

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and that number is $1,854,100.00; and a profitability index at 10 percent, which is defined as the net cash discounted at 10 percent divided by the investment also discounted at 10 percent, and that number, that ratio is 3.2:1.0.

Q You have made similar calculations for 1100 acres, 640 acres, 320 acres and 160 acres?

A Yes, sir.

Q Explain briefly, without referring to each one like you did in the first column, what it shows; the result.

A In terms of net profit, the result of developing an aerial extent as established by this volumetric determination would show a net loss per well of $295,100.00; 320-acre development would show a net profit of $138,200.00; and 640-acre spacing would show a net profit of $1,004,800.00. The pay-out of a 160-acre spaced well is nill. There is not a pay-out since there is a profit loss. For a 320-acre well the pay-out is 17.7 years, and for 640-acre spacing it's 8.0 years. All of the economic parameters that are developed here indicate a loss until one assumes 640-acre spacing, which is just a break-even proposition, so to speak.

Q This is considering the most favorable calculations which have been made?

A It assumes that the reservoir was completed, developed, the day the first well was completed, and that each

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surface acre participates equally in the initial reserve.

Q In other words, this is considering the initial gas-in-place in the reservoir?

A Yes, sir.

Q It is not taking into consideration the gas that has been produced to date?

A No, sir.

Q And you have used the greatest volume, 39.4 billion cubic feet, which is the most favorable calculation which has been made?

A That's the largest reserve calculation that anyone has come up with so far.

(Whereupon, Union's Exhibit Number 15 marked for identification.)

Q Refer to Union's Exhibit 15 and explain what that shows.

A Union's Exhibit 15 is similar in nature to Union's Exhibit 14 in that it is a set of economics developed for a 14,200-foot Wolfcamp Well, but using the reserve estimate as developed here earlier today by H. J. Gruy and Associates. The original gas-in-place as found by Mr. Gruy's people, was 26,540 billion. This indicated an aerial extent of 1,798 acres. They testified to a porosity of 4.8, and a water saturation of 25.0 percent. The thickness used in this

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volumetric determination was 25 feet, and it had a unit reserve of 590.42 unit reserve per acre. In using the same economic parameters, and in the same sense, yardsticks were developed to illustrate the profitability of development in the same fashion that I had on the previous Exhibit 14. In taking the net profit column, again, a 160-acre spacing shows a net loss of $371,100.00. There is no pay-out. 0.6 of the investment is never recovered.

320-acre spacing shows a net loss of $13,900.00. There is no pay-out indicated, and for all practical purposes the profit to investment ratio is 0.0:1.0; that you just recover your investment.

For 640-acre spacing $700,400.00 is indicated as a net profit. There is a 9.9 year pay-out and a profit to investment ratio of 1.2:1.0.

Again, one producing from denser to wider spacing, to 640 acres before profitable economics are developed.

Q I note that there's two corrections made in ink; one in Column 3 on the 640-acre spacing, and one under the 160-acre spacing. Were those corrections made by you?

A Yes, sir, they were.

Q They are correct as indicated?

A Yes, sir.

Q Do you have anything else that you would like to

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tell the Commission with respect to these exhibits?

A It's my opinion, and is what I have advised my management, that we cannot economically develop Union's area of Red Hills-Wolfcamp Unit on spacing denser than 640 acres.

Q That's your conclusion of all the information available?

A Yes, sir.

MR. HINKLE: We would like to offer in evidence Exhibits 12, 13, 14 and 15.

(Whereupon, Union's Exhibits 12, 13, 14 and 15 offered into evidence.)

MR. HUNKER: If the Commission please, we object to the admission of these exhibits. They are a rehash of what the Commission has heard previously. They're trying to bolster their case by the same kind of testimony that has previously been heard by the Commission. Nothing new has been offered and we object to their admission.

MR. PORTER: Objection overruled.

MR. HUNKER: Note our objection.

MR. PORTER: The exhibits will be admitted.

(Whereupon, Union's Exhibits 12, 13, 14 and 15 admitted into evidence.)

MR. HINKLE: That's all the direct examination.

MR. PORTER: Are there any questions of the

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witness?

CROSS-EXAMINATION

BY MR. PRAY:

Q I would like to direct the witness's attention to Exhibit 12, which is the letter you say you wrote and Charles W. Browning signed, attached to which is a curve of P/Z versus cumulative production. Do you have other data or do you have data upon which you based the drawing of this curve; for example the static pressures?

A The data upon which the curve is drawn is tabulated on that curve.

Q Directing your attention to the static pressures which you computed, have you had an opportunity to compare those with the static pressures made by Gruy?

A Yes, sir.

Q How do they compare; take them point by point, if we might.

A I'll have to ask Mr. Gruy, or I can get that Exhibit 11 and make the comparison.

Q All right. Start with January 15, 1965. What is the pressure which you show?

A Please refer to Exhibit 11, the 4th page, which is the tabulation of results of his analysis --

Q All right. I want you to testify for me as to --

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A -- and Mr. Gruy tabulates a pressure in the tabular column which is headed Calculated Stabilized Reservoir Pressure, and the January 5th through January 18th, '65 pressure is 11,376 pounds. Mine, as tabulated on the second part of Exhibit Number 12, is 11,306 pounds.

GOVERNOR CAMPBELL: You gave the figure for August 23, '64.

A Oh, it's 10,944 pounds, excuse me, sir.

Q (By Mr. Pray) That's correct. There's approximately some three, four hundred pounds difference. Next point, May 2, 1965?

A Gruy, 9,500 pounds; mine, 9,908 pounds.

Q For the February 2, 1966 pressure, what was Gruy?

A Gruy, 7,770 pounds. Mine is 8,392 pounds.

Q Approximately six, maybe seven hundred pounds difference. Can you explain this difference of some seven, eight, nine percent?

A Yes, sir. My analysis was accomplished in the daily routine of my job and I used two or three different methods of analyzing this data, one of which Mr. Gruy said he used.

Q Did you use good engineering practices?

A Yes, sir. It's perfectly satisfactory to the other engineers that have seen it, and to my management.

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Q You omitted, did you, the August 1965 pressure curve from your curve?

A I personally did, yes, sir. It's not that I didn't analize it, I didn't show the point on this curve.

Q On a later data sheet did you compute the static pressure for August 31, 1965?

A It was an earlier data sheet.

Q Have you computed the static pressures for August?

A Yes, sir.

Q What is this?

A I'd have to look and see, I don't recall.

Q Is this paper familiar to you at all?

A Yes, sir, it is. And the August 31, 1965 pressure as I had calculated, was 9,532 pounds.

Q Do you see a "Z" factor on that?

A Yes, sir.

Q Did you compute where the point would lie on this curve, which is Page 2 of the exhibit?

A Yes, sir. And that is approximately the same point that's on my worksheets, that I placed the point at.

Q Would it be above the curve?

A Yes, sir.

Q And if you use that point would it tend to flatten

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the curve and show greater reserves?

A I assume that it would. There is a mathematical possibility that it would decline the curve and show less reserves. I'd have to check it to know.

Q You say there's a mathematical possibility it could decline the curve more. What is this possibility?

A The curve being above the other three points, it would in fact increase it.

Q Increase the reserve?

A Yes.

Q Directing your attention now, to Exhibit 13. I believe you stated that the tabular information shown above there, was given to you by the Division Geological Staff, is that correct -- pardon me, Exhibit 14?

A Yes, sir, it was.

Q So you didn't compute the porosity?

A No, sir.

Q You didn't compute the water saturation?

A No, sir.

Q You didn't pick the pay thickness?

A No, sir.

Q Is there any figure on this exhibit which is yours?

A Yes, sir.

Q Would you state for the record what that figure is?

A The original gas-in-place as abbreviated, 39.4 billion.

Q To arrive at the number of acres in this reservoir you have to use somebody else's figure to use your figure, is that correct?

A Yes, sir.

Q Is the person who supplied this information present here?

A He's testified today..

Q Who is that?

A Mr. David Dunn.

Q He's the man who supplied you the information?

A Yes, sir.

Q You don't know where he got the information?

A He analized the log.

Q From his analysis?

A Yes, sir.

Q The 6.5 percent is Mr. Dunn's figure?

A Yes, sir.

Q On your well cost, exhibit -- did you prepare this exhibit?

A No, sir.

Q Who did prepare this exhibit?

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A The District Drilling Supervisor.

Q Is he present today?

A No, sir.

MR. PRAY: If the Commission please, I request that this estimated cost from Exhibit 13 be striken from the record for failure to properly authenticate it. I have no opportunity to cross-examine as to the basis of this cost, and that goes for the entire economic value he has made, and I ask that that be stricken.

MR. HINKLE: I would like to ask Mr. Black a question here.

REDIRECT EXAMINATION

BY MR. HINKLE:

Q Was this Exhibit Number 13 prepared under your direction or at your request?

A The first part was prepared -- Page 1 of Exhibit Number 13 was prepared by myself.

Q It was prepared by you. But it's only the second page that gives the detailed estimates of the cost of a well?

A The detailed estimates of the cost of the Red Hills Well was first made in the District Office, and early last week I carried the estimates to the Drilling Supervisor so he could check them out to see if they were still

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applicable, and he said they were.

Q You actually prepared, yourself, all the information shown on this exhibit except the breakdown of the different costs in connection with the drilling of wells in the Wolfcamp?

A Yes, sir.

MR. PRAY: If the Commission please, these costs are what make the total costs; and if you have the opportunity to determine what the second part is, we have the opportunity to determine what the total is, or whether it is good.

Q (By Mr. Hinkle) In your opinion, are the study of the drilling costs and the costs shown on the exhibit reasonable and --

MR. PRAY: He hasn't shown that he has any experience in this matter.

Q (By Mr. Hinkle) What experience have you had?

A I have estimated costs of wells prior to their being drilled for my company's planning.

Q For a good many years?

A Yes, sir.

Q Have you kept up with the drilling costs?

A Not as a normal every day function.

Q But you do in a general way?

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A I have.

Q And you know what the cost of drilling in this area is?

A Yes, sir.

Q In your opinion is the cost shown reasonable and normal for a Wolfcamp Well in this area?

A Yes, sir.

RECROSS-EXAMINATION

BY MR. PRAY:

Q I would like to ask you a question. Do you have independent knowledge of any of the details of this as to whether they are correct and accurate, of your own personal knowledge? For example, the contract rated $9.50 a foot. Do you have any knowledge of whether or not that is a proper figure?

A I know that's about the going rate in Southeast New Mexico.

Q For wells of this depth?

A Yes, sir.

Q How did you arrive at this information?

A Seeing other -- making these estimates and talking to contractors.

Q How about the mud cost of $50,000.00?

A That I couldn't testify to.

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MR. PRAY: If the Commission please, I renew my objection.

MR. PORTER: Here again the objection appears over the weight of the evidence, and the document admissibility will be accepted.

MR. HUNKER: Note our objection.

Q (By Mr. Pray) I would like to ask you that if in making your valuation you took into consideration the possibility of a dual completion of the Wolfcamp and Pennsylvanian Zone?

A No, sir.

Q Why not?

A Because I was advised by -- not to have -- to do that.

Q You were advised by whom?

A By counsel.

Q In your opinion, if you were making an economic appraisal of the particular property, and it was known that it had a zone comparable to the Pennsylvanian in this well, would you take that zone into consideration in making the economic study?

A Not necessarily.

Q As a matter of good engineering practice would you consider all potential economic productive zones in making

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your economic valuation?

A Yes, sir.

MR. PRAY: No further questions.

MR. PORTER: Anyone else have a question?

MR. HINKLE: I would like to ask Mr. Black one other question.

REDIRECT EXAMINATION

BY MR. HINKLE:

Q Referring to Exhibit 14, are the net feet of water saturation and porosity figure shown on that exhibit, those testified to by Mr. Dunn this morning?

A Yes, sir, they are.

MR. HINKLE: That's all.

MR. PORTER: Any further questions?

MR. HINKLE: If the Commission please, I would like just a moment.

MR. PRAY: I would like to ask a question in reference to the last answer. Mr. Dunn did not testify that he had computed 6.5 percent porosity. He stated that he had -- that he made an engineering study and that when he went to Gruy he told them that he had come up with 24 feet of pay and 6.5 percent porosity; he didn't testify this was the porosity and how he arrived at it.

MR. HINKLE: If the Commission please, we're going

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to put Mr. Dunn back on anyway, as the next witness, just for a few questions here, and if it's true that he did not testify as to the porosity he will now.

GOVERNOR CAMPBELL: In view of the fact that Mr. Dunn is going to testify, did you want to pursue your objection?

MR. PRAY: No, we'll wait.

MR. PORTER: If there are no further questions this witness may be excused. You may proceed.

* * *

D A V I D D U N N, a witness, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. HINKLE:

Q Your name is David Dunn?

A That's correct, sir.

Q You have previously testified in this case this morning?

A Yes, sir.

Q Refer to Union's Exhibit Number 14 and state whether or not you calculated the porosity which is shown on that exhibit, and gave it to Mr. Black?

A I did. I calculated the porosity given on that exhibit and I furnished it to Mr. Black and asked him to make

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the type of calculation he has made here. I calculated the porosity from the Schlumberger Gamma Ray Neutron Log based on the porosity measurement curve that Schlumberger furnished me, identified the pay from 13,468 feet to 13,474 feet, a total of 6 feet of pay; I identified as pay section the interval on the Schlumberger Log from 13,600 feet to 13,618 feet, 18 feet of pay, making a total of net pay of 24 feet.

Utilizing the determinations as I stated before, the Schlumberger gave me, and arrived at a net average porosity of 6-1/2 percent. The 30 percent water saturation is a water saturation that I assumed based on comparable porosity in this type of a reservoir.

Q Mr. Dunn, were your calculations of porosity made before the core was analized?

A They were.

Q Do you have any special rules to propose to the Commission to be adopted as special field rules for the Wolfcamp formation in this case?

A I do.

Q Refer to Union's Exhibit Number 16 and state briefly what these rules consist of?

A These rules are the same rules that were previously submitted in the hearing. Rule 1 is a statement

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that "Each well completed in the Red Hills-Wolfcamp Gas Pool or in the Wolfcamp formation within one mile of the Red Hills-Wolfcamp Gas Pool, and not nearer to or within the limits of another designated Wolfcamp pool, shall be spaced, drilled, operated, and produced in accordance with these Special Rules and Regulations.

Rule 2, each well completed in the Red Hills-Wolfcamp Gas Pool shall be located on a standard unit containing 640 acres, more or less, consisting of a single governmental section.

Rule 3, each well completed in the Red Hills-Wolfcamp Gas Pool shall be located no nearer than 1650 feet to the outer boundary of the section and no nearer than 330 feet to any governmental quarter-quarter section line.

Rule 4, any well presently"--

Q This is a new rule, is it not -- go ahead.

A Rule 4 is a new rule?

Q No, it's 5.

A "Any well presently drilling, being completed or now completed in the Red Hills-Wolfcamp Gas Pool is granted an exception to the well location requirements of Rule 3".

Rule 5 is a new rule. It is very similar to Rule 104-C-2A of the State Regulations. "Any well completed in the Red Hills-Wolfcamp Gas Pool and located in Section 5,

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Township 26 South, Range 33 East, New Mexico Prime Meridian, shall be located, as an exception to Rule 3, not closer than 660 feet to any outer boundary of said Section 5 nor closer than 330 feet to any quarter-quarter section or subdivision inner boundary nor closer than 1320 feet to the nearest well drilling to or capable of producing from the Red Hills-Wolfcamp Gas Pool".

Q Mr. Dunn, based upon your study of this area, well production, well history, is it your opinion that one well will effectively and efficiently drain more than 640 acres?

A Yes, sir, it is.

Q Do you feel that because of the economics involved that Correlative Rights will be better protected by 640-acre spacing than by the statewide spacing of 160 acres?

A I certainly do.

Q What is the purpose of submitting Rule 5 that you have referred to?

A Rule 5 has been submitted because the offset mineral owners in the Red Hills unit area have consistantly and frequently stated that they felt that the only way they could protect their Correlative Rights was to drill a well close to the Number 1 Red Hills unit well. The location that they have requested in Case 3401 and in 3402,

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Paragraph 2, will fit the requirements of Rule 5.

Union Oil Company has offered to join these people in pooling of acreage in Section 5 so that their Correlative Rights may be protected and to pay our way in the drilling of a well at a location of their choice, if it meets the approval of the Commission, the Commission of the State of New Mexico, the Commissioner of Public Lands and U.S.G.S., Geological Survey.

Q Has this offer been previously made to them?

A Yes, sir, in Dallas on April 28th, and was repeated to the Kermit Oil Company, which I made to them on May the 6th, 1966.

Q Is Union Oil Company still willing to so provide for the drilling of a well in Section 5 on the basis you talked to them?

A We are, we have complete management approval.

MR. PORTER: Your agreement is for only one well to be drilled in Section 5?

THE WITNESS: That is right, sir, based on the 640-acre spacing.

MR. HINKLE: That is all the direct examination at this time.

MR. PORTER: Are there any questions of the witness?

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CROSS-EXAMINATION

BY MR. PRAY:

Q First, I would like to discuss just for a moment, Mr. Dunn, your selection of the pay picks. I believe you picked the same intervals and the same zones with the exception of one foot that was picked by Gruy, is that correct?

A That is correct.

Q Did you pick those before you gave the information or contacted Gruy, or --

A Before I contacted Gruy.

Q You didn't pick any pay above this 13,468 feet, is that correct?

A No, sir, I did not. I questioned an interval or two as potential pay, and had to reject it.

Q What basis did you reject it?

A I rejected it principally on the cleanliness of the section as separated from the gamma ray log by discussions with Schlumberger that the zones I suspected were severely enlarged and could not be considered as an indication of porosity from the neutron curve, and by the same factors that Mr. Ford testified to that the well remained under constant and consistant control of 9-1/2 pound mud.

Q Do you have a complete drilling report with you?

A I have the core laboratory mud log report which is

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complete, sir.

Q But you don't have anything else indicating, other than the core log report?

A No.

Q No tabulation of cementing jobs, for example?

A No, sir.

Q Are you familiar with the Sub Surface Library in Midland, Texas?

A Vaguely.

Q Do you use their service?

A No, sir, not personally; the company may.

Q That's what I meant. I presume you're speaking for Union Oil Company?

A I'm speaking for Union Oil Company, however it's a large concern, sir, I do not know all the services that we subscribe to.

Q What is the Sub Surface Library?

A I don't know that I can define its function; I've simply heard of it.

Q May I ask you a question? During the drilling of this well, you will have to perforate the 10-3/4" casing at approximately 12,700 feet and squeeze cement?

A I would not dispute the fact, sir, if you have the record with you, but by my memory I could not testify to that.

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Q Would you have any information whether or not this work was done?

A I can check the time interval on this core laboratory report and see.

Q Would that show cementing?

A No, it would not show cementing, not normally.

Q Well, I think it's a very important point because my information is that the well is kicking up in this zone at about 13,300 feet, and it was squeezed.

A The mud log does show gas characteristics, and the well was never reported in danger or out of control prior to the depth on the Schlumberger of 13,471 feet.

Q Is it necessary that the well be out of control or the rig be in danger before there's substantial gas, and before you term in a blow out?

A No, sir, that is not true. As a matter of fact, you can have a blow out without having substantial gas.

Q Is it possible that you can determine if the well is kicking?

A Yes, you can determine that the well is kicking. This is, in fact, something that happens to practically every well drilled in the Delaware Basin as it goes through the Wolfcamp.

Q Are you familiar with the Rhinehart Oil Reports?

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A Yes, I am.

Q Do you personally use that from time to time?

A I read that from time to time.

Q If I told you that Rhinehart reports show that at 13,304 feet the well blew out an estimated 12 million cubic feet of gas per day, would you say that this is substantially the same information obtained in the Sub Surface Library Report; do you have any way to check that information?

A Not with me, it can be checked. I have read the report carefully and that is an unverified report, and our reports do not indicate a blow out above 13,471 feet. Neither does the drilling log that I have here show any break in continuity at that stage that would indicate such an occurrence.

Q What was occurring between the dates of June 5th, 1963 and June 12th, 1963?

A What are your dates, sir?

Q June 5th and June 12th.

A On June the 5th, 1963 at 12:01 A.M., according to this log, the well was drilling at a depth of 12,980 feet; on June the 6th, 1963 at 12:01 A.M., the well was drilling at a depth of 13,068 feet. What dates were you wanting included?

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Q Through the 12th.

A On the 7th the well was drilling at 12:01 A.M., at 13,120 feet; on the 8th at 12:01 A.M. it was drilling at 13,200 feet; on the 9th at 12:01 A.M., it was drilling at 13,246 feet.

Q What happened at that time, on your report?

A I see no particular comments, sir.

Q It doesn't say, "Heavy gas cut mud up on break"?

A It says back -- it says back at 13,220 to 26, "Heavy gas cut mud up on break after 2 hour down time". And the volume of this gas is measured here, sir, and it does not represent a stronger gas reading. That was encountered up higher in the drill stem test up in the Bone Springs. No shows were indicated in the samples. And the best judgment on the well of the people at that time, was not to test this zone.

Q You did drill stem test what interval?

A We drill stem tested an interval from 12,938 feet to 13,499 feet.

Q It included the entire interval?

A It included the entire interval and the test interval was necessitated by setting the packer up in the liner so that the test would not get into trouble. The zone being tested was the zone that had blown out.

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Q What was the rate on that test?

A I'll read the report as they have it here, I do not have the chart, DDT-4, "12,938 to 13,499".

Q Give the rate.

A All right. States that "The flowing heavy gas cut mud stabilized flow on 1-1/2" choke at 1700 pounds at 12 million cubic feet of gas per day; no measurement of fluid; some distillate or condensate present".

Q That will be satisfactory, Mr. Dunn. How many feet of pay did you pick on this drill stem tested interval?

A On this interval I picked 6 feet.

Q Mr. Dunn, were you present at Midland, Texas on the occasion of April 7, 1965 at a certain meeting in which I was present and you were present, and Union Oil Company was represented by attorney Jack Snodgrass.

A Yes, sir. I don't recall the exact date but I was.

Q We did have a meeting in Midland, did we not?

A That's right.

Q Do you recall Mr. Snodgrass's opening remarks on the deposition?

A No, sir, I do not.

Q I would like to read very briefly a page from the deposition which was certified, and I would be happy to

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introduce it.

MR. PORTER: What is that?

MR. PRAY: This is a deposition made in a separate matter concerning drainage. It has to do with this case. This comment is directed to the Commission hearing which is going to be made.

MR. HINKLE: This deposition was not taken for this case, was it?

Q (By Mr. Pray) "And as a technical matter, I don't think it would be appropriate to use this deposition as a vehicle for exploring that, but the statement I want to make is that this spacing hearing which is coming up is not going to be handled like the last one, in that there is going to be a very free and open exchange of information on our part with you prior to that hearing. And before we get into the hearing, and well in advance of it so that you will have time enough to analize it, we are going to lay before you -- I say we are, the lawyers that are handling it are going to lay before you the information and you are going to be fully advised, and you are not going to be confronted with any problem of subpoenas and that sort of thing. And we are going to try to handle it on the basis of full disclosure, and the reason I'm making this statement is so you wouldn't feel like you had to use this deposition

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as a means of trying to get information that you could use in your other lawsuit. That's not necessary, you're going to have it anyway". Do you recall that statement, Mr. Dunn?

A It sounds familiar.

Q Were you present when Mr. Snodgrass made that statement?

A I was.

Q I'll ask you to view this letter?

A Yes, sir.

Q Is that your letter of May 6th, addressed to me?

A That is correct.

Q Is this report of Charles Browning, whom we now find to have been prepared by the other engineer, Mr. Black?

A Mr. Black's initials are here in the corner.

Q Is that the report that accompanied this?

A That is correct.

GOVERNOR CAMPBELL: "That and this" are what?

MR. PRAY: I'm sorry.

Q (By Mr. Pray) Is this the report of Mr. Black; did that accompany your letter of May 6th?

A No, the report of Mr. Black's was sent to you through your attorney, Mr. Hunker. You had it available at the meeting in Dallas.

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Q And it was supplemented by this letter to show the pressure point?

A That's right.

Q But the pressures you submitted to us are the ones prepared by Black?

A That is correct.

Q Did you at any time ever submit any information to us from your study by Gruy?

A No, sir, I did not.

Q Did you ever submit any information to us concerning, or did you ever mention the core analysis?

A I did not.

Q Do you consider that this is full disclosure?

A No, sir, I do not consider that it's full disclosure.

MR. HINKLE: If the Commission please, I don't think we're required to turn over our complete case to the other side before we have a hearing here. Now, I think Mr. Dunn has complied with all their requests and furnished them with all the information they have called for.

After this conference took place the engineers were hired, the core analyses were made, and all of the engineering report was gotten up. I don't think there's any obligation on our part to turn that information over to them before we have a hearing here today.

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GOVERNOR CAMPBELL: Mr. Hinkle and Mr. Pray, I think it's been obvious that the Commission has felt that this was one of those matters which should be resolved between the parties involved, and was hopeful that it could be, and I'm hopeful it can be because I believe that's the way it should be handled. I think that's the reason the subject came up, Mr. Hinkle, because it was discussed to some extent in the prior hearings, and obviously which it apparently is a matter of litigation, why, that's another thing. You're not required to disclose, of course, at least at our proceedings; we had hoped you would.

MR. HINKLE: We would like to offer in evidence Exhibit 16, which is the special field rules proposed.

(Whereupon, Union's Exhibit 16 marked for identification.)

(Whereupon, Union's Exhibit 16 offered into evidence.)

MR. PORTER: Are there any objections to the admission of Exhibit 16? It will be admitted.

(Whereupon, Union's Exhibit 16 admitted into evidence.)

GOVERNOR CAMPBELL: May I ask the counsel to approach the bench here a minute? Do you have any further questions of this witness, Mr. Pray?

MR. PRAY: No, sir.

MR. PORTER: The witness may be excused.

GOVERNOR CAMPBELL: Off the record.

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(Whereupon, a discussion was held off the record.)

MR. PORTER: Call your next witness, Mr. Hinkle.

MR. HINKLE: That completes our case.

MR. PORTER: Mr. Pray, do you desire to put on testimony at this time?

MR. PRAY: Yes, we do.

MR. PORTER: Call your witnesses, please.

MR. PRAY: Mr. Bill Stapler, will you take the stand, please? Our witnesses haven't been sworn, Mr. Stapler, Mr. Keplinger and Mr. Schuman.

(Witnesses sworn.)

* * * *

B I L L S T A P L E R, a witness, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. PRAY:

Q Mr. Stapler, would you state your full name for the Commission, and your position?

A Bill Stapler, Vice President and General Manager of Kermit Oil Company.

Q What do your duties as Vice President and General Manager of Kermit entail?

A Oh, management and decisions in running the company, as to securing leases, drilling wells,

Q What has been your experience in the oil business, Mr. Stapler?

A I have been in the oil business all my life from the time I roughnecked and roustabouted. I spent 6 years with Skelly Oil Company; 6 years with Sharp Drilling Company; 2 years in Midland; then to North Dakota; and two years figuring bids and working on wells and well bids. And for the past two and a half years I have been at Kermit Oil.

Q Mr. Stapler, have you examined all the data which, prior to this hearing, was submitted by Pure Oil Company and then Union Oil Company?

A Yes, sir, I have examined the entire case file.

Q Have you examined all of the logs and all of the testimony?

A Yes, sir.

Q Have you reached any conclusions concerning the advisability of the development on the present spacing?

A We have a contract with the mineral owners of this tract to drill a Wolfcamp Pennsylvanian test under the present spacing.

Q Do you feel this will be an economic venture?

A Yes, sir.

Q Do you believe a reasonably prudent operator would

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drill a well on that spacing?

A I believe they would.

Q Have you computed what the well costs would be for drilling a single Wolfcamp completion?

A Yes, sir, I have. I may have left that information down here. I now have that information.

Q All right. And what is the cost of drilling a well in the Wolfcamp formation as a single completion?

A We feel a single completion in the Wolfcamp formation can be accomplished for $393,782.00.

Q Do you have experience in drilling producing wells of comparable depth?

A Yes, sir. We have drilled wells to 14,000 feet. This well would be deeper but we feel the experience gained to this depth would benefit us and we can make the few extra feet of hole we're talking about.

Q Do you have a contractor for this well?

A Yes, sir.

Q Who is it?

A Sharp Gullington.

Q Has Sharp had experience in drilling wells similar to this?

A Yes, sir. They operate some 20 rigs in West Texas-New Mexico area and have drilled several holes to 20,000 feet.

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Q Did they in fact drill the Red Hills Number 1?

A In fact they drilled the Red Hills Number 1.

Q Have you computed what a dual completion in the Wolfcamp and Pennsylvanian would cost?

A It is our opinion that a dual completion of the Wolfcamp and Pennsylvanian would cost $689,980.00.

Q Is your company ready to commence drilling?

A We are prepared to commence this test when we have an appropriate order from the Commission.

MR. PRAY: No further questions.

MR. PORTER: Do you have any questions of the witness, anyone?

CROSS-EXAMINATION

BY MR. CHRISTY:

Q The contract you're speaking of, is this a contract of February 1966 between Mr. Schuman, et al., and Kermit Oil?

A That's correct.

Q You have to date been furnished Exhibits 13, 14 and 15, have you not?

A Yes, sir.

Q And examination of those exhibits would indicate that a well on a 160 acres would not be profitable. If you had not made the contract of February '66 would you make it

today?

A Yes, sir.

Q You would make it today even in view of Exhibits 13, 14 and 15?

A Yes, sir.

Q You say your Wolfcamp cost $393,782.00 and Mr. Sharp is going to drill that for you?

A Yes, sir.

Q Is he getting an override or any other figure besides the $393,000?

A No, sir.

Q He doesn't get an override?

A No, sir.

Q That's the total cost for drilling the well?

A In our opinion, yes, sir.

Q What type of basis, is that a cost plus?

A Footage and day-work.

Q And that is his estimate. Now, what is your surface equipment going to cost?

A We feel that pipe and fittings for a Wolfcamp completion, $3,000; tank & stairs, $4500; separators & treators, $12,000.00; well head, $13,000.00.

Q Total up?

A I don't have a total of those, I'm sorry.

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Q Would you total them for me, please?

A $32,500.00.

Q Which, of course, should be added to the $393,000 you spoke of a minute ago?

A No, sir.

Q That includes it?

A Yes, sir.

Q I assume, then, sir, that you feel the estimated costs shown on Exhibit 13 are unreasonable costs. And I will refer you to Exhibit 13, because they show 539,000 and you show 393,000.

A I don't say they're unreasonable, there could be two basis for figuring. In my opinion $393,000.00 is the cost.

Q But in your further opinion, the Exhibit 13 well costs of 539 are not unreasonable?

A Yes, sir, I believe they are unreasonable.

Q In what respect, sir?

A I think they're a hundred and thirty-nine thousand dollars high.

Q And would you show me where the hundred and thirty-nine thousand is that's unreasonable; what items are unreasonable?

A We have a less expensive casing program.

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Q You have a less expensive casing program. Now, in what items are you less expensive; is it the 13-3/8" casing?

A It's the 9-5/8" casing.

Q Do you plan for the full 6,000 feet of it?

A No, sir.

Q Why don't you plan for 6,000 feet of it?

A In our studies we feel that we can set this string of casing at 5200 feet and that -- that's it at this time, sir. I don't have my complete casing program here and I can't compare it foot by foot, but the total difference is some $50,000.00.

Q You can't tell me where it's unreasonable?

A There are --

Q I believe that will be sufficient on that question. Let me ask you another question. In this drilling cost that you spoke of, is there any profit involved, or do you know?

A I feel there is profit.

Q You feel there is profit involved because Mr. Sharp is drilling this --

A Yes, sir.

Q -- and Kermit Oil Company is having it drilled?

A Yes, sir.

Q And does Mr. Sharp, in fact, own Kermit Oil Company?

A Yes, sir.

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MR. CHRISTY: That's all.

MR. PORTER: Any further questions of the witness?

MR. PRAY: Nothing further.

MR. PORTER: The witness may be excused. Call your next witness.

MR. PRAY: Call Jerald Schuman.

* * * *

J E R A L D S C H U M A N, a witness, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. PRAY:

Q State your full name, please?

A Jerald N. Schuman.

Q What is your occupation?

A Attorney.

Q Do you own any interest at all in Section 5, which is Township 26 South, Range 33 East?

A Yes, sir, I do.

Q And has that ownership previously been entered in the record of Case 3158?

A Yes, sir.

Q Mr. Schuman, did the Pure Oil Company, and subsequently Union Oil Company by merger, own a lease covering your mineral interest?

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A They did.

Q And have they released that lease?

A They have.

Q What was the date of that lease being released?

A I believe the date that they released it was September 1st, 1965.

Q Did they at that time or at any other time tell you why they released your lease?

A They did.

Q What was the reason given?

A There was a meeting with Mr. E. B. White, I think it was some time in July of Nineteen Hundred and Sixty-Five, the 20th or 21th, with a Mr. Sabin, along with Mr. George Bowen, an attorney in Tulsa, and at that meeting Mr. White told me that additional, or however he phrased it, that they could not justify, economically, to drill a well on Section 5.

Q Have they at any other time indicated to you that they did not believe a well in Section 5 was justified on an economic standpoint?

A They have.

Q What occasion was this?

A In about January, on the 13th or 14th, a deposition was taken by Union Oil Company, it was my deposition in my

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office, where attending that was the attorney, Mr. Jack Snodgrass, representing Union Oil Company, and Mr. Robert Humphrey who, I believe is present in this hearing.

Q Did they at that time tell you that they didn't believe that a well on Section 5 was justified?

A They told me that they didn't want any part of it and that they would be very happy to see a well drilled in Section 5 because they've got a lot of other acreage around, but they didn't want to have anything to do with it.

Q When did you conclude your agreement with Kermit for the development of Section 5?

A I believe it was either February 18th or 19th, Nineteen Hundred and Sixty-Six.

Q And approximately how long after this did Union file the present application?

A From the testimony here in the hearing, the date that I had, I thought it was some time around March 23, Nineteen Hundred and Sixty-Six, or March the 25th, one of the two, approximately, oh, a little over a month later.



Q What would be the effect of this spacing order on Union's ownership in a well drilled on 640-acre spacing?

A Their ownership then would be increased tremendously.

Q Over what it is under the present spacing?

A Over what it is under the present spacing, that's correct.

Q Yet they told you they didn't want any part of Section 5?

A That is correct.

MR. PRAY: No further questions.

MR. PORTER: Any questions of the witness?

CROSS-EXAMINATION

BY MR. CHRISTY:

Q I believe you stated that Mr. Snodgrass in Midland, and I don't believe I got the date, stated to you that Union was not interested in drilling a well in Section 5?

A I didn't say in Midland.

Q Where was it?

A In Tulsa in my office, I think I said.

Q And when was that, approximately?

A January 13th.

Q Year?

A 1966.

Q And at that time the area spacing was 160 acres, it is in fact today?

A That is correct.

Q Did Mr. Snodgrass say anything to you about the aerial extent or was he speaking in fact, Mr. Schuman, of a

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160-acre well in Section 5 and that's what he meant, rather than a 640-acre well in Section 5?

A He said they just didn't want the lease.

Q He didn't want the lease?

A Referring to Union.

Q But he didn't say that he would not drill a well on 640 acres in Section 5, did he?

A He did not.

Q As a matter of fact, on February 28, 1966 in a meeting in Dallas, Union agreed to drill a 640-acre well in Section 5, that is correct, is it not, a Wolfcamp well?

A That is correct.

Q You say that Union's interest in Section 5 increases by virtue of the 640-acre spacing, did I understand you correctly, is that your statement, sir?

A Yes.

Q How does Union's acreage increase in Section by virtue of 640-acre spacing, how do we get more acreage, I don't understand?

A You don't understand?

Q No, sir.

Q If I understand, myself, Mr. Christy, under the existing statewide rules, which is 160 acres for standard location, if we should drill a well in the, say, Northeast

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Quarter of Section 5, the undivided mineral owners, other than a fractional interest of approximately a 1/16 owned by some other parties, which is leased to Union Oil Company, approximately 120 acres of that 160 acres is owned by myself and the other undivided mineral owners, and that Union Oil Company or their -- whoever is involved with them own approximately 40 acres.

Q All right, sir. We didn't loose or gain right there, did we, acreage?

A We're just staying with a hundred and sixty, and that's exactly what our interest would be. We would have approximately 3/4 interest in that particular well.

Q And Union would have 1/4?

A That is correct. If a 640-acre spacing were granted, we own, based upon the same type of a mineral interest, undivided, which is not owned by Union, we have approximately 280 acres out of 640 acres, thereby reducing our proportionate interest.

Q And Union would have the balance of the acreage in Section 5?

A That is correct.

Q And if you drilled another well that would be 50-50?

A I don't understand.

Q If you drilled it in the Northwest it would be a

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50-50 well, would it not?

A In the Northwest Quarter of the Northwest Quarter?

Q Northwest Quarter as a proration unit, 160 acres?

A You would own half and Union would own half.

Q I'm talking about a 160-acre well spacing in the Northwest Quarter of Section 5. You own the North half Northwest, Union owning the South half?

A If it were drilled in the Northwest Quarter, that's correct.

Q And in the Southwest Quarter Union would own it all, and in the Southeast it would be 50-50 again?

A That's correct.

Q How does Union's acreage increase in Section 5 by virtue of the 640-acre spacing; it all comes out the same, doesn't it?

A I don't see how you can determine that.

MR. CHRISTY: No more questions.

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



REDIRECT EXAMINATION

BY MR. PRAY:

Q Mr. Schuman, if a well were drilled on the present spacing and there was production from that well, let's assume as Mr. Christy was saying, it's in the Northeast Quarter on

160 acres, how would the production be allocated?

A 3/4 on me and 1/4 on Union.

Q 160 spacing, it would be allocated entirely different?

A That is correct.

Q 280 acres or 640, I believe the ownership of Union would be about 9/16, isn't that correct?

A That ratio.

Q So a larger share they would get from any well that was drilled?

A That is correct.

MR. PRAY: No further questions.

MR. PORTER: Any further questions? The witness may be excused.

MR. PRAY: I would like to take a few minutes recess.

MR. PORTER: We will take a short recess.

(Whereupon, a recess was taken.)

* * * *

H E N R Y K E P L I N G E R, a witness, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. PRAY:

Q Would you state your name, please, sir?

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A Henry Keplinger.

Q What is your occupation, Mr. Keplinger?

A Petroleum engineer.

Q What is your experience?

A I have worked in the oil fields, started out in 1929 with Shell Oil Company.

MR. CHRISTY: We would be happy to stipulate that Mr. Keplinger is a petroleum engineer.

MR. PRAY: We would prefer to have his qualifications in the record, thank you very much.

Q (By Mr. Pray) Would you continue, Mr. Keplinger?

A I graduated from the University of Tulsa in 1931; took a Masters Degree in Physics from George Washington University, 1933; started with Shell in 1933. Personally, before that I worked in the summer for Shell and others in oil fields, and worked for Shell for approximately 11 years as a petroleum engineer, appraisal of oil and gas properties, well spacing problems in the States of Kansas, Oklahoma, Illinois and Texas. In 1944 I formed a company with my partner, Mr. Wanenmacher, and since that time we've engaged in the practice of petroleum engineering, estimating oil and gas reserves, completion problems. We have a firm of petroleum engineers who have worked in every state in the Union, and most of the foreign countries. We have a staff

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of operating people who drill wells, produce wells. At the present time we operate 800 wells and have many gas wells under our supervision.

Q Mr. Keplinger, have you had an opportunity to view all of the exhibits presented at the prior hearings by Pure Oil Company?

A Yes, sir, I have looked at the exhibits.

Q Have you had an opportunity to review all of the testimony?

A I've tried to review most of the testimony that was available.

Q Have you had an opportunity to view all of the information which up until today had been submitted by Union Oil Company concerning the pressure surveys?

A I have.

Q And you have heard the testimony at this hearing?

A I have.

Q Mr. Keplinger, are you of the opinion that Union Oil Company has presented new evidence which would entitle them to a change in the spacing?

A New evidence today or since the hearing?

Q Today.

A No, I don't think that the information that has been presented today would entitle them to a new hearing on well

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spacing.

Q Let's direct our attention to the core analysis. Do you believe that this core analysis furnishes any new information upon which to change the data which was presented at the last hearing?

A No, and specifically, in reference to this core analysis, we had a complete description which was furnished at the formal hearing. It was a shale section containing limestone streaks, and although there is a little discrepancy in where the core was at that time compared to what the testimony was today, it doesn't constitute new data from this core analysis. And in addition, the information from the core, as to porosity, isn't used because none of the pay picks that were presented today, the new pay picks were in the section which was cored.

Now, formerly there was a portion of the core which was indicated to be in the pay section, there was some two or three feet of pay picked maybe at the top part, maybe at the top part of this core, so it doesn't, in my opinion, constitute additional information by having this core run.

Q In your opinion, would good engineering practice entitle them to change on the basis of this core analysis, the porosities and the pay picks which they presented today, to change the testimony from the prior hearing?

A No, sir, and my experience at picking pays, the pay picks have to come from the gamma ray neutron log which is run many months ago, and the analysis of the core couldn't be used as a calibration as we speak of calibration in the neutron log in the oil industry or oil industries, because the pays they picked, none of it, the section which they analized, none of it was considered pay by these new picks or within these new picks.

Q In your opinion, are there additional pay zones which they did not pick today?

A Yes, sir. Mr. Cavler, in a previous hearing, picked additional pay which they have failed to pick today.

Q What is your opinion of what the pay pick should be in the Wolfcamp, based on all the information that we have?

A Well, I feel that the pay picks by Mr. Cavler are justified.

Q Do you recall what those pay picks, total pay, was in the Wolfcamp?

A Total pay was about 80 feet.

Q Is there a substantial amount of pay above this first zone which was picked today at 13,468?

A Yes, sir, there is.

Q Upon what do you base this opinion?

A Based upon the characteristics of the neutron log

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and the blow out and the drill stem tests.

Q Do you use this drill stem test in arriving at your conclusion, did you?

A As part of the fact that this well, it has this small pay section, supposedly made 12 million cubic feet. And also, before the drill stem tests was made, number four test, there was this kick in the mud, indicating gas.

Q What was the porosity which was presented by the Pure Oil Company at the time of the last hearing?

A The porosity on Exhibit Number 5, average porosity was 10 percent; pay pick was 28 feet.

Q Do you see any reasonable basis, using good engineering practice, why they should be reduced to some 4.89 percent and 24 feet?

A No, sir, I do not.

Q Have you had an opportunity to study the pressure charts, the pressure data which has been submitted to us prior to the date of this hearing?

A Yes, sir, in great detail.

Q Have you presented or prepared your own pressure build up curves based on this data?

A Yes, sir.

Q Now, does it compare with the curves by Gruy?

A Mr. Gruy's curves -- they're really not Mr. Gruy's,

they're presented by Gruy Engineering, but those curves are in general, higher. The pressures are higher at the beginning and lower at the end.

Q And what is the result of this?

A The result of this is to decrease, as pointed out, the probable gas-in-place in the Wolfcamp Reservoir.

Q Approximately how much of the computed reservoir reserves had been produced to the time that the last survey was made, do you recall?

A I know how much was produced, but how much of the reservoir is a problematical thing.

Q According to their information, I believe they stated that there was 25 billion cubic feet?

A This was, I believe, more than 10 percent, because it would produce better than 2.8 billion.

Q In your opinion, how can these pressure surveys be applied to an economic evaluation?

A They will give the range of results, the number. The August test of '65, which is their Exhibit Number 8, was the survey with the longest shut in period, some 585 hours, and in there they calculated a little higher pressure, it went above their curve. The same thing happens in our calculations. This is a very tight reservoir. We feel that on the basis of additional calculations of permeability in

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C-2, both near the well bore and away from the well bore, that the permeability is less than 1 millidarcy. We come up with a little lower figure than the figures presented today.

So this is a very tight gas reservoir, and in a tight reservoir like this where we have to reach out for the boundary, a type of curve where you plot P/Z of one well, and being very tight, there is a possibility that where we have P/Z on the left here and down below, we have accumulated gas, that with time more and more may feed in and the curve may not break off as fast because of the low permeability of this reservoir. And in my experience in the Hugerton Field where we have had low permeability in certain wells, there the curve came down fairly rapidly for awhile and then flattened off, indicating gas feeding in. So the information presented, we cannot, and I don't think anyone else can, definitely say what these reserves are at this time.

For instance, if we take the long shut in pressure period at this point here, which is August 31, 1965, that was 585 hours, you take that point and the point before, and extend that out, you can see you can reach up into several more billion cubic feet of gas by this.

Q Did you in fact compute what the maximum potential reserves would be using those points?

A Well, it depends on the width of your pencil, and

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it's very delicate, but it would surely double the 25 billion, and probably approximate 50.

Q In your opinion, do these pressure surveys show any change at all in the volumetric capacity of a particular acre foot of this reservoir?

A No, these pressure surveys include the entire reservoir which is perforated and tied in with this part where the pressure is effecting the reservoir at this time, or where the withdrawals are effecting the pressures.

In this particular reservoir to date, although Union did perforate an additional section which they haven't called pay, which I think has a pay section in, they haven't completely perforated all the pay sections in this well, so that there was additional reserves from that.

Q In other words, there are reserves in the Wolfcamp which are not reflected by this curve?

A I don't think the system is such that it would tie in there a couple hundred foot section.

Q In fact, didn't the gentleman state that there were two separate zones which he viewed on these curves?

A You would have to ask him. I think he stated they showed two different pay sections as producing in this well; I think that's what he was talking about. Our analysis of these curves definitely indicate two sections

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producing, but they also indicate that whenever you get a change in slope, going along like this, and then changing, or particularly like this, and then changing, and this little trend like that indicates fracturing in my opinion.

Q How is it possible to determine the aerial extent of this reservoir by using the pressure surveys?

A The pressure surveys have to incorporate the best estimate of the volumetric and the thickness or the recovery per acre foot times the thickness. As pointed out, if you change the porosity from 4.8 percent to approximately 9 percent or 9-1/2, the aerial extent of being effected by the well would be reduced to half, or from 1800 acres down to 900 acres. So it's very critical in determining the aerial extent to have a reliable porosity and thickness figures.

Q Have you been able to develop an opinion as to the volumetric capacity of this reservoir?

A In my case I have used the information submitted at the last hearing by Pure Oil Company and accepted their 28 percent porosity.

Q What is your basis?

A I think that is a minimum that additional pay in the well up above that gives a reasonable estimate.

Q What are the figures you have used?

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A It's their Exhibit 5 of the last hearing. That gives approximately 30, 30 million cubic feet per acre.

Q Have you then computed the recoverable gas-in-place in this reservoir, based on the testimony given by Pure Oil Company in the former hearings?

A I have.

Q What is this?

A Approximately 30 million per acre.

Q You stated you believe this is a minimum figure?

A I think it's a realistic figure based on the pay picks. Additional perforating will increase the well.

Q If you used this conservative figure and used the reservoir volume as computed by Gruy of some; I speak of Gruy, I mean Gruy Engineering; if I remember, of 25 billion, how many acres in aerial extent would this reservoir cover?

A 25 billion divided by 30 million, would be less than a thousand.

Q Have you prepared an exhibit showing where this would most likely lay if you used the circular flow?

A It's impossible. If you used a circular you could just assume a circular area around the thousand acres. But in this particular case, from the seismic information which has been furnished, the formation in the devonian is dipping off to the south and southwest, so that it's impossible that

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it may have the limits of the reservoir earlier to the South than you might have it to the North Northeast.

Q In your opinion, is there any evidence to show that the South half of Section 5 will be commercially productive?

A There's a possibility, but at this time it's problematical.

Q It's less likely than the North half?

A Yes, from the basis, the drilling of only one well in the field. Drilling the offset which would be 660 feet from the line as proposed, I think that the 320 acres in the North half, the gas-in-place there is far more assured than it would be under the South half.

Q Have you prepared an economic evaluation using the well cost testified to by Mr. Stapler?

A I have prepared an economic analysis using Pure's information at the last hearing, their Exhibit 5, as to reserves and costs, but in addition I have included the Pennsylvanian as a dual completion. So I have made the analysis on the basis of the costs to drill the completed dual well in the Pennsylvanian, 160 for the Wolfcamp and 320 for the Pennsylvanian.

Q Have you an opinion as to the potential, the commercial potential of the Pennsylvanian Zone based on

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information previously educed?

A Yes, sir. I feel that it's commercial, and that at the present time it's only a problem of breaking the seal in the well that's causing the flow to stop before it gets to the surface. As far as the analysis of the well log, the core, I mean the well log, the drill stem tests, everything was very favorable, and in my opinion it is a plugged well in the tubing and it is not in the formation. The formation looks the same today as it did when it was drilled, or when they ran the first test.

Q In your opinion, would it be a profitable venture for a group of operators to drill a well based on the present spacing?

A A dual well on the present spacing, it would be prudent to do it.

MR. PRAY: I believe I have no further questions of Mr. Keplinger.

MR. PORTER: Anyone else have a question of the witness?

CROSS-EXAMINATION

BY MR. CHRISTY:

Q Mr. Keplinger, you're a petroleum engineer?

A Yes, sir.

Q Are you a log analyst, also?

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A Yes, sir.

Q You can help me a little bit here, then. You said initially, I believe, that the evidence here presented by Union, the new evidence presented by Union did not justify in your mind the granting of a 640-acre spacing?

A That's correct, the logs haven't changed in any way, sir.

Q Would the new evidence plus the past evidence give you an indication that the 640 acres might be justified, taking into consideration the testimony in the prior hearing, plus the testimony today, would you alter your opinion?

A No, I surely wouldn't, because the evidence in the past hearings or past hearing, indicated that the 640 and the 320 Pennsylvanian, and the 160 Wolfcamp was profitable, and I still contend that that's the same. The only thing today is that you have some pressure history, and this pressure history is not exact. If you use two points here you may get 50 billion; if you use a couple other points like this you will get less than 25 billion; or if you do it as Gruy Engineering did you come out in between.

Q What testimony here by Union today would indicate lesser spacing was the correct thing to do?

A Lesser than 160?

Q Lesser than 640? In other words, isn't all the

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evidence presented here today by Union indicative that 640-acre spacing is the correct thing to do? I'm not asking you whether it is or isn't. Isn't what they presented a case for 640 spacing?

A I think that's what they presented.

Q Yes, sir, thank you. You say the core analysis does not help in picking the pay picks, is that correct, did I understand you correct, sir?

A That's right.

Q Would it not in fact rule out one or two of the pay picks of Doctor Cavler, because as a matter of fact, you testified that you agreed with the pay picks of Doctor Cavler, but as a matter of fact, three feet of those pay picks are within the cored section of the log, isn't that correct?

A That's correct.

Q Then those three feet must come out?

A Let me see which --

Q My informants say it's approximately 13,486 feet.

A No, Mr. Cavler picked -- he has the same pay. This bottom part at 80, start at 80; you're right, it's in that section where it was cored and he had a pay pick there, that's correct.

Q So I assume you would wish to correct your testimony and you do not agree with all the picks of Doctor

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Cavler?

A No. This core analysis was taken in that section but during -- in this particular section you had a permeability indicated, I mean a porosity indicated of about 5 percent from the micro log --

Q Yes, sir.

A -- and he thinks that would produce and so do I, that there would be a small production come from that area.

Q Was there in fact a micro log?

A I mean neutron log.

Q You think that thin section might produce?

A It's not completely ruled out.

Q But not definitive pay?

A That's right.

Q And I believe what Mr. Ford testified to today was definitive pay?

A Yes, sir.

Q And admittedly conservative?

A I don't know whether it's conservative or not.

Q You do not agree, I assume, with Mr. Ford that the picks by Doctor Cavler above the core should be ruled out because the mud calculated at that point was about 6700 pounds?

A No, sir.

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Q You do not agree with that statement?

A No, sir.

Q Now, you said that in the pressure build up curves, if you could flatten the curve you could increase the volume?

A Not the pressure build up.

Q Excuse me. If you increase the volume you flatten the curve, didn't that increase the volume?

A The static pressure divided by the "Z" factor, this is your material balance calculation of reserves.

Q If I flatten the curve do I increase the volume?

A That's correct.

Q Now, sir, if the pay picks by Mr. Ford are correct, and you flatten the line, we simply increase the aerial extent, do we not?

A That's correct.

Q Now, sir, you are, of course, familiar with the transit test analysis?

A Yes, sir.

Q I assume they are a reasonable basis of calculation?

A We seem to have a difference of opinion in this case. We come out with the build up pressures very nearly the same as Union Oil Company's.

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Q The pressures?

A Pressure build ups. We don't have the same pressures as Gruy's. It's this part right here, that is very critical.

GOVERNOR CAMPBELL: Which part is that?

THE WITNESS: From "D" to "E" on Exhibit 8, and from "B" to "C" on Exhibit 9, and from a little past "B" to "C" on Exhibit 10. It must be that my eye just doesn't go quite that way, and we plotted them up and we're within a few percentage of Union's figures, and we don't jive with these.

Q Did you use a computer?

A No, sir.

Q You used the eye method?

A Yes, sir.

Q And I believe it was testified to by Mr. Garb that they used a computer picking those figures, they are in Exhibit for the record?

A I've been in this business for 40 years and two and two makes four, and that's what I've done with these pressure tests. I worked with Shell Oil Company when this method was first brought out, and I think Mr. Garb testified that they were some of the old Shell papers that he relied upon, he didn't go all the way back to our first papers that

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the company had prepared. So I think my method is pretty good, and I've used them for many years.

Q Fine. Now, did you estimate an average reservoir pressure from these transit tests that you ran?

A A what?

Q An average reservoir pressure?

A No, sir.

Q You just used the, what is it, the "P" bar?

A The final build up.

Q Final build up. And not the "P" bar?

A That's right.

Q Did you find that the "P" bar was declining in pressure?

A I didn't calculate it.

Q So you couldn't come out with a "B" bar?

A No, sir.

Q So you don't know the average reservoir pressure?

A That's correct.

Q I believe Doctor Cavler used 33 billion in this calculation for aerial extent, is that correct?

A Let me see --

Q My question will be, sir, do you agree with Doctor Cavler in that respect? Page 10 of the March '65 hearings; Doctor Cavler down at the bottom of the page, so it's 33

million cubic feet of gas reserve attributable to 640 acres, do you agree with that?

A On his Exhibit Number 3, which sets out his 7 percent porosity and his estimate, he used a recovery of 59 million per acre.

Q Do you agree with that?

A No, I used the figure that Pure used in the last hearing, calculated it, and that came up some 30. I didn't use, in making my test today, economics, the 59 billion, no, sir, I didn't use that.

Q All right, sir. You mentioned additional pay zones that were not perforated?

A Yes, sir.

Q Could you tell us where they are?

Q I assume you know they're there, if you can tell us where they are?

A You start up at 13,100.

Q All right, sir.

A You have 10 feet there, 13,100 to 13,110.

Q All right.

A Has 9 percent porosity, probably that range.

Q All right, sir.

A You've got another 5 foot section at 13,174.

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Q To 13,179?

A Right.

Q Porosity?

A Porosity of around 4 percent.

Q All right, sir.

A Then you have a section from 13,390, 13,390 to 13,396.

Q Six more feet?

A Six more feet.

Q Porosity?

A Excess of 20 percent; very prolific, very high porus zone.

Q All right.

A Then you have a section here at 13,419; 4 feet.

Q To 13,423. Porosity?

A In excess of 5 percent.

Q 5 percent?

A At 13,430; 2 feet.

Q A total of 2 feet; and the porosity?

A 15.

Q Percent?

A 15 percent.

Q All right, sir.

A And 13,449 -- 48, sorry; 4 feet.

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Q To thirteen thousand and --

A 52.

Q 52, for a total of 4 feet; and the porosity?

A 5 percent. Now, you have in the form of perforations below that point.

Q Yes, sir, and I believe all these picks were above where we change from the 12-1/4 down to the 9-1/2?

A Yes, sir. You never changed the hole size until 13,895 feet. It is on the log, these depths are, which was 1-22, October 19, 1963, tool model TNGT.

Q Did I understand you, sir, that a dual well would be prudent to operate, that the economics are sound for a dual well?

A Yes, sir.

Q I don't believe you mentioned a single well?

A I don't believe I did.

Q Would that be prudent to operate?

A I didn't testify to a single well.

Q You don't know?

A I could look it up.

Q I would appreciate it.

MR. PRAY: If the Commission please. We have, in our presentation, talked about the Pennsylvanian, also. We have an admission in there case that prudent engineering

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practices would require that you consider all potential productive zones which Mr. Keplinger, I assume, in good engineering practice, has considered, and that I don't believe it's necessary for us to consider the economics of a single completion at this time. I did not go into my case and I would object to cross-examination on that point at this time.

MR. CHRISTY: The witness has not testified to anything as production in the Pennsylvanian, but the statement was made, if you knew you had a Pennsylvanian Reservoir in good economics you would include it in your study. But there's not a word that the Pennsylvanian is productive.

THE WITNESS: I testified as shown on the Pennsylvanian, on Exhibit 5.

Q (By Mr. Christy) My question is, would you as a prudent operator, with your economics, not Pure's, but yours, drill a Wolfcamp Well on a 160-acre spacing?

A Yes.

MR. PRAY: Object to the question, Your Honor.

MR. CHRISTY: He's testifying as an economics expert.

MR. PRAY: You heard him say, yes, didn't you. Withdraw the objection.

Q (By Mr. Christy) Let me ask you this last question, sir. I believe you mentioned that the North half of Section 5 would have better prospects for production than the South half, is that correct, sir?

A That's correct.

Q I assume a well in the North half North half would effectively and efficiently drain gas underlying the South half of the North half?

A That is correct.

MR. CHRISTY: Thank you.

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

MR. PRAY: I have about two more questions.

REDIRECT EXAMINATION

BY MR. PRAY:

Q In your opinion, is it possible on the basis of one well, in the available information presented at this time, to practicably determine the amount of recoverable gas under the South half of Section 5 in the Wolfcamp as compared to the recoverable gas in the North half of Section 5?

A Practical?

Q No.

A With one well drill?

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Q Yes.

A No, as I stated, the drilling of another well in the North Half would recover gas which I thought was proven, but it would be a less chance of proving up the gas on the South half.

Q In your opinion, would proceeding with the development on the present spacing constitute waste?

A No, there would be no waste.

MR. PRAY: No further questions.

MR. PORTER: Anyone else have a question?

MR. CHRISTY: I believe not, no further questions.

MR. PORTER: Did your witness have any exhibits?

MR. PRAY: No exhibits. I would like to rule for limited purposes.

MR. PORTER: The witness may be excused.

GOVERNOR CAMPBELL: He didn't refer to that chart up there, or was his testimony --

MR. PRAY: He referred to it but what we would offer as an exhibit, it's really an aid in testifying.

GOVERNOR CAMPBELL: I realize that, but I think he made some general reference to it.

MR. PORTER: Would you identify that?

MR. PRAY: This is a curve showing pressure over the gas deviation factor versus cumulative gas in billions of

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feet.

THE WITNESS: The pressures being those given by Pure Oil Company and confirmed by our calculations.

MR. PORTER: What I'm really after is a number.

MR. PRAY: Exhibit Number 1, sir. We would like to recall Mr. Garb, who was earlier excused making calculations for us.

MR. PORTER: Mr. Garb, would you take the stand, please?

MR. PRAY: Since we have a new reporter, I would like to make it clear for the record that Mr. Garb has previously testified in the case and he was excused to make calculations.

* * * *

F O R R E S T G A R B, a witness, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. PRAY:

Q Mr. Garb, you realize that you are still testifying under oath and that you have previously been sworn?

A Yes, sir.

Q I believe I asked you to take the 5 foot of pay which was included in the drill stem test in the Wolfcamp, I don't remember the exact figures, drill stem test interval;

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anyway, you are familiar with the drill stem test I'm talking about?

A Number 4, sir.

Q Drill stem test Number 4. And that you were further to take the permeability as computed from your pressure build up surveys of 1.56 millidarcies, and the pressure of 11,000 pounds from the drill stem test, and you were to compute for me the rate at which this 5 foot zone would be capable of flowing. Have you computed such a rate?

A Yes, sir.

Q What is that rate?

A The one -- may I explain the calculations, sir?

Q Yes.

A The 1.56 millidarcies that is computed from the build up is a weighted average permeability which we attributed to two zones. We do not know that the 5 foot in question has 1.56 millidarcies or perhaps could have as high as 7.8 millidarcies if it had all the permeability zone. I have made a calculation over the range.

Q Based on the figure I stated to you, give it to me, and do you have any information which would be better to show what the actual permeability is in that?

A In that one zone?

Q In that one zone.

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A Only the question as to what it is.

Q The best information you have available is that there is an average permeability?

A A weighted average between two zones of which neither individually I know.

Q We have no better approach than taking the weighted average?

A Yes, sir.

Q Would you give us the figure?

A On the basis of 1 over 5 situation and the steady state flow equation, we had to make several assumptions; one, that the initial drill stem test was 11,376 and that the final flowing pressure as exhibited in that test was 4,310 pounds. We also, by reading the chart, determined that the flow period had been approximately 4.75 hours, and that the radius of drainage or the flow period of that duration with a 1.56 millidarcy permeability, calculated to be approximately 440 feet.

Q I believe what I'm after is not the radius of drainage but it is the rate of flow?

A You cannot calculate it, sir, without the radius of drainage. Once we have computed the RA/RW and we assumed again an average well bore diameter of 1 foot, we computed a flow rate of approximately three million, one ninety, 3.190

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million MCF per day.

Q 3.190 million MCF per day?

A Yes, sir.

Q The actual flow was 12 million from the drill stem test?

A Yes, sir.

Q So that if you had an error of 100 percent you would still come up with only 6 million from that zone?

A If you have a hundred percent error.

MR. PRAY: No further questions.

MR. PORTER: Any further questions? The witness may be excused.

MR. PRAY: Do you have anything else you would like to state to the Commission?

THE WITNESS: With the Commission's permission, if we are allowed to attribute the 7.8 millidarcies, the yield from the well would have been 14.25 MCF per day.

MR. PRAY: Do you have any basis for establishing this maximum permeability?

A No, sir, I do not.

MR. PORTER: The witness may be excused.

MR. PRAY: The respondent rests in the case.

MR. CHRISTY: We would like to recall Mr. Ford just for one question.

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* * * *

M A R T I N E. F O R D, a witness, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. CHRISTY:

Q You are Martin Ford, who has previously testified at this hearing on direct?

A Yes, sir.

Q Mr. Ford, one point from your direct, did you use the cores in calibrating the pay section that you used?

A No, sir, no, I didn't. I believe it's not possible to use the core in that way. However, it is possible, once having established a calibration by the other means that I was describing, to use the core to check whether this calibration is a reasonable one. This I did and I found there was a satisfactory agreement between them.

Q Now, sir, I believe it was testified by Mr. Keplinger, certain other pay zones which he picked from the gamma ray neutron log, a portion of which is shown as Exhibit 7. Do you have the whole log that we might mark so we can get to these other pays he picked above this point?

MR. CHRISTY: This will be Union's Exhibit Number 17.

(Whereupon, Union's Exhibit Number 17 marked for identification.)

Q (By Mr. Christy) Union's Exhibit Number 17, which is the entire log, is that correct?

A Yes, sir.

Q Now, if you would go over with me, please, very briefly, there was picked a 10 feet of pay from 13,100 to 13,110?

A 100 to 110.

Q You did not pick that as pay?

A No, sir.

Q Why?

A I relied on the information that I had that the well was still retained in control when it should be in excess pressure in effective reservoir rock towards the bore hole, which would result in the movement of reservoir fluids into the bore hole, and the probable loss of control of the well. That particular zone that you've described to me over that depth interval of the Schlumberger log is quite a thick zone and one would expect, therefore, that if that had effective porosity it would very likely result in a large flow of fluid on the well bore.

Q It is the situation of 6700 pounds of mud not blowing out?

A Yes.

Q What is the next pick you used, 13,184 to 13,189?

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A 13,184.

Q 13,184, for 5 feet?

A 184 to 189, that is coming very close to the level of natural gamma ray radiation that one would associate with a shale, and the neutron curves give us a rather similar indication. I believe I would say there was certainly not effective reservoir rock in that interval. Over that interval there is rock which bears some similarity to that which we have recognized as pay. I would -- my estimate is that it would have less than 2 percent porosity.

Q And --

A Although I recognize that there isn't a close association between porosity and permeability. It might lead one to suspect that that might not be pay. However, in the absence of any information about the performance of the well during the drilling of that section, it would be difficult to decide whether that was pay or not.

Q It would or would not?

A Could be.

Q 2 percent?

A Something less than 2 percent, that is without a shale correction.

Q Next was 13,390 to 96, 6 feet?

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A Yes, sir. That section, I think one would have to evaluate in conjunction with the section above. However, it would seem rather surprising -- allow me to put it this way. There's a surprising level of difference of porosity between this and the lower sections without some shale correction, that, according to my calibration, would have a porosity of the order of 25 percent.

Q All right, sir. And you would not pick that as pay?

A No, sir, because I think that the extreme movement of both the curves towards the left is an indication that, in fact, the hole at that point is even larger than the surrounding hole. And this I wouldn't find surprising if there had been a flow of fluids from the formation at the time that the well was nearly blowing out, which might result in some turbulence in the lower section and some increase in hole size.

Q Next, 13,419 to 13,423 feet, a total distance of 4 feet. I believe it was given at 5 percent porosity, may I have your comment on that?

A I believe I would estimate a lower porosity, but I would have to say that could be net pay if not for the performance of the well in that interval.

Q What type of porosity would you use?

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A I would say perhaps half the 5 percent or less.

Q The next pay is only 2 feet, it's 13,430 to 13,432 feet, picked for 15 percent porosity?

A Well, if one didn't make a correction for the effects of the shale, one might think that I would estimate that it had a porosity of the order of about 8 percent. However, if I corrected for shale it would be something like 6 percent or less. I think that were it not for the -- again for the evidence of the performance of the well over that interval it might be difficult to decide whether that was net pay or not. However, I do think that when we consider these very thin sections we have to remember that even if there was porosity originally it was very unlikely that it was preserved.

In that connection, too, I would like to draw attention to a zone above the interval you spoke of a little earlier, that is from 80 to 90, which has gamma ray characteristics similar to the zone 30 to 32, which were picked as net pay but which Mr. Keplinger excluded from his estimates.

Q There is one more pick from 13,448 to 452, a total of 4 feet?

A May I have that interval again, please?

Q 448 to 452.

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A Yes.

Q 4 feet, 5 percent porosity, would you agree with that or wish to comment on it?

A I would estimate something of the order of 2-1/2 percent in that interval.

Q 2-1/2 percent porosity for a possible addition of 4 feet of pay?

A Possibly, providing the well didn't go out of control in that interval.

Q Could some of these pays be based on mud log kicks?

A Yes, I think they might.

Q That might be an answer?

A That could be the reason why they were picked. I would have to say that if one were using drilling rigs one would have to use very great caution in interpreting the rate of drilling in terms of porosity, because there are so many other factors that determine rate of drilling other than porosity.

Q Have you seen these mud logs kick where pay is not existent?

A Yes, sir.

MR. CHRISTY: That's all.

CROSS-EXAMINATION

BY MR. PRAY:

Q Mr. Ford, as I understand it, you're saying to this Commission that because the well was under control that you did not pick these zones which you have testified to, and I'll lump them altogether for sake of time because there was no blow out of this well, is that correct, the well was under control, therefore you didn't pick them as pays?

A Substantially so, except for the zone from 390 to 396, which I thought had it's log characteristics due to an enlarged hole.

Q Then I take it it would be very difficult for us to pick pay unless the well was out of control; you don't pick pay unless the well is out of control?

A No, sir.

Q You want a drill stem test?

A No, sir, that's not what I've said. I have said that this is an additional criterion which one should use if it's available.

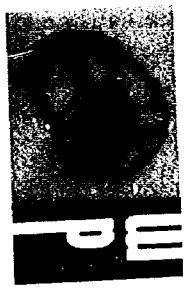
Q You're condemning the hole pay picks based on this criterion?

A Some of them.

Q The area where you say porosity is 25 percent, did you say, but you think maybe the hole is larger than the surrounding hole?

A I think that the characteristics above that

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section, which for some reason Mr. Keplinger has excluded, he must have used some criteria in excluding that section and I believe that very probably it was enlarged hole size.

Q Do you have any information to confirm that?

A The log.

Q So you're saying it's either a large porosity or it's washed out?

A It's either tremendous porosity or it's washed out.

Q But you don't know which?

A I think it's most unlikely that one would find porosity of 30.

Q 25?

A I believe you said 25, 20 in that section.

Q What would you pick in that zone just above from 80 to 90?

A Allow me to refer, I'd say that would be about 30 percent without making any correction for shaling.

Q You don't make any correction?

A Without making a correction for shalingness. If I did that it would be on the order of 28 percent.

Q That increases it, then, the porosity?

A Did I not say 30? I thought the figure I had given you --

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Q You started at 25, pardon me. Are you familiar with this curve from the Schlumberger log from the porosity index?

A Yes.

Q Does that take into account the shale?

A No, sir.

Q You use yours independently?

A I use the technique prescribed by Mr. Bush.

Q Did you use this type of curve to arrive at your primary picks?

A Yes, sir.

MR. CHRISTY: No further questions. At this time we would like to offer in evidence Union's Exhibit 17, being the complete well log on the gamma ray neutron, a portion of which is shown on Exhibit 7.

(Whereupon, Union's Exhibit No. 17 offered into evidence.)

MR. PORTER: If there is no objection it will be admitted.

(Whereupon, Union's Exhibit No. 17 admitted into evidence.)

MR. CHRISTY: That is all from this witness.

MR. PORTER: Does anyone else desire to present testimony in the case?

MR. HUNKER: Mr. Porter, Mr. Cavler would like

to have been here to attend this Commission Hearing but he has lateral sclerosis which is the Lou Gehrig disease. He has addressed a letter to the Commission which I would like to present at this time.

GOVERNOR CAMPBELL: Do you have any objection to this?

MR. CHRISTY: No objection to filing it just like the Commission usually receives letters.

MR. PORTER: The Commission will place this letter in its files. I will say that we certainly regret that Mr. Cavler's health is such that he is not able to appear in this case at this time. I think we all know him personally and we have worked with him, and we have a lot of respect for him.

Are there any statements to be made?

MR. HINKLE: If the Commission please, you've been very patient in being with us most of the day and I don't want to take very much of your time, but I do want to call your attention briefly to what I believe to be the duty of the Commission.

This whole matter was started by reason of a unit agreement which was approved by the Commission as a conservation measure. The well was drilled by the unit operator. The unit agreement, as you know, has some -- built some Fees which protect Correlative Rights. This particular

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case had those owners of Fee Land in Section 5, if they had been willing to commit 280 acres to the unit, the questions which we have discussed today and the reason we're here today would not have arisen. We believe that we have made out a clear case for 640-acre spacing. I don't think there's any question whatsoever that one well will effectively and efficiently drain more than 640 acres.

Now, I believe that it is also the duty of the Commission, under our statute where they find that to be the case, to take into consideration the economics involved, and we have clearly shown here today that operators would loose money by the drilling of wells on the standard spacing unit of 160 acres; that it's going to cause Correlative Rights to be violated; that by reason of having a 160-acre spacing, because there's going to be a lot of 160-acre units that will be drilled and the waste will be permitted because the gas and liquid hydrocarbons will not be recovered, whereas if you have 640-acre spacing there's an avenue open to the parties who have not joined the unit, to create a 640-acre spacing unit, and then they can be force-pooled, for that matter, to create this so that wells can be drilled and so that Correlative Rights will be protected. And that all of the parties will receive their fair share of the production underlying their lands, which

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would be equivalent to their percentage of the whole pool. In Section 65-3-14 New Mexico Statutes Annotated, Section B provides, "The Commission may establish a proration unit for each pool, such being the area that can be efficiently and economically drained and developed by one well, and in so doing the Commission shall consider the economic loss caused by the drilling of unnecessary wells". So I believe that it's the duty of the Commission in this case to consider the economics as well as the physical aspects of being able to drain more than 640 acres by one well. And as I say, where it shows that it's a loosing proposition for the operators to develop on the 160 acres, that the Commission should go to the larger spacing in order to protect Correlative Rights rather than going to smaller units to protect Correlative Rights, because as I say, a lot of the units are not going to be drilled on 160 acres.

Now, we have also shown here that if the Commission is willing to adopt special field rules for 640-acre spacing that Union has evidenced their willingness to go ahead and drill a well in Section 5, not only to the Wolfcamp but to sufficiently test the Pennsylvanian Zone.

Now, they have a right to participate in the well, and according to their ideas, which is as it should be, and in that way their Correlative Rights will be adequately protected.

MR. PRAY: I'll try to make it as brief as possible.

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I'd like to call the Commission's attention, I know you have heard it many times and seen it, it's contained in your own rules, the statements of what are Correlative Rights, and I would like to point out and imphasize that Correlative Rights are several things. It's the opportunity afforded to each owner to produce without waste his share in the oil and gas, but it is also to permit him to produce his share in the pool being in amount substantially in the proportion that the quantity of recoverable oil or gas, or both, under such property bears to the total recoverable oil or gas.

I'm sure this Commission is also very familiar with the case of Continental Oil versus the Commission in which the Supreme Court of New Mexico extensively discussed the meaning of Correlative Rights, and the court states in its opinion that there must be a consideration and that there must be a determination by the Commission that before Correlative Rights can be protected there must be a finding as to what are the Correlative Rights, and that requires a finding as to the recoverable gas-in-place under each individuals property in the pool and the relationship which that gas bears to the total gas in the pool.

There's no evidence in the record, at all, today, or in the prior hearings as to the amount of gas located in the South half of Section 5, therefore we don't believe

the Commission, without the evidence to support it, can make the finding as to the recoverable gas in the South half of Section 5, and the effect of Union Oil Company would be to bring in the North half of Section 5 to share, and we don't believe this constitutes Correlative Rights under the statutes of the State of New Mexico.

We have made our continuous objection to the evidence presented by the Union Oil Company. As stated by Mr. Hunker, the case of Sims B. Mechum states that there cannot be a new order of the Commission unless there is a finding of waste under the old order of the Commission, and we do not believe there has been a finding of such.

I could go into the matter that we had not always received all the information we desired. I could go into the matter of the location of the well, but I shall not. The Commission knows more about that than most of the people today, because the people here today didn't participate by and large in the last hearing.

We don't believe that this evidence submitted today, other than the last two pressure surveys, is anything new. It's evidence which could have been prepared if they had been inclined to do so at the time of the last hearings.

They changed their pay picks, the porosity, the amounts of taxes, the price which they're getting for the

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gas, they have changed everything which they educed at the last hearing, downward, minimizing the present spacing. We believe they did that the last time.

The original order of this Commission establishing 320-acre spacing in the Pennsylvanian and 160 in the Wolfcamp contained the finding that economic waste will be prevented by this spacing ruling. It contained a finding that no unnecessary wells would be drilled, thereby this finding and this rule was attacked in the last hearing after a well had been drilled, and they attempted at that time to show the economics were such that they couldn't develop a 640-acre spacing; that attack failed. They have come in today and attempted through one bit of information to reopen the entire hearing and to make a new attack without any new wells being drilled. We don't believe the one well sufficiently defines this reservoir, and admittedly with the drilling problems they have we don't believe it gives sufficient information. Therefore, we respectfully request that the Commission deny the application of Union Oil Company.

MR. HINKLE: Just one brief additional statement. I think I ought to call the Commission's attention to the situation which would exist in the event 640 acres of spacing is not granted in this case and we have to continue

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development of this area on 160 acres, two cases pending before the Commission; one of them is for a non-standard location consisting of the North half North half of Section 5, that would be supposedly a dual well from the Wolfcamp and Pennsylvanian; another case pending under which a non-standard unit is sought which would consist of the Southeast Quarter of the Northeast Quarter of the East half of the Southeast Quarter of Section 5, that covers the 280 acres, a question here not committed to the unit.

Now, let's assume the Commission goes ahead and grants these units and they're permitted to drill those wells. The Union and the other owners of the remainder of that section would have to come before the Commission to ask permission to create non-standard units in each instance, because you cannot work out any other way to where you can select a standard unit except with the exception of the Southwest Quarter of Section 5. So you would have to have another non-standard unit consisting of 120 acres and another non-standard unit consisting of 80 acres, and, or if you take 160 acres in one unit and 160-acre non-standard unit, otherwise you would end up with 40 acres that is not allocated to any well; what are you going to do with it? And you can't force pool it because you can't force pool anything except to create a standard unit. In other words, you can't

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force pool to create a non-standard unit but I think you're going to have a bad situation in the event this is continued on a 160 basis.

MR. ANDERSON: John Anderson, Geological Survey, Roswell, New Mexico. We are much interested in this case primarily because of the amount of Federal Lands that are involved and also because it involves lands in the Red Hills Unit area which was approved by the Commissioner of Public Lands, the Oil Conservation Commission, and the Director of Geological Survey. This unit area consists of about 29,000 acres. Only 2,000 acres including the lands owned by Mr. Yager and Schuman are committed. This unit agreement has a section in it called "Plan of Development" and under the terms of the unit agreement the wells that are prescribed in "Plan of Development" are the only ones that can be drilled on committed lands, and the submittal to the approving officers that the Commissioner of Public Lands and the supervisor of Geological Survey establishes insofar as the committed lands are concerned, and to the extent not contradictory to any Commission order, the spacing for those committed lands within the unit area.

Now, in 1965 a plan of development was submitted for an approval calling for a Devonian well to be drilled in the Southwest Quarter of Section 22. That plan was approved

by the Commissioner of Public Lands and the supervisor. In 1966 a plan of development was submitted calling for a Devonian well to be drilled in the Southwest Quarter of Section 22 or the Southeast Quarter of 21 or the Northeast Quarter of 28 or the Northwest Quarter of Section 27. Now, in all of these plans of development and in any conversations that we had with the Pure as the original unit operator and Union of California as successor, we never talked about anything except 640 acre spacing, this is for lands committed to the unit agreement.

There is one thing I think we all should take a good look at, we've got one well drilled in this field. We had testimony today that there was 28 feet of pay in the Wolfcamp. I think all of us will agree that a mile or a mile and a half away from here we may have 10 feet less or 40 or 50 feet more. We don't know anything about this reservoir right now except what we can see from the performance of this one well. So the Survey feels that adoption of a 640-acre spacing for a Wolfcamp on a temporary order at this time would protect the interests of the lands that are committed to the unit agreement as well as those lands that are not committed to the unit agree it. We would certainly hate to see the unit area developed on 160 acres in the Wolfcamp to protect the committed lands from drainage.

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MR. HUNKER: I would like for Mr. Anderson to come forward and be sworn. I would like to ask him some questions.

GOVERNOR CAMPBELL: Do you wish to testify, Mr. Anderson?

MR. HUNKER: I think he's an adverse witness, as is rather obvious. I would like to cross-examine him.

MR. ANDERSON: I'm not permitted to testify.

GOVERNOR CAMPBELL: Do you have any rebuttal?

MR. HUNKER: I would like to make this comment to Mr. Anderson. The Shell Oil Company has a unit called the Antelope Unit and you entered no objection to the statewide rules in connection with that particular unit. Now, Shell was perfectly willing to stay by the statewide rules in connection with deep gas that they've discovered in that particular unit, and to the best of my knowledge Mr. Anderson didn't come up here and let you all know that he objected to your statewide rules in connection with that particular unit.



I think that if he's going to protest in one instance he ought to let his views be known in all instances. He's a man greatly respected in our community, his opinion in this particular case will undoubtedly have some weight as far as the Commissioners are concerned, but I

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think he's inconsistant, especially since we're not allowed to examine the Pennsylvanian and find out about the unit operation, why they haven't started their well yet in connection with their plan of development.

I would like to ask a lot of questions along these lines, if the Commission please. I feel we have been thwarted and it's unfortunate that the U.S.G.S. has taken this position.

GOVERNOR CAMPBELL: What is it that prohibits an official from testifying?

MR. HINKLE: 43-CFR, you have to have permission of your superior.

MR. PRAY: Let the record show that we object to the statement that was made by Mr. Anderson and we move that it be stricken as being inappropriate. We haven't had the opportunity to cross-examine the witness; it's improper for him to make the statement.

MR. PORTER: The objection is overruled.

MR. HUNKER: Note our exception.

MR. PORTER: Exception will be noted. Mr. Lyon; let the record show that this is Mr. Lyon, L-y-o-n, of Continental Oil Company.

MR. LYON: Continental Oil Company is a working interest owner in the Red Hills Unit by virtue of having committed our leases to the unit, which are within the unit

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area, and we feel that the record today and the record in the previous hearing certainly justifies 640-acre spacing of the Wolfcamp Formation, and we strongly urge the Commission to adopt such a spacing on a permanent basis. Should the Commission feel the evidence is inadequate, we strongly recommend that 640-acre spacing on a temporary basis be provided.

MR. PORTER: Anyone else have a statement? I believe the Commission has received some correspondence which the attorney has. Would you indicate what that is, Mr. Hill?

MR. HILL: I have a letter dated May 16, 1966 from Tidewater Oil Company, signed by John S. Cameron, Jr., Proration Supervisor; "Please be advised that Tidewater fully supports Union's request for 640 spacing. Tenneco Oil Company, dated May 11, 1966, W. Lyons, District Production Superintendent, "Tenneco Oil Company supports Union Oil Company's request for 640 acres. Telegram from George T. Abel, Midland, Texas, received May 17, 1966, he is a working interest owner in the Red Hills Wolfcamp, and he supports Union Oil Company of California's application for 640-acre spacing. Have a letter from Texaco Incorporated dated May 16, 1966, signed by J. H. Markley, Division Manager, "Texaco therefore concurs with the recommendation made under Case 3158.

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Finally, I have a letter from Pan American Petroleum Corporation, May 13, 1966, signed by W. V. Grissom, and they urge the adoption of the rules proposed by Union Oil Company. That's all the communications I have.

MR. PORTER: Anyone else have anything further to offer in this case? The Commission will take the case under advisement.

Mr. Pray, you have two other cases docketed here. How long do you anticipate the direct testimony would take in those cases?

MR. PRAY: Just my direct testimony would probably take 30 minutes, not counting 30 minutes --

GOVERNOR CAMPBELL: Each case?

MR. PRAY: No, total.

MR. PRAY: Do you intend to move to consolidate the cases?

MR. PRAY: I believe they can be considered together, yes, sir, they all have the same type testimony.

MR. PORTER: In that event we will recess the hearing and reconvene at 8:00 o'clock in the morning.

(Whereupon, the hearing was recessed at 6:20 o'clock P.M.)

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

We, ADA DEARNLEY and BOBBY J. DAVIS, Court Reporters, do hereby certify that the foregoing and attached transcript of proceedings before the New Mexico Oil Conservation Commission at Santa Fe, New Mexico, is a true and correct record to the best of our knowledge, skill and ability.

IN WITNESS WHEREOF, I have affixed my hand and notarial seal this 7th day of June, 1966.

Ada Dearnley
NOTARY PUBLIC

My Commission Expires:

(date) March 13, 1969.

IN WITNESS WHEREOF, I have affixed my hand and notarial seal this 7th day of June, 1966

Bobby J. Davis
NOTARY PUBLIC

My Commission Expires:

(date)

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REG

9-27-65
3:30
3716

CASE NO. 3955

Application,
Transcripts,
Small Exhibits
ETC.

	1st Min.	2nd Min.				
Flow Time	3	90	Date	4-30-63	Ticket Number	362669 S
Closed In Press. Time	30	60	Kind of Job	OPEN HOLE	Halliburton District	HOBBS
Pressure Readings	Field	Office Corrected	Tester	GENTRY	Witness	MR. TEAGOR
Depth Top Gauge	9645 Ft.	Blanked No Off	Drilling Contractor	SHARP DRILLING CO.		
BT. P.R.D. No.	1836	Hour 24 Clock	Elevation	3380' Est.	Top Packer	6657'
Initial Hydro Mud Pressure	4475	4442	Total Depth	9896'	Bottom Packer	9662'
Initial Closed in Pres.	1300	1333	Interval Tested	9662-9896'	Formation Tested	Bone Springs
Initial Flow Pres.	1	169*	Casing or Hole Size	12¼"	Casing Top / Perfs. Bot.	
	65 2	78				
Final Flow Pres.	1	69*	Surface Choke	1"	Bottom Choke	5/8"
	65 2	72				
Final Closed in Pres.	2122	2124	Size & Kind Drill Pipe	4 1/2" IF	Drill Collars Above Tester I.D. - LENGTH	2 3/4" X 150'
Final Hydro Mud Pressure	4445	4442	Mud Weight	9.1	Mud Viscosity	
Depth Con. Gauge	9892 Ft.	Blanked Yes Off	Temperature °F Est. / °F Actual	143	Anchor Size & Length ID / OD	7 1/4 X 234
BT. P.R.D. No.	1837	Hour 24 Clock	Depths Mea. From	Rotary Table	Depth of Tester Valve	6640' Ft.
Initial Hydro Mud Pres.	4575	4565	Cushion TYPE / AMOUNT	none Ft.	Depth Back Pres. Valve	Ft.
Initial Closed in Pres.	1385	1413	Recovered	180 Feet of Oil & gas cut mud	Mea. From Tester Valve	
Initial Flow Pres.	1	**	Recovered	Feet of		
	155 2	317				
Final Flow Pres.	1	**	Recovered	Feet of		
	155 2	295				
Final Closed in Pres.	2195	2240	Recovered	Feet of		
Final Hydro Mud Pres.	4575	4565	Oil A.P.I. Gravity		Water Spec. Gravity	
Depth Bot. Gauge	Ft.	Blanked Off	Gas Gravity		Surface Pressure	1 psi
BT. P.R.D. No.		Hour Clock	Tool Opened	9:00 AM A.M. P.M.	Tool Closed	12:03 PM A.M. P.M.
Initial Hydro Mud Pres.			Remarks	Tool opened with a strong blow, gas to		
Initial Closed In Pres.				the surface in 17 minutes, no fluid to the surface.		
Initial Flow Pres.	1 / 2			* Questionable. ** Unable to read.		
Final Flow Pres.	1 / 2					
Final Closed In Pres.						
Final Hydro Mud Pres.						

Legal Location Sec. - Twp. - Rng. Sec. 32 25S 33E | Lease Name RED HILLS UNIT | Well No. 1 | Test No. 2

Field Area Wildcat | County LEA | State NEW MEXICO

Lease Owner/Company Name THE PURE OIL COMPANY | Owner's District HOBBS

FORMATION TEST DATA

17

Gauge No. 1836 Depth 9645 Clock 24 hour Ticket No. 362669

	First Flow Period		Initial Closed In Pressure			Second Flow Period		Final Closed In Pressure		
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\bullet}{\bullet}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\bullet}{\bullet}$	PSIG Temp. Corr.
P_0	.000	169*	.000		69	.000	78	.000		72
P_1	.008	69*	.113		1333	.327	72	.217		2124
P_2										
P_3										
P_4										
P_5										
P_6										
P_7										
P_8										
P_9										
P_{10}										

Gauge No. 1837 Depth 9892 Clock 24 hour

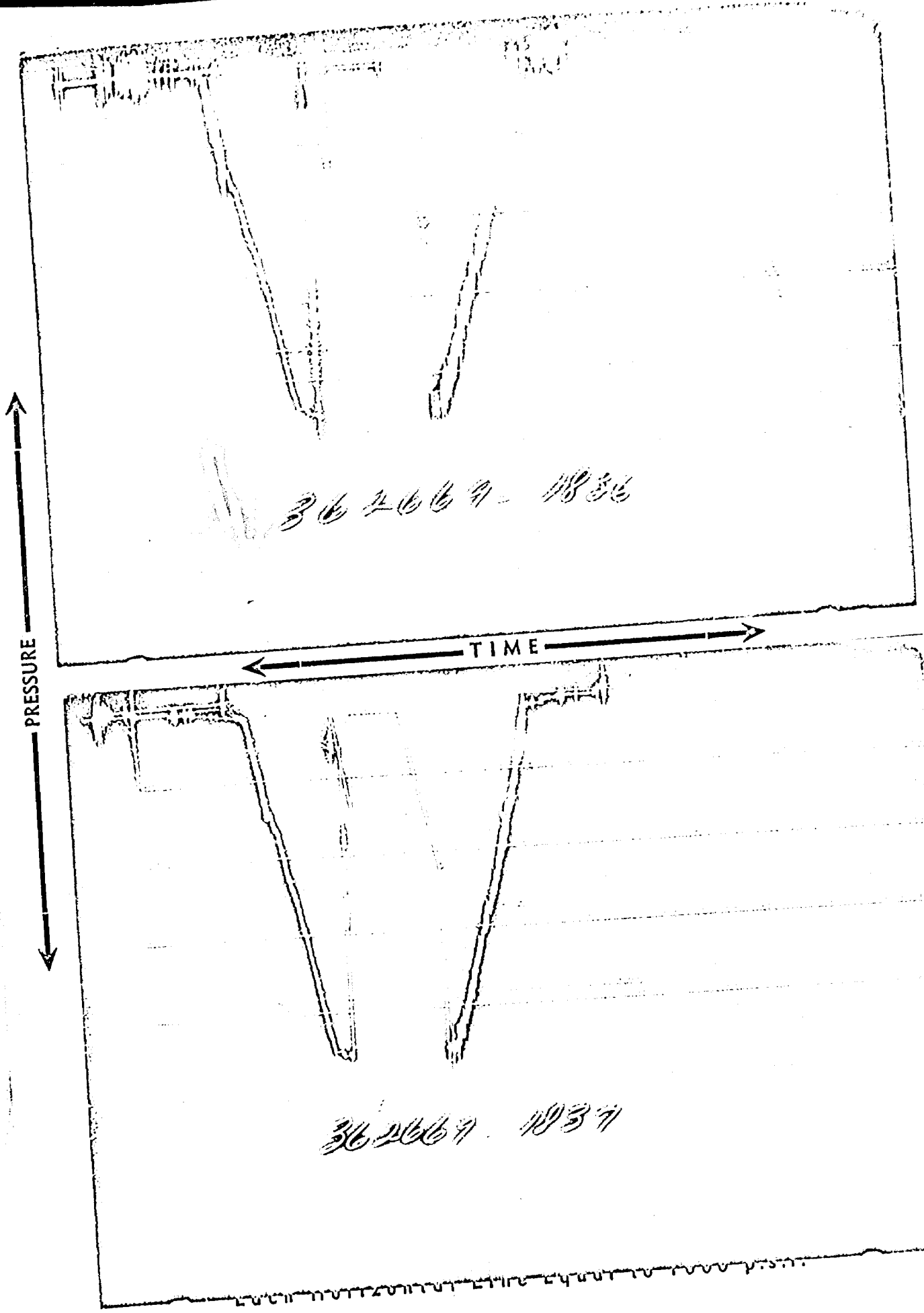
P_0	.000	**	.000		301*	.000	317	.000		295
P_1		**	.093		1413	.297	295	.194		2240
P_2										
P_3										
P_4										
P_5										
P_6										
P_7										
P_8										
P_9										
P_{10}										

Reading Interval Minutes

REMARKS: * Questionable ** Unable to read.

SPECIAL PRESSURE DATA

Form No. 1290-R2


PRESSURE
TIME

	1st Min.	2nd Min.				
Flow Time	20	2655	Date	11-6-64	Ticket Number	330338 - S
Closed In Press. Time	25	75	Kind of Job	HOOK WALL TEST	Halliburton District	HOBBS
Pressure Readings	Field	Office Corrected	Tester	MR. TAMPLEN	Witness	MR. PYE
Depth Top Gauge	13434 Ft.	NO Blanked Off	Drilling Contractor	SHARP DRILLING COMPANY		IC
BT. P.R.D. No.	1898	72 Hour Clock	Elevation	-	Top Packer	13401'
Initial Hydro Mud Pressure	-	12112	Total Depth	14325'	Bottom Packer	-
Initial Closed in Pres.	-	11431	Interval Tested	13401'-14325'	Formation Tested	WOLFCAMP
Initial Flow Pres.	- 1	10498	Casing or Hole Size	6 5/8" 28#	Casing Top / Perfs. Bot.	13440' / 13512'
	- 2	7130				
Final Flow Pres.	- 1	10074	Surface Choke	18/64", 28/64" 28/64", 24/64", 20/64"	Bottom Choke	-
	- 2	5825				I.D. - LENGTH
Final Closed in Pres.	-	11026	Size & Kind Drill Pipe	2 7/8" H.D.	Drill Collars Above Tester	-
Final Hydro Mud Pressure	-	11979	Mud Weight	17.1	Mud Viscosity	60
Depth Cen. Gauge	Ft.	Blanked Off	Temperature	200 °F Est. / °F Actual	Anchor Size & Length ID / OD	1.90" / 2 3/8" 81'
BT. P.R.D. No.		Hour Clock	Depths Mea. From	ROTARY TABLE	Depth of Tester Valve	- Ft.
Initial Hydro Mud Pres.			Cushion TYPE AMOUNT	- Ft.	Depth Back Pres. Valve	- Ft.
Initial Closed in Pres.			Recovered	Feet of		
Initial Flow Pres.	1		Recovered	Feet of		
	2					
Final Flow Pres.	1		Recovered	Feet of		
	2					
Final Closed in Pres.			Recovered	Feet of		
Final Hydro Mud Pres.			Oil A.P.I. Gravity	56	Water Spec. Gravity	-
Depth Bot. Gauge	13418 Ft.	YES Blanked Off	Gas Gravity	-	Surface Pressure	4625-8900# psi
BT. P.R.D. No.	1897	72 Hour Clock	Tool Opened	11-5-64 1:30 AM / P.M.	Tool Closed	11-7-64 12:45 AM / P.M.
Initial Hydro Mud Pres.	-	12124	Remarks	SEE ATTACHED SHEETS.		
Initial Closed in Pres.	-	11429				
Initial Flow Pres.	- 1	10255				
	- 2	7149				
Final Flow Pres.	- 1	9979				
	- 2	6511				
Final Closed in Pres.	-	11033				
Final Hydro Mud Pres.	-	12033				

Legal Location Sec. - Twp. - Rge. SEC. 32 - 25S - 33E | Field Area WILDCAT | County LEA | State NEW MEXICO

Lease Name RED HILLS | Well No. 1 | Test No. 3

Lease Owner/Company Name PURE OIL COMPANY | Owner's District MIDLAND

Meas. From Tester Valve

FORMATION TEST DATA

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Gauge No. 1898 | Depth 13414' | Clock 72 hour | Ticket No. 330338

	First Flow Period		Initial Closed In Pressure			Second Flow Period		Final Closed In Pressure		
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.
P_0	.000	10498	.000		10074	.000	7130	.000		5825
P_1	.0023	10165	.003		10874	2.972	5825	.0084		9831
P_2	.0046	10000	.006		11198			.0168		10238
P_3	.0069	10035	.009		11328	SEE		.0252		10485
P_4	.0090	10074	.012		11375	ATTACHED		.0336		10628
P_5			.015		11397		SHEET	.0420		10732
P_6			.018		11409			.0504		10814
P_7			.021		11418			.0588		10879
P_8			.024		11422			.0672		10939
P_9			.027		11427			.0756		10987
P_{10}			.030		11431			.0840		11026

Gauge No. 1897 | Depth 13418' | Clock 72 hour

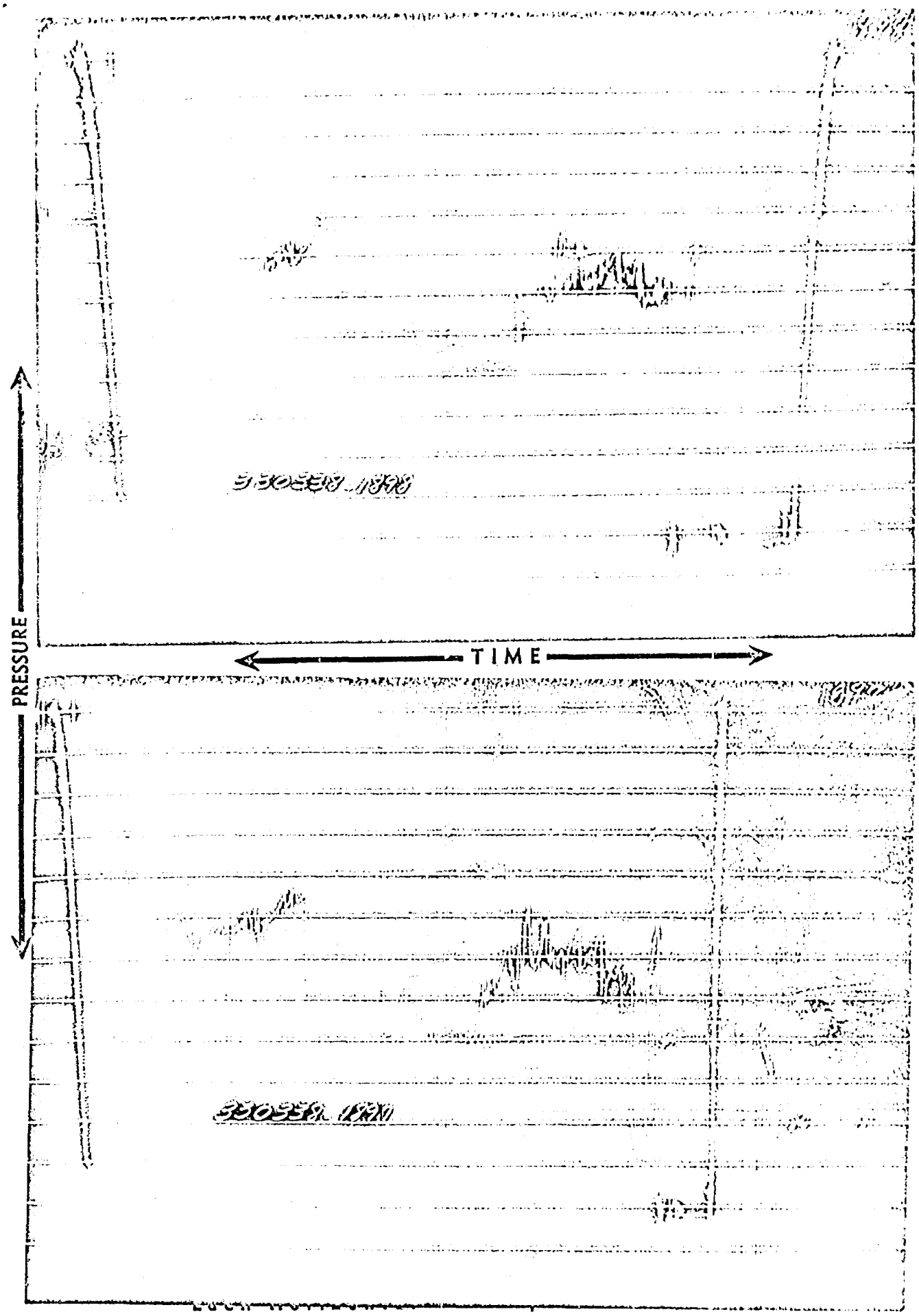
P_0	.000	10255	.000		9979	.000	7149	.000		6511
P_1	.0018	10234	.0027		11104	2.941	6511	.0082		9916
P_2	.0036	10105	.0054		11317			.0164		10272
P_3	.0054	10017	.0081		11363	SEE		.0246		10481
P_4	.0070	9979	.0108		11383	ATTACHED		.0328		10628
P_5			.0135		11396		SHEET	.0410		10741
P_6			.0162		11404			.0492		10820
P_7			.0189		11413			.0574		10887
P_8			.0216		11421			.0656		10941
P_9			.0243		11425			.0738		11000
P_{10}			.0270		11429			.0820		11033

Reading Interval 5 | 2.5 | 7.5 Minutes

REMARKS:

SPECIAL PRESSURE DATA

Form No. 1296-R2


PRESSURE
TIME

PURE OIL COMPANY
TICKET #330338
B. T. #1897
SECOND FLOW PERIOD

	TIME DEFL. .000"	PSI TEMP. CORR.
P-0	.000	7149
1	.0665	6000
2	.1329	5391
3	.1994	5187
4	.2659	5174
5	.3323	5183
6	.3988	5021
7	.4652	5455
8	.5317	5179
9	.5982	5251
10	.6646	5226
11	.7311	5187
12	.7976	5336
13	.8640	5123
14	.9305	4699
15	.9969	4525
*16	1.0800	4525
	60 MINUTE INTERVALS	
	*LAST INTERVAL EQUAL TO 75 MINUTES	
17	1.1133	6923
18	1.1465	6851
19	1.1797	6860
20	1.2130	6834
21	1.2462	6791
22	1.2794	6783
23	1.3126	6783
24	1.3459	6787
25	1.3791	6787
26	1.4123	6774
27	1.4456	6766
28	1.4788	6783
29	1.5120	6791
30	1.5453	7872
31	1.5785	7685
32	1.6117	7553
33	1.6450	7536
34	1.6782	7409
35	1.7114	7349
P-36	1.7447	7460
37	1.7779	7366
38	1.8111	8047
39	1.8444	7906
40	1.8776	7868
41	1.9108	7749
42	1.9440	7830
43	1.9773	7970
44	2.0105	7872
45	2.0437	7894
46	2.0770	7464
	30 MINUTE INTERVALS	
46	2.0770	7464
47	2.4425	5319
	TIME FROM 9:30 AM to 3:00 PM	
48	2.5090	6089
49	2.5754	6094
50	2.6419	5243
51	2.7084	5885
52	2.7748	6489
53	2.8413	6502
54	2.9078	6783
**55	2.9410	6511
	60 MINUTE INTERVALS	
	**LAST INTERVAL EQUAL TO 30 MINUTES	

PURE OIL COMPANY
TICKET #330338
B.T. #1898
SECOND FLOW PERIOD

	TIME DEFL. .000"	PSI TEMP. CORR.
P-0	.000	7130
1	.0672	5974
2	.1343	5380
3	.2015	5240
4	.2687	5197
5	.3358	5162
6	.4030	5031
7	.4702	5520
8	.5373	5301
9	.6045	5310
10	.6716	5162
11	.7388	4852
12	.8060	4834
13	.8731	4917
14	.9403	4476
15	1.0075	4515
*16	1.0910	4240
	60 MINUTE INTERVALS	
	*LAST INTERVAL EQUAL TO 75 MINUTES	
17	1.1250	6821
18	1.1586	6760
19	1.1922	6769
20	1.2257	6738
21	1.2593	6699
22	1.2929	6690
23	1.3265	6690
24	1.3601	6694
25	1.3936	6690
26	1.4272	6681
27	1.4608	6668
28	1.4944	6690
29	1.5280	6699
30	1.5616	7796
31	1.5951	7565
32	1.6287	7426
33	1.6623	7417
34	1.6959	7296
35	1.7295	7239

	TIME DEFL. .000"	PSI TEMP. CORR.
P-36	1.7631	7348
37	1.7966	7243
38	1.8302	7900
39	1.8638	7804
40	1.8974	7748
41	1.9310	7635
42	1.9645	7713
43	1.9981	7839
44	2.0317	7778
45	2.0653	7774
46	2.0989	7517
	30 MINUTE INTERVALS	
46	2.0989	7517
47	2.4683	5035
	TIME FROM 9:30 AM to 3:00 PM	
48	2.5354	5729
49	2.6026	5502
50	2.6698	5083
51	2.7369	5550
52	2.8041	5838
53	2.8713	6245
54	2.9384	6048
**55	2.9720	5825
	60 MINUTE INTERVALS	
	**LAST INTERVAL EQUAL TO 30 MINUTES	

PURE OIL COMPANY
TICKET #330338
REMARKS

Opened tool for 20 minute 1st flow. Closed tool for 25 minute initial closed in pressure. Reopened tool for 2655 minute 2nd flow and closed tool for 75 minute final closed in pressure.

TIME	REMARKS
7:00 PM	Set clocks
12:30 AM	On bottom 13,400+
1:30 AM	Open well to pits
1:50 AM	Shut in for initial closed in pressure
2:15 AM	Open to pit on 1/4" & 5/8" chokes
9:00 AM	Open to pit on 5/8" & 3/4" chokes
12:00 NOON	Plug line up to pit briefly
6:30 PM	Flow through separator with 18/64" choke
1:15 AM	Unload volume of mud, flow rate increased 8.6 to 9.6 MMCF/D
9:30 AM	Set choke at 26/64"
12:30	Turned to pit through 3/4" & 5/8" chokes
1:40 PM	To separator 26/64" choke
2:40 PM	To pit through 3/4" & 5/8" chokes
3:00 PM	Flow to separator 26/64" chokes
5:30 PM	Open to 28/64" choke
6:00 PM	Open to 26/64" choke
8:30 PM	Open to 24/64" choke
9:00 PM	Open to 20/64" choke
10:30 PM	Shut in for final closed in pressure
11:45 PM	Open to pit
12:45 AM	Pumped in mud to kill

	1st Min.	2nd Min.				
Flow Time	3	60	Date	4-9-63	Ticket Number	342947 S
Closed In Press. Time	30	30	Kind of Job	OPEN HOLE	Halliburton District	LOVINGTON
Pressure Readings	Field	Office Corrected	Tester	MAC MC CANN	Witness	MR. TEAGUE
Depth Top Gauge	6677 Ft.	Blanked No Off	Drilling Contractor	SHARP DRILLING COMPANY		
BT. P.R.D. No.	35	Hour Clock 24	Elevation		Top Packer	6694'
Initial Hydro Mud Pressure	3005	2930	Total Depth	6747'	Bottom Packer	6699'
Initial Closed in Pres.	2690	2687	Interval Tested	6699-6747'	Formation Tested	Cherry Canyon
Initial Flow Pres.	- 1	45	Casing or Hole Size	12 1/4"	Casing Perfs. Top	
	55 2	51			Bot.	
Final Flow Pres.	1	47	Surface Choke	1/4"	Bottom Choke	5/8"
	85 2	80				I.D. - LENGTH
Final Closed in Pres.	2050	2037	Size & Kind Drill Pipe	4 1/2" IF	Drill Collars Above Tester	3" - 2x0'
Final Hydro Mud Pressure	3005	2930	Mud Weight	Fresh Water	Mud Viscosity	
Depth Cen. Gauge	6743 Ft.	Blanked Yes Off	Temperature	140 °F Est. / °F Actual	Anchor Size & Length	ID 2.50 OD 5.75 X 48
BT. P.R.D. No.	97	Hour Clock 24	Depths Mea. From	Rotary Table	Depth of Tester Valve	6674 Ft.
Initial Hydro Mud Pres.	3005	2973	Cushion TYPE / AMOUNT	none Ft.	Depth Back Pres. Valve	Ft.
Initial Closed in Pres.	2690	2718	Recovered	30 Feet of Water		
Initial Flow Pres.	1	*				
	55 2	18	Recovered	60 Feet of Salty water		
Final Flow Pres.	1	*				
	85 2	46	Recovered	Feet of		
Final Closed in Pres.	2050	2044	Recovered	Feet of		
Final Hydro Mud Pres.	3005	2965	Oil A.P.I. Gravity		Water Spec. Gravity	
Depth Bot. Gauge	Ft.	Blanked Off	Gas Gravity		Surface Pressure	psi
BT. P.R.D. No.		Hour Clock	Tool Opened	12:52 PM A.M. P.M.	Tool Closed	3:00 PM A.M. P.M.
Initial Hydro Mud Pres.			Remarks	Tool opened with weak blow for a 3 minute		
Initial Closed in Pres.				first flow. Rotated tool for a 30 minute initial		
Initial Flow Pres.	1			closed in pressure. Reopened tool with weak blow		
	2					
Final Flow Pres.	1			for a 60 minute second flow. Took a 30 minute		
	2					
Final Closed in Pres.				final closed in pressure. * Unable to read.		
Final Hydro Mud Pres.						

Mcg. From Tester Valve

Legal Location Sec. - Twp. - Rng. Sec. 32 T 25S R 33E — Lease Name 1 — Well No. 1 — Test No. — Field Area West Joel NE — County LEA — State NEW MEXICO

ANDREWS OFFICE — THE PURE OIL COMPANY — Lease Owner/Company Name — 11035S — Owner's District

FORMATION TEST DATA

13

Gauge No.		Depth		Clock	hour	Ticket No.	

	First Flow Period		Initial Closed In Pressure			Second Flow Period		Final Closed In Pressure		
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.
P_0	.000	45	.000		47	.000	51	.000		80
P_1	.006	47	.009		1156	.050	61	.0098		366
P_2			.018		1918	.100	68	.0196		682
P_3			.027		2152	.150	74	.0294		1028
P_4			.035		2301	.200	80	.0392		1286
P_5			.043		2410			.0490		1483
P_6			.054		2494			.0588		1639
P_7			.063		2558			.0686		1770
P_8			.072		2613			.0784		1878
P_9			.081		2653			.0882		1970
P_{10}			.090		2687			.0980		2037

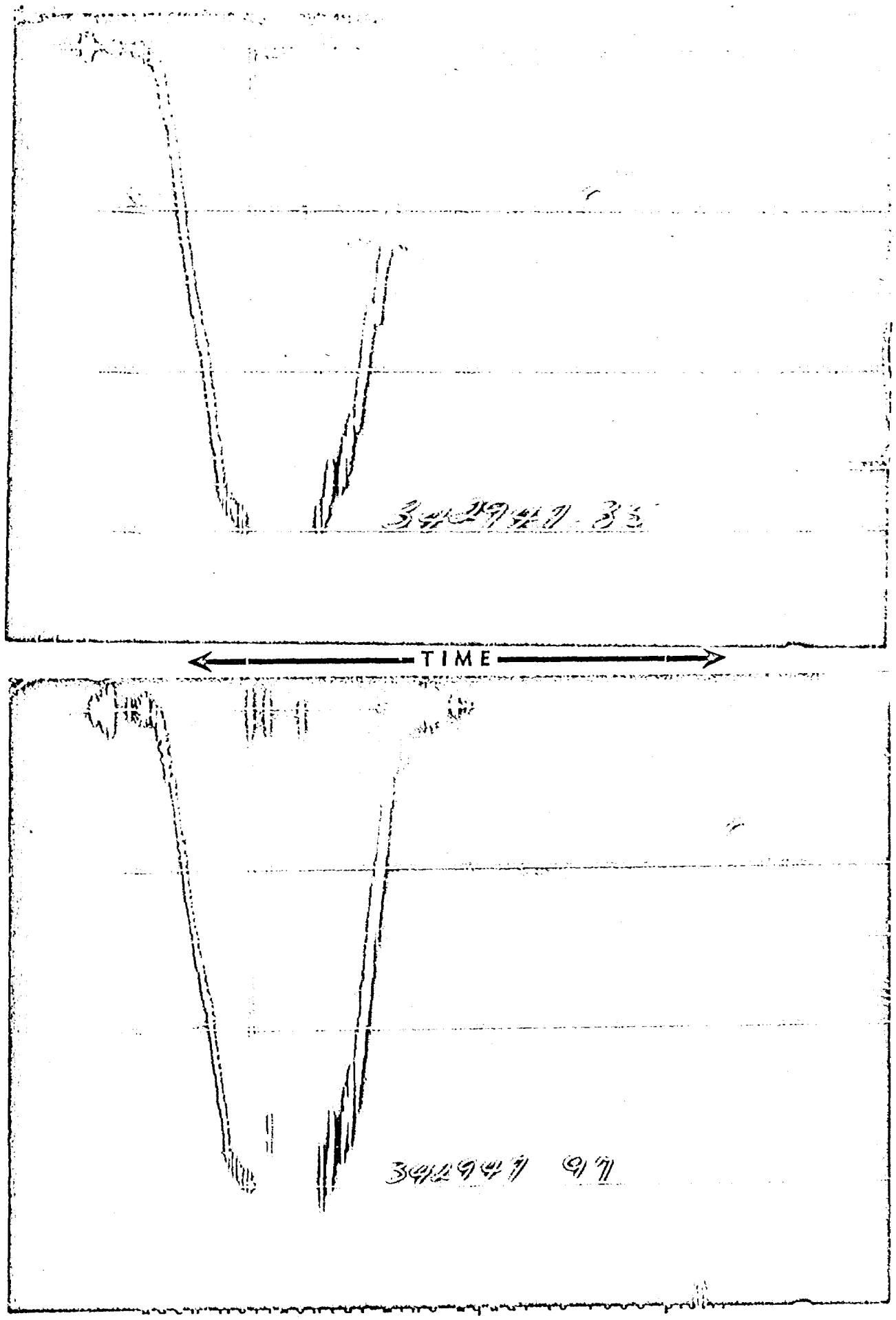
Gauge No.	97	Depth	6743'	Clock	24	hour				
P_0	.000		.000		*	.000	18	.000		46
P_1	*UNABLE TO		.0105		1132	.0485	27	.0108		474
P_2	READ		.0210		1671	.0970	35	.0216		771
P_3			.0315		2010	.1455	40	.0324		1046
P_4			.0420		2230	.1940	46	.0432		1272
P_5			.0525		2390			.0540		1458
P_6			.0630		2502			.0648		1622
P_7			.0735		2583			.0756		1756
P_8			.0840		2646			.0864		1870
P_9			.0945		2693			.0972		1961
P_{10}			.1050		2718			.1080		2043
Reading Interval			3			15		3		Minutes

REMARKS:

SPECIAL PRESSURE DATA

PRESSURE

TIME



PRESSURE

TIME

	1st Min.	2nd Min.
Flow Time	1	384
Closed In Press. Time	65	436
Pressure Readings	Field	Office Corrected
Depth Top Gauge	13465 Ft.	no Blanked Off
BT. P.R.D. No.	75	24 Hour Clock
Initial Hydro Mud Pressure	11475	11507
Initial Closed in Pres.	11280	11359
Initial Flow Pres.	1 8750	1 *
	2	2 11239
Final Flow Pres.	1 4345	1 *
	2	2 4397
Final Closed in Pres.	9915	9834
Final Hydro Mud Pressure	-	11507
Depth Cen. Gauge	Ft.	Blanked Off
BT. P.R.D. No.		Hour Clock
Initial Hydro Mud Pres.		
Initial Closed in Pres.		
Initial Flow Pres.	1	
	2	
Final Flow Pres.	1	
	2	
Final Closed in Pres.		
Final Hydro Mud Pres.		
Depth Bot. Gauge	13472 Ft.	- Blanked Off
BT. P.R.D. No.	418	24 Hour Clock
Initial Hydro Mud Pres.	11400	11449
Initial Closed in Pres.	11240	11291
Initial Flow Pres.	1	1 *
	6370 2	2 11161
Final Flow Pres.	1	1 *
	4215 2	2 4295
Final Closed Pres.	10400	10412
Final Hydro Mud Pres.	-	11449

Date	8-23-63	Ticket Number	362805 - S
Kind of Job	Open Hole	Halliburton District	Hobbs
Tester	Joe A. Kennedy	Witness	Hugh Teague
Drilling Contractor	Sharp Drlg Co.		
Elevation	3380' GL	Top Packer	12650'
Total Depth	13499'	Bottom Packer	-
Interval Tested	12938-13499'	Formation Tested	Wolfcamp
Casing or Hole Size	10 3/4"	Casing Top / Perfs. Bot.	
Surface Choke	3/8(1/8-3/8) 3/8-½"	Bottom Choke	-
Size & Kind Drill Pipe	4½" XH	Drill Collars Above Tester	I.D. - LENGTH 3# x 360'
Mud Weight	16	Mud Viscosity	65
Temperature	°F Est. 190 °F Actual	Anchor Size & Length	ID / OD x
Depths Mea. From	Ground Level	Depth of Tester Valve	12633 Ft.
Cushion TYPE AMOUNT	water 12633 Ft.	Depth Back Pres. Valve	Ft.
Recovered	Feet of		
Recovered	12633 Feet of	water blanket	
	Gas to surface with mud & distillate.		
Recovered	Feet of		
Recovered	Feet of		
Oil A.P.I. Gravity		Water Spec. Gravity	22000 PPMC
Gas Gravity		Surface Pressure	psi
Tool Opened	4:43 A.M. / 5:50 P.M.	Tool Closed	4:45 A.M. / 12:14 PM P.M.
Remarks	See attached sheet for remarks.		
	*unable to read.		

Mea. From Tester Valve

Legal Location Sec. - Twp. - Rng. Sec. 32-T25S-R33E | Field Area Wildcat | County LEA | State NEW MEXICO

RED HILLS UNIT — Lease Name | 1 — Well No. | 4 — Test No. | THE PURE OIL COMPANY — Lease Owner/Company Name | HOBBS — Owner's District

FORMATION TEST DATA

17

equal intervals

SPECIAL PRESSURE DATA

Gauge No. 75	Depth 13,465	Clock 24 hour	Ticket No. 362805

	First Flow Period		Initial Closed In Pressure			Second Flow Period		Final Closed In Pressure		
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.
P_0	Unable	to read	.000	-	10854	.000	11239	.000	-	4397
P_1			.0258	.9421	11232	.227	8752	.0165	1.9807	4634
P_2			.0516	.6880	11297	.454	8283	.0330	1.6842	6981
P_3			.0774	.5543	11324	.681	5900	.0495	1.5126	7835
P_4			.1032	.4680	11340	.908	4854	.0660	1.3921	8276
P_5			.1290	.4066	11346	1.135	5209	.0825	1.2995	8552
P_6			.1548	.3602	11353	1.362	4397	.0990	1.2247	9338
P_7			.1806	.3237	11356			.1155	1.1620	9508
P_8			.2064	.2942	11356			.1320	1.1083	9630
P_9			.2322	.2698	11359			.1485	1.0614	9738
P_{10}			.2580	.2492	11359			.1650 *	1.0198	9834

Gauge No. 418	Depth 13,472	Clock 24 hour	

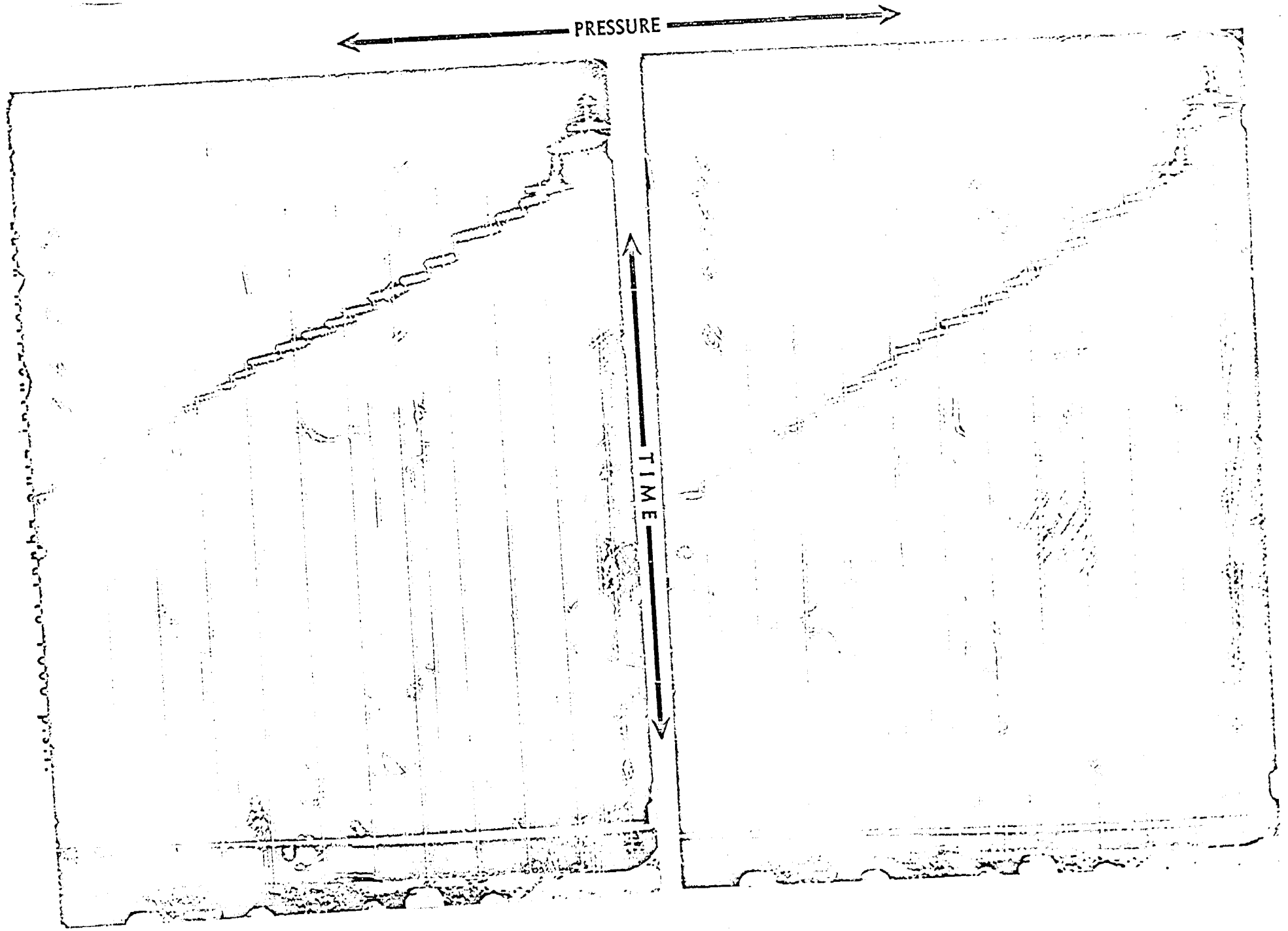
P_0	Unable	to read	.000	-	10772	.000	11161	.000	-	4295
P_1			.0243	.7088	11170	.212	8665	.038	1.5694	7891
P_2			.0486	.4853	11226	.424	8188	.076	1.2799	9096
P_3			.0729	.3552	11251	.636	5806	.114	1.1151	9528
P_4			.0972	.3072	11263	.848	4738	.152	1.0011	9778
P_5			.1215	.2608	11266	1.060	5117	.190	.9149	9960
P_6			.1458	.2268	11279	1.272	4295	.228	.8461	10089
P_7			.1701	.2008	11285			.266	.7894	10197
P_8			.1944	.1802	11291			.304	.7414	10280
P_9			.2187	.1635	11291			.342	.6999	10354
P_{10}			.2430	.1496	11291			.380 **	.6637	10412
Reading Interval			6.5			64				Minutes

REMARKS: * Read at the end of approx 47 minutes when chart time expired.

** Read at the end of approx. 114 minutes when chart time expired. Cut up in 10 equal intervals.

SPECIAL PRESSURE DATA

Form No. 1296-R2


PRESSURE
TIME

	1st Min.	2nd Min.
Flow Time	13	240
Closed In Press. Time	60	120
Pressure Readings	Field	Office Corrected
Depth Top Gauge	17440 Ft.	NO Blanked Off
BT. P.R.D. No.	1898	24 Hour Clock
Initial Hydro Mud Pressure	-	8226
Initial Closed in Pres.	-	7596
Initial Flow Pres.	-	1 5690
	-	2 5721
Final Flow Pres.	-	1 5716
	-	2 889
Final Closed in Pres.	-	7600
Final Hydro Mud Pressure	-	8183
Depth Gen. Gauge	Ft.	Blanked Off
BT. P.R.D. No.		Hour Clock
Initial Hydro Mud Pres.		
Initial Closed in Pres.		
Initial Flow Pres.	1	
	2	
Final Flow Pres.	1	
	2	
Final Closed in Pres.		
Final Hydro Mud Pres.		
Depth Bot. Gauge	17570 Ft.	YES Blanked Off
BT. P.R.D. No.	1897	48 Hour Clock
Initial Hydro Mud Pres.	8262	8245
Initial Closed in Pres.	7561	7601
Initial Flow Pres.	- 1	5724
	- 2	5728
Final Flow Pres.	- 1	5728
	- 2	910
Final Closed in Pres.	7561	7579
Final Hydro Mud Pres.	8262	8166

Date 4-2-64 | Ticket Number 377695 S

Kind of Job OPEN HOLE TEST | Halliburton District MONAHANS

Tester MR. JACKSON | Witness MR. ODOM

Drilling Contractor SHARP DRILLING COMPANY

Elevation 3382' S.L. | Top Packer 17459'

Total Depth 17575' | Bottom Packer 17464'

Interval Tested 17464'-17575' | Formation Tested DEVONIAN

Casing or Hole Size 5 5/8" | Casing Perfs. Top - Bot. -

Surface Choke 1/4" 3/4" | Bottom Choke 3/8"

Size & Kind Drill Pipe 4½" x 20# 3½" x 13,30 | Drill Collars Above Tester (I.D. - LENGTH) 1 3/4" x 750'

Mud Weight 9 | Mud Viscosity 55

Temperature 240 °F Est. / °F Actual | Anchor Size & Length ID 1 3/4" OD 3 3/4" x 111'

Depths Mea. From ROTARY BUSHINGS | Depth of Tester Valve 17435' Ft.

Cushion TYPE 7500' WATER AMOUNT Ft. | Depth Back Pres. Valve - Ft.

Recovered 10,14 BBLS. Feet of Sulphur water

Recovered Feet of

Recovered Feet of

Oil A.P.I. Gravity - | Water Spec. Gravity 1.55

Gas Gravity Est. .65 | Surface Pressure 800# MAX. psi

Tool Opened 5:30 AM A.M. P.M. | Tool Closed 12:40 PM A.M. P.M.

Remarks Opened tool for 13 minute 1st flow. Closed tool for 60 minute initial closed in pressure. Reopened tool for 240 minute 2nd flow with 1800# nitrogen. Bled down to 6300. Blow increased slowly to good blow in 35 minutes. Unloaded water cushion and had gas to surface in 20 minutes. Gas flow decreased to weak at end of test. Closed tool for 120 minute final closed in pressure.

Legal Location Sec. - Twp. - Rng. SEC. 32 - 25 - 33 | Field Area WILDCAT | County LEA | State NEW MEXICO | Office MIDLAND

Lease Name REED HILLS UNIT | Well No. 1 | Test No. 5 | Lease Owner/Company Name PURE OIL COMPANY

Meas. From Tester Valve

FORMATION TEST DATA

Gauge No. [illegible]	Depth [illegible]	Clock [illegible] hour	Ticket No. [illegible]

	First Flow Period		Initial Closed In Pressure			Second Flow Period		Final Closed In Pressure		
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.
P_0	.000	5690	.000	---	[illegible]	.000	5723	.000	---	[illegible]
P_1	.0101	5703	.0202	.509	[illegible]	.1596	4113	.0101 .0397	2.767 1.347	[illegible] [illegible]
P_2	.0208	5716	.0404	.205	[illegible]	.3192	2670	.0794	1.065	[illegible]
P_3	.0312	5716	.0606	.213	[illegible]	.4788	2822	.1191	.907	[illegible]
P_4	.0450	5716*	.0808	.192	[illegible]	.6384	1757	.1588	.800	[illegible]
P_5			.1010	.160	7596	.7980	889	.1985	.720	7600
P_6			.1212	.137	7596			.2382	.657	7600
P_7			.1414	.120	7596			.2779	.606	7600
P_8			.1616	.107	7596			.3176	.563	7600
P_9			.1818	.096	7596			.3573	.526	7600
P_{10}			.2020	.087	7596			.3970	.495	7600

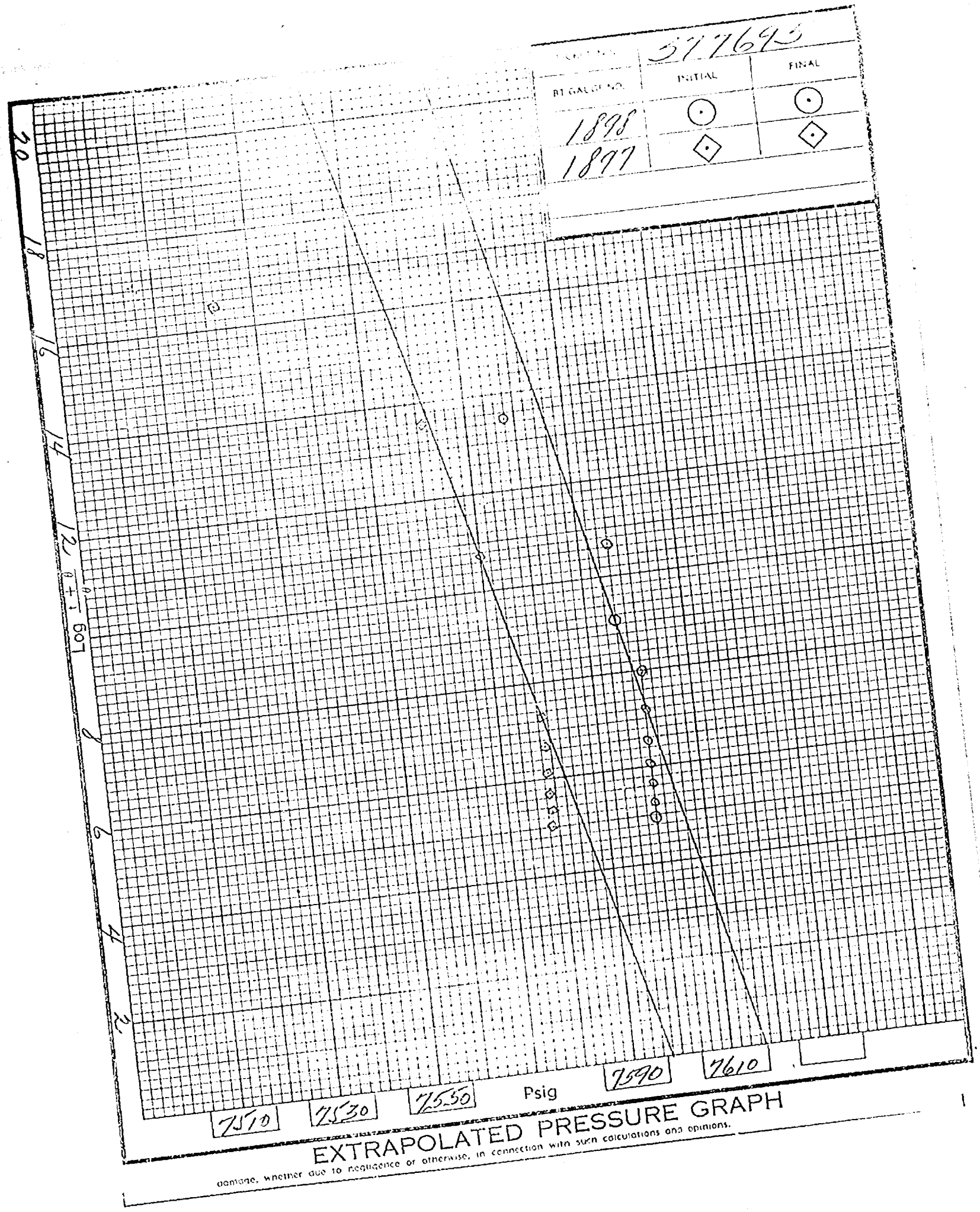
Gauge No. 1897	Depth [illegible]	Clock 48 hour								
P_0	.000	5724	.000	---	5728	.000	5728	.000	---	9[illegible]0
P_1	.022	5728	.0202	.496	7575	.082	4079	.010 .0199	1.645 1.356	75[illegible] 756
P_2			.0206	.336	7592	.164	2675	.0398	1.074	7580
P_3			.0309	.234	7596	.246	2816	.0597	.916	7579
P_4			.0412	.186	7596	.328	3754	.0796	.808	7579
P_5			.0515	.154	7601	.410	910	.0995	.728	7579
P_6			.0618	.132	7601			.1194	.604	7579
P_7			.0721	.116	7601			.1393	.613	7579
P_8			.0824	.103	7601			.1592	.570	7579
P_9			.0927	.092	7601			.1791	.533	7579
P_{10}			.1030	.084	7601			.1990	.501	7579

Reading Interval	3	6	48	32	Minutes

REMARKS: *Last interval equal to 4 minutes **Unequal interval

SPECIAL PRESSURE DATA

	377693
BT GAUGE NO.	INITIAL / FINAL
1898	⊙ / ⊙
1877	◇ / ◇



EXTRAPOLATED PRESSURE GRAPH

damage, whether due to negligence or otherwise, in connection with such calculations and opinions.

Gas Production

B.T. Gauge Numbers			1898 PRESSURE	1897 PRESSURE	Ticket Number 4/2/64	37695
Initial Hydrostatic			8226	8245	Elevation	3382 ft.
Final Hydrostatic			8183	8166	Production Rate Intial	- m cu. ft.
		Time			Production Rate Final	2500 m cu. ft.
1st Flow	Initial	- - - -	5690	5724		
	Final	13	5716	5728	Hole Size	5.62 in.
Initial Closed In Pressure		60	7596	7601	Footage Tested	Net 40 ft.
	Initial	- - - -	5721	5728	Mud Weight	9. lbs. gal.
2nd Flow	Final	240	889	910	Gas Viscosity	.032 cp
Final Closed In Pressure		120	7600	7579	Gas Gravity	Est. .65 —
	Initial		-	-	Gas Compressibility	1.25 —
Extrapolated Static Pressure	Final		7617	7698	TEMP.	240
	Initial		-	-		
Slope ~~Psi²/cycle~~ P10	Final		7594	7572		

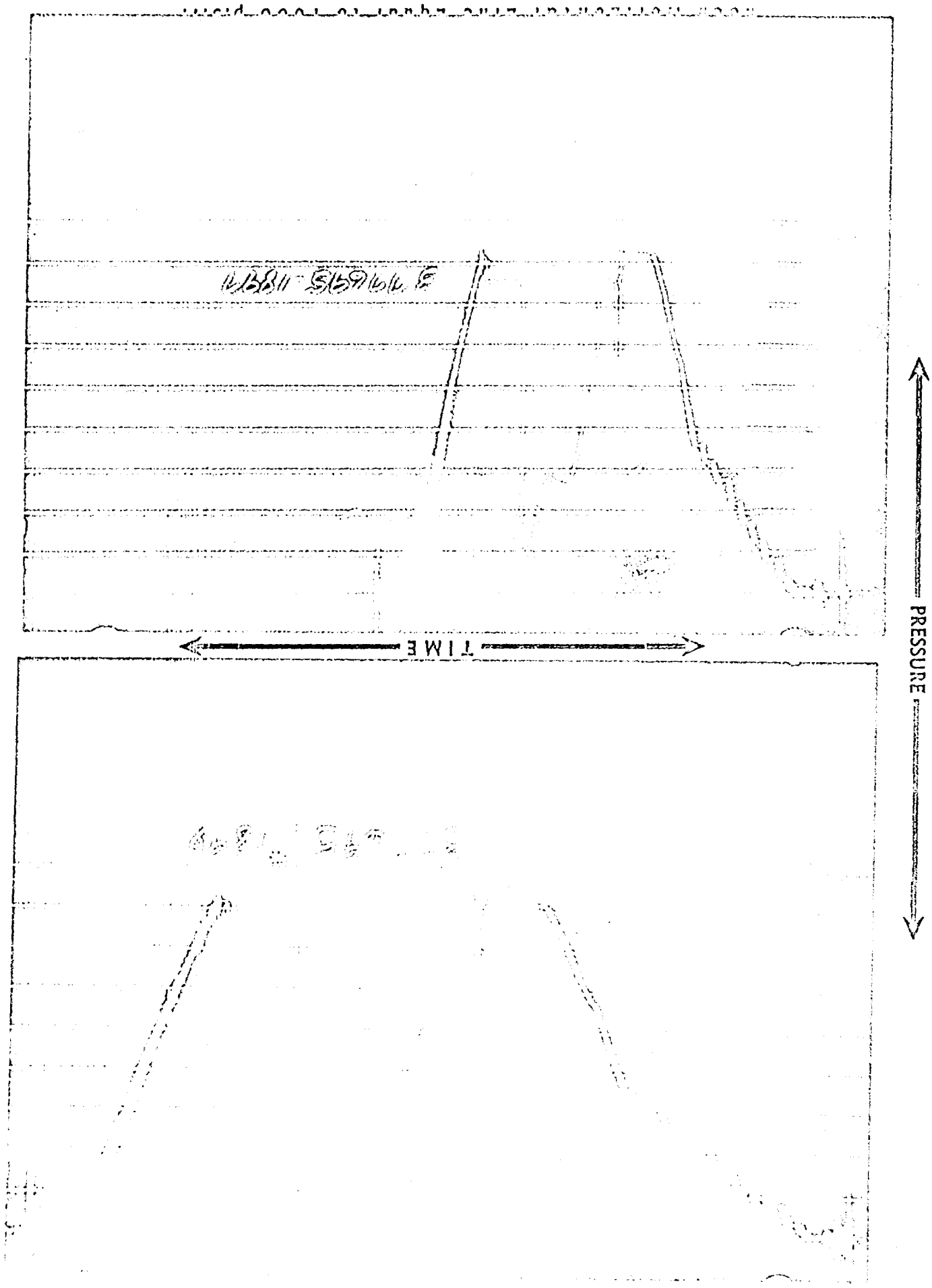
Remarks:

SUMMARY

Product	Equation	BT Gauge Number Depth Initial	BT Gauge Number Depth Final	Initial	Final	Units
			1898/17440'		1897/17570'	
Transmissability	$\frac{Kh}{\mu} = \frac{1637\ Q\ ZT}{m}$		10235		9078.	md. ft. / cp
Theoretical Flow Capacity	$Kh = \frac{Kh}{\mu}\ \mu$		327.		290.	md. ft.
Average Effective Permeability	$K = \frac{Kh}{h}$		-		-	md.
	$K_1 = \frac{Kh}{h_1}$		8.19		7.26	md.
Indicated Flow Capacity	$(Kh)_3 = \frac{3200\ Q_s\ \mu\ ZT\ \log(0.472\ b/r_w)}{P_s^2 - P_f^2}$		7.81		7.76	md. ft.
Damage Ratio	$DR = \frac{\text{Theo. Flow Cap}}{\text{Indicated Flow Cap}}\ \frac{Kh}{(Kh)_3}$		41.8		37.4	—
Indicated Flow Rate	$OF_1 = \frac{Q_s\ P_s^2}{P_s^2 - P_f^2}$ Max.		2534.		2536.	MCFD
	$OF_2 = \frac{Q_s\ P_s}{\sqrt{P_s^2 - P_f^2}}$ Min.		2517.		2518.	MCFD
Theoretical Potential Rate	$OF_3 = OF_1\ DR$ Max.		106189.		94979.	MCFD
	$OF_4 = OF_2\ DR$ Min.		105464.		94295.	MCFD
Approx. Radius of Investigation	$b \cong \sqrt{Kt}$ or $\sqrt{Kt_0}$		-		-	ft.
	$b_1 \cong \sqrt{K_1 t}$ or $\sqrt{K_1 t_0}$		44.8		42.2	ft.
Potentiometric Surface *	Pot. = (El − GD) + (2.319 Ps)		3605.		3431.	ft.

NOTICE: These calculations are based upon information furnished by you and taken from Drill Stem Test pressure charts, and are furnished you for your information. In furnishing such calculations and evaluations based thereon, Halliburton is merely expressing its opinion. You agree that Halliburton makes no warranty express or implied as to the accuracy of such calculations or opinions, and that Halliburton shall not be liable for any loss or damage, whether due to negligence or otherwise, in connection with such calculations and opinions.

INTERPRETATIONS AND CALCULATIONS


PRESSURE
TIME

	1st Min.	2nd Min.				
Flow Time	10	240	Date	4-6-64	Ticket Number	374841 S
Closed In Press. Time	1st Min. 60	2nd Min. 60	Kind of Job	OPEN HOLE	Halliburton District	MONAHANS
Pressure Readings	Field	Office Corrected	Tester	J. C. NALL	Witness	FRANK PYE
Depth Top Gauge	17575 Ft.	No Blanked Off	Drilling Contractor	SHARP DRILLING CO.		
BT. P.R.D. No.	1398	24 Hour Clock	Elevation	3382'	Top Packer	17592'
Initial Hydro Mud Pressure	8500	8496	Total Depth	17678'	Bottom Packer	17597'
Initial Closed in Pres.	7587	7609	Interval Tested	17597-17638'	Formation Tested	Devonian
Initial Flow Pres.	1 5477	1 5435	Casing or Hole Size	5 5/8"	Casing Perfs. Top / Bot.	
	2	2 5474				
Final Flow Pres.	1 2017	1 5470	Surface Choke	1/8" - 1"	Bottom Choke	3/8"
	2	2 1983				I.D. - LENGTH
Final Closed in Pres.	7587	7583	Size & Kind Drill Pipe	3½-13.30 4½-20# DP	Drill Collars Above Tester	1 3/4" .. 842'
Final Hydro Mud Pressure	8456	8439	Mud Weight	9.1	Mud Viscosity	56
Depth Cen. Gauge	Ft.	Blanked Off	Temperature	°F Est. 246 °F Actual	Anchor Size & Length	ID 1 3/4 OD 2 3/4 X 41
BT. P.R.D. No.		Hour Clock	Depths Mea. From	KB	Depth of Tester Valve	17570' Ft.
Initial Hydro Mud Pres.			Cushion TYPE Water AMOUNT 3500 Ft. Nitrogen 2500		Depth Back Pres. Valve	Ft.
Initial Closed in Pres.			Recovered	Feet of		
Initial Flow Pres.	1		Recovered	11 bbls. Feet of Heavy gas cut sulphur water		
	2					
Final Flow Pres.	1		Recovered	Feet of		
	2					
Final Closed in Pres.			Recovered	Feet of		
Final Hydro Mud Pres.			Oil A.P.I. Gravity		Water Spec. Gravity	
Depth Bot. Gauge	17634 Ft.	Yes Blanked Off	Gas Gravity		Surface Pressure	20 3/4" choke psi
BT. P.R.D. No.	1897	48 Hour Clock	Tool Opened	8:15 AM A.M. P.M.	Tool Closed	2:25 PM A.M. P.M.
Initial Hydro Mud Pres.	8436	8502	Remarks	Tool opened for a 10 minute first flow.		
Initial Closed in Pres.	7561	7618		Closed in for a 60 minute initial closed in		
Initial Flow Pres.	1 5456	1 5456		pressure. Reopened tool and started bleeding		
	2 5456	2 5491				
Final Flow Pres.	1	1 5482		off nitrogen thru 1/4" to 3/4" chokes. No psi		
	1864	2 1978				
Final Closed in Pres.	7605	7579		in 2 hrs. Gas to the surface in 2 hours, 10 mins.		
Final Hydro Mud Pres.	8349	8441		Max. gas 478,000 cu ft p. d. 3/4" choke.		

Legal Location Sec. - Twp. - Rng. 32 25 33 | Field Area Wildcat | County LEA | State N. MEXICO

Lease Name RED HILLS UNIT | Well No. 1 | Test No. 6

Lease Owner/Company Name THE PURE OIL COMPANY

Owner's District MIDLAND

Mea. From Tester Valve

FORMATION TEST DATA

20

Gauge No.	1898		Depth	[illegible]		Clock	24	hour	Ticket No.	374841		
	First Flow Period		Initial Closed In Pressure			Second Flow Period			Final Closed In Pressure			
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.		Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	
P_0	.000	5435	.000	–	5470	.000	5474		.000		1985	
P_1	.006	5439	.010 .020	.6020 .3979	7583 * 7596	.102	4378		.019	1.6582	7452	
P_2	.012	5456	.040	.2430	7604	.204	3235		.038	1.3666	7487	
P_3	.018	5461	.060	.1760	7609	.306	1739		.057	1.1998	7513	
P_4	.024	5465	.080	.1383	7609	.408	1478		.076	1.0839	7530	
P_5	.030	5470	.100	.1139	7609	.510	1539		.095	.9958	7548	
P_6			.120	.0969	7609	.612	1617		.114	.9253	7556	
P_7			.140	.0843	7609	.714	1822		.133	.8669	7565	
P_8			.160	.0746	7609	.816	1983		.152	.8172	7574	
P_9			.180	.0669	7609				.171	.7743	7578	
P_{10}			.200	.0606	7609				.190	.7366	7583	

Gauge No.	1897		Depth	17,634		Clock	48	hour			
P_0	.000	5456	.000	–	5482	.000	5491		.000	–	1978	
P_1	.0032	5456	.0060 .0102	.5642 .4097	7575 * 7597	.052	4382		.0095	1.6672	7461	
P_2	.0064	5461	.0204	.2514	7610	.104	3307		.0190	1.3754	7491	
P_3	.0096	5474	.0306	.1826	7614	.156	1855		.0285	1.2084	7513	
P_4	.0128	5478	.0408	.1436	7618	.208	1491		.0380	1.0923	7531	
P_5	.0160	5482	.0510	.1185	7618	.260	1544		.0475	1.0041	7544	
P_6			.0612	.1008	7618	.312	1618		.0570	.9334	7557	
P_7			.0714	.0878	7618	.364	1816		.0665	.8748	7566	
P_8			.0816	.0777	7618	.416	1978		.0760	.8250	7570	
P_9			.0918	.0697	7618				.0855	.7819	7575	
P_{10}			.1020	.0632	7618				.0950	.7440	7579	
Reading Interval		2	6			30			6			Minutes

REMARKS: * Uneven interval

SPECIAL PRESSURE DATA

TICKET NO.	5746491	
BT GAUGE NO.	INITIAL	FINAL
1898	⊙	⊙
1897	◇	◇

Log $\frac{1}{n}$

0 1 2 3 4

7200 7300 7400 Psig 7500 7700

EXTRAPOLATED PRESSURE GRADI

Gas Production

B.T. Gauge Numbers		1898	1897	Ticket Number 4-6-64	37484
		PRESSURE	PRESSURE		
Initial Hydrostatic		8496	8502	Elevation	3382 ft.
Final Hydrostatic		8439	8441	Production Rate Intial	. m cu. ft.
		Time		Production Rate Final	– m cu. ft.
1st Flow	Initial	– – – –	5435	5456	
	Final	10	5470	5482	Hole Size 5.62 in.
Initial Closed In Pressure		60	7609	7618	Footage Tested 41 ft.
2nd Flow	Initial	– – – –	5474	5491	Mud Weight 9.1 lbs. gal.
	Final	240	1983	1978	Gas Viscosity .032 cp.
Final Closed In Pressure		60	7583	7579	Gas Gravity Est. 65 —
Extrapolated Static Pressure	Initial	–	–		Gas Compressibility 1.25 —
	Final	7668	7658		Temp. 246
Slope ~~Psi²/cycle~~ P-10	Initial	–	–		
	Final	7550	7550		

Remarks:

SUMMARY

Product	Equation	BT Gauge Number 1898 Depth 17575 Initial	BT Gauge Number 1898 Depth 17575 Final	BT Gauge Number 1897 Depth 17634 Initial	BT Gauge Number 1897 Depth 17634 Final	Units
Transmissability	$\frac{Kh}{\mu} = \frac{1637\ Q_c\ ZT}{m}$		48.27		52.7	md. ft. / cp
Theoretical Flow Capacity	$Kh = \frac{Kh}{\mu}\ \mu$		1.54		1.69	md. ft.
Average Effective Permeability	$K = \frac{Kh}{h}$				--	md.
	$K_1 = \frac{Kh}{h_1}$		.037		.041	md.
Indicated Flow Capacity	$(Kh)_3 = \frac{3200\ Q_c\ \mu\ ZT\ \log(0.472\ b/r_w)}{P_s^2 - P_f^2}$		.083		.085	md. ft.
Damage Ratio	$DR = \frac{\text{Theo. Flow Cap}}{\text{Indicated Flow Cap}}\ \frac{Kh}{(Kh)_3}$		18.5		19.8	—
Indicated Flow Rate	$OF_1 = \frac{Q_c}{P_s^2 - P_f^2}\ P_s^2$ Max.		64.3		64.3	MCFD
	$OF_2 = \frac{Q_c}{\sqrt{P_s^2 - P_f^2}}\ P_s$ Min.		62.1		62.1	MCFD
Theoretical Potential Rate	$OF_3 = OF_1\ DR$ Max.		1195.		1275	MCFD
	$OF_4 = OF_2\ DR$ Min.		1154		1232	MCFD
Approx. Radius of Investigation	$b \leq \sqrt{Kt}$ or $\sqrt{Kt_0}$					ft.
	$b_1 \leq \sqrt{K_1 t}$ or $\sqrt{K_1 t_0}$		3.30		3.44	ft.
Potentiometric Surface *	Pot. = (El − GD) + (2.319 Ps)		3589		3506	ft.

NOTICE: These calculations are based upon information furnished by you and taken from Drill Stem Test pressure charts, and are furnished you for your information. In furnishing such calculations and evaluations based thereon, Halliburton is merely expressing its opinion. You agree that Halliburton makes no warranty express or implied as to the accuracy of such calculations or opinions, and that Halliburton shall not be liable for any loss or damage, whether due to negligence or otherwise, in connection with such calculations and opinions.

INTERPRETATIONS AND CALCULATIONS

PRESSURE

TIME

	1st	Min.	2nd	Min.
Flow Time	30		420	
Closed In Press. Time	60		760	

Pressure Readings	Field	Office Corrected
Depth Top Gauge	17450 Ft.	NO Blanked Off
BT. P.R.D. No.	1898	2½ Hour Clock
Initial Hydro Mud Pressure	8182	8200
Initial Closed in Pres.	7673	7526
Initial Flow Pres.	1669	1 1283 2 1767
Final Flow Pres.	2626	1 1648 2 2600
Final Closed in Pres.	7673	7552
Final Hydro Mud Pressure	8285	8317
Depth Cen. Gauge	Ft.	Blanked Off
BT. P.R.D. No.		Hour Clock
Initial Hydro Mud Pres.		
Initial Closed in Pres.		1
Initial Flow Pres.		2
Final Flow Pres.		1 2
Final Closed in Pres.		
Final Hydro Mud Pres.		
Depth Bot. Gauge	17688 Ft.	TES Blanked Off
BT. P.R.D. No.	1897	48 Hour Clock
Initial Hydro Mud Pres.	-	8231
Initial Closed in Pres.	-	7535
Initial Flow Pres.	- -	1 1794 2 2070
Final Flow Pres.	- -	1 1974 2 2807
Final Closed in Pres.	-	7504
Final Hydro Mud Pres.	-	8118

Date 1-10-64

Ticket Number 37697 S

Kind of Job OPEN HOLE TEST

Halliburton District MONAHANS

Tester J. JACKSON

Witness MR. MURPHY

Drilling Contractor SHARP DRILLING COMPANY

Elevation 3360' G.L.

Total Depth 17693'

Interval Tested 17469'-17693' (100')

Formation Tested DEVONIAN

Casing Perfs. Top -- Bot. --

Casing or Hole Size 5 5/8"

Surface Choke --

Bottom Choke 3/8"

Drill Collars Above Tester I.D. x LENGTH 2" x 664'

Size & Kind Drill Pipe 4½" F.H.

Mud Viscosity 57

Mud Weight 9

Temperature °F Est. 248 °F Actual

Anchor Size & Length ID 2" OD 3 3/4" X 225'

Depths Mea. From ROTARY BUSHINGS

Depth of Tester Valve 17445' Ft.

Depth Back Pres. Valve -- Ft.

Cushion TYPE -- AMOUNT -- Ft.

Recovered 1580 Feet of Black salty sulphur wate

Recovered Feet of in drill pipe

Recovered Feet of

Recovered Feet of

Oil A.P.I. Gravity --

Water Spec. Gravity 1.05

Gas Gravity Est. .06

Surface Pressure MAX. 500# psi

Tool Opened 5:20 AM A.M. P.M.

Tool Closed 4:35 PM A.M. P.M.

Remarks Opened tool for 15 minute 1st flow. Closed tool for 60 minute initial closed in pressure. Reopened tool for 420 minute 2nd flow with very weak blow and strong blow in 10 minutes. Gas to surface in 5 minutes. Well flowing gas at rate of 3 MMcF/D, and salty sulphur water at 12 BBL/H. Closed tool for 180 minute final closed in pressure.

Legal Location Sec. - Twp. - Rng. Sec. 32 - 25S - 33E

Lease Name [illegible] LEA

Well No.

Test No.

Field Area WILDCAT

County LEA

State NEW MEXICO

Company Name [illegible] OIL COMPANY

Lease Owner/Company Name

MIDLAND Owner's District

20

FORMATION TEST DATA

Gauge No. [illegible] Depth [illegible] Clock 24 hour Ticket No. [illegible]

	First Flow Period		Initial Closed In Pressure			Second Flow Period		Final Closed In Pressure		
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.
P_0	.000	1373	.000	---	1610	.000	1761	.000	---	[illegible]
P_1	.007	1396	.0188	.457	7330	.2738	2870	.061	1.382	[illegible]
P_2	.014	1487	.0376	.286	[illegible]	.5476	2739	.122	1.097	[illegible]
P_3	.021	1548	.0564	.210	7530	.8214	2726	.183	.938	[illegible]
P_4	.028	1609	.0752	.166	7557	1.0952	2670	.244	.830	7543
P_5	.035	1648	.0940	.137	7561	1.3690	2600	.305	.748	7552
P_6			.1128	.117	7570			.366	.685	7558
P_7			.1316	.102	7578			.427	.633	7560
P_8			.1504	.091	7578			.488	.589	7558
P_9			.1692	.082	7578			.549	.551	7552
P_{10}			.1880	.074	7578			.610	.519	7552

Gauge No. 1897 Depth 17638' Clock 48 hour

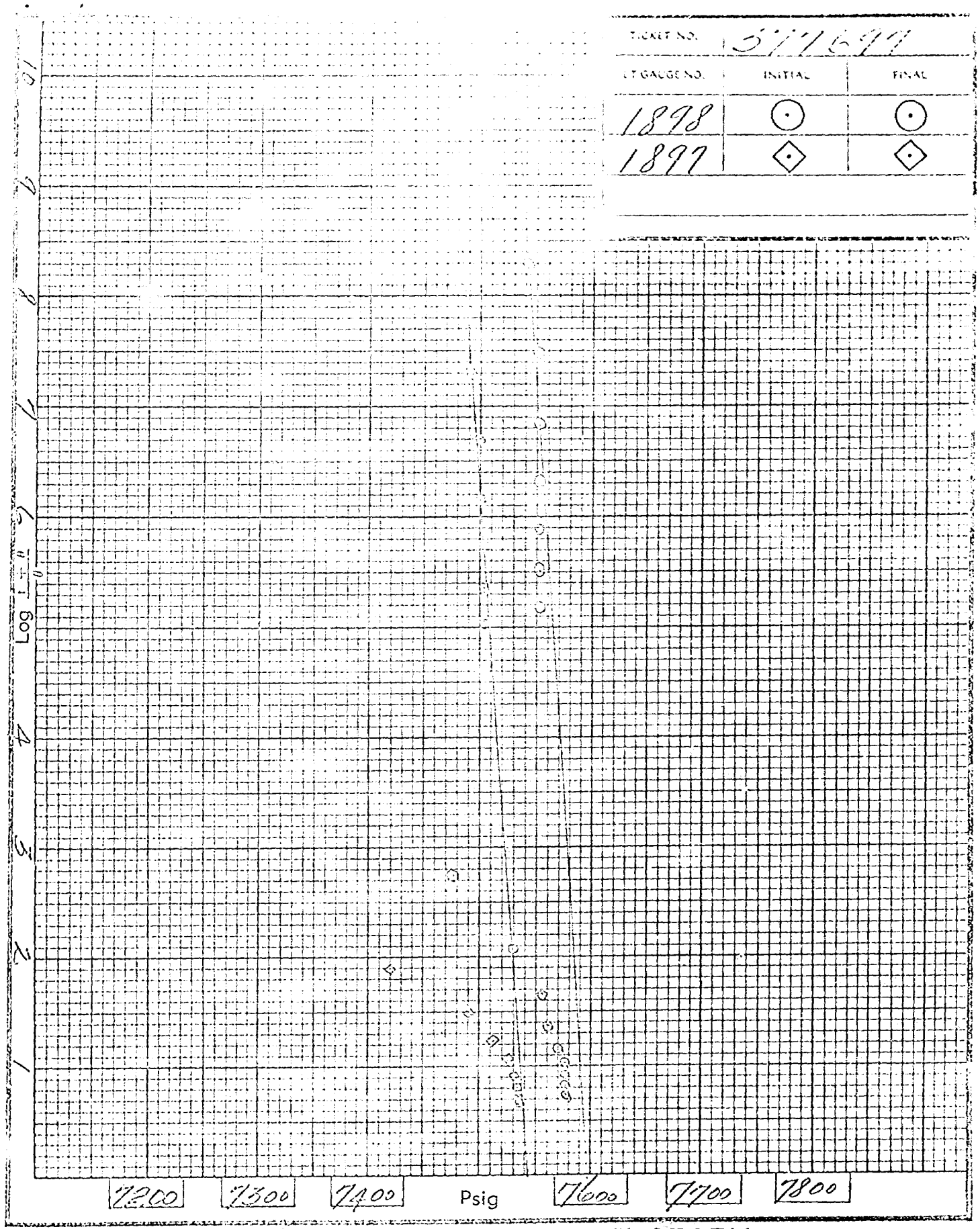
P_0	.000	1794	.000	---	1974	.000	2070	.000	---	[illegible]
P_1	.0036	1754	.011	.421	6149	.139	3048	.0324	1.362	[illegible]
P_2	.0072	1838	.022	.260	7184	.278	2939	.0648	1.079	[illegible]
P_3	.0108	1899	.033	.189	7421	.417	2912	.0972	.923	[illegible]
P_4	.0144	1956	.044	.149	7491	.556	2868	.1296	.813	[illegible]
P_5	.0180	1974	.055	.123	7513	.695	2807	.1620	.733	[illegible]
P_6			.066	.105	7526			.1944	.669	7503
P_7			.077	.091	7531			.2268	.617	7500
P_8			.088	.081	7535			.2592	.574	7504
P_9			.099	.073	7535			.2916	.537	7504
P_{10}			.110	.066	7535			.3240	.505	[illegible]

Reading Interval 3 — 6 — 84 — 18 Minutes

REMARKS:

SPECIAL PRESSURE DATA

TICKET NO.	5776977	
LT GAUGE NO.	INITIAL	FINAL
1898	⊙	⊙
1897	◇	◇



EXTRAPOLATED PRESSURE GRAPH

damage, whether due to negligence of ourselves, in connection with such calculations and opinions.

Gas Production

B.T. Gauge Numbers			2898	2[illegible]	Ticket Number	1/10/64 [illegible]
Initial Hydrostatic			8200	8231	Elevation	3380 ft
Final Hydrostatic			8217	8238	Production Rate Initial	.. m cu ft
1st Flow	Initial	Time ----	1383	1794	Production Rate Final	- m cu ft
	Final	15	1618	1974	Hole Size	5.62 in
Initial Closed In Pressure		60	2574	7535	Footage Tested	Net 100 ft
2nd Flow	Initial	----	1761	2070	Mud Weight	9. lbs/gal
	Final	420	2600	2807	Gas Viscosity	.032 cp
Final Closed In Pressure		180	7552	7504	Gas Gravity	.60 —
Extrapolated Static Pressure	Initial		-	-	Gas Compressibility	1.25 —
	Final		7598	7542	TEMP.	248
Slope Psi2/cycle P10	Initial		-	-		
	Final		7530	7472		

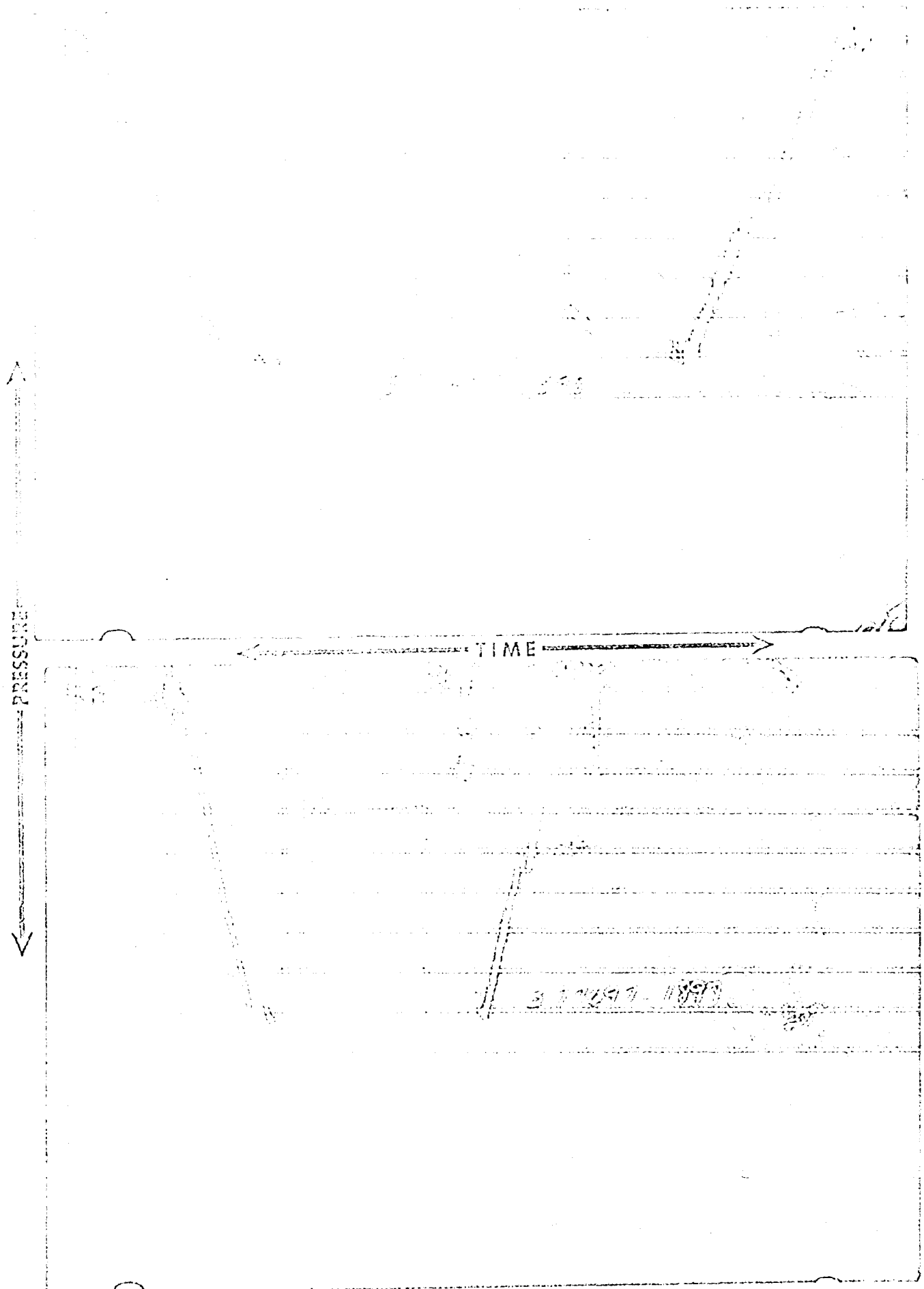
Remarks:

SUMMARY

Product	Equation	BT Gauge Number Depth 1898/17450' Initial	1898/17450' Final	BT Gauge Number Depth 1897/17688' Initial	1897/17688' Final	Units
Transmissability	$\frac{Kh}{\mu} = \frac{1637\ Q\ ZT}{m}$		4224.		4135.	md. ft. / cp
Theoretical Flow Capacity	$Kh = \frac{Kh}{\mu}\ \mu$		135.		132.	md. ft.
Average Effective Permeability	$K = \frac{Kh}{h}$		-		-	md.
	$K_1 = \frac{Kh}{h_1}$		1.35		1.32	md.
Indicated Flow Capacity	$(Kh)_a = \frac{3200\ Q_c\ \mu\ ZT\ \text{Log}(0.472\ b/r_w)}{P_s^2 - P_f^2}$		9.22		9.5	md. ft.
Damage Ratio	$DR = \frac{\text{Theo. Flow Cap}}{\text{Indicated Flow Cap}} \frac{Kh}{(Kh)_a}$		14.6		13.8	—
Indicated Flow Rate	$OF_1 = \frac{Q_c \quad P_s^2}{P_s^2 - P_f^2}$ Max.		3397		3482.	MCFD
	$OF_2 = \frac{Q_c \quad P_s}{\sqrt{P_s^2 - P_f^2}}$ Min.		3192		3232.	MCFD
Theoretical Potential Rate	$OF_3 = OF_1\ DR$ Max.		49812		48171	MCFD
	$OF_4 = OF_2\ DR$ Min.		46802		44711	MCFD
Approx. Radius of Investigation	$b \backsimeq \sqrt{Kt}$ or $\sqrt{Kt_0}$		-		-	ft.
	$b_1 \backsimeq \sqrt{K_1 t}$ or $\sqrt{K_1 t_0}$		24.5		24.2	ft.
Potentiometric Surface *	Pot. = (El — GD) + (2.319 Ps)		3549.7		3181.	ft.

NOTICE: These calculations are based upon information furnished by you and taken from Drill Stem Test pressure charts, and are furnished you for your information. In furnishing such calculations and evaluations based thereon, Halliburton is merely expressing its opinion. You agree that Halliburton makes no warranty express or implied as to the accuracy of such calculations or opinions, and that Halliburton shall not be liable for any loss or damage, whether due to negligence or otherwise, in connection with such calculations and opinions.

INTERPRETATIONS AND CALCULATIONS



Each Horizontal Line Equal to 1000 p.s.i.

Flow Time	1st 40 Min.	2nd 170 Min.	Date	5-3-64	Ticket Number	374207 S
Closed In Press. Time	1st 90 Min.	2nd 90 Min.	Kind of Job	OPEN HOLE	Halliburton District	MONAHANS
Pressure Readings	Field	Office Corrected	Tester	J.C. NAIL	Witness	FRANK PYE
Depth Top Gauge	18,530 Ft.	no Blanked Off	Drilling Contractor	SHARP DRILLING COMPANY		
BT. P.R.D. No.	1898	72 Hour Clock	Elevation	---	Top Packer	18,550'
Initial Hydro Mud Pressure	8978	9013	Total Depth	18,700'	Bottom Packer	18,555'
Initial Closed in Pres.	8021	8074	Interval Tested	(net pay 145') 18,555'-18,700'	Formation Tested	Devonion
Initial Flow Pres.	7543	1 6035 2 7970	Casing or Hole Size	5 5/8"	Casing Perfs. Top / Bot.	
Final Flow Pres.	8021	1 8061 2 8070	Surface Choke	¼" - 1"	Bottom Choke	3/8"
Final Closed in Pres.	8021	8074	Size & Kind Drill Pipe	6108 - 3½" - 13.30# 11,645 - 4½" -20.00#	Drill Collars Above Tester (I.D. - LENGTH)	1 3/4" - 755'
Final Hydro Mud Pressure	8897	8830	Mud Weight	9.2	Mud Viscosity	67
Depth Cen. Gauge	Ft.	Blanked Off	Temperature	252 °F Est. / °F Actual	Anchor Size & Length	ID 1 3/4" / OD 3 3/4" X 145'
BT. P.R.D. No.		Hour Clock	Depths Mea. From	Kelly Bushing	Depth of Tester Valve	18,525 Ft.
Initial Hydro Mud Pres.			Cushion	TYPE: nitrogen AMOUNT: 1500# water 2000 Ft.	Depth Back Pres. Valve	--- Ft.
Initial Closed in Pres.			Recovered	2000 Feet of water blanket.		
Initial Flow Pres.	1 2		Recovered	16,625' Feet of salt water.		
Final Flow Pres.	1 2		Recovered	Feet of		
Final Closed in Pres.			Recovered	Feet of		
Final Hydro Mud Pres.			Oil A.P.I. Gravity	0	Water Spec. Gravity	---
Depth Bot. Gauge	18,696 Ft.	yes Blanked Off	Gas Gravity	---	Surface Pressure	0 psi
BT. P.R.D. No.	1897	48 Hour Clock	Tool Opened	3:35 A.M. / P.M.	Tool Closed	10:05 A.M. / P.M.
Initial Hydro Mud Pres.	9047	9059	Remarks	Tool opened for 40 minute first flow and sur-		
Initial Closed in Pres.	8087	8096	face pressure went from 1550 Psi to 3020#. Closed			
Initial Flow Pres.	7868	1 7044 2 8044	tool for a 90 minute initial closed in pressure.			
Final Flow Pres.	8087	1 8096 2 8087	Reopened tool for a 170 minute second flow and bled			
Final Closed in Pres.	8087	8096	off nitrogen to zero pressure in 45 minutes. Gas to			
Final Hydro Mud Pres.	8960	8838	surface too small to measure. Closed tool for a 90 minute final closed in pressure.			

Mea. From Tester Valve

Legal Location Sec. - Twp. - Rng. 32 - 25S - 33E

Field Area WILDCAT

County LEA

State NEW MEXICO

Lease Name RED HILL UNIT

Well No. 1

Test No. 8

Lease Owner/Company Name THE PURE OIL COMPANY

Owner's District MIDLAND, TEXAS

FORMATION TEST DATA

20

Gauge No. 1898	Depth 18,530'	Clock 72 hour	Ticket No. 374207

	First Flow Period		Initial Closed In Pressure			Second Flow Period		Final Closed In Pressure		
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.
P_0	.000	6035	.000		8061	.000	7970	.000		8070
P_1	.047	8061	.099		8074	.174	8070	.101		8074
P_2										
P_3										
P_4										
P_5										
P_6										
P_7										
P_8										
P_9										
P_{10}										

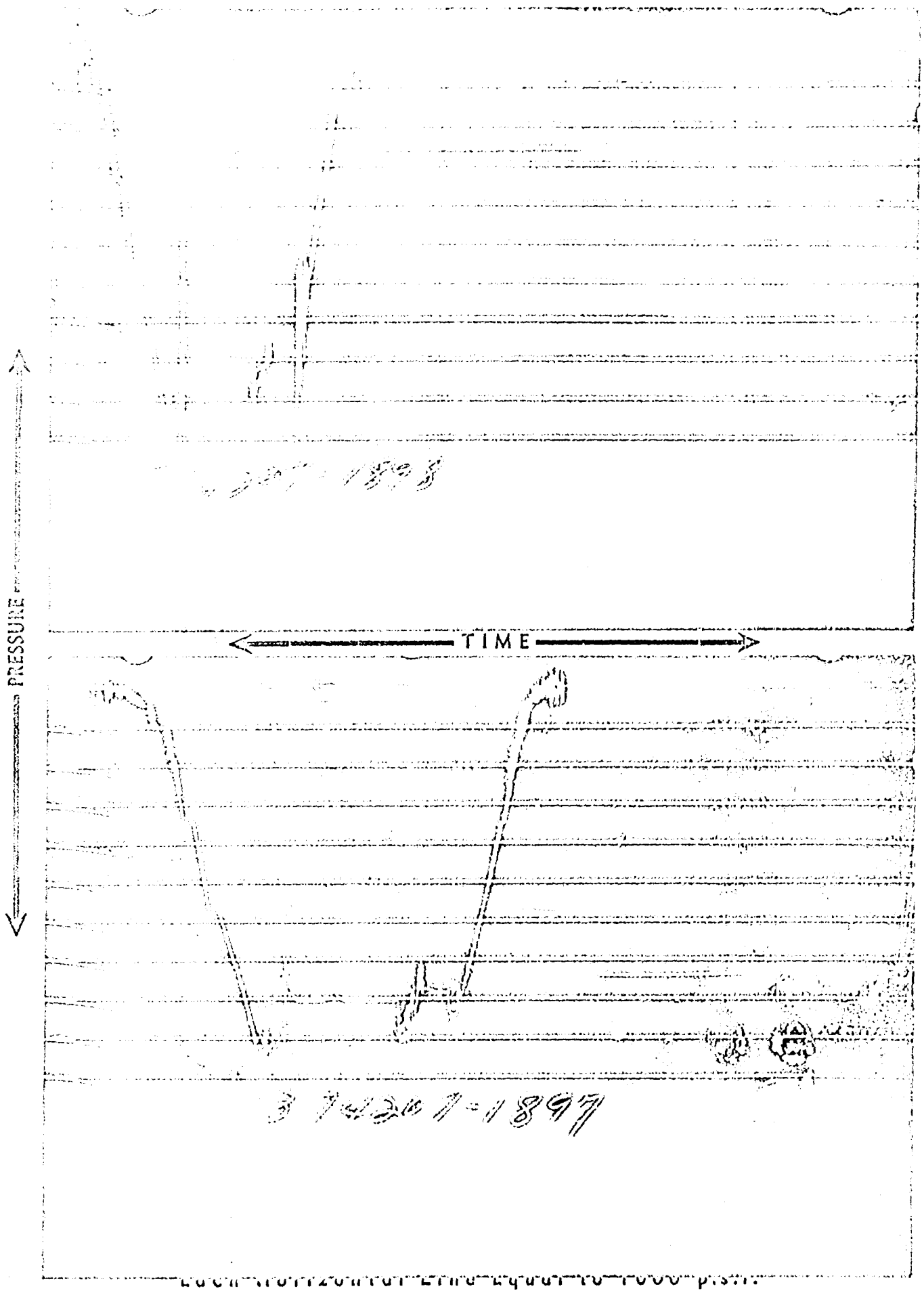
Gauge No. 1897	Depth 18,696'	Clock 48 hour

P_0	.000	7044	.000		8096	.000	8044	.000		8087
P_1	.073	8096	.154		8096	.227	8087	.188		8096
P_2										
P_3										
P_4										
P_5										
P_6										
P_7										
P_8										
P_9										
P_{10}										
Reading Interval										Minutes

REMARKS: Corrected baseline on BT 1897

SPECIAL PRESSURE DATA

Form No. 1196-R2


PRESSURE
TIME

Flow Time	1st Min. [illegible]	2nd Min. 210	Date	7-16-64	Ticket Number	18823 - S	
Closed In Press. Time	1st Min. 30	2nd Min. 90	Kind of Job	OPEN HOLE	Halliburton District	MONAHANS	
Pressure Readings	Field	Office Corrected	Tester	MR. HANCOCK	Witness	MR. PIE	
Depth Top Gauge	20539 Ft.	NO Blanked Off	Drilling Contractor	SHARP DRILLING COMPANY		IG	
BT. P.R.D. No.	[illegible]	24 Hour Clock	Elevation	-	Top Packer	20193'	
Initial Hydro Mud Pressure	8594	8759	Total Depth	20532'	Bottom Packer	20198'	
Initial Closed in Pres.	3103	2991	Interval Tested	20198'-20532'	Formation Tested	EILENBURGER	
Initial Flow Pres.	- 1 2056 2	2004 2155	Casing or Hole Size	5 5/8"	Casing Perfs. Top Bot.	- -	
Final Flow Pres.	- 1 433 2	2056 377	Surface Choke	-	Bottom Choke	3/8"	
Final Closed in Pres.	1039	1034	Size & Kind Drill Pipe	2 7/8" IF 4½"	Drill Collars Above Tester	I.D. - LENGTH 2" x 570'	
Final Hydro Mud Pressure	8594	8585	Mud Weight	8.4	Mud Viscosity	80	
Depth Cen. Gauge	Ft.	Blanked Off	Temperature	°F Est. 275 °F Actual	Anchor Size & Length	ID OD 3 3/4" X 333'	
BT. P.R.D. No.		Hour Clock	Depths Mea. From	KELLY BUSHINGS	Depth of Tester Valve	20154' Ft.	
Initial Hydro Mud Pres.			Cushion	TYPE - AMOUNT - Ft.	Depth Back Pres. Valve	- Ft.	
Initial Closed in Pres.			Recovered	1438 Feet of Gas cut drilling fluid			Meas. From Tester Valve
Initial Flow Pres.	1 2		Recovered	Feet of			
Final Flow Pres.	1 2		Recovered	Feet of			
Final Closed in Pres.			Recovered	Feet of			
Final Hydro Mud Pres.			Oil A.P.I. Gravity	-	Water Spec. Gravity	-	
Depth Bot. Gauge	20526 Ft.	YES Blanked Off	Gas Gravity	-	Surface Pressure	- psi	
BT. P.R.D. No.	328	72 Hour Clock	Tool Opened	7:45 AM A.M. P.M.	Tool Closed	1:30 PM A.M. P.M.	
Initial Hydro Mud Pres.	8594	8851	Remarks	Opened tool for 15 minute 1st flow with no			
Initial Closed in Pres.	3103	3184		increase in pressure. Opened tool for 30 minute			
Initial Flow Pres.	- 1 2056 2	2215 2275		initial closed in pressure. Reopened tool for			
Final Flow Pres.	- 1 433 2	2156 429		210 minute 2nd flow with nitrogen bleeding off.			
Final Closed in Pres.	1039	1029		Received show of gas. Closed tool for 90 minute			
Final Hydro Mud Pres.	8594	8653		final closed in pressure.			

Legal Location Sec. - Twp. - Rng. ---

Lease Name RED HILLS UNIT Well No. 1 Test No. 5

Lease Owner/Company Name PURE OIL COMPANY

Owner's District MIDLAND

Field Area WILDCAT County LEA State NEW MEXICO

FORMATION TEST DATA

SPECIAL PRESSURE DATA

Gauge No. [illegible] Depth 20159' Clock 24 hour Ticket No. [illegible]

	First Flow Period		Initial Closed In Pressure			Second Flow Period		Final Closed In Pressure		
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.
P_0	.000	2004	.000		2056	.000	2155	.000		377
P_1	.0102	2013	.0103		2352	.1392	1643	.0309		446
P_2	.0204	2016	.0202		2588	.2784	1052	.0618		515
P_3	.0306	2034	.0303		2725	.4176	537	.0927		584
P_4	.0408	2043	.0404		2858	.5568	381	.1236		649
P_5	.0510	2056	.0505		2940	.6960	377	.1545		719
P_6			.0606		2991			.1854		784
P_7			.0707		3064			.2163		848
P_8			.0808		3069			.2472		902
P_9			.0909		2815			.2781		970
P_{10}			.1010		2991			.3090		1034

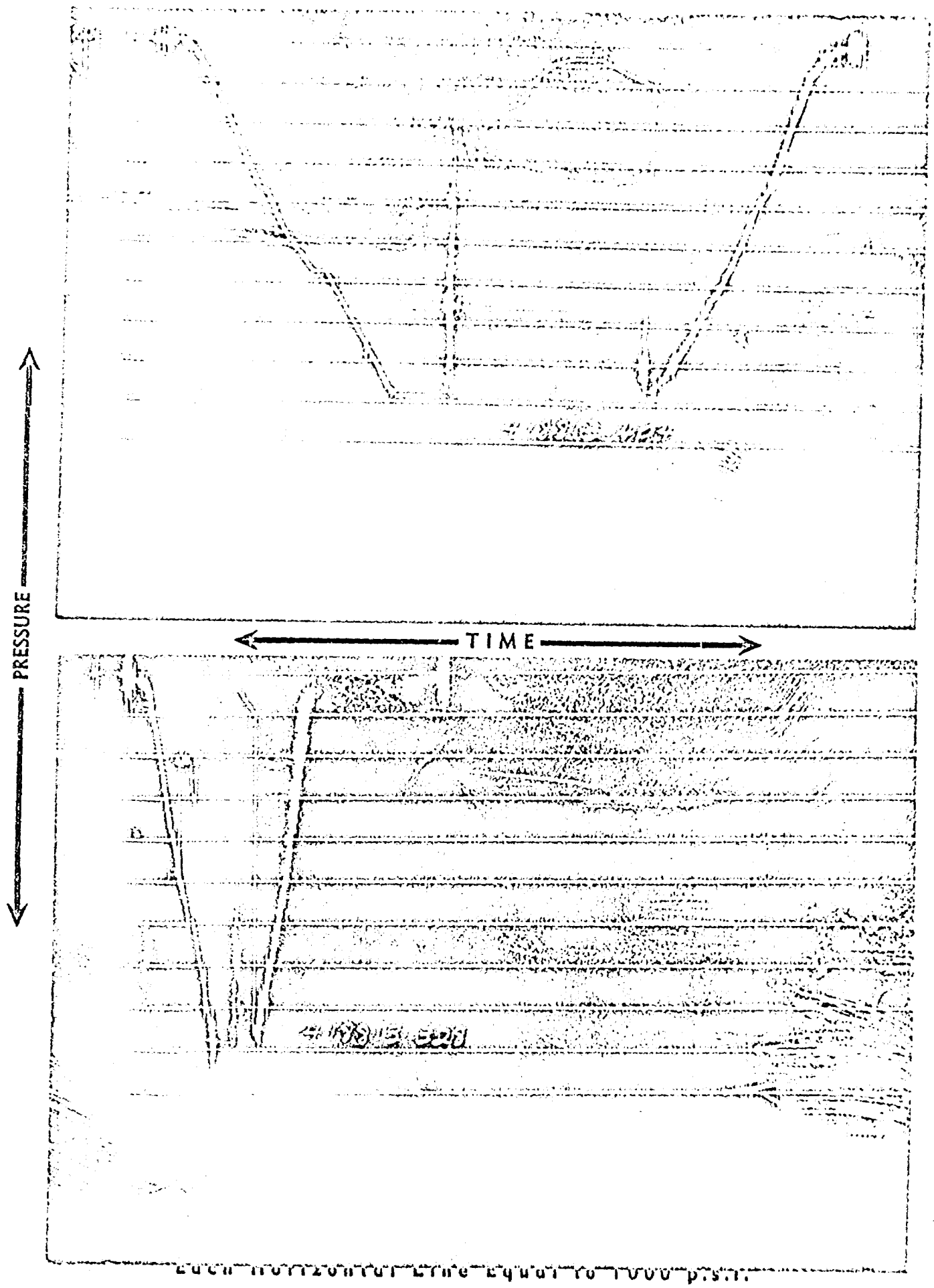
Gauge No. 588 Depth 20526' Clock 72 hour

P_0	.000	2115	.000		2156	.000	2275	.000		429
P_1	.0028	2123	.0028		2393	.047	1790	.010		486
P_2	.0056	2127	.0056		2582	.094	1082	.020		542
P_3	.0082	2135	.0084		2730	.141	580	.030		609
P_4	.0135	2148	.0112		2861	.188	433	.040		668
P_5	.0170	2156	.0140		2967	.235	429	.050		735
P_6			.0168		3057			.060		794
P_7			.0196		3110			.070		857
P_8			.0224		3184			.080		916
P_9			.0252		3180			.090		971
P_{10}			.0280		3184			.100		1022
Reading Interval	3		3			42		9		Minutes

REMARKS: INITIAL CLOSED IN PRESSURE ON BOTH CHARTS QUESTIONABLE DUE TO LEAKAGE.

SPECIAL PRESSURE DATA

Form No. 1296-B3


PRESSURE
TIME

	1st Min.	2nd Min.				
Flow Time	15	240	Date	7-28-64	Ticket Number	418819 - S
Closed In Press. Time	1st Min. 60	2nd Min. 120	Kind of Job	OPEN HOLE	Halliburton District	MONAHANS
Pressure Readings	Field	Office Corrected	Tester	MR. HANCOCK	Witness	MR. HARDIN
Depth Top Gauge	[illegible] Ft.	Blanked Off NO	Drilling Contractor	SHARP DRILLING COMPANY		IC
BT. P.R.D. No.	[illegible]	Hour Clock 72	Elevation	--	Top Packer	20438'
Initial Hydro Mud Pressure	[illegible]	8900	Total Depth	20936'	Bottom Packer	20443'
Initial Closed in Pres.	[illegible]	7133	Interval Tested	20443'-20936'	Formation Tested	ELLENBURGER
Initial Flow Pres.	- 1 / 2288 2	2122 / 2288	Casing or Hole Size	5 5/8"	Casing Perfs. Top / Bot.	-
Final Flow Pres.	- 1 / 933 2	2183 / 1013	Surface Choke	--	Bottom Choke	3/8"
Final Closed in Pres.	[illegible]	1657	Size & Kind Drill Pipe	3 7/8" IF 4½"FH	Drill Collars Above Tester I.D. · LENGTH	2" x 420'
Final Hydro Mud Pressure	[illegible]	8769	Mud Weight	8.4	Mud Viscosity	75
Depth Cen. Gauge	Ft.	Blanked Off	Temperature °F Est. / °F Actual	271	Anchor Size & Length ID / OD	2" X 3 3/4" 493'
BT. P.R.D. No.		Hour Clock	Depths Mea. From	KELLY BUSHINGS	Depth of Tester Valve	- Ft.
Initial Hydro Mud Pres.			Cushion TYPE / AMOUNT	NITROGEN Ft.	Depth Back Pres. Valve	- Ft.
Initial Closed in Pres.			Recovered	3100 Feet of Water & gas cut mud		
Initial Flow Pres.	1 / 2		Recovered	Feet of		
Final Flow Pres.	1 / 2		Recovered	Feet of		
Final Closed in Pres.			Recovered	Feet of		
Final Hydro Mud Pres.			Oil A.P.I. Gravity	-	Water Spec. Gravity	-
Depth Dot. Gauge	20931 Ft.	Blanked Off YES	Gas Gravity	-	Surface Pressure	- psi
BT. P.R.D. No.	1893	Hour Clock 24	Tool Opened	12:30 AM A.M. P.M.	Tool Closed	5:35 AM A.M. P.M.
Initial Hydro Mud Pres.	9054	9038	Remarks	Opened tool for 15 minute 1st flow. Had 112		
Initial Closed in Pres.	7254	7302		nitrogen cushion. Closed tool for 60 minute		
Initial Flow Pres.	- 1 / 2404 2	2272 / 2460		initial closed in pressure. Reopened tool for		
Final Flow Pres.	- 1 / 1043 2	2302 / 1013		240 minute 2nd flow with gas to surface in 132		
Final Closed in Pres.	[illegible]	1223		minutes but too small to measure. Closed tool		
Final Hydro Mud Pres.	8864	8852		for 120 minute final closed in pressure.		

Legal Location Sec. - Twp. - Rng. —

Lease Name [illegible] Well No. 1 Test No. 5

Field Area WILDCAT

County LEA

State NEW MEXICO

Lease Owner/Company Name [illegible] OIL COMPANY

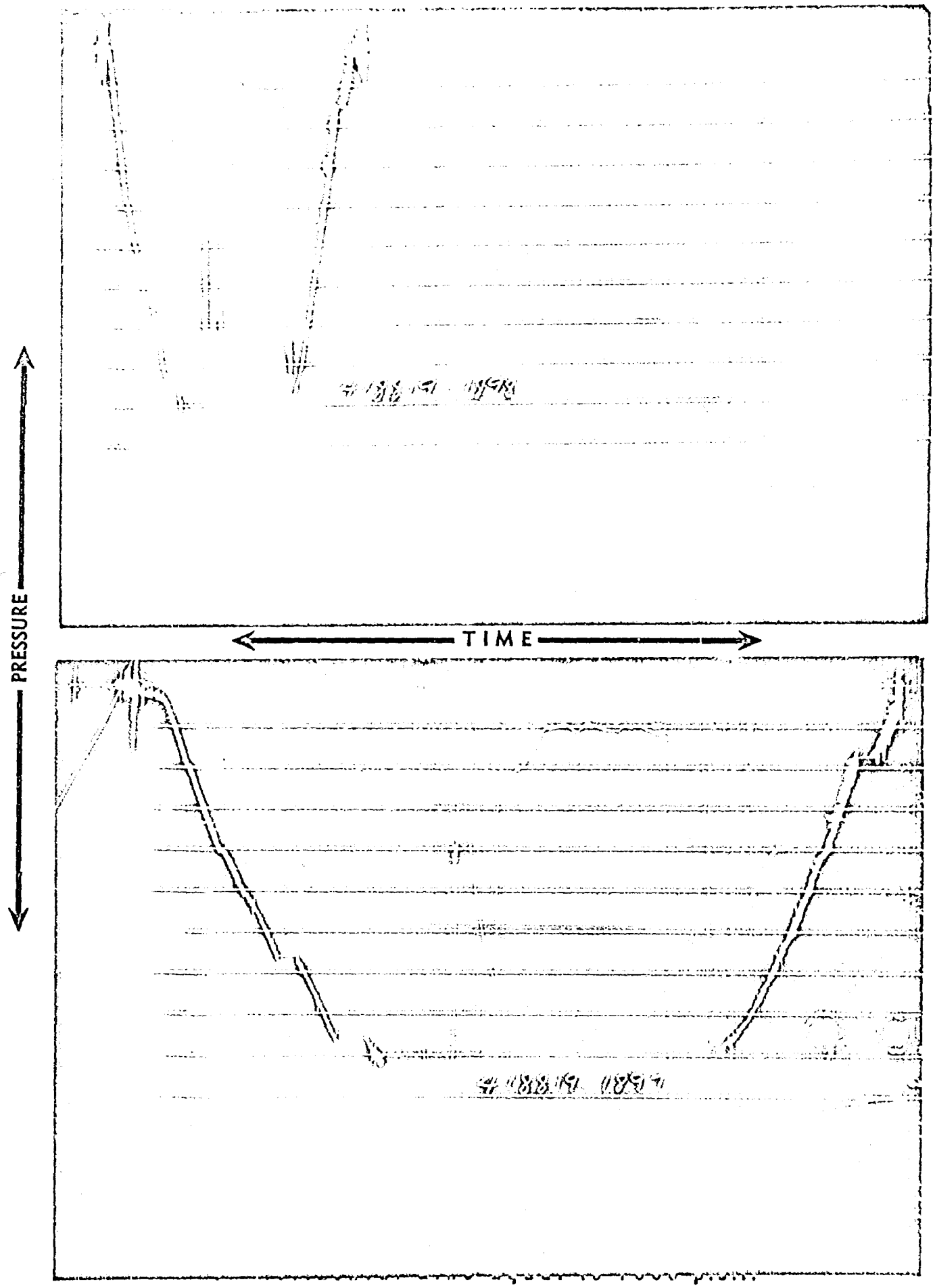
Owner's Director —

FORMATION TEST DATA

Gauge No. 1528			Depth 20423'			Clock 72 hour		Ticket No. 118[illegible]		
	First Flow Period		Initial Closed In Pressure			Second Flow Period		Final Closed In Pressure		
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.
P_0	.000	2122	.000		2183	.000	2288	.000		1013
P_1	.0028	2127	.006		2716	.0472	1691	.0117		1148
P_2	.0056	2148	.012		3310	.0944	848	.0234		1209
P_3	.0084	2157	.018		3860	.1416	982	.0351		1270
P_4	.0112	2170	.024		4459	.1888	835	.0468		1322
P_5	.0140	2183	.030		5000	.2360	973	.0585		1378
P_6			.036		5716	.2830	1013	.0702		1435
P_7			.042		6262			.0819		1483
P_8			.048		6620			.0936		1539
P_9			.054		6965			.1053		1600
P_{10}			.060		7113			.1170		1657
Gauge No. 1897			Depth 20931'			Clock 24 hour				
P_0	.000	2272	.000		2302	.000	2460	.000		1013
P_1	.0036	2281	.021		2911	.1348	1991	.0396		1102
P_2	.0072	2289	.042		3579	.2696	1068	.0792		1170
P_3	.0108	2294	.063		4250	.4044	1060	.1188		1247
P_4	.0144	2298	.084		4924	.5392	996	.1584		1315
P_5	.0180	2302	.105		5498	.6740	1115	.1980		1383
P_6	CLOCK STOPPED		.126		6004	.8090	1013	.2376		1455
P_7	DURING FIRST		.147		6409			.2772		1519
P_8	FLOW.		.168		6774			.3168		1593
P_9			.189		7064			.3564		1650
P_{10}			.210		7302			.3960		1721
Reading Interval			5			40		12 Minutes		
REMARKS:										

SPECIAL PRESSURE DATA

Form No. 1296-B2


PRESSURE
TIME
TIME

	1st	Min.	2nd	Min.
Flow Time				
Closed In Press. Time	1st	Min.	2nd	Min.
Pressure Readings	Field		Office Corrected	
Depth Top Gauge	20,884' Ft.		NO	Blanked Off
BT. P.R.D. No.	404		72	Hour Clock
Initial Hydro Mud Pressure	9324		9137	
Initial Closed in Pres.	-		-	
Initial Flow Pres.	-	1	-	
	-	2	-	
Final Flow Pres.	-	1	-	
	-	2	-	
Final Closed in Pres.	-		-	
Final Hydro Mud Pressure	9324		9137	
Depth Cen. Gauge		Ft.		Blanked Off
BT. P.R.D. No.				Hour Clock
Initial Hydro Mud Pres.				
Initial Closed in Pres.				
Initial Flow Pres.		1		
		2		
Final Flow Pres.		1		
		2		
Final Closed in Pres.				
Final Hydro Mud Pres.				
Depth Bot. Gauge	21,318' Ft.		YES	Blanked Off
BT. P.R.D. No.	328		24	Hour Clock
Initial Hydro Mud Pres.	9224		9200	
Initial Closed in Pres.	-		-	
Initial Flow Pres.	-	1	-	
	-	2	-	
Final Flow Pres.	-	1	-	
	-	2	-	
Final Closed in Pres.	-		-	
Final Hydro Mud Pres.	9244		9116	

Date 8-14-64 — Ticket Number 48369

Kind of Job OPEN HOLE — Halliburton District MONAHANS

Tester GLASGOW — Witness PIE

Drilling Contractor SHARP DRILLING COMPANY — BM

Elevation ? — Top Packer 20,904'

Total Depth 21,321' — Bottom Packer 20,909'

Interval Tested 20,909' - 21,321' — Formation Tested FUSSELMAN

Casing Perfs. Top - Bot. -

Casing or Hole Size 5 9/16" — Bottom Choke 3/8"

Surface Choke 1/8" to 1" — Drill Collars Above Tester I.D. - LENGTH 2" x 464' x ?

Size & Kind Drill Pipe 4½" F H 2 7/8" IF D.C. — Mud Viscosity 45

Mud Weight 8.4 — Anchor Size & Length ID 1 3/4" x 3 3/4" OD 4 1/8" x 367'

Temperature 269 °F Est. °F Actual — Depth of Tester Valve 20,872' Ft.

Depths Mea. From ROTARY KELLY BUSHING — Depth Back Pres. Valve - Ft.

Cushion TYPE NITROGEN AMOUNT 1150 Ft.

Recovered Feet of

Recovered Feet of

Recovered Feet of

Recovered Feet of

Oil A.P.I. Gravity — Water Spec. Gravity

Gas Gravity — Surface Pressure 1150# Nitrogen psi

Tool Opened 2:48 AM A.M. P.M. — Tool Closed - A.M. P.M.

Remarks MISRUN. PACKER GAVE WAY. NO PACKER SEAT.

NO SPECIAL READING ADAPTABLE.

Legal Location Sec. - Twp. - Rng. -

Lease Name RED HILLS UNIT — Well No. 2 — Test No. 5

Field Area WILDCAT — County LEA — State NEW MEXICO

Lease Owner/Company Name THE PURE OIL COMPANY

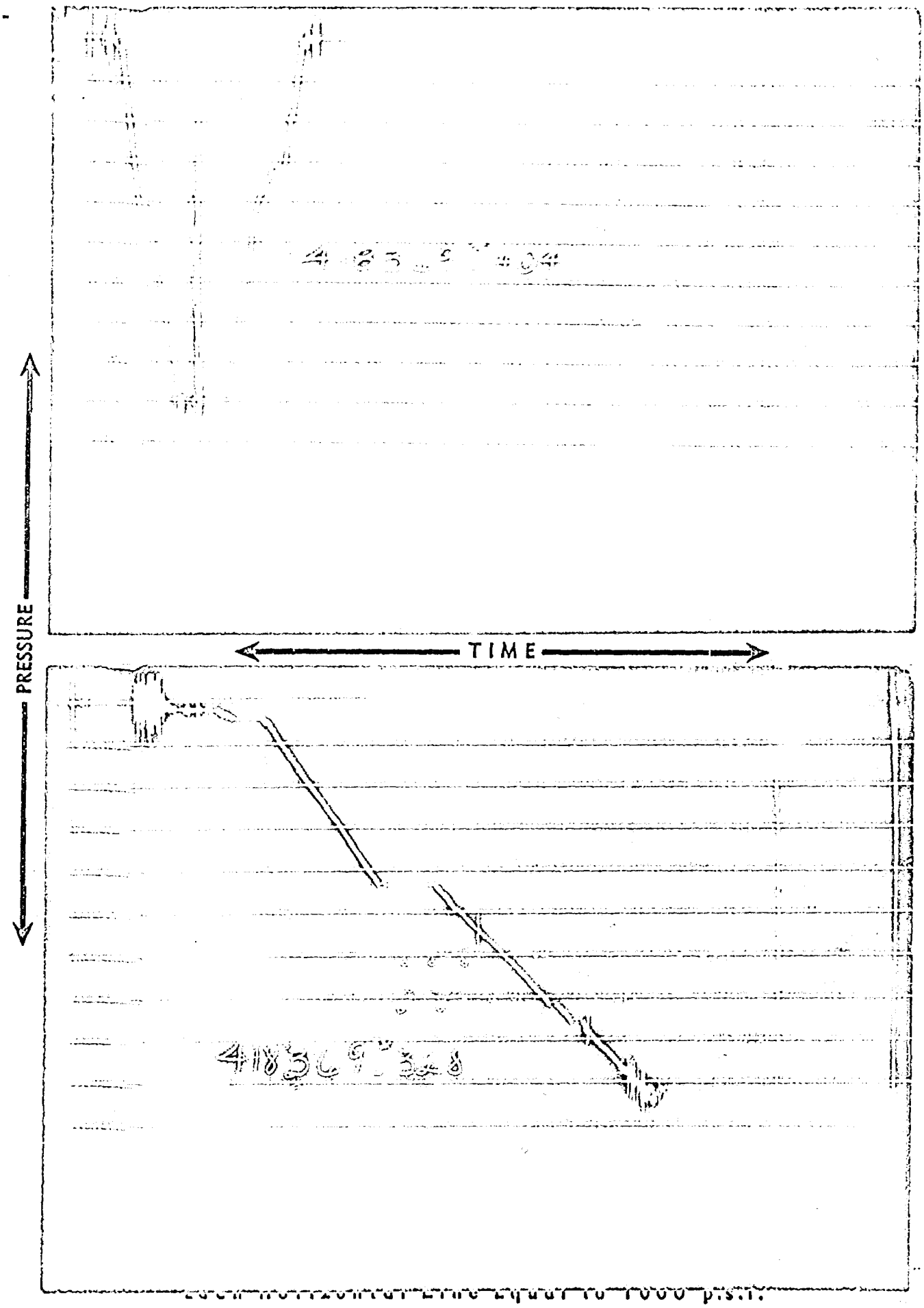
Owner's Division MIDLAND, TEXAS

Mea. From Tester Valve

FORMATION TEST DATA

* Potentiometric Surface Reference to Rotary Table When Elevation Not Given, Fresh Water Corrected to 100° F.

Form No. 1296-R3


PRESSURE
TIME

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS 7, TEXAS

Formation cored in the subject well has been analyzed according to instructions received at the laboratory. Results of the analysis are presented in both tabular and graphical form on the attached Completion Coregraph. Information relative to the drilling fluid used during the coring operation, sampling and preservation of the core and type of analysis employed will also be found on the Completion Coregraph.

Thank you for the opportunity to be of service.

Core Laboratories, Inc.
P. O. Box 4337
Midland, Texas

Distribution of Final Reports

8-20-64

3 Copies	The Pure Oil Company V & J Tower Midland, Texas
1 Copy	Pan American Petroleum Corporation P. O. Box 268 Roswell, New Mexico
3 Copies	Continental Oil Company P. O. Box 1291 Roswell, New Mexico
1 Copy	Texaco Inc. P. O. Box 2248 Roswell, New Mexico
2 Copies	Perry R. Bass Petroleum Life Building Midland, Texas
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1 Copy	Humble Oil & Refining Company P. O. Box 1597 Roswell, New Mexico
1 Copy	Humble Oil & Refining Company Humble Building Midland, Texas
1 Copy	Mobil Oil Company P. O. Box 820 Roswell, New Mexico

State of New Mexico

Commissioner of Public Lands

MAIL OFFICE OCD
'66 MAY 11 AM 8 11

GUYTON B. HAYS
COMMISSIONER

P. O. BOX 1148
SANTA FE, NEW MEXICO

April 27, 1966

Humble Oil & Refining Company
Post Office Box 2100
Hobbs, New Mexico 88240

Attention: Mr. A. L. Carpenter

Re: Commingling on State of New Mexico
Leases K-4495 and E-9089
Your New Mexico "BN" State and
New Mexico "BX" State Leases

Gentlemen:

We have received your revised proposal of April 26, 1966, regarding the commingling of Chaveroo San Andres undesignated production derived from the Southeast Quarter of Section 16, Township 18 South, Range 33 East, which is contained in New Mexico State Lease E-9089, and the Southwest Quarter and the North Half of Section 16, Township 8 South, Range 33 East, which is contained in New Mexico State Lease K-4495.

The Commissioner of Public Lands hereby approves your proposal of April 26, 1966, for commingling the production from the above described acreage. We would like for you to notify us after the installation is completed, but before it is put into operation.

The Commissioner of Public Lands reserves the right to review the operation in the future and in the event he deems the operation to be against the best interest of the State of New Mexico, he reserves the right to amend or withdraw this approval.

Very truly yours,

GUYTON B. HAYS
Commissioner of Public Lands

By

TED BILBERRY, Director
Oil and Gas Department

GBH/TB/d
cc: New Mexico Oil Conservation Commission
Post Office Box 2088
Santa Fe, New Mexico

EX. NO. 1

RESERVE AND ECONOMIC EVALUATION

WOLFCAMP-ATOKA DUAL COMPLETION

I - Atoka-Pennsylvanian Pool Reserve

(A)	Average Porosity	9.2%	
	Connate Water	32.2%	(?)
	Reservoir Pressure, psia	7,863	
	Reservoir Temperature	208 °F	
	Gas Deviation	1.229	
	Gas Gravity	0.580	
	Condensate, Bbls/MMcf	1.5	
	Pay Thickness, Ft.	84+	(42)

* * * * * * *

		Gas, MMcf	Cond., Bbls
(B)	Hydrocarbons In-Place per Ac-Ft.	0.9192	1.38
	Reserve per Ac-Ft. (90% Recovery)	0.8273	1.24
	Reserve per Acre	69.49	104.24
	W. I. Reserve per Acre (after 1/8 Royalty)	60.80	91.21

* * * * * * *

		640 Acres	320 Acres
(C)	Reserve: MMMcf	38.91	19.46
	Bbls.	58,374	29,187
(D)	Revenue: Gas @ $160/MMcf	$ 6,225,600	$3,113,600
	Cond. @ $2.70/Bbl.(15¢ transp.)	157,610	78,805
	Total	$ 6,383,210	$3,192,405

II - Wolfcamp-Atoka Dual Economic Evaluation

(D-a)	Revenue: Wolfcamp (Ex. ____)	$ 8,921,620	$4,460,810
	Atoka	6,383,210	3,192,405
	Total	$15,304,830	$7,653,215
	Operating Expense (360 months)	(216,000)	(216,000)
	Production Tax - 2%	(306,100)	(153,100)
	Operating Income	$14,782,730	$7,284,115
	Investment - Well and Equipment	(900,000)	(900,000)
	Profit	$13,882,730	$6,384,115
	Profit - Investment Ratio	15.43	7.09
	Present Worth Profit (6%)	$ 6,558,063	$3,015,792
	Present Worth Profit - Investment Ratio	7.29	3.35

EX. NO. ___

RESERVE AND ECONOMIC EVALUATION

WOLFCAMP-DEVONIAN DUAL COMPLETION

I - Devonian Pool Reserve

(A)	Average Porosity	5.0%	
	Connate Water	24.4%	
	Reservoir Pressure, psia	7,632	
	Reservoir Temperature	240 °F	
	Gas Deviation	1.206	
	Gas Gravity	0.58	
	Condensate, Bbls/MMcf	0	
	Pay Thickness, Ft.	62	(42)

* * * * * * * *

		Gas, MMcf
(B)	Hydrocarbons In-Place per Ac-Ft.	0.5265
	Reserve per Ac-Ft. (90% Recovery)	0.4739
	Reserve per Acre	29.38
	W. I. Reserve per Acre (after 1/8 Royalty)	25.71

* * * * * * * *

		640 Acres	320 Acres
(C)	Reserve: MMMcf	16.454	8.227
(D)	Revenue: Gas @ $160/MMcf	$ 2,632,640	$1,316,320

II - Wolfcamp-Devonian Dual Economic Evaluation

(D-a)	Revenue: Wolfcamp (Ex. ___)	$ 8,921,620	$4,460,810
	Devonian	2,632,640	1,316,320
	Total	$11,554,260	$5,777,130
	Operating Expense (360 months)	(216,000)	(216,000)
	Production Tax - 2%	(231,100)	(115,500)
	Operating Income	$11,107,160	$5,445,630
	Investment - Well and Equipment	(1,150,000)	(1,150,000)
	Profit	$ 9,957,160	$4,295,630
	Profit - Investment Ratio	8.66	3.74
	Present Worth Profit (6%)	$ 4,703,634	$2,029,213
	Present Worth Profit - Investment Ratio	4.09	1.76

EX. NO. 3

RESERVE AND ECONOMIC EVALUATION

WOLFCAMP POOL

(A)	Average Porosity	7%	(10%)
	Connate Water	30%	(?)
	Reservoir Pressure, psia	11,304	
	Reservoir Temperature	190 °F	
	Gas Deviation	1.596	
	Gas Gravity	0.766	
	Condensate, Bbls/MMcf	40	
	Pay Thickness, Ft.	80+	(28)

* * * * * * * * *

		Gas, Mcf	Cond., Bbls
(B)	Hydrocarbons In-Place per Ac-Ft.	825	33.0
	Reserve per Ac-Ft. (90% Recovery)	743	29.72
	Reserve per Acre	59,440	2,378
	W. I. Reserve per Acre (after 1/8 Royalty)	52,010	2,081

* * * * * * * * *

		640 Acres	320 Acres
(C)	Reserve: MMcf	33,286	16,643
	Bbls	1,331,800	665,900
(D)	Revenue: Gas @ $160/MMcf	$5,325,760	$2,662,880
	Cond. @ $2.70 (15¢ transp.)	3,595,860	1,797,930
	Total	$8,921,620	$4,460,810
	Operating Expense (360 months)	(180,000)	(180,000)
	Production Tax - 2%	(178,400)	(89,200)
	Operating Income	$8,563,220	$4,191,610
	Investment - Well and Equipment	(600,000)	(600,000)
	Profit	$7,963,220	$3,591,610
	Profit - Investment Ratio	13.27	5.99
	Present Worth Profit (6%)	$3,761,745	$1,696,641
	Present Worth Profit - Investment Ratio	6.27	2.83

dearnley-meier
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1120 SIMMS BLDG. • P. O. BOX 1092 • PHONE 243-6691 • ALBUQUERQUE, NEW MEXICO

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
January 6, 1965

EXAMINER HEARING

IN THE MATTER OF:

APPLICATION OF THE PURE OIL COMPANY FOR THE CREATION OF A NEW GAS POOL AND FOR SPECIAL POOL RULES, LEA COUNTY, NEW MEXICO — Case No. 3158

APPLICATION OF THE PURE OIL COMPANY FOR THE CREATION OF A NEW GAS POOL AND FOR SPECIAL POOL RULES, LEA COUNTY, NEW MEXICO — Case No. 3159

BEFORE:

DANIEL S. NUTTER

TRANSCRIPT OF HEARING

dearnley-meier reporting service, inc.
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MR. NUTTER: The hearing will come to order. The first case to be called this morning will be Case Number 3158 and also Number 3159.

MR. DURRETT: Application of The Pure Oil Company for the creation of a new gas pool and for special pool rules, Lea County, New Mexico.

MR. NUTTER: That is the style of both cases, Mr. Durrett?

MR. DURRETT: That is the style of both cases, Mr. Examiner.

MR. NUTTER: I'd like to inform anyone who may be interested that the Commission has received a request for certain information regarding the application of The Pure Oil Company in these two cases. Subpoenas duces tecum have been issued for the data requested; motions to quash the subpoenas have also been filed. The cases are hereby continued to the Commission hearing on January 13, 1965, at which time motions to quash will be heard, and also the cases will be heard.

* * *

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, Elizabeth K. Hale, Notary Public and Court Reporter, do hereby certify that proceedings in Cases Number 3158 and 3159 were taken and transcribed by me, and that the foregoing

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transcript is a true and accurate record of proceedings to the best of my knowledge, skill and ability.

IN WITNESS WHEREOF, my hand and seal this 13th day of January, 1965.

Notary Public

My commission expires

May 23, 1968.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No 3158-3159 heard by me on 1-6, 1965.

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

CA-2011

CORE LABORATORIES, INC.

Petroleum Reservoir Engineering

DALLAS, TEXAS

Company THE PURE OIL COMPANY — File WP-1-6809

Well RED HILLS UNIT NO. 1 — Date 5-5-66

Field WILDCAT — Elevation 2819' GF 2849' RT

County LEA — State NEW MEXICO — Drlg. Fluid

Location 330' FSL 2310' FEL SEC. 32 T-25-S R-33-E

Lithological Abbreviations

SAND-SS SHALE-SH LIME-LM	DOLOMITE-DOL CHERT-CHT GYPSUM-GYP	ANHYDRITE-ANHY CONGLOMERATE-CONG FOSSILIFEROUS-FO	SANDY-SDY SHALY-SHY LIMY-LMY	FINE-FN MEDIUM-MED COARSE-CRSE	CRYSTALLINE-XLN GRAIN-GN GRANULAR-GNR	BROWN-BRN GRAY-GRY VUGGY-VGY	FRACTURED-FRAC LAMINATED-LAM STYLOLITIC-STYC	SLIGHTLY-SL/ VERY-V/ WITH-W/

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY MILLIDARCYS MAX	PERMEABILITY MILLIDARCYS 90°	POROSITY PERCENT	RESIDUAL SATURATION PERCENT PORE OIL	RESIDUAL SATURATION PERCENT PORE WATER	DESCRIPTION
				GRAIN DENSITY			
1	13476	*		8.8	2.76		SH, SL/LMY
2	13477	<0.1		6.8	2.78		SH, SL/LMY
3	13478	<0.1		4.2	2.80		LM, SHY
4	13479	<0.1		4.1	2.84		LM, SHY
5	13479 A	<0.1		3.3	2.80		LM, SHY
6	13480	<0.1		2.8	2.79		LM, SHY
7	13482	<0.1		1.8	2.69		LM, SLY/SHY
8	13483	<0.1		1.6	2.73		LM, SLY/SHY
9	13484	<0.1		1.4	2.73		LM, SLY/SHY, FO
10	13485	<0.1		2.6	2.72		LM, SLY/SHY
11	13487	*		10.4	2.77		SH
12	13488	*		11.4	2.77		SH
13	13490	<0.1		0.9	2.64		LM, SHY
14	13492	*		8.2	2.71		SH
15	13493	<0.1		0.9	2.67		LM, SLY/SHY, FO
16	13495	*		9.0	2.74		SH
17	13497	<0.1		2.3	2.67		LM, SHY
18	13498	*		10.2	2.74		SH

* NO PERMEABILITY MEASUREMENT MADE - PLUG FRACTURED

THE ANALYSIS AND CORE GAMMA LOG WERE ANALYSED AND PROCESSED ON SLABBED CORE.

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Union Exhibit No. 2
Case No. 3158
May 18, 1966

These analyses, opinions or interpretations are based on observations and materials supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories, Inc. (all errors and omissions excepted); but Core Laboratories, Inc. and its officers and employees, assume no responsibility and make no warranty or representations, as to the productivity, proper operations, or profitableness of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

Union Ex 2

Form CA 19 Amended 8 61 XXX

CORE LABORATORIES, INC. CORE LAB *Petroleum Reservoir Engineering*

COMPANY [redacted] FIELD [redacted] FILE [redacted]

WELL [redacted] COUNTY [redacted] DATE [redacted]

LOCATION [redacted] STATE [redacted] ELEV. [redacted]

CORE-GAMMA CORRELATION

[redacted]

VERTICAL SCALE: 5" = 100'

CORE-GAMMA SURFACE LOG

(PATENT APPLIED FOR)

GAMMA RAY

RADIATION INCREASE →

COREGRAPH

PERMEABILITY — MILLIDARCYS

100 50 10 5 1 0.5 0.1

POROSITY — PERCENT

50 0

TOTAL WATER — PERCENT TOTAL WATER

80 60 40 20 0

OIL SATURATION — PERCENT PORE SPACE

0 20 40 60 80

[redacted]

[redacted]

CORE LABORATORIES, INC. *Petroleum Reservoir Engineering*

COMPANY THE PURE OIL COMPANY — FILE NO. WP-1-6809

WELL RED HILLS UNIT NO. 1 — DATE 5-5-66 — ENGRS. HOGAN-DILLARD

FIELD WILDCAT — FORMATION — ELEV. 3819' GR 3849'RT

COUNTY LEA — STATE NEW MEXICO — DRLG. FLD. — CORES

LOCATION 330' FSL 2310' FEL SEC. 32 T-25-S R-35-E — REMARKS SAMPLED AS DIRECTED BY CLIENT

COMPLETION COREGRAPH

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SAND | LIMESTONE | CONGLOMERATE | CHERT | ANHYDRITE

SHALE | DOLOMITE | OOLITES

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

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

TOTAL WATER O—O PERCENT PORE SPACE 75 50 25

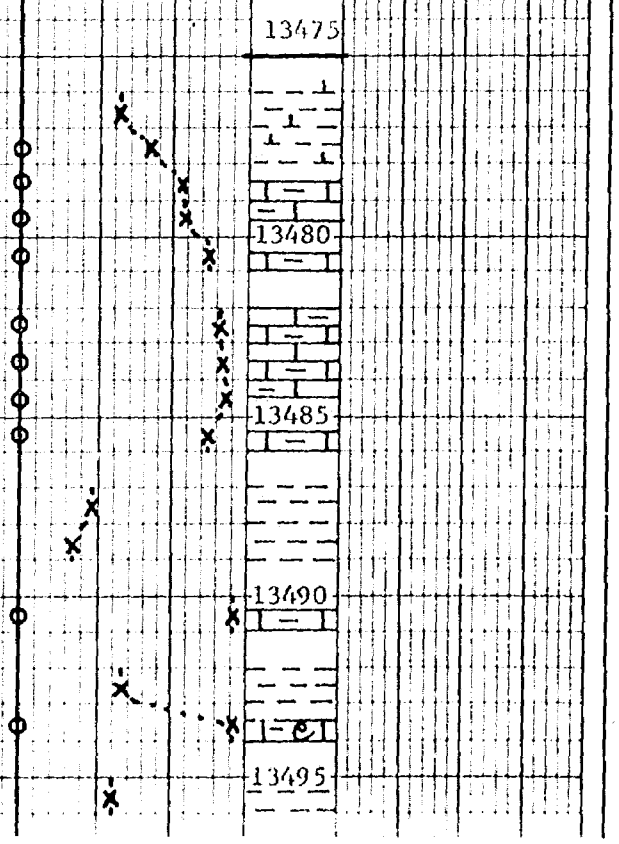
OIL SATURATION X---X PERCENT PORE SPACE 25 50 75

THE ANALYSIS AND CORE GAMMA LOG WERE ANALYSED AND PROCESSED ON SLABBED CORE

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY, MD. * = Horizontal Perm Plug	POROSITY %	RESIDUAL SATURATION % PORE SPACE OIL	RESIDUAL SATURATION % PORE SPACE TOTAL WATER	GRAIN DENSITY
1	13476	*	8.8			2.76
2	13477	<0.1	6.8			2.78
3	13478	<0.1	4.2			2.80
4	13479	<0.1	4.1			2.84
6	13480	<0.1	2.8			2.79
7	13482	<0.1	1.8			2.69
8	13483	<0.1	1.6			2.73
9	13484	<0.1	1.4			2.73
10	13485	<0.1	2.6			2.72
11	13487	*	10.4			2.77
12	13488	*	11.4			2.77
13	13490	<0.1	0.9			2.64
14	13492	*	8.2			2.71
15	13493	<0.1	0.9			2.67
16	13495	*	9.0			2.74

PERMEABILITY O—O MILLIDARCYS 10 5

POROSITY X---X PERCENT 10 5



COMPANY THE PURE OIL COMPANY — FILE NO. WP-1-6809

WELL RED HILLS UNIT NO. 1 — DATE 5-5-66 — ENGRS. HOGAN-DILLARD

FIELD WILDCAT — FORMATION — ELEV. 3319' GR 3349' RT

COUNTY LEA — STATE NEW MEXICO — DRLG FLD — CORES

LOCATION 330' FSL 2310' FEL SEC. 32 T-15-S R-35-E — REMARKS SAMPLED AS DIRECTED BY CLIENT

COMPLETION COREGRAPH

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SAND — LIMESTONE — CONGLOMERATE — CHERT — ANHYDRITE

SHALE — DOLOMITE — OOLITES

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

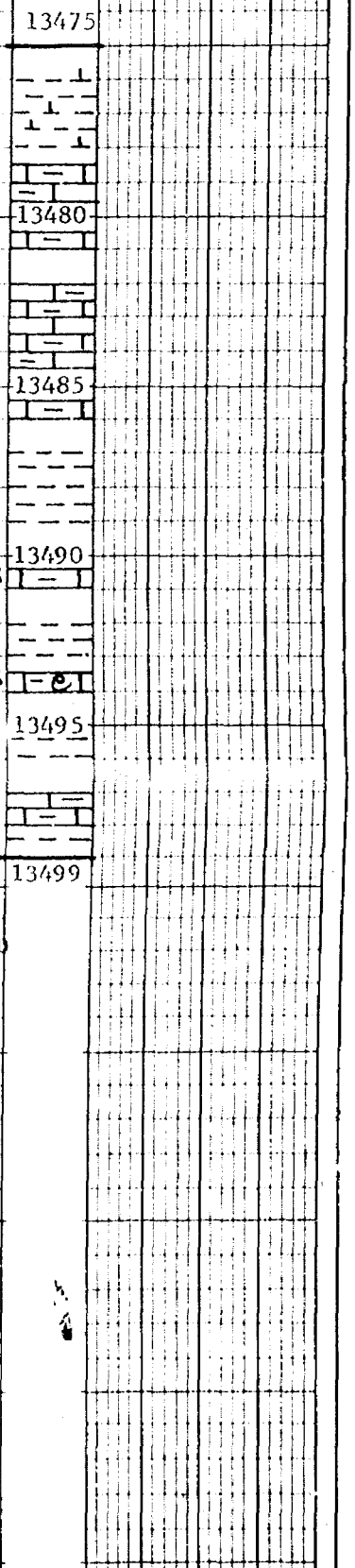
PROBABLE PRODUCTION
O=Oil W=Water G=Gas T=Transitional

TOTAL WATER O—O
PERCENT PORE SPACE
75 50 25

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

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY, MD. * = Horizontal Perm Plug	GRAIN DENSITY	POROSITY %	RESIDUAL SATURATION % PORE SPACE OIL	RESIDUAL SATURATION % PORE SPACE TOTAL WATER
		*				
	THE ANALYSIS AND CORE GAMMA LOG WERE ANALYSED AND PROCESSED ON SLABBED CORE					
1	13476	*	2.76	8.8		
2	13477	<0.1	2.78	6.8		
3	13478	<0.1	2.80	4.2		
4	13479	<0.1	2.84	4.1		
6	13480	<0.1	2.79	2.8		
7	13482	<0.1	2.69	1.8		
8	13483	<0.1	2.73	1.6		
9	13484	<0.1	2.73	1.4		
10	13485	<0.1	2.72	2.6		
11	13487	*	2.77	10.4		
12	13488	*	2.77	11.4		
13	13490	<0.1	2.64	0.9		
14	13492	*	2.71	8.2		
15	13493	<0.1	2.67	0.9		
16	13495	*	2.74	9.0		
17	13497	<0.1	2.67	2.3		
18	13498	*	2.74	10.2		

* INDICATED NO PERMEABILITY MEASUREMENT MADE - PLUG FRACTURED



H. J. GRUY AND ASSOCIATES, INC.

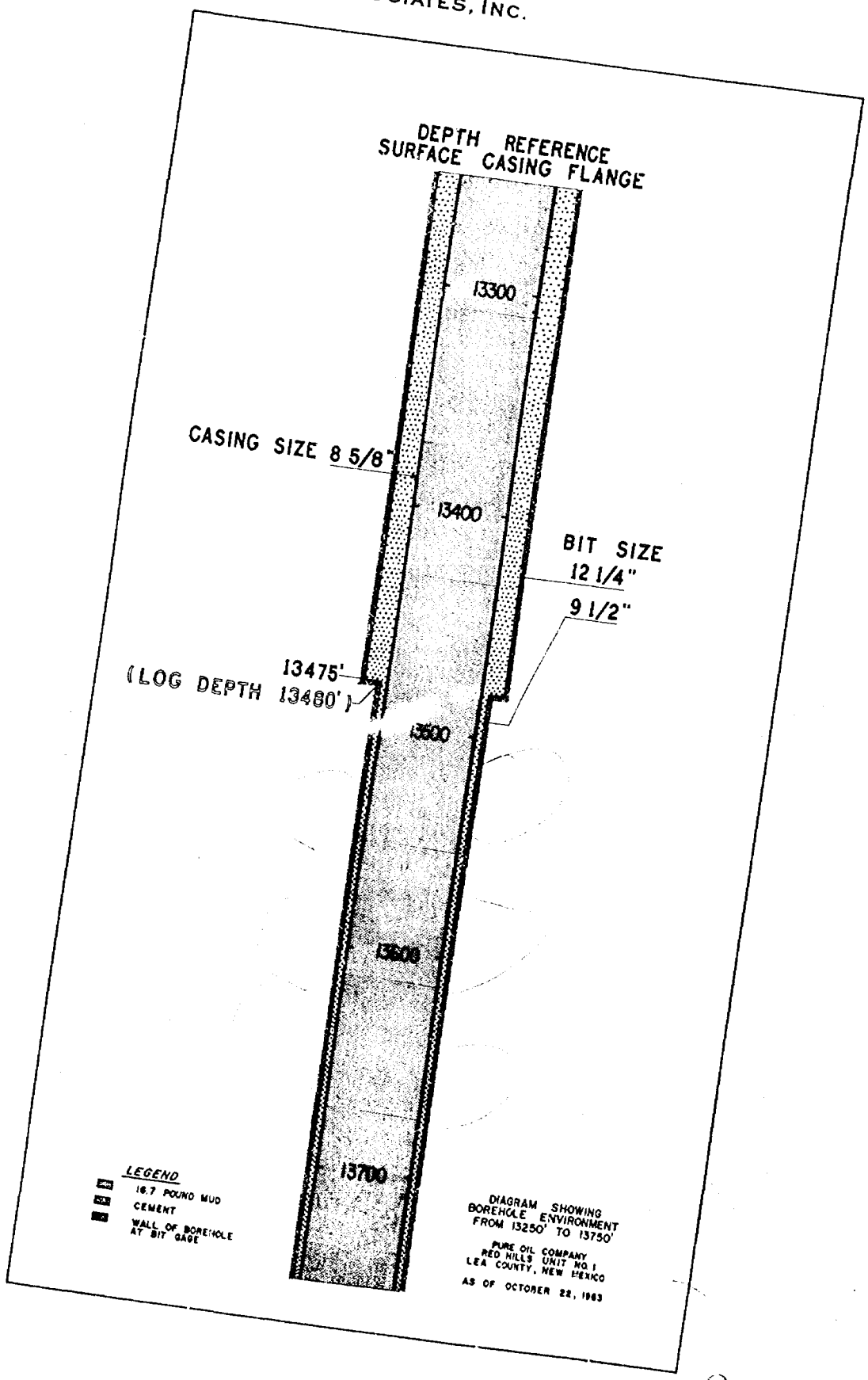


EXHIBIT NO. Union 4

PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

EXHIBIT NO. 5

CORE LABORATORIES, INC. *Petroleum Reservoir Engineering*

WP-3-2174

COMPANY THE PURE OIL COMPANY FIELD WILDCAT FILE WP-1-6082

WELL RED HILLS UNIT NO. 1 COUNTY LEA DATE 8-22-63

LOCATION 530 FS & 2310 FEL SEC 32-T-19S R35E STATE NEW MEXICO ELEV. 2819' GR 2849' RT

CORE-GAMMA CORRELATION

WHOLE CORE

CORE-GAMMA SURFACE LOG
(PATENT APPLIED FOR)

GAMMA RAY
RADIATION INCREASE →

COREGRAPH

TOTAL WATER
PERCENT TOTAL WATER
80 60 40 20 0

PERMEABILITY
MILLIDARCYS
1000 50 10 5 1 0.5 0.1

POROSITY
PERCENT
10 5

OIL SATURATION
PERCENT PORE SPACE
0 20 40 60 80

13475

13499

Amoco Eds

EXHIBIT NO. 6

CORE LABORATORIES, INC. *Petroleum Reservoir Engineering*

COMPANY THE PURE OIL COMPANY FIELD WILDCAT FILE NP-1-6809

WELL RED HILLS UNIT NO. 1 COUNTY LEA DATE 5-5-66

LOCATION 530' FSL 2310' FEL SEC. 32 STATE NEW MEXICO ELEV. 2819' GR 2849' RT
T-25-S R-35-E

CORE-GAMMA CORRELATION

SLABBED CORE

CORE-GAMMA SURFACE LOG
(PATENT APPLIED FOR)

GAMMA RAY
RADIATION INCREASE →

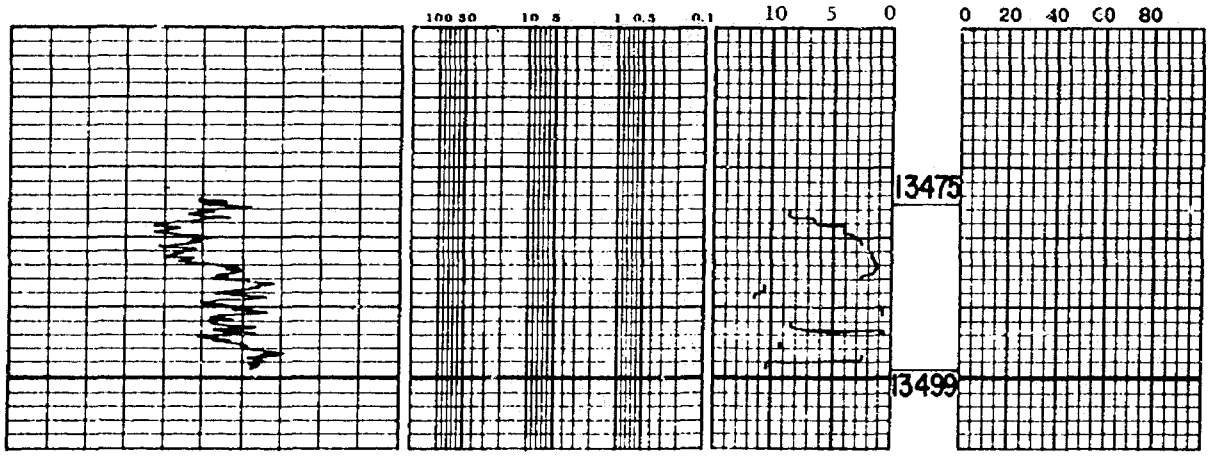
COREGRAPH

TOTAL WATER
PERCENT TOTAL WATER
80 60 40 20 0

PERMEABILITY
MILLIDARCYS
100 50 10 5 1 0.5 0.1

POROSITY
PERCENT
10 5 0

OIL SATURATION
PERCENT PORE SPACE
0 20 40 60 80



Marion Exh 6

H. J. GRUY AND ASSOCIATES, INC.

SCHLUMBERGER GAMMA RAY NEUTRON LOG
DEPTH REFERENCE - SURFACE CASING FLANGE

PURE OIL COMPANY
RED HILLS UNIT NO. 1
LEA COUNTY, NEW MEXICO
OCTOBER 22, 1963

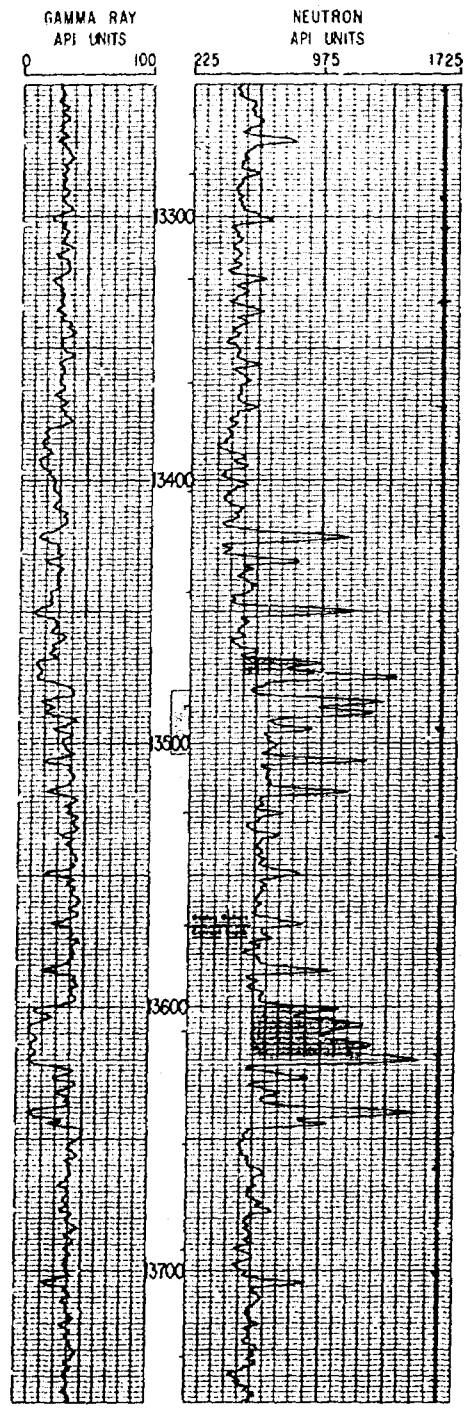


EXHIBIT NO. Nucor 7

PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

August 21, 1964

REPLY TO
P. O. BOX 4337
MIDLAND, TEXAS

The Pure Oil Company
P. O. Box 671
Midland, Texas

Attention: Mr. J. H. Parrish

Subject: Mud and Cuttings Analysis
Red Hills Unit No. 1 Well
Wildcat
Lea County, New Mexico
Location: Sec. 32-T25S-R33E

Gentlemen:

A mobile laboratory of Core Laboratories, Inc. was present at the site of the subject well during drilling operations between the depths of 4800 and 21,321 feet. Using standard equipment and procedures, laboratory personnel continuously monitored the drilling fluid for hydrocarbon content and inspected the drill cuttings at regular intervals for gas and oil content and lithology. To supplement the hot wire gas detector, a Programmed Hydrocarbon Detector (gas chromatograph) was used for detecting and measuring each hydrocarbon in the total gas. The results of the observations are shown on the accompanying Grapholog with other pertinent information, including drilling rate data and drilling fluid properties.

All shows of hydrocarbon have been reported and evaluated on the attached Show Reports. This information was also reported to a representative of the company. Should there be any questions, please do not hesitate to contact us.

We are pleased to have been of service and trust this information has assisted in evaluating this property.

Very truly yours,

Core Laboratories, Inc.

R S Bynum Jr (RB)

R. S. Bynum, Jr.,
Division Manager

RSB:jr

SHOW REPORT CL-408

CORE LABORATORIES, INC.

No. 1
Date 4/3/63
CLI No. FL-260 TL MCL

Operator PURE OIL COMPANY
Well #1 RED HILLS County LEA State N. MEXICO

DESCRIPTION OF SHOW:

Show Interval 6700' To 6748'
Color of Flu PALE YELLOW Intensity of Flu SL TR PALE YELLOW
% Sand-~~k~~ in Sample 90% % of Sand-~~k~~ w/Flu 10%
Cut: Visual V WK Flu PALE YELLOW.
Lithology of Section: SS: CLR-LT GY CLEAN VFG UNCONSL

GAS UNITS:

	HOT WIRE			P/H/D (CHROMATOGRAPH)					
Mud	Hi	Lo	Mud	Methane C_1	~~Ethane~~	Ethane C_2	Propane C_3	Butane C_{4+}	~~Pentane~~
From:	55	35	From:	120		25	20	0	
To:	170	110	To:	520		110	70	25	
Cuttings			Cuttings						
From:	0	0	From:	X					
To:	0	0	To:	X					

ADDITIONAL INFORMATION:

Bit Condition	New X	Worn	Dull	
Drilling Break	Yes X	No		
Average Drilling Rate	Controlled Rate NC	Before Break 2"/FT	During Break 1"/FT	
Weight on Bit Changes	Increased	Decreased	No Change X	
Circulated Out	Yes X No	Depth CO 6748'		
Chloride Changes	Before ND	After ND		

FIELD EVALUATION:

Minor Poor X Fair Good Remarks: CLEAN SD BELOW FIRM SHK W POSITIVE BUT WEAK GAS KICK WITHOUT SUPPORTING SHOWS INDICATE PROB WATER GAS. RELATIVE TO PREVIOUS SHOWS THIS ZONE BEST YET.

FINAL EVALUATION: (It is recognized that other information such as other shows, side wall samples, etc. are necessary for the best evaluation. Consequently, this final opinion will be given at the end of the job after this data is available.)

THIS INTERVAL TESTED AS FOLLOWS:

DST# 1 6700-6743' TO 1HR. WK BLOW THRU OUT TEST. REC. 30' FRESH WTR & 60' SW
NO OIL OR GAS.
ISIP(30") 2690# IFP 55# 1 HYD 3395#
FSIP(35") 2590# FFP 55# F HYD 3395# BHT 112°.

CORE LABORATORIES, INC.

SHOW REPORT
CL-408

No. 2
Date 4/19/63
CLI No. FL-250 1L
MCL

Operator PURE OIL COMPANY County LEA State NEW MEXICO
Well #1 RED HILLS

DESCRIPTION OF SHOW:

Show Interval 8690' To 8714'
Color of Flu BLUE Intensity of Flu BRIGHT
% Sand-~~X~~ in Sample 90% % of Sand-~~X~~ w/Flu 60%
Cut: Visual LT BRN Flu BLU YELLOW
Lithology of Section: SS, CLR QTZ EXTREMELY FG UNCONSOL.

GAS UNITS:

HOT WIRE

Mud	Hi	Lo	Mud
From:	80	60	From:
To:	>200	160	To:

Cuttings			Cuttings
From:	15	10	From:
To:	10	5	To:

P/H/D (CHROMATOGRAPH)

	Methane C_1	~~XXXXX~~	Ethane C_2	Propane C_3	Butane C_4+	~~XXXX~~
From:	160		40	30	10	
To:	880		220	140	60	
From:						
To:						

ADDITIONAL INFORMATION:

Bit Condition	New	Worn X	Dull	
Drilling Break	Yes X	No	Before Break 5"/FT	During Break 3.5"/FT
Average Drilling Rate	Controlled Rate NO	Decreased		No Change X
Weight on Bit Changes	Increased	Depth CO		
Circulated Out	Yes	No X	After NO DATA	
Chloride Changes	Before NO DATA			

FIELD EVALUATION:

Minor Poor Fair X Good Remarks: SMPLS WET APPEARS WET. NO FURTHER APPRAISAL ON THIS ZONE, GAS SAME CHARACTER AS ABOVE INDICATE POSS. WTR GAS.

FINAL EVALUATION: (It is recognized that other information such as other shows, side wall samples, etc. are necessary for the best evaluation. Consequently, this final opinion will be given at the end of the job after this data is available.)

NO DATA AVAILABLE OTHER THAN ABOVE.

SHOW REPORT
CL-402

CORE LABORATORIES, INC.

Operator PURE OIL COMPANY
Well #1 RED HILLS County LEA State NEW MEXICO

No. 8
Date 10/3/63
CLI No. FL-760 1L
MCL

DESCRIPTION OF SHOW:

Show Interval 14396 To 14412
Color of Flu - Intensity of Flu -
% Sand-~~Lime~~ in Sample 70 % of Sand-~~Lime~~ w/Flu 0
Cut: Visual 0 Flu 0
Lithology of Section: THIS SAND UNDER A DNS BLK SILIC LS. SS MG GY TO TN MED TO WELL CONSL, SL CALC & SILIC, V SLTY, SM PYRO & PYRITIC. NO APPARENT SHOW.

GAS UNITS:

	HOT WIRE			P H/D (CHROMATOGRAPH)					
Mud	Hi	Lo	Mud	Methane C_1	~~Ethane~~ C_2	Ethane C_2	Propane C_3	Butane C_{4+}	~~Pentane~~
From:	SATURATED		From:	7200		1100	500	400	
To:	SATURATED		To:	7200		1000	500	350	
			AFTER TRIP	13000		1050	500	250	
Cuttings			Cuttings						
From:			From:						
To:			To:						

ADDITIONAL INFORMATION:

Bit Condition	New	Worn X	Dull	
Drilling Break	Yes 8	No		
Average Drilling Rate	Controlled Rate NO	Before Break 3'-7 0"/FT	During Break 12"/FT	
Weight on Bit Changes	Increased	Decreased	No Change X	
Circulated Out	Yes X	No	Depth CO 14412	
Chloride Changes	Before -	After -		

FIELD EVALUATION:

Minor Poor Fair X Good Remarks: ALTHO OIL NOT EVIDENT IN SAMPLES, GAS AFTER TRIP INDICATES ADDITION OF NEW, DRYER, HIGHER BTU GAS FROM THIS ZONE.

FINAL EVALUATION: (It is recognized that other information such as other shows, side wall samples, etc. are necessary for the best evaluation. Consequently, this final opinion will be given at the end of the job after this data is available.)

EVALUATION TO BE MADE BY ELEC. LOGS. AC. HOLE NOT IN CONDITION FOR TESTING.

CORE LABORATORIES, INC.

No. 3
Date 4/27-28/63
CLI No. FL-260 IL
MCL

SHOW REPORT
CL-403

Operator PURE OIL COMPANY County LEA State NEW MEXICO
Well #1 RED HILLS

DESCRIPTION OF SHOW:

Show Interval 9682' To 9694'
Color of Flu BLUE-YELLOW Intensity of Flu V/DULL
~~%~~ of ~~Sand~~-Lime in Sample 40% ~~%~~ of ~~Sand~~-Lime w/Flu 25%
Cut: Visual BRN Flu FAIR TO GOOD BLUE
Lithology of Section: LS: BRN-BUFF F SUCR BLEEDING GAS W 10% PP & SM VUGGY PORO & 10% FAIR PORO.

GAS UNITS: HOT WIRE

	Hi	Lo	Mud
Mud From:	130	40	
To:	SATURATED		
Cuttings From:	20	10	
To:	100	90	

P/H/D (CHROMATOGRAPH)

	Methane C_1	~~Ethane~~ ~~Propane~~ ~~Butane~~ ~~XXXX~~	Ethane C_2	Propane C_3	Butane C_{4+}	~~XXXX~~
From:	120		40	20	20	
To:	6300		2500	1200	550	
Cuttings From:						
To:						

ADDITIONAL INFORMATION:

Bit Condition	New X	Worn	Dull
Drilling Break	Yes X	No	During Break 6"/FT
Average Drilling Rate	Controlled Rate NO	Before Break 10"/FT	No Change X
Weight on Bit Changes	Increased	Decreased	
Circulated Out	Yes X No	Depth CO 9700'	
Chloride Changes	Before NO DATA	After NO DATA	

FIELD EVALUATION:

Minor Poor Fair Good X Remarks: THIN BUT EXCELLENT SHOW FROM EVERY RESPECT. GAS READINGS INDICATE SOME OILS PRESENT. BRT GREEN THIN (HI GRAV) OIL ON PITS AS SMPLS FROM THIS ZONE CAME UP. BRT BLUE FLUO & GAS CONTINUED TO BLEED INTO BORE AND REGISTER WITH SAME INTENSITY WHILE DRILLING AHEAD TO TEST.

FINAL EVALUATION: (It is recognized that other information such as other shows, side wall samples, etc. are necessary for the best evaluation. Consequently, this final opinion will be given at the end of the job after this data is available.)

DST #2 9663-9896 TO 1½HR W STRNG BLOW THRUOUT TEST. EST 7.5M CFPD AT END OF 1HR & 1½HR, REC 180' FLUID: 80'HGC&SL/GC MUD & 100'HG&HGCMUD, NO WATER. GTS 17MIN.

ISIP (30MIN) 1300# IFP 65# I HYD 4445#
FSIP (1HR) 2122# FFP 65# F HYD 4445# BHT 1440

OIL IN MUD BRT GN THIN W BRT BLU FLUO, INSUFF FOR GRAV.

SHOW REPORT
CL-403

CORE LABORATORIES, INC.

Operator PURE OIL COMPANY — No. 4
Well #1 RED HILLS — County LEA — State NEW MEXICO — Date 5/13/53
CLI No. FL-260 1L MCL

DESCRIPTION OF SHOW:

Show Interval 10976 to 10990 / 11002 To 11014
Color of Flu YELLOW — Intensity of Flu V. DULL
% ~~Stain~~-Lime in Sample 50 — % of ~~Stain~~-Lime w/Flu 10
Cut: Visual NIL — Flu V DULL YELLOW
Lithology of Section: LS: GY-BRN VF XLN DNS TO SFT SLTY, TR WH BUFF CHLK, SM DK GY-BRN VF XLN W SEC CALCITE XTL & FOSS, SM REWORKED & BROKEN LS IN SH W POSS EDGE PORO.

GAS UNITS:

	HOT WIRE			P/H/D (CHROMATOGRAPH)					
Mud	Hi	Lo	Mud	Methane C_1	~~Ethane~~ ~~C_2~~	Ethane C_2	Propane C_3	Butane C_4 +	~~Propane~~ ~~C_3~~
From:	290	200	From:	800		210	110	100	
To:	SATURATED		To:	6500		2400	1200	600	
Cuttings			Cuttings						
From:	24	16	From:	x					
To:	50	20	To:	x					

ADDITIONAL INFORMATION:

Bit Condition	New	Worn X	Dull
Drilling Break	Yes X	No	
Average Drilling Rate	Controlled Rate NO	Before Break 7-10"/FT	During Break 5"/FT
Weight on Bit Changes	Increased	Decreased	No Change X
Circulated Out	Yes X No	Depth CO 11012	
Chloride Changes	Before	After	

FIELD EVALUATION:

Minor ___ Poor X Fair ___ Good ___ Remarks: SAMPLES WERE GOOD BUT LACKED PORO AND WAS SHLY, GAS POSS FROM FRAC AS DESCRIBED ABOVE.

FINAL EVALUATION: (It is recognized that other information such as other shows, side wall samples, etc. are necessary for the best evaluation. Consequently, this final opinion will be given at the end of the job after this data is available.)

NONE

SHOW REPORT
CL-40a

CORE LABORATORIES, INC.

Operator PURE OIL COMPANY
Well #1 RED HILLS County LEA State NEW MEXICO

No. 5
Date 6/8/63
CLI No. FL-260 1L
MCL

DESCRIPTION OF SHOW:

Show Interval 13208 To 13224
Color of Flu * Intensity of Flu *
~~%Sand~~-Lime in Sample 50% % of Sand-Lime w./Flu *
Cut: Visual * Flu *
Lithology of Section: LS: BRN & WH MOTT REWORKED F XLN ONS SILIC V FOSS W SM F CGL & CHT INCL, TR SS BRN VFG TI W TR DULL YELL FLUO & TR YELL CUT.

GAS UNITS:

	HOT WIRE			P/H/D (CHROMATOGRAPH)						
Mud	Hi	Lo	Mud	Methane C_1	~~Ethane~~	Ethane C_2	Propane C_3	Butane C_{4+}	~~Pentane~~	
From:	SATURATED		From:	4400		1800	600	500		
To:	SATURATED		To:	9500		3200	1700	1300		
Cuttings			Cuttings							
From:	16	10	From:	x						
To:	40	10	To:	x						

ADDITIONAL INFORMATION:

Bit Condition — New ____ Worn x Dull ____
Drilling Break — Yes x No ____
Average Drilling Rate — Controlled Rate NO Before Break 18"/FT During Break 5"/FT
Weight on Bit Changes — Increased ____ Decreased ____ No Change x
Circulated Out — Yes X No ____ Depth CO 13212 & 13220
Chloride Changes — Before - After -

FIELD EVALUATION:

Minor ____ Poor ____ Fair ____ Good X Remarks: THIS BASED ONLY ON GAS INCREASE. HVY GAS CUT MUD (9.2 CUT TO 7.1#/GAL.) UP W SAMPLS WHICH SHOWED NOTHING EXCEPT AS DESCRIBED ABOVE.

FINAL EVALUATION: (It is recognized that other information such as other shows, side wall samples, etc. are necessary for the best evaluation. Consequently, this final opinion will be given at the end of the job after this data is available.)

THIS ZONE INCLUDED IN INTERVAL TESTED ON DST #4 12938-13439.

SHOW REPORT
CL-403

CORE LABORATORIES, INC.

Operator PURE OIL COMPANY
Well #1 RED HILLS County LEA State NEW MEXICO

No. 6
Date 6/13/63
CLI No. FL-260 1L
MCL

DESCRIPTION OF SHOW:

Show Interval 13470 To 13476
Color of Flu – Intensity of Flu –
% Sand-Lime in Sample – % of Sand-Lime w/Flu –
Cut: Visual – Flu –
Lithology of Section: –

GAS UNITS:

HOT WIRE

Mud	Hi	Lo
From:	NR	
To:	NR	

Mud	Hi	Lo
From:		
To:		

P/H/D (CHROMATOGRAPH)

	Methane C_1	Ethane C_2	Propane C_3	Butane C_4+
From:	NR			
To:	NR			

From:				
To:				

Cuttings

	Hi	Lo
From:	NR	
To:		

Cuttings

From:				
To:				

ADDITIONAL INFORMATION:

Bit Condition	New X	Worn	Dull
Drilling Break	Yes X	No	
Average Drilling Rate	Controlled Rate NO	Before Break 22"/FT	During Break 2"/FT
Weight on Bit Changes	Increased	Decreased	No Change X
Circulated Out	Yes X No	Depth CO 13476	
Chloride Changes	Before –	After –	

FIELD EVALUATION:

Minor Poor Fair Good X Remarks: WELL BLEW OUT 15MIN AFTER BEGAN CIRCULATING. NO LITHOLOGY OR GAS FROM MUD AVAILABLE.

FINAL EVALUATION: (It is recognized that other information such as other shows, side wall samples, etc. are necessary for the best evaluation. Consequently, this final opinion will be given at the end of the job after this data is available.)

THIS ZONE INCLUDED IN DST #1 12938-13499. TO 6HR 24MIN. HOLE FULL WTR & 3100# PRESS INCR TO5000# WHEN OPENED. ON 3/8"+ 1/8" SURF CHOKE 400# AFTER 1 HR 17MIN. ON 1/2"+ 3/8" PRESS DOWN TO 80# AT 1HR 33MIN W MUD TO SURFACE. INCR TO MAX 2000# 2HR 55MIN & STAB AT 1800-2000# FLOWING HVY GAS CUT MUD. STAB FLOW ON 1/2" CHK AT 1700# W 12MMCFPD. NO MEAS ON FLUID. SM DIST OR COND PRESENT. CHK CUT OUT TO 9/16". SM WTR W 22,000PPM CCL.
ISIP (1HR) 11280# IFP 8750# I HYD 11475# BHT 190°
FSIP (2HR) 10400# FFP 4345# F HYD NO F HYD-CLOCK OUT.

SHOW REPORT
CL-408

CORE LABORATORIES, INC.

Operator PURE OIL COMPANY
Well #1 RED HILLS County LEA State NEW MEXICO

No. 7
Date 8/28, 29/63
CLI No. FL-260 1L
MCL

DESCRIPTION OF SHOW:

Show Interval 13592 To 13612
Color of Flu - Intensity of Flu -
% Sand-Lime in Sample 30 - 50 % of Sand-Lime w/Flu -0-
Cut: Visual 0 Flu 0
Lithology of Section: UPPER 8 TI VFG SS V CALC & SILIC, NO SHOW: LOWER 14' 50% LS LT GY-LT IN F-MXLN V SDY & V FOSS, 70% W TR PP PORO & 30% W FAIR PORO, ALL BLEEDING GAS.

GAS UNITS:

HOT WIRE

Mud	Hi	Lo
From:	SATURATED	
To:	SATURATED	

Cuttings

From:	40	20
To:	80	20

P/H/D (CHROMATOGRAPH)

Mud	Methane C_1	[illegible]	Ethane C_2	Propane C_3	Butane C_{4+}	[illegible]
From:	350		140	50	120	
To:	10000		1700	600	600	

Cuttings

From:	x						
To:	x						

ADDITIONAL INFORMATION:

Bit Condition	New	Worn x	Dull
Drilling Break	Yes x	No	
Average Drilling Rate	Controlled Rate NO	Before Break 25"/FT	During Break 3"/FT
Weight on Bit Changes	Increased	Decreased	No Change x
Circulated Out	Yes x No	Depth CO 13602 & 13612	
Chloride Changes	Before -	After -	

FIELD EVALUATION:

Minor Poor Fair Good x Remarks: PORO IN MOST OF LS AND VERY GOOD GAS READINGS WITH SHIFT IN CHARACTER TO DRY END INDICATES DEFINITE PICKUP OF GOOD GAS SHOW AS MUD WT AT THIS TIME 10.1#/GAL. SHOWING PROB GOOD PRESSURE. WELL TRYING TO KICK WHILE CIRC. GOOD DRILLING BREAK ALSO.

FINAL EVALUATION: (It is recognized that other information such as other shows, side wall samples, etc. are necessary for the best evaluation. Consequently, this final opinion will be given at the end of the job after this data is available.)

EVALUATION ON THIS ZONE TO BE DETERMINED BY ELEC LOGS.

SHOW REPORT
CL-403

CORE LABORATORIES, INC.

Operator PURE OIL COMPANY
Well #1 RED HILLS County LEA State NEW MEXICO

No. 5
Date 1/26/64
CLI No. FL-260 1L
MCL

DESCRIPTION OF SHOW:

Show Interval 15900 To 15908
Color of Flu NONE Intensity of Flu -
% Sand-~~Lime~~ in Sample 30% % of Sand-~~Lime~~ w/Flu 0
Cut: Visual 0 Flu 0
Lithology of Section: SS: BRN-GY VF-FG W SM PYR, SLTY, CALC, MIC, W SM BLD GAS

GAS UNITS:

	HOT WIRE Hi	HOT WIRE Lo		P/H/D (CHROMATOGRAPH) Methane C_1	~~Ethane~~	Ethane C_2	Propane C_3	Butane C_4 +	~~Pentane~~
Mud From:	25	T	Mud From:	50		T			
Mud To:	160	10	Mud To:	655		20	T		
Cuttings From:	0	0	Cuttings From:	X					
Cuttings To:	0	0	Cuttings To:	X					

ADDITIONAL INFORMATION:

Bit Condition New ____ Worn X Dull ____
Drilling Break Yes X No ____
Average Drilling Rate Controlled Rate NO Before Break 30"/FT During Break 13"/FT
Weight on Bit Changes Increased ____ Decreased ____ No Change X
Circulated Out Yes ____ No X Depth CO ____
Chloride Changes Before - After -

FIELD EVALUATION:

Minor ____ Poor X Fair ____ Good ____ Remarks: VERY THIN BUT POSITIVE SHOW OF GAS OPPOSITE DRILLING BREAK ON SD STRINGER.

FINAL EVALUATION: (It is recognized that other information such as other shows, side wall samples, etc. are necessary for the best evaluation. Consequently, this final opinion will be given at the end of the job after this data is available.)

TOO THIN FOR FURTHER INVESTIGATION.

SHOW REPORT
CL-403

CORE LABORATORIES, INC.

No. 10
Date 3/31/64

Operator PURE OIL COMPANY
Well #1 RED HILLS County LEA State NEW MEXICO
CLI No. FL-260 1L
MCL

DESCRIPTION OF SHOW:

Show Interval 17528 To 17574
Color of Flu 0 Intensity of Flu 0
% ~~Sample~~ Sample DOLO 40% % of ~~Sample~~/Flu DOLO 0
Cut: Visual 0 Flu 0
Lithology of Section: DOLO: WH-LT GY F XLN SUCR, CLN, TR ~~X~~ WH INCL TR CSE XLN CLR DOLO RHOMBS W GOOD IN XLN PORO, POSS DEAD OIL STN IN F XLN CALC TO CHLKY PT.

GAS UNITS:

	HOT WIRE			P/H/D (CHROMATOGRAPH)					
Mud	Hi	Lo	Mud	Methane C_1	~~Ethane~~ (C_2)	Ethane C_2	Propane C_3	Butane C_4 +	~~Pentane~~
From:	40	T	From:	160		T			
To:	8		To:	30					
Cuttings			Cuttings						
From:	0	0	From:	X					
To:	0	0	To:	X					

ADDITIONAL INFORMATION:

Bit Condition — New ____ Worn X Dull ____
Drilling Break — Yes X No ____
Average Drilling Rate — Controlled Rate NO Before Break 12"/FT During Break 7"/FT
Weight on Bit Changes — Increased ____ Decreased ____ No Change X
Circulated Out — Yes X No ____ Depth CO 17575
Chloride Changes — Before ____ After ____

FIELD EVALUATION:

Minor ____ Poor X Fair ____ Good ____ Remarks: NO SHOW DETECTED BUT GIVEN AS TOP OF POROSITY.

FINAL EVALUATION: (It is recognized that other information such as other shows, side wall samples, etc. are necessary for the best evaluation. Consequently, this final opinion will be given at the end of the job after this data is available.)

TESTED DST #5 17464-17575 TO 4HRS. BEGIN TEST W 1800# N BLANKET & 7500' WTR BLANKET. 1HR 40MIN BLED TO 0#, 2HR 15MIN SLOW BLOW W WTR BLKT, GTS 2HR 35MIN ON 1"CHK 50-75#, 3HR ON 3/4"CHK MAX 600# W EST 7,000MCFPD, DECR TO 2,400MCFPD AT 155# ON MANIFOLD WHEN SHUT IN.
ISIP (1HR) 7561# IFP 5719# I HYD 8262#
FSIP (2HR) 7561# FFP 89?# F HYD 8262# BHT 240°
REC 1780' BLK SULP WTR W MAX 10,000PPM CCL.

CORES # 2,3,4,5,6,7 RUN BELOW THIS AND TESTED AS ON SAMPLE LOG.
BY SAMPLES CONTINOUS POROSITY DOWN TO 17560.

SHOW REPORT
CL-402

CORE LABORATORIES, INC.

Operator PURE OIL COMPANY
Well #1 RED HILLS County LEA State NEW MEXICO

No. 11
Date 4/30, 5/1/64
CLI No. FL-260 1L
MCL

DESCRIPTION OF SHOW:

Show Interval 18568 To 18700
Color of Flu NONE Intensity of Flu NONE
% Sample in Sample DOLO 100 % of Sample w/Flu DOLO 0
Cut: Visual NONE Flu NONE
Lithology of Section: 18568-86 LS WH CLR MED XLN W YR IN XLN PORO W CLEAR, - 18586-18700 DOLO WH-LT GY F-M XLN W INTER XLN PORO BETWEEN RHOMBS, NO SHOW, UP TO 30% W GOOD PORO.

GAS UNITS:

	HOT WIRE			P/H/D (CHROMATOGRAPH)					
Mud	Hi	Lo	Mud	Methane C_1	[illegible]	Ethane C_2	Propane C_3	Butane C_{4+}	[illegible]
From:	50	T	From:	160		20	T		
To:	SATURATED		To:	3000		300	40	T	
Cuttings			Cuttings						
From:	0	0	From:	x					
To:	0	0	To:	x					

ADDITIONAL INFORMATION:

Bit Condition	New X	Worn	Dull
Drilling Break	Yes X	No	
Average Drilling Rate	Controlled Rate NO	Before Break 4[illegible]"/FT	During Break 5-20"/FT
Weight on Bit Changes	Increased	Decreased	No Change X
Circulated Out	Yes X No	Depth CO 18700	(FOR TEST)
Chloride Changes	Before -	After -	

FIELD EVALUATION:

Minor Poor X Fair Good Remarks: NO SHOW BUT SOME GAS KICK 18680-700, TOP OF PORO.

FINAL EVALUATION: (It is recognized that other information such as other shows, side wall samples, etc. are necessary for the best evaluation. Consequently, this final opinion will be given at the end of the job after this data is available.)

THIS INTERVAL TESTED: DST #8 18556-18700 TO 2HRS 45MIN. BEGAN TEST W 1500# N_2 AND 1500' WTR BLANKET. BLED N_2 TO 0# 55MIN. WK BLOW GAS THRUOUT TEST.
ISIP (1½HR) 8087# IFP 7868# I HYD 9047#
FSIP (1½HR) 8087# FFP 8087# F HYD 3960# BHT 252°
REC 17626' TOTAL FLUID, 2000' WATER CUSHION & 15625' (174BBLS) SLTY SULP WTR W 30,000PPM MAX CCL.

Distribution of Final Reports

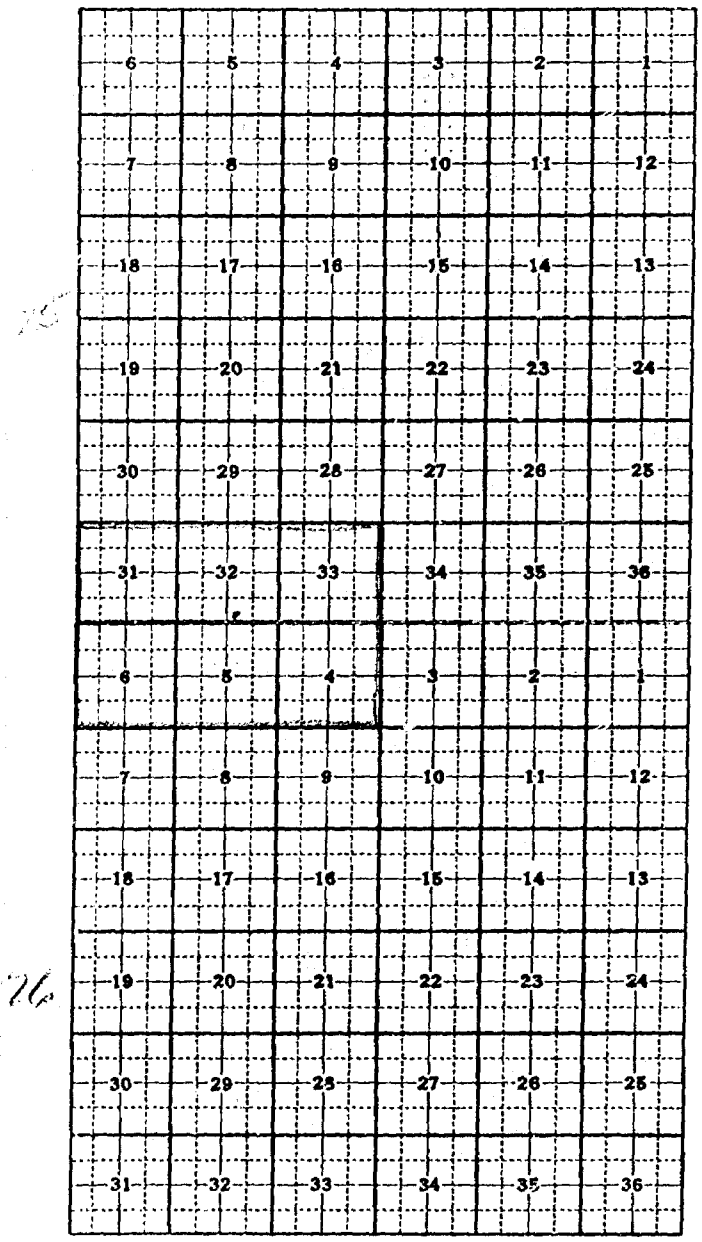
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HORIZONTAL LIMITS FOR

Name

Address Ph.

Remarks:



T ..... R ..... State or County .....

3158 - 3159

PALS INC

Fractional Distillation Analysis Results Summary

Petroleum Analytical Laboratory Service, Inc.

P. O. Box 388 Phone EM 6-2866

ODESSA, TEXAS

No. .....
Run No. 7637
DATE OF RUN 10-20-64
Date Secured 10-20-64

A Sample of GAS, FROM RED HILLS UNIT #1, PENN GAS, 14607-14788 TEST SEP.
Secured from Pure Oil Company
At Midland, Texas Secured by C.E. Speight
Time 11:30AM Date 10-19-64
Sampling conditions Press. 175psi on container.
Temp.

FRACTIONAL DISTILLATION

Percentage Composition

	MOL%	LIQ.%
Carbon Dioxide	0.80	
Air		
Nitrogen	0.72	
Oxygen		
Hydrogen sulf.	sweet to lead acetate	
Hydrogen		
Methane	97.66	
Ethane	0.50	
Propane	0.23	
Butanes		
Iso-Butane	0.04	
N-Butane	0.05	
Pentanes		
Iso-Pentane		
N-Pentane		
Hexanes		
Heptanes		
TOTAL	100.00%	

Calc. Sp. Gr. .572
Calc. A.P.I.
Calc. Vapor Press. Lb./Sq. In.
Sp. Gr.
Mol. Wt.

Liquid Content

Method	G.P.M.
Based on Analysis (Butanes)	0.029
Based on Analysis (Pentanes & Heavier)	-
Based on Analysis (Propanes)	0.063
Based on Analysis (Ethane)	

Heating Value

British Thermal Units Per Cu. Ft. at 14.65 p.s.i. at 60 °F

Method	Gal.	Dry Basis	Wet Basis
Based on % Composition		1003	985

Run by H. Berry Checked by T.M. Simpson Approved by

Additional Data and Remarks

PALS INC

Fractional Distillation Analysis Results Summary

Petroleum Analytical Laboratory Service, Inc.

P. O. Box 388 Phone EM 6-2866

ODESSA, TEXAS

No. .....
Run No. 7688
DATE OF RUN 10-21-64
Date Secured 10-20-64

A Sample of PENN LIQUID, FROM RED HILLS UNIT #1, 14607-14788 TEST SEP.
Secured from Pure Oil Company
At Midland, Texas Secured by C.E. Speight
Time 9:30AM Date 10-19-64
Sampling conditions Press. 115psi on container
Temp. 100°F

FRACTIONAL DISTILLATION

Percentage Composition

	MOL%		LIQ.%
Carbon Dioxide			
Air			
Nitrogen			
Oxygen			
Hydrogen sulf.			
Hydrogen			
Methane C_1	1.17		0.32
Ethane C_2	0.49		0.20
Propane C_3	0.44		0.19
Butanes			
Iso-Butane iC_4	0.10		0.05
N-Butane nC_4	0.44		0.22
Pentanes			
Iso-Pentane iC_5	0.77		0.44
N-Pentane nC_5	0.52		0.31
Hexanes C_6	3.26		2.09
Heptanes C_7+	92.82		96.18
TOTAL	100.00%		100.00%

Calc. Sp. Gr.—
Calc. A.P.I.—
Calc. Vapor Press.— Lb./Sq. In.
Sp. Gr. of C_7+ .7995
Mol. Wt. of C_7+ 166.7

Liquid Content

Method	G.P.M.
Based on Analysis (Butanes)	
Based on Analysis (Pentanes & Heavier)	
Based on Analysis (Propanes)	
Based on Analysis (Ethane)	

Heating Value

British Thermal Units Per Cu. Ft. at 14.65 p.s.i. at 60 °F

Method	Gal.	Dry Basis	Wet Basis
Based on % Composition			

Run by H. Berry Checked by T.M. Simpson Approved by

Additional Data and Remarks

EX 5-B

PALS INC

Fractional Distillation Analysis Results Summary

Petroleum Analytical Laboratory Service, Inc.

P. O. Box 388 Phone EM 6-2866

ODESSA, TEXAS

No. .....
Run No. 7755
DATE OF RUN 11/5/64
Date Secured 11/4/64

RED HILL UNIT. #1 13,622-13,643
A Sample of #1 LIQUID LOWER COLEMAN 13,669-13667 24.9 BBL/MMCF. Taken 11/3/64
Secured from The Pure Oil Company
At Midland, Texas Secured by L.L. H & SJB
Time 2:00PM 2:00PM Date 11/3/64
Sampling conditions Press. 1025 #
Temp. 76°F Atmos. 69°F.

FRACTIONAL DISTILLATION

Percentage Composition

	MOL%		LIQ.%
Carbon Dioxide			
Air			
Nitrogen			
Oxygen			
Hydrogen sulf.			
Hydrogen			
Methane	11.39		5.04
Ethane	11.09		7.36
Propane	11.11		7.96
Butanes			
Iso-Butane	4.91		4.18
N-Butane	7.38		6.06
Pentanes			
Iso-Pentane	5.00		4.76
N-Pentane	4.83		4.60
Hexanes	10.56		11.29
Heptanes	11.99		14.42
OCTANES +	21.69		34.33
TOTAL	100.00		100.00

Calc. Sp. Gr.—
Calc. A.P.I.—
Calc. Vapor Press.— Lb./Sq. In.
Sp. Gr. C-8+ .7689
Mol. Wt. C-6+ 147.2

Liquid Content

Method	G.P.M.
Based on Analysis (Butanes)	
Based on Analysis (Pentanes & Heavier)	
Based on Analysis (Propanes)	
Based on Analysis (Ethane)	

Heating Value

British Thermal Units Per Cu. Ft. at 14.65 p.s.i. at 60 °F

Method	Gal.	Dry Basis	Wet Basis
Based on % Composition			

Run by Simpson & Berry Checked by Approved by

Additional Data and Remarks

PALS INC

Fractional Distillation Analysis Results Summary

Petroleum Analytical Laboratory Service, Inc.

P. O. Box 388 Phone EM 6-2866

ODESSA, TEXAS

No. .....
Run No. 7756
DATE OF RUN 11-6-64
Date Secured 11-4-64

RED HILLS UNIT #1
A Sample of SEPARATOR OFF GAS, HIGH STAGE, FLOW RATE 12.1 MMCF, WOLFCAMP
Secured from The Pure Oil Company 13,659-13,667
At Midland, Texas Secured by L.L.Harmon 13,622-13,643
Time 9:00PM Date 11-3-64
Sampling conditions Press. 1025psi
Temp. 76°F

FRACTIONAL DISTILLATION

Percentage Composition

	MOL%	LIQ.%
Carbon Dioxide	0.20	
Air		
Nitrogen	0.55	
Oxygen		
Hydrogen sulf.	sweet to lead acetate	
Hydrogen		
Methane	87.30	(87.00)
Ethane	7.98	
Propane	2.52	
Butanes		
Iso-Butane	0.45	
N-Butane	0.60	
Pentanes		
Iso-Pentane	0.20	
N-Pentane	0.16	
Hexanes +	0.34	
Heptanes		
TOTAL	100.00%	

Calc. Sp. Gr. .653
Calc. A.P.I.
Calc. Vapor Press. Lb./Sq. In.
Sp. Gr.
Mol. Wt.

Liquid Content

Method	G.P.M.
Based on Analysis (Butanes)	0.335
Based on Analysis (Pentanes & Heavier)	0.289
Based on Analysis (Propanes)	0.691
Based on Analysis (Ethane)	

Heating Value

Method	Gal.	British Thermal Units Per Cu. Ft. at 14.65 p.s.i. at 60 °F Dry Basis	Wet Basis
Based on % Composition		1146	1126

Run by Simpson & Berry Checked by Approved by J. R. Simpson

Additional Data and Remarks

H_2S .003
RSH .004
RSR .001
RSSR .001
.009
Total .009

PALS INC

Fractional Distillation Analysis Results Summary

No. 2
Run No. 7757
DATE OF RUN 11/6/64
Date Secured 11/5/64

Petroleum Analytical Laboratory Service, Inc.

P. O. Box 388 Phone EM 6-2866

ODESSA, TEXAS

RED HILLS UNIT C #1 [illegible] 13,622-13,643
A Sample of #2 LIQUID LOWER WOLFCAMP 13,659-13-667 28.0 bbls/mmcf Taken 11/3/64
Secured from The Pure Oil Company
At Midland, Texas Secured by LLH & SJB
Time 9.00 PM Date 11/3/64
Sampling conditions Press. 1025 psi
Temp 76 °F.

FRACTIONAL DISTILLATION

Percentage Composition

	MOL%		LIQ.%
Carbon Dioxide			
Air			
Nitrogen			
Oxygen			
Hydrogen sulf.			
Hydrogen			
Methane	12.84		5.80
Ethane	11.18		7.57
Propane	11.24		8.22
Butanes			
Iso-Butane	4.90		4.26
N-Butane	7.63		6.40
Pentanes			
Iso-Pentane	5.03		4.89
N-Pentane	4.82		4.64
Hexanes	10.50		11.46
Heptanes	12.28		15.08
OCTANES +	19.58		31.68
TOTAL	100.00		100.00

Calc. Sp. Gr.—
Calc. A.P.I.—
Calc. Vapor Press.— Lb./Sq. In.
Sp. Gr. C-8+ .7681
Mol. Wt. C-8+ 147.2

Liquid Content

Method	G.P.M.
Based on Analysis (Butanes)	
Based on Analysis (Pentanes & Heavier)	
Based on Analysis (Propanes)	
Based on Analysis (Ethane)	

Heating Value

British Thermal Units Per Cu. Ft. at 14.65 p.s.i. at 60 °F

Method	Gal.	Dry Basis	Wet Basis
Based on % Composition			

Run by Berry & Simpson Checked by Approved by J. D. Simpson

Additional Data and Remarks

PALS INC

Fractional Distillation Analysis Results Summary

Petroleum Analytical Laboratory Service, Inc.

P. O. Box 388 Phone EM 6-2866

ODESSA, TEXAS

No. .....
Run No. 7779
DATE OF RUN 11-9-64
Date Secured 11-9-64

RED HILLS UNIT #1,
A Sample of #1 GAS, UPPER WOLFCAMP 13,440-13,512, FLOW RATE 8.7 MMCF 11-5-64
Secured from The Pure Oil Company
At Midland, Texas Secured by L.L. Harmon
Time 11:30 PM Date 11-5-64
Sampling conditions Press. 980psi
Temp. 76°F

FRACTIONAL DISTILLATION

Percentage Composition

	MOL%	LIQ.%
Carbon Dioxide	0.20	
Air		
Nitrogen	0.55	
Oxygen		
Hydrogen sulf.	sweet to lead acetate	
Hydrogen		
Methane	83.40	
Ethane	7.91	
Propane	2.84	
Butanes		
Iso-Butane	0.61	
N-Butane	1.02	
Pentanes		
Iso-Pentane	0.71	
N-Pentane	0.80	
Hexanes +	1.96	
Heptanes		
TOTAL	100.00	

Calc. Sp. Gr.— .732
Calc. A.P.I.—
Calc. Vapor Press.— Lb./Sq. In.
Sp. Gr.
Mol. Wt.

Liquid Content

Method	G.P.M.
Based on Analysis (Butanes)	0.519
Based on Analysis (Pentanes & Heavier)	1.456
Based on Analysis (Propanes)	0.779
Based on Analysis (Ethane)	

Heating Value

British Thermal Units Per Cu. Ft. at 14.65 p.s.i. at 60 °F

Method	Gal.	Dry Basis	Wet Basis
Based on % Composition		1268	1245

Run by Simpson & Berry Checked by Approved by D. H. Simpson

Additional Data and Remarks

Total Sulfur: Hydrogen Sulfide, gr./100 cu.ft. 0.002
" Mercaptan 0.005
" Sulfides 0.004
" Residual Sulfur 0.002
TOTAL 0.013

PALS INC

Fractional Distillation Analysis Results Summary

Petroleum Analytical Laboratory Service, Inc.

P. O. Box 388 Phone EM 6-2866

ODESSA, TEXAS

No. .....
Run No. 7781
DATE OF RUN 11/10/64
Date Secured 11/7/64

RED HILLS UNIT #1 Taken 11-6-64

A Sample of #2 GAS UPPER WOLFCAMP 13,440-13512 FLOW RATE 12.5 MMCF 32BBLs/MMCF

Secured from The Pure Oil Company

At Midland, Texas Secured by L.L. Harmon

Time 7:40 PM Date 11/6/64

Sampling conditions Press 1000 psi

Temp gas 82 deg. F. atmos. 60 deg. F.

FRACTIONAL DISTILLATION

Percentage Composition

	MOL%	LIQ.%
Carbon Dioxide	0.20	
Air		
Nitrogen	0.63	
Oxygen		
Hydrogen sulf.	sweet to lead acetate	
Hydrogen		
Methane	86.82	
Ethane	8.00	
Propane	2.59	
Butanes		
Iso-Butane	0.45	
N-Butane	0.62	
Pentanes		
Iso-Pentane	0.20	
N-Pentane	0.18	
Hexanes +	0.31	
Heptanes		
TOTAL	100.00	

Calc. Sp. Gr. .656
Calc. A.P.I. —
Calc. Vapor Press. — Lb./Sq. In.
Sp. Gr.
Mol. Wt.

Liquid Content

Method	G.P.M.
Based on Analysis (Butanes)	0.342
Based on Analysis (Pentanes & Heavier)	0.282
Based on Analysis (Propanes)	0.710
Based on Analysis (Ethane)	

Heating Value

Method	Gal.	British Thermal Units Per Cu. Ft. at 14.65 p.s.i. at 60 °F Dry Basis	Wet Basis
Based on % Composition		1151	1131

Run by H. Berry Checked by Approved by W. Simpson

Additional Data and Remarks

TOTAL SULFUR:	Hydrogen Sulfide gr./100 cu.ft.	0.003
	Mercaptans	0.006
	Sulfides	0.002
	Residual Sulfur	0.001
	TOTAL	0.012

Fractional Distillation Analysis Results Summary

Petroleum Analytical Laboratory Service, Inc.

P. O. Box 388 Phone EM 6-2866

ODESSA, TEXAS

No. .....
Run No. 7782
DATE OF RUN 11/10/64
Date Secured 11/7/64

A Sample of #2 LIQUID UPPER MOLDCAMP, 13440-13-512 32 BBLS?MMCF TAKEN 11-6-64 RED HILLS UNIT NO. 1
Secured from The Pure Oil Company
At Midland, Texas Secured by L.L. Harmon
Time 7:30 PM Date Nov. 6, 1964
Sampling conditions Press. 1000 psi at sep.
Temp liq. 82°F Atmos. 60 Deg. F.

FRACTIONAL DISTILLATION

Percentage Composition

	MOL%		LIQ.%
Carbon Dioxide			
Air			
Nitrogen			
Oxygen			
Hydrogen sulf.			
Hydrogen			4.70
Methane	11.17		6.50
Ethane	10.30		6.70
Propane	9.84		
Butanes			3.48
Iso-Butane	4.30		5.52
N-Butane	7.07		
Pentanes			3.88
Iso-Pentane	m4.29		3.79
N-Pentane	4.23		9.31
Hexanes	9.16		12.44
Heptanes	10.88		43.68
OCTANES +	28.76		
TOTAL	100.00		100.00

Calc. Sp. Gr.
Calc. A.P.I.
Calc. Vapor Press. Lb./Sq. In.
Sp. Gr. C-8+ .7698
Mol. Wt. C-8+ 148.8

Liquid Content

Method	G.P.M.
Based on Analysis (Butanes)	
Based on Analysis (Pentanes & Heavier)	
Based on Analysis (Propanes)	
Based on Analysis (Ethane)	

Heating Value

Method	British Thermal Units Per Cu. Ft. at 14.65 p.s.i. at 60 °F Gal.	Dry Basis	Wet Basis
Based on % Composition			

Run by Simpson & Berry Checked by Approved by J. D. Simpson

Additional Data and Remarks

Form 103.10 P-80 1-58

LTD FRACTIONAL ANALYSIS AND TEST REPORT

REPORT NO. D-125-64C

THE PURE OIL COMPANY — Gas Department

DATE 8-[illegible]-64

DIVISION SOUTHERN PRODUCING DISTRICT MIDLAND PLANT DOLLARHIDE NO. 20

SAMPLE RED HILL SAMPLES 2 (Gas) or (Liquid) DATE OF ANALYSIS 8-31-64 ANALYZED BY KETCHUM

UNIT DEV 17426-22 DEU 17523-44 DATE OF SAMPLING 8-31-64 TIME

POINT OF SAMPLING PRESSURE 130 psig PURPOSE To CHECK COMPOSITIONS

POINT OF SAMPLING TEMPERATURE ° F. FLOW RATE AT SAMPLING TIME

LOW TEMPERATURE DISTILLATION ANALYSIS

Component	Mol %	Liquid Volume %		GPM at 14.65 psia and 60° F.	Liq. Vol. % ___ # RVP Gasoline	Liq. Vol. % Ethane
Hydrogen Sulphide						
Carbon Dioxide	1.56					
Nitrogen	.96					
Methane	96.98					
Ethane	.49					
Propane	.01					
Iso butane						
Normal butane						
Iso pentane						
Normal pentane						
Iso hexane						
Normal hexane						
Iso heptane						
Normal heptane and heavier						
TOTAL	100.00					

MISCELLANEOUS

Molecular weight ____ Total Sample

Molecular weight ____ C___'s and heavier

Calculated specific gravity .576 at 60° F.

Tested specific gravity ____ at 60° F.

Calculated (Net) (Gross) BTU/Cubic foot at 14.696 psia 990.44

Actual vapor pressure at ____ ° F. ____ Lbs.

Calculated vapor pressure at ____ ° F. ____ Lbs.

Hydrogen sulphide 2362.52* grains per 100 SCF

Total sulphur ____ grains per 100 SCF

LPG Weathering Test — 95% evaporated at ____ °F.

Propane Residue test ____ Volume %

Corrosion test ☐ Positive ☐ Negative

Dryness test ☐ Positive ☐ Negative

Doctor test ☐ Sweet ☐ Sour

Color ____ Saybolt

Water Content ____ Lbs. per MMCF at 14.65 psia and 60° F.

PLANT PROCESS DATA

	Pressure psig	Temperature ° F. Top	Temperature ° F. Tray Control	Temperature ° F. Reboiler	Reflux Temperature ° F.	Reflux GPM	Feed Temperature ° F.	Feed GPM
Deethanizer								
Depropanizer								
Debutanizer								

		Temperature ° F.	Flow Rate	Pressure	Temperature
PRIMARY ABSORBER ____ psig	Rich Oil out		GPM	Intake	
	Lean Oil in		GPM		
	Gas In		MCFD	1st Stage Discharge	
	Gas Out		MCFD		
SECONDARY ABSORBER ____ psig	Rich Oil out		GPM	2nd Stage Discharge	
	Lean Oil in		GPM		
	Gas In		MCFD	3rd Stage Discharge	
	Gas Out		MCFD		
STRIPPER ____ psig	Top		____	Recompressor	
	Reflux		GPM		
	Rich Oil out		GPM		
	Lean Oil In		GPM		
	Steam		[illegible]		

DISTILLATION DATA (ASTM D-216-40)

I.B.P. ____ ° F.		Recovery ____ %	
10% ____ ° F.		Residue ____ %	
20% ____ ° F.		Total recovery ____ %	
30% ____ ° F.		Loss ____ %	
40% ____ ° F.		% at 212° F. ____	
50% ____ ° F.		% Evaporated at 140° F. ____	
60% ____ ° F.		% Evaporated at 248° F. ____	
70% ____ ° F.			
80% ____ ° F.			
90% ____ ° F.			
95% ____ ° F.			
End point ____ ° F.			

Remarks: * CADMIUM SULFATE METHOD

cc: 1- PLANT SUPT
1- DIST SUPT
1- DIV GAS SUPT
1- DIV PETROLEUM ENGR
1- FOREMAN
1- ENGINEER
1- LAB MANAGER

Noted and approved by [signature] Superintendent

Signed [signature] Plant Chemist

All Miscellaneous and Distillation Data results to be reported at temperatures and barometric pressure specified by N.G.A.A.

Form 303.10 P-50 1-59

LTD FRACTIONAL ANALYSIS AND TEST REPORT

REPORT NO. D-124-64C

THE PURE OIL COMPANY — Gas Department

DATE 8-31-64

DIVISION SOUTHERN PRODUCING DISTRICT MIDLAND PLANT DALLARHIDE NO. 20

SAMPLE RED HILL SAMPLER #1 (Gas) or (Liquid) DATE OF ANALYSIS 8-31-64 ANALYZED BY KETCHUM

UNIT DEV 17776-22 DEV 17525-14 DATE OF SAMPLING 8-31-64 TIME

POINT OF SAMPLING PRESSURE 130 psig PURPOSE To CHECK Composition

POINT OF SAMPLING TEMPERATURE ° F. FLOW RATE AT SAMPLING TIME

LOW TEMPERATURE DISTILLATION ANALYSIS

Component	Mol %	Liquid Volume %		GPM at 14.65 psia and 60° F.	Liq. Vol. % ___ # RVP Gasoline	Liq. Vol. % Excess
Hydrogen Sulphide						
Carbon Dioxide	1.58					
Nitrogen	.92					
Methane	97.01					
Ethane	.48					
Propane	.01					
Iso butane						
Normal butane						
Iso pentane						
Normal pentane						
Iso hexane						
Normal hexane						
Iso heptane						
Normal heptane and heavier						
TOTAL	100.00					

MISCELLANEOUS

Molecular weight ____ Total Sample

Molecular weight ____ C___'s and heavier

Calculated specific gravity .576 at 60° F.

Tested specific gravity ____ at 60° F.

Calculated (Net) (Gross) BTU/Cubic Foot at 14.696 psia 990.56

Actual vapor pressure at ____ ° F. ____ Lbs.

Calculated vapor pressure at ____ ° F. ____ Lbs.

Hydrogen sulphide 230.60 * grains per 100 SCF

Total sulphur ____ grains per 100 SCF

LPG Weathering Test— 95% evaporated at ____ °F.

Propane Residue test ____ Volume %

Corrosion test ☐ Positive ☐ Negative

Dryness test ☐ Positive ☐ Negative

Doctor test ☐ Sweet ☐ Sour

Color ____ Saybolt

Water Content ____ Lbs. per MMCF at 14.65 psia and 60° F.

PLANT PROCESS DATA

	Pressure psig	Temperature ° F. Top	Tray Control	Bobsitter	Reflux Temperature ° F.	Reflux GPM	Feed Temperature ° F.	Feed GPM
Deethanizer								
Depropanizer								
Debutanizer								

		Temperature ° F.	Flow Rate	Pressure Temperature
PRIMARY ABSORBER ____ psig	Rich Oil out		GPM	Intake
	Lean Oil in		GPM	
	Gas In		MCFD	1st Stage Discharge
	Gas Out		MCFD	
SECONDARY ABSORBER ____ psig	Rich Oil out		GPM	2nd Stage Discharge
	Lean Oil in		GPM	
	Gas In		MCFD	3rd Stage Discharge
	Gas Out		MCFD	
STRIPPER ____ psig	Top		____	Recompressor
	Reflux		GPM	
	Rich Oil out		GPM	
	Lean Oil in		GPM	
	Steam		Lbs./Hr.	

DISTILLATION DATA (ASTM D-216-40)

I.B.P.	° F.	Recovery	%
10%	° F.	Residue	%
20%	° F.	Total recovery	%
30%	° F.	Loss	%
40%	° F.	% at 212° F.	
50%	° F.	% Evaporated at 140° F.	
60%	° F.	% Evaporated at 278° F.	
70%	° F.		
80%	° F.		
90%	° F.		
95%	° F.		
End point	° F.		

Remarks: * CADMIUM SULFATE METHOD.

CC: 1-PLANT SUPT.
1-DIST SUPT.
1-DIV GAS SUPT.
1-GEN OFF GAS SUPT.
1-T.E. BURGER
1-JOHN MURPHY
1-LL HARMAN
1-FILE

Noted and approved by George H. Walker
(Plant Superintendent)

Signed Jack Ketchum
(Plant Chemist)

All Miscellaneous and Distillation Data Results to be reported at temperature and barometric pressure specified by NGAA.

Form 303.10 P-60 1-59

LTD FRACTIONAL ANALYSIS AND TEST REPORT

THE PURE OIL COMPANY – Gas Department

REPORT NO. D-111-64 C

DATE 1-30-64

DIVISION SOUTHERN PRODUCING DISTRICT MIDLAND PLANT DOLLARHIDE NO. 2-A

SAMPLE DRILL STEM TEST #10 DATE OF ANALYSIS 1-30-64 ANALYZED BY KETCHUM

UNIT RED HILL (Gas) & 20,123 (Liquid) To 20,936 DATE OF SAMPLING 1-28-64 TIME

POINT OF SAMPLING PRESSURE 1 LB psig PURPOSE To CHECK Composition

POINT OF SAMPLING TEMPERATURE ____ ° F. FLOW RATE AT SAMPLING TIME ____

LOW TEMPERATURE DISTILLATION ANALYSIS

Component	Mol %	Liquid Volume %		GPM at 14.65 psia and 60° F.	Liq. Vol. % ____ # RVP Gasoline	Liq. Vol. % Excess
Hydrogen Sulphide						
Carbon Dioxide	2.35					
Nitrogen	2.14					
Methane	95.23					
Ethane	.14					
Propane	.05			.01		
Iso butane	.01			.00		
Normal butane	.03			.01		
Iso pentane	.02			.01		
Normal pentane	.02			.01		
Iso hexane	.01			.00		
Normal hexane						
Iso heptane						
Normal heptane and heavier						
TOTAL	100.00			.04		

MISCELLANEOUS

Molecular weight ____ Total Sample

Molecular weight ____ C____'s and heavier

Calculated specific gravity .589 at 60° F.

Tested specific gravity ____ at 60° F.

Calculated (Net) (Gross) BTU/Cubic Foot at 14.696 psia 970.93

Actual vapor pressure at ____ ° F. ____ Lbs.

Calculated vapor pressure at ____ ° F. ____ Lbs.

Hydrogen sulphide ____ grains per 100 SCF

Total sulphur ____ grains per 100 SCF

LPG Weathering Test– 95% evaporated at ____ °F.

Propane Residue test ____ Volume %

Corrosion test ☐ Positive ☐ Negative

Dryness test ☐ Positive ☐ Negative

Doctor test ☐ Sweet ☐ Sour

Color ____ Saybolt

Water Content ____ Lbs. per MMCF at 14.65 psia and 60° F.

PLANT PROCESS DATA

	Pressure psig	Temperature ° F. Top	Temperature ° F. Tray Control	Temperature ° F. Reboiler	Reflux Temperature ° F.	Reflux GPM	Feed Temperature ° F.	Feed GPM
Deethanizer								
Depropanizer								
Debutanizer								

		Temperature ° F.	Flow Rate	Pressure / Temperature
PRIMARY ABSORBER ____ psig	Rich Oil out		GPM	Intake
	Lean Oil In		GPM	
	Gas In		MCFD	1st Stage Discharge
	Gas Out		MCFD	
SECONDARY ABSORBER ____ psig	Rich Oil out		GPM	2nd Stage Discharge
	Lean Oil In		GPM	
	Gas In		MCFD	3rd Stage Discharge
	Gas Out		MCFD	
STRIPPER ____ psig	Top		____	Recompressor
	Reflux		GPM	
	Rich Oil out		GPM	
	Lean Oil In		GPM	
	Steam		Lbs./Hr.	

DISTILLATION DATA (ASTM D-216-60)

I.B.P.	° F.	Recovery	%
10%	° F.	Residue	%
20%	° F.	Total recovery	%
30%	° F.	Loss	%
40%	° F.	% at 212° F.	
50%	° F.	% Evaporated at 140° F.	
60%	° F.	% Evaporated at 278° F.	
70%	° F.		
80%	° F.		
90%	° F.		
95%	° F.		
End point	° F.		

Remarks

cc: 1-PLANT SUPT
1-DIST SUPT
1-SPEC ACCTS GAS DEPT
1-DIV GAS DEPT
1-T MURPHY
1-T BURNER
1-FILE

Noted and approved by George H. Walker, Gas Superintendent

Signed Jack A. Ketchum, Plant Chemist

All Miscellaneous and Distillation Data Results to be reported at temperature and barometric pressure specified by NGAA.

DIRECTIONAL DRILLING
EASTMAN
INSTRUMENTATION

"Symbol of Service"

REPORT
of
SUB-SURFACE
DIRECTIONAL
SURVEY

Exh. 1-B
Cs 31-8-5N
1-21-65

PURE OIL COMPANY
COMPANY

RED HILLS UNIT WELL NO. 1
WELL NAME

WILDCAT FIELD
LEA COUNTY, NEW MEXICO
LOCATION

JOB NUMBER	TYPE OF SURVEY	DATE
WT-85964	MAGNETIC	AUGUST 13, 1964

SURVEY BY
JACK B. JONES

OFFICE
ODESSA, TEXAS

RECORD OF SURVEY

JOB NO. WT-85964 DATE August 13, 1964

CHECKED BY ASSUMED VERTICAL TO 16,900'

STATION	MEASURED DEPTH	DRIFT ANGLE	TRUE VERTICAL DEPTH	VERTICAL SECTION	COURSE DEVIATION	DRIFT DIRECTION	RECTANGULAR COORDINATES NORTH	SOUTH	EAST	WEST
					87	S 09 W		0 86		0 14
1	17000 00	0° 30'			5 67	N 74 E	0 70		5 31	
2	17100 00	3° 15'			10 45	N 67 E	4 78		14 93	
3	17200 00	6° 00'			7 85	N 67 E	7 85		22 15	
4	17300 00	4° 30'			3 49	EAST	7 85		25 64	
5	17400 00	2° 00'	17398 92						28 68	
					3 05	S 84 E	7 53		32 57	
6	17500 00	1° 45'			3 93	N 82 E	8 08		34 08	
7	17600 00	2° 15'			1 75	S 60 E	7 21		37 50	
8	17700 00	1° 00'			3 50	S 78 E	6 48		40 02	
9	17900 00	1° 00'			2 62	N 74 E	7 20			
10	18100 00	0° 45'	18098 71						43 59	
					7 86	N 27 E	14 20		46 06	
11	18300 00	2° 15'			3 49	N 45 E	16 67		49 22	
12	18400 00	2° 00'			3 49	N 65 E	18 14		54 86	
13	18500 00	2° 00'			6 98	N 54 E	22 24			
14	18600 00	4° 00'								

PURE #1 RED HILLS UNIT
Lea County, New Mexico

Drillstem Tests

DST #1 in Wolfcamp 11820-12055 — 5/8" bottom 1" surface ch., 1500' WC. Tool open 1 hr., weak blow to surface decreasing to v. weak blow at end of 1 hr. Rec 1500' WC, 110' v. sli. gas cut mud. Chart showed tool to be partly plugged at different times. 1 hr. ISIP 1495#, IFP 730#, FSIP 730#, ? hr. FSIP 1625#, HP in and out 5835#, Bottom hole temperature 152°.

DST #2 in Wolfcamp 12650-13499 — 1/2" bottom 3/8" surface ch., Full WC, tool open 6 hr. and 24 min., Mud to surface in 1 hr. and 33 min. In 2 hrs. 55 min. had max. flow pressure of 2000#. Pressure stabilized at 1800-2000#. Flowed in pit with stabilized pressure of 1700# at rate of 12 MMCFGPD.

Pressures:

	Top clock (2 hrs.)	Bottom clock (55 min.)
IHP	11400#	11475#
ISIP	11240#	11280#
IFP	9205#	8750#
FFP	4215#	4345#
FSIP	10400#	9915#

BHT 190°, salinity of produced water - 22000 PPM.

THE PURE OIL COMPANY
RED HILLS UNIT #1
Deviation Survey

Depth Feet	Deviation Degrees
75	1/4
170	1/4
290	1/2
358	1/2
446	1
479	1-1/2
528	1-1/4
615	1-1/2
674	1-1/2
714	1-1/2
740	1-1/4
770	1-1/2
805	1-1/2
880	1-1/4
972	3/4
1,034	1
1,096	1-1/4
1,159	1-1/4
1,215	3/4
1,275	3/4
1,372	1/2
1,503	1/2
1,597	1/2
1,691	3/4
1,780	1/2
1,870	1/4
1,960	1/4
2,150	1/4
2,318	3/4
2,444	1
2,504	1/2
2,630	1
2,820	1/4
2,945	3/4
3,069	1
3,131	1
3,215	1-1/2
3,255	1-1/4
3,307	1
3,350	1
3,400	1-1/2
3,536	1-1/4
3,650	1-1/2
3,718	1-1/4
3,782	1-3/4
3,805	1-3/4
3,876	1-1/2
3,972	1-3/4
4,025	1-3/4
4,098	1-3/4
4,162	1-3/4
4,220	1-3/4
4,321	1-1/2
4,375	1-1/2
4,440	1-1/2
4,637	1-1/2
4,700	1-1/4
4,824	1/4
4,996	1
5,120	1/2
5,350	1/4
5,776	1/4
5,955	1/4
6,170	1/4
6,480	1/4
6,650	-0-
6,747	1/2
6,980	1/4
7,470	3/4
7,760	3/4
8,160	1/4
8,390	3/4
8,836	1/2
9,220	1/2
9,425	1/4
9,540	1/4
10,120	1/2
10,520	1
10,800	1
11,015	1
11,330	3/4
11,540	3/4
12,200	1-1/4
12,340	2
12,500	1-1/2
12,975	2-1/4
13,095	2-1/2
13,250	2
13,792	1
14,070	3/4
14,500	1-3/4
14,601	2-1/2
14,645	2-1/4
14,700	2-1/4

All Future Footage is reported as KB instead of SCF, there is a difference of 33'.

19,994	14+
20,530	43
20,573	42
20,820	52

*Signed J. F. Wilkinson

STATE OF TEXAS,
COUNTY OF Midland

Before me, the undersigned authority, on this day personally appeared J. F. Wilkinson, known to me to be the person whose name is subscribed to the above instrument, who being by me duly sworn on oath states that he is authorized to make this report and has knowledge of the facts stated herein and that said report is true and correct.

Subscribed and sworn to before me this the 7th day of January, 1965.

W. E. Townsend
Notary Public in and for Midland County, Texas.

THE PURE OIL COMPANY
RED HILLS UNIT #1
Deviation Survey

Depth Feet	Deviation Degrees
75	1/4
170	1/4
290	1/2
358	1/2
446	1
479	1-1/2
528	1-1/4
615	1-1/2
674	1-1/2
714	1-1/2
740	1-1/4
770	1-1/2
805	1-1/2
880	1-1/4
972	3/4
1,034	1
1,096	1-1/4
1,159	1-1/4
1,215	3/4
1,275	3/4
1,372	1/2
1,503	1/2
1,597	1/2
1,691	3/4
1,780	1/2
1,870	1/4
1,960	1/4
2,150	1/4
2,318	3/4
2,444	1
2,504	1/2
2,630	1
2,820	1/4
2,945	3/4
3,069	1
3,131	1
3,215	1-1/2
3,255	1-1/4
3,307	1
3,350	1
3,400	1-1/2
3,536	1-1/4
3,650	1-1/2
3,718	1-1/4
3,782	1-3/4
3,805	1-3/4
3,876	1-1/2
3,972	1-3/4
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4,098	1-3/4
4,162	1-3/4
4,220	1-3/4
4,321	1-1/2
4,375	1-1/2
4,440	1-1/2
4,637	1-1/2
4,700	1-1/4
4,824	1/4
4,996	1
5,120	1/2
5,350	1/4
5,776	1/4
5,955	1/4
6,170	1/4
6,480	1/4
6,650	-0-
6,747	1/2
6,980	1/4
7,470	3/4
7,760	3/4
8,160	1/4
8,390	3/4
8,836	1/2
9,220	1/2
9,425	1/4
9,540	1/4
10,120	1/2
10,520	1
10,800	1
11,015	1
11,330	3/4
11,540	3/4
12,200	1-1/4
12,340	2
12,500	1-1/2
12,975	2-1/4
13,095	2-1/2
13,250	2
13,792	1
14,070	3/4
14,500	1-3/4
14,601	2-1/2
14,645	2-1/4
14,700	2-1/4
All Future Footage is reported as KB instead of SCF, there is a difference of 33'.	
19,994	14+
20,530	43
20,573	42
20,820	52

Signed J. F. Wilkinson

STATE OF TEXAS,
COUNTY OF Midland

Before me, the undersigned authority, on this day personally appeared J. F. Wilkinson, known to me to be the person whose name is subscribed to the above instrument, who being by me duly sworn on oath states that he is authorized to make this report and has knowledge of the facts stated herein and that said report is true and correct.

Subscribed and sworn to before me this the 7th day of January, 1965.

W. E. Townsend

Notary Public in and for Midland County, Texas.

THE PURE OIL COMPANY
RED HILLS UNIT #1
Deviation Survey

Depth Feet	Deviation Degrees
75	1/4
170	1/4
290	1/2
358	1/2
446	1
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674	1-1/2
714	1-1/2
740	1-1/4
770	1-1/2
805	1-1/2
880	1-1/4
972	3/4
1,034	1
1,096	1-1/4
1,159	1-1/4
1,215	3/4
1,275	3/4
1,372	1/2
1,503	1/2
1,597	1/2
1,691	3/4
1,780	1/2
1,870	1/4
1,960	1/4
2,150	1/4
2,318	3/4
2,444	1
2,504	1/2
2,630	1
2,820	1/4
2,945	3/4
3,069	1
3,131	1
3,215	1-1/2
3,255	1-1/4
3,307	1
3,350	1
3,400	1-1/2
3,536	1-1/4
3,650	1-1/2
3,718	1-1/4
3,782	1-3/4
3,805	1-3/4
3,876	1-1/2
3,972	1-3/4
4,025	1-3/4
4,098	1-3/4
4,162	1-3/4
4,220	1-3/4
4,321	1-1/2
4,375	1-1/2
4,440	1-1/2
4,637	1-1/2
4,700	1-1/4
4,824	1/4
4,996	1
5,120	1/2
5,350	1/4
5,776	1/4
5,955	1/4
6,170	1/4
6,480	1/4
6,650	-0-
6,747	1/2
6,980	1/4
7,470	3/4
7,760	3/4
8,160	1/4
8,390	3/4
8,836	1/2
9,220	1/2
9,425	1/4
9,540	1/4
10,120	1/2
10,520	1
10,800	1
11,015	1
11,330	3/4
11,540	3/4
12,200	1-1/4
12,340	2
12,500	1-1/2
12,975	2-1/4
13,095	2-1/2
13,250	2
13,792	1
14,070	3/4
14,500	1-3/4
14,601	2-1/2
14,645	2-1/4
14,700	2-1/4
All Future Footage is reported as KB instead of SCF, there is a difference of 33'.	
19,994	14+
20,530	43
20,573	42
20,820	52

Signed J. F. Wilkinson
J. F. Wilkinson

STATE OF TEXAS,
COUNTY OF MIDLAND

Before me, the undersigned authority, on this day personally appeared J. F. Wilkinson, known to me to be the person whose name is subscribed to the above instrument, who being by me duly sworn on oath states that he is authorized to make this report and has knowledge of the facts stated herein and that said report is true and correct.

Subscribed and sworn to before me this the 28th day of January, 1965.

Marvin N. Bigby
MARVIN N. BIGBY
Notary Public in and for Midland County, Texas.

Testing Data No. 1 Red Hills Unit

Devonian:

Perfs 17,633' - 17,684' with two jet shots per foot, Acidized with 3,024 gallons; Flowed gas at a rate too small to measure, made no fluid. Squeezed perfs.

Perfs 17,476' - 17,492' and 17,523' - 17,544' with two jet shots per foot, Acidized with 5,000 gallons. HCL 15% plud 271,300 cubic feet of CO_2. Flowed 7.8 MMCFG/D, 20/64" choke, FTP 4850# $5\frac{1}{2}$ hours, Flowed 10.4 MMCFG/D, 24/64" choke, FTP 4370# 3 hours. COF 25 MMCFG/D (based on two-point test). Squeezed perfs 17,476' - 17,492' and 17,523' - 17,544' with 150 sacks.

Gas Analysis of Devonian from DST #5 17,464' - 17,575'

CO_2	2.15%
N_2	.87%
C_1	96.49%
C_2	.48%
C_3	.01%
H_2S	259.82 grams
Sp. Gr.	.582
BTU	985

Pennsylvanian: (Morrow)

Perforated one shot each at 15,442', 15,447', 15,458', 15,468', 15,486', 15,490' and 15,530'. Pumped in water and pressured up, no results, tested and found RTTS tool leaking. Re-perforated Penn. one shot each at 15,442', 15,447', 15,458', 15,468', 15,486', 15,490' and 15,530'. Ran and set RTTS tool at 15,426', spotted acid, water and mud in tubing, pressured up, had leak, pulled out of hole. Perforated Penn. one shot each at 15,034', 15,044', 15,060', 15,081', 15,124', 15,126' and 15,138'. Ran and set RTTS tool at 15,003'. Pumped in 26 barrels BD acid. Flowed back 22 bbls. water and died, pumped in 20 bbls. water, flowed back 8 bbls. water and died. Squeezed perforations 15,034' to 15,138' with 200 sacks cement.

Pennsylvanian: (Atoka)

Perforated 2 shots per foot at 14,840', 14,844', 14,852', 14,856' and 14,864'. Acidized with 2000 gals. acid, flowed to pit 18-1/2 hours, turned through separator 2-1/2 hours, 32/64" choke, rate of 1.36 MMCFD. Flowed 4-1/2 hours, 5/8" choke, 1.36 MMCFD, TP 350# to 420#. Acidized with 5000 gallons 15% HCL acid. Flowed to pit to clean up, 1/2 hour through separator, maximum rate 2.2 MMCFD. 12 hours flowed through separator, 1/2" choke, rate of 2.3 MMCFD, 25 barrels water per MMCF, surface pressure 600#. Set 6-5/8" DC bridge plug at 14,812'.

Perforated one shot per foot 14,607'-11', 14,618'-32', 14,643'-52', 14,658'-62', 14706'-12', 14,716'-21', 14,737'-42', 14,748'-52', 14,758'-64', 14,772'-76', 14,784'-88', total 65 shots. Opened well to pit to clean up, pressure 2400# to 2500#. 18 hours flowed through separator, 16/64" choke, rate of 7.65 MMCFD, estimated 6 bbls. liquid hydrocarbons per MMCF, well head pressure 5400#. 6 hours flowed, 18/64" choke, rate of 10.7 MMCFD, 11 barrels condensate per MMCF. Killed well, set bridge plug at 14,550'.

Gas Analysis from Separator (Pennsylvanian Atoka)

C_1	1.17%
C_2	.48%
C_3	.44%
iC_4	.10%

nC_4	.44%
iC_5	.77%
nC_5	.527%
C_6	3.26%
C_{7+}	92.82%

Pennsylvanian: (Strawn)

Perforated 14,350'-58', 14,400'-08', 14,416'-32', 14,438'-52', 14,462'-70', 14,476'-84', 14,488'-94'. Set packer at 14,325'. Acidized with 2000 gallons BD acid. Flowed back acid and load water and died. Squeezed perforations 14,350' to 14,494' with 200 sacks cement.

Wolfcamp:

Perforated 6-5/8" casing 13,659'-67' and 13,622'-43' one shot per foot. Set SVDC tool at 13,560'. 24 hours flowed to pit to clean up, 6-3/4 hours flowed through separator, 18/64" choke, rate of 9.6 MMCFD, 24.9 barrels condensate per MMCF, FTP 4750#. 4-1/2 hours flowed, 28/64" choke, rate of 12.1 MMCFD, 28 barrels condensate per MMCF, FTP 2400#.

Perforated 6-5/8" casing, one shot per foot 13,440'-46', 13,469'-74', 13,490'-98', 13,504'-12', total 27 shots. Set RTTS tool at 13,400'. Flowed well to pit to clean up, 12-1/2 hours flowed through separator, 18/64" choke, rate of 9.6 MMCFD, 30 barrels condensate per MMCF, pressure 5125#. 12-3/4 hours flowed, 20/64" choke, rate of 12.3 MMCFD, pressure 3125#.

Gas Analysis from Separator (Wolfcamp)

CO_2	.20%	iC_5	.20%
N_2	.55%	nC_5	.16%
C_1	87.00%	C_6	34.
C_2	7.98%	H_2S	Sweet to lead acetate
C_3	2.52%	Sp. Gr.	.653
iC_4	.45%	BTU	1146 (Dry)
nC_4	.60%		

RED HILLS UNIT #1 - 10-3-64 to 11-13-64

PENNSYLVANIAN

Perforated one shot each at 15,442', 15,447', 15,458', 15,468', 15,486', 15,490', and 15,530'. Pumped in water and pressured up, no results, tested and found RTTS tool leaking. Re-perforated Penn one shot each at 15,442',15,447', 15,458', 15,468', 15,486', 15,490', and 15,530'. Ran and set RTTS tool at 15,426', spotted acid, water and mud in tubing, pressured up, had leak, pulled out of hole. Perforated Penn one shot each at 15,034', 15,044', 15,060', 15,081', 15,124', 15,126' and 15,138'. Ran and set RTTS tool at 15,003'. Pumped in 26 barrels BD acid. Flowed back 22 bbls. water and died, pumped in 20 bbls. water, flowed back 8 bbls. water and died. Squeezed perforations 15,034' to 15,138' with 200 sacks cement.

Perforated 2 shots per foot at 14,840', 14,844', 14,852', 14,856', and 14,864'. Acidized with 2000 gals. acid, flowed to pit 18-1/2 hours, turned through separator 2-1/2 hours, 32/64" choke, rate of 1.36 MMCFD. Flowed 4-1/2 hours, 5/8" choke, 1.36 MMCFD, TP 350# to 420#. Acidized with 5000 gallons 15% HCL acid. Flowed to pit to clean up, 1/2 hour through separator, maximum rate 2.2 MMCFD. 12 hours flowed through separator, 1/2" choke, rate of 2.3 MMCFD, 25 barrels water per MMCF, surface pressure 600#. Set 6-5/8" DC bridge plug at 14,812'.

Perforated one shot per foot 14,607'-11', 14,618'-32', 14,643'-52', 14,658'-62', 14,706'-12', 14,716'-21', 14,737'-42', 14,748'-52', 14,758'-64', 14,772-76', 14,784'-88', total 65 shots. Opened well to pit to clean up, pressure 2400# to 2500#. 18 hours flowed through separator, 16/64" choke, rate of 7.65 MMCFD, estimated 6 bbls. liquid hydrocarbons per MMCF, well head pressure 5400#. 6 hours flowed, 18/64" choke, rate of 10.7 MMCFD, 11 barrels condensate per MMCF. Killed well, set bridge plug at 14,550'.

Perforated 14,350'-58', 14,400'-08', 14,416'-32', 14,438'-52', 14,462'-70', 14,476'-84', 14,488'-94'. Set packer at 14,325'. Acidized with 2000 gallons BD acid/. Flowed back acid and load water and died. Squeezed perforations 14,350' to 14,494' with 200 sacks cement.

WOLFCAMP

Perforated 6-5/8" casing 13,659'-67' and 13,622'-43' one shot per foot. Set SVDC tool at 13,560'. 24 hours flowed to pit to clean up, 6-3/4 hours flowed through separator, 18/64" choke, rate of 9.6 MMCFD, 24.9 barrels condensate per MMCF, FTP 4750#. 4-1/2 hours flowed, 28/64" choke, rate of 12.1 MMCFD, 28 barrels condensate per MMCF, FTP 2400#.

Perforated 6-5/8" casing, 1 shot per foot 13,440'-46', 13,469'-74', 13,490'-98', 13,504'-12', total 27 shots. Set RTTS tool at 13,400'. Flowed well to pit to clean up, 12-1/2 hours flowed through separator, 18/64" choke, rate of 9.6 MMCFD, 30 barrels condensate per MMCF, pressure 5125#. 12-3/4 hours flowed, 20/64" choke, rate of 12.3 MMCFD, pressure 3125#.

PURE #1 RED HILLS UNIT
Lea County, New Mexico

Drillstem Tests

DST #1 6710-6747 — Delaware Cherry Canyon, 5/8" bottom 1/2" surface ch., No WC, tool open 1 hr., Weak blow to surface throughout test, rec. 30' fresh drlg. water, 60' clear salt water, No oil or gas. 30 min. ISIP 2690#, IFP 85#, 30 min. FSIP 2050#, HP in and out 3005#, BHT 114°.

DST #2 9663-9896 — Bone Spring, 5/8A bottom 1" surface ch., tool open 1½ hr., strong air blow to surface when tool open, (1½# pressure behing 1" choke for 10 min.) GTS - 17 min., 7500 cf and cont. throughout test. Rec. 180' drlg. mud, 80' hvy gas and sli. oil cut mud, 100' hvy oil and gas cut mud, no water. 30 min. Initial shut-in pressure 1300# and still building, IFP 65#, FFP 65#. 1 hr. FSIP 2122# and still building. HP in and out 4445#.

DST #3 11820-12055 — Wolfcamp, 5/8" bottom 1" surface ch., 1500' WC. Tool open 1 hr, weak blow to surface decreasing to v. weak blow at end of 1 hr. Rec. 1500' WC, 110' v. sli. gas cut mud. Chart showed tool to be partly plugged at different times. 1 hr. ISIP 1495#, IFP 730#, FSIP 730 #, 2 hr. FSIP 1625#, HP in and out 5835#, Bottom hole temperature 152°.

DST #4 12650-13499 — Wolfcamp, 1/2" bottom 3/8" surface ch., Full WC, tool open 6 hr. and 24 min., Mud to surface in 1 hr. and 33 min. In 2 hrs. 55 min. had max. flow pressure of 2000#. Pressure stabilized at 1800-2000#. Flowed in pit with stabilized pressure of 1700# at rate of 12 MMCFGPD.

Pressures:

	Top clock (2 hrs.)	Bottom clock (55 min.)
IHP	11400#	11475#
ISIP	11240#	11280#
IFP	9205#	8750#
FFP	4215#	4345#
FSIP	10400#	9915#

BHT 190°, salinity of produced water - 22000 PPM.

PURE #1 RED HILLS UNIT
Lea County, New Mexico

Drillstem Tests (cont'd):

DST #5 17464-17575 Devonian, tool open 4 hrs.; Loaded drill pipe with 7500' water blanket and 1800# Nitrogen blanket; Bled off Nitrogen to 0# in 1 hr. 40 mins.; then had slight blow until water blanket hit surface after 2 hrs. 15 mins. at 5# pressure; Gas to surface on 1" choke after 2 hrs. 35 mins. at 50#-75# sur. pressure; after 3 hrs. changed to 3/4" choke with sur. pressure 500#-600#; Maximum gas flow rate 7 MMCFD; Minimum gas flow rate 2.4 MMCFD; well shut-in after sur. pressure dropped to 155#.
Recovery: 1860' muddy sulphur water (probably 1/3 of recovery represents formation water).
Pressures: 60" ISIP 7561#
120" FSIP 7561#
IFP 5719# (N_2 head)
FFP 897#
IHSP 8262#
FHSP 8262#
BHT 240°

Fluid Analysis

Footage	Chloride PPM
1860'	300
1271'	400
590'	5,400
410'	9,800
230'	10,080
140'	18,000
35'	22,000

DST Gas Analysis (Spl. No. 1)

CO_2	2.15%
N_2	.87%
C_1	96.49%
C_2	.48%
C_3	.01%
H_2S	259.82 grams
Sp. Gr.	.582
BTU	985

PURE #1 RED HILLS UNIT
Lea County, New Mexico

Drillstem Tests (cont'd):

DST #6 17597-17638 Devonian, tool open 4 hrs.; loaded drill pipe with 3500' water blanket and 2800# Nitrogen blanket; Bled Nitrogen blanket from 2800# to 0# in 2 hrs.; water blanket did not flow; Gas to surface in 2 hrs. 8 mins.; Surface flowing pressure on 3/4" choke 20# decreased to 5# in 2 hrs. 53 mins.; Surface flowing pressure on 1/8" choke increased to 185#; maximum gas flow rate 478 MCFGPD; minimum gas flow rate 64 MCFGPD.
Recovery: Unloaded water blanket with 1984' of heavy gas cut salty sulphur water. Chlorides 53000 to 69000 PPM
Pressures: 60" ISIP 7561#
60" FSIP 7605#
IFP 5456# (N_2 head)
FFP 1864#
IHSP 8437#
FHSP 8349#
BHT 246°

Gas Analysis (DST #6)

CO_2	1.47
N_2	.95
C_1	97.06
C_2	.51
C_3	.01
Sp. Gr.	.575
BTU	991.6
H_2S	37.21 grains/100

PURE #1 RED HILLS UNIT
Lea County, New Mexico

Drillstem Tests (cont'd):

DST #7 17469-17693 Tool open 7 hours, no water blanket, no Nitrogen blanket, gas to surface in 5 mins., surface pressure 0# to 75# then decreased to 5#, formation mud to surface in 1 hour 8 mins., gas and mud flowed and cleaned up, gas and mist of sulphur water flowed with surface pressure 300#, stabilized at 275#, estimated flow rate 3 MMCFGPD plus 288 BSWPD.

Recovery: 1580' of sulphur water

Pressures:
60" ISIP 7561#
180" FSIP 7561#
IFP 2127#
FFP 2829#
IHSP 8349#
FHSP 8349#
BHT 246°

Gas Analysis (DST #7)

	Sample No. 1	Sample No. 2
CO_2	1.87	1.83
N_2	.95	.89
C_1	96.63	96.72
C_2	.52	.51
C_3	.01	.02
C_4	.00	.00
C_4	.02	.03
SG	.579	.580
BTU	988.1	989.4
H_2S	285.3	

Pure #1 Red Hills Unit
Lea County, New Mexico

Drillstem Tests (cont'd):

DST #8 18555-18700 Fusselman, loaded drill pipe with 2000' water blanket and 1550# Nitrogen blanket. Tool open 40 minutes for first flow and surface pressure increased from 1550# to 3020#. Closed tool for 90 minutes initial shut-in pressure. Reopened tool for 170 minutes second flow and bled off nitrogen to zero pressure in 45 minutes. Gas to surface too small to measure. Closed tool for 90 minute shut-in pressure.

Recovered: 2000' water and 16625' salt water.

Pressures:
IHP 8978#
ISIP 8021#
IFP 7543#
FFP 8021#
FSIP 8021#
FHP 8891#
BHT 252°

DST #9 20198-20532 Ellenburger, loaded drill pipe with 1500# Nitrogen blanket. Tool open 3 hours 45 minutes. Bled off Nitrogen blanket. Gas to surface (TSTM) in 2½ hours.

Recovered: 1400' heavily gas cut mud, no water.

Pressures:
HSP in 8742#
IFP 2242#
ISIP 3225# (1 hr.)
FFP 420#
FSIP 1008# (1½ hr.)
HSP out 8742#
Temp. 278°

DST #10 20443-20936 Ellenburger, loaded drill pipe with 1125# Nitrogen blanket. Bled off Nitrogen blanket. Tool open 4 hours. Gas to surface (TSTM) 2 hours 12 minutes.

Recovered: 3100' G&SWC mud. Chlorides 3100 to 70,000 PPM

Pressures:
IHSP 9034#
IFP 2404#
ISIP 7251# (1 hr.)
FFP 1042#
FSIP 1723# (2 hrs.)
FHSP 8864#
Temp. 271°

Pure #1 Red Hills Unit
Lea County, New Mexico

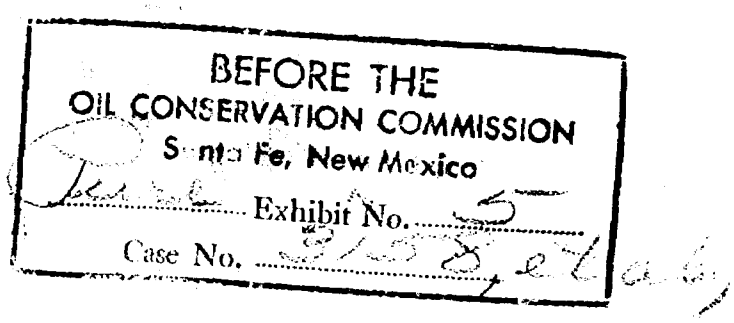
Drillstem Tests (cont'd):

DST #11 20909-21321 Ellenburger, loaded drill pipe with 1150# Nitrogen blanket. Tool open 4 minutes and packer failed. Bled off Nitrogen blanket.
Recovered: 8000 SGC and SWCM. Chlorides 2000-14000 PPM
Pressures no good.

RED HILLS UNIT WELL NO. 1

RESERVOIR ROCK AND FLUID PROPERTIES

NAME	WOLFCAMP	PENNSYLVANIAN	DEVONIAN
AVERAGE POROSITY - %	10.0	9.2	4.91
POROSITY RANGE - %	5 - 20	5 - 14	3.5 - 5.0
AVERAGE PERMEABILITY - md	.94	12.3	6.7
CONNATE WATER SATURATION - %	30.0	32.2	24.4
RESERVOIR PRESSURE - psia	11,304	7,863	7,632
GAS COMPRESSIBILITY	1.596	1.229	1.206
GAS GRAVITY - (Air = 1.0)	.766	.580	.58
STOCK TANK LIQUIDS - Bbls./MMCF	40	0	0



RED HILLS UNIT

WELL COST ESTIMATE WOLFCAMP-DEVONIAN DUAL

Labor, Transportation, District Expense	$ 30,000
Location, Roads, ROW, Damages	20,000
Contract Rig	400,000
Drilling Mud	230,000
Cementing Service & Cement	70,000
Logging, Perforating, Coring & Testing	60,000
Bits	50,000
Stimulation	10,000
Miscellaneous	20,000
Casing:	
550' - 20"	7,000
5,000' - 13-3/8"	45,000
13,000' - 10-3/4"	145,000
16,000' - 7-5/8"	100,000
2,000' - 5"	10,000
Tubing:	
30,000' - 2-7/8"	75,000
Control Equipment & Christmas Tree	35,000
Float Equipment, Centralizers, etc.	18,000
Packers & Down Hole Equipment	10,000
Miscellaneous	20,000
Surface Equipment	105,000
TOTAL	$1,460,000

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Exhibit No. 5
Case No. 3158 etc.

RED HILLS

ECONOMIC CALCULATIONS

WOLFCAMP-DEVONIAN DUAL
WELL COST $1,460,000

DEVONIAN RESERVES	640 Ac.	320 Ac.
Gas Reserves - MMMCF	11.6	5.8
Liquid Reserves	0	0
Net Gas Revenue @ $141/MMCF Average	$1,635,600	$ 817,800
Total Net Revenue	$1,635,600	$ 817,800
WOLFCAMP RESERVES		
Gas Reserves - MMMSCF	10.065	5.032
Liquid Reserves - Thousands Bbls.	402.4	201.2
Net Gas Revenue @ $146/MMCF Average	$1,469,490	$ 734,745
Net Liquid Revenue @ $2.00/Bbl. Average	804,800	402,400
Total Net Revenue	$2,274,290	$1,137.145
Net Value of Production	$3,909,890	$1,954,945
Investment	1,460,000	1,460,000
Profit	2,449,890	494,945
Profit to Investment	1.68	.328
Net Value of Production 6% Discount	$2,569,200	$1,465,000
Investment	1,460,000	1,460,000
Profit @ 6% Discount	1,109,200	5,000
Profit @ 6% Discount to Investment	.76	.0034

All values are net to operator assuming 80% Net to Gross ratio and before Federal Income Tax.

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Exhibit No. 7
Case No. 3158 etc.

RED HILLS UNIT

WELL COST ESTIMATE WOLFCAMP-DEVONIAN-PENN TRIPLE

Labor, Transportation, District Expense	$ 30,000
Location, Roads, ROW, Damages	20,000
Contract Rig	405,000
Drilling Mud	230,000
Cementing Service & Cement	70,000
Logging, Perforating, Coring & Testing	65,000
Bits	50,000
Stimulation	15,000
Miscellaneous	20,000

Casing:

550' - 20"	7,000
5,000' - 13-3/8"	45,000
13,000' - 10-3/4"	145,000
16,000' - 7-5/8"	100,000
2,000' - 5"	10,000

Tubing:

46,000' - 2-7/8"	105,000

Control Equipment & Christmas Tree	45,000
Float Equipment, Centralizers, Etc.	18,000
Packers & Down Hole Equipment	15,000
Miscellaneous	20,000
Surface Equipment	120,000
TOTAL	$1,535,000

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Exhibit No. 8
Case No. 3,283, Del

RED HILLS

ECONOMIC CALCULATIONS

WOLFCAMP-PENNSYLVANIAN-DEVONIAN TRIPLE
WELL COST $1,535,000

	640 Ac.	320 Ac.
DEVONIAN RESERVES		
Gas Reserves - MMMCF	11.60	5.80
Liquid Reserves - Thousands Bbls.	0	0
Net Gas Revenue @ $141/MMCF Average	$1,635,600	$ 817,800
Total Net Revenue	1,635,600	817,800
PENNSYLVANIAN RESERVES		
Gas Reserves - MMMCF	.757	.3785
Liquid Reserves - Thousands Bbls.	0	0
Net Gas Revenue @ $146/MMCF Average	$ 110,500	$ 55,250
Net Liquid Revenue @ $200/Bbl. Average	0	0
Total Net Revenue	$ 110,500	$ 55,250
WOLFCAMP RESERVES		
Gas Reserves - MMMCF	10.065	5.032
Liquid Reserves-Thousands Bbls.	402.4	201.2
Net Gas Revenue @ $146/MMCF Average	$1,469,490	$ 734,745
Net Liquid Revenue @ $2.00/Bbl. Average	804,800	402,400
Total Net Revenue	$2,274,290	$1,137,145
Net Value of Production	$4,020,390	$2,010,195
Investment	1,535,000	1,535,000
Profit	2,485,390	475,195
Profit to Investment	1.62	.31
Net Value of Production 6% Discount	$2,641,800	$1,506,400
Investment	1,535,000	1,535,000
Profit @ 6% Discount	1,106,800	(-28,600)
Profit @ 6% Discount to Investment	.72	-

All values are net to operator 80% net to gross ration and before federal income tax.

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Exhibit No. 7
Case No. 3585

RED HILLS UNIT

WELL COST ESTIMATE WOLFCAMP-PENN DUAL

Labor, Transportation, District Expense	$ 20,000
Location, Roads, ROW, Damages	20,000
Contract Rig	280,000
Drilling Mud	200,000
Cementing Service & Cement	40,000
Logging, Perforating, Coring, & Testing	40,000
Bits	15,000
Stimulation	10,000
Miscellaneous	10,000
Casing:	
550' - 20"	7,000
5,000' - 13-3/8"	45,000
13,000 - 10-3/4"	145,000
16,000' - 7-5/8"	100,000
Tubing:	
27,000' - 2-7/8"	60,000
Control Equipment & Christmas Tree	35,000
Float Equipment, Centralizers, etc.	18,000
Packers & Down Hole Equipment	10,000
Miscellaneous	10,000
Surface Equipment	45,000
TOTAL	$1,100,000

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Exhibit No. 10
Case No. 3158, et al.

RED HILLS

ECONOMIC CALCULATIONS

WOLFCAMP-PENN DUAL
WELL COST $1,100,000

	640 Ac.	320 Ac.
WOLFCAMP RESERVES		
Gas Reserves - MMMCF	10.065	5.032
Liquid Reserves - Thousands Bbls.	402.4	201.2
Net Gas Revenue @ $146/MMCF Average	$1,469,490	$ 734,745
Net Liquid Revenue @ $2.00/Bbl. Average	804,800	402,400
Total Net Revenue	$2,274,290	$1,137,145
PENNSYLVANIAN RESERVES		
Gas Reserves - MMMCF	.757	.3785
Liquid Reserves - Thousands Bbls.	0	0
Net Gas Revenue @ $146/MMCF Average	$ 110,500	$ 55,250
Net Liquid Revenue @ $2.00/Bbl. Average	0	0
Total Net Revenue	$ 110,500	$ 55,250
Net Value of Production	$2,384,790	$1,192,395
Investment	1,100,000	1,100,000
Profit	1,284,790	92,395
Profit to Investment	1.17 to 1	.077 to 1
Net Value of Production 6% Discount	$1,569,000	$ 893,500
Investment	1,100,000	1,100,000
Profit @ 6% Discount	469,000	(-206,500)
Profit @ 6% Discount to Investment	.30 to 1	-

All values are net to operator assuming 80% Net to Gross ratio and before Federal Income Tax.

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Exhibit No. 11
Case No. 3538 et al

RED HILLS UNIT

WELL COST ESTIMATE WOLFCAMP-SINGLE

Labor, Transportation, District Expense	$ 20,000
Location, Roads, ROW, Damages	20,000
Contract Rig	200,000
Drilling Mud	120,000
Cementing Service & Cement	40,000
Logging, Perforating, Coring, & Testing	30,000
Bits	13,000
Stimulation	5,000
Miscellaneous	10,000
Casing:	
550'- 13-3/8"	4,700
5,000'- 9-5/8"	30,000
13,000'- 7"	65,000
1,400'- 5"	7,000
Tubing:	
13,500'- 3-1/2"	47,000
Control Equipment & Christmas Tree	15,000
Float Equipment, Centralizers, etc.	15,000
Packers & Down Hole Equipment	4,000
Mascellaneous	10,000
Surface Equipment	31,000
TOTAL	$686,700

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Exhibit No. 12
Case No. 8588 adl

RED HILLS

ECONOMIC CALCULATIONS
WOLFCAMP
WELL COST $686,700

	640 ac.	320 ac.
Wolfcamp Reserves	10.065	5.032
Gas Reserves - MMMSCF	402.4	201.2
Liquid Reserves - Thousands Bbls.		
Net Gas Revenue @ $1.46/MMCF Average	$1,469,490	$ 734,745
Net Liquid Revenue @ $2.00/Bbl. Average	804,800	402,400
Total Revenue	2,274,290	1,137,145
Investment	$ 686,700	$ 686,700
Profit	1,587,590	450,445
Profit to Investment	2.31	.655
Net Value of Production 6% Discount	$1,494,400	$ 842,200
Investment	686,700	686,700
Profit @ 6% Discount	807,700	155,500
Profit @ 6% Discount to Investment	1.175	.226

All value are net to operator assuming 80% net to gross ratio and before federal income tax.

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Exhibit No. 5
Case No. 3158 et al

SPECIAL RULES AND REGULATIONS
FOR THE
RED HILLS-WOLFCAMP GAS POOL

RULE 1. Each well completed in the Red Hills-Wolfcamp Gas Pool or in the Wolfcamp formation within one mile of the Red Hills-Wolfcamp Gas Pool, and not nearer to or within the limits of another designated Wolfcamp pool, shall be spaced, drilled, operated, and produced in accordance with these Special Rules and Regulations.

RULE 2. Each well completed in the Red Hills-Wolfcamp Gas Pool shall be located on a standard unit containing 640 acres, more or less, consisting of a single governmental section.

RULE 3. Each well completed in the Red Hills-Wolfcamp Gas Pool shall be located no nearer than 1650 feet to the outer boundary of the section and no nearer than 330 feet to any governmental quarter-quarter section line. Any well drilled to or being completed in the Red Hills-Wolfcamp Gas Pool is granted an exception to the well location requirements of this rule.

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Exhibit No. 14
Case No. 3158

SPECIAL RULES AND REGULATIONS
FOR THE
RED HILLS-PENNSYLVANIAN GAS POOL

RULE 1. Each well completed in the Red Hills-Pennsylvanian Gas Pool or in the Pennsylvanian formation within one mile of the Red Hills-Pennsylvanian Gas Pool, and not nearer to or within the limits of another designated Pennsylvanian pool, shall be spaced, drilled, operated, and produced in accordance with these Special Rules and Regulations.

RULE 2. Each well completed in the Red Hills-Pennsylvanian Gas Pool shall be located on a standard unit containing 640 acres, more or less, consisting of a single governmental section.

RULE 3. Each well completed in the Red Hills-Pennsylvanian Gas Pool shall be located no nearer than 1650 feet to the outer boundary of the section and no nearer than 330 feet to any governmental quarter-quarter section line. Any well drilled to or being completed in the Red Hills-Pennsylvanian Gas Pool is granted an exception to the well location requirements of this rule.

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Exhibit No. 15
Case No. 3158

SPECIAL RULES AND REGULATIONS
FOR THE
RED HILLS-DEVONIAN GAS POOL

RULE 1. Each well completed in the Red Hills-Devonian Gas Pool or in the Devonian formation within one mile of the Red Hills-Devonian Gas Pool, and not nearer to or within the limits of another designated Devonian pool, shall be spaced, drilled, operated, and produced in accordance with these Special Rules and Regulations.

RULE 2. Each well completed in the Red Hills-Devonian Gas Poo. shall be located on a standard unit containing 640 acres, more or less, consisting of a single governmental section.

RULE 3. Each well completed in the Red Hills-Devonian Gas Pool shall be located no nearer than 1650 feet to the outer boundary of the section and no nearer than 330 feet to any governmental quarter-quarter section line. Any well drilled to or being completed in the Red Hills-Devonian Gas Pool is granted an exception to the well location requirements of this rule.

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Exhibit No. 16
Case No. 2458

DIRECTIONAL DRILLING
EASTMAN
INSTRUMENTATION

"Symbol of Service"

REPORT
of
SUB-SURFACE
DIRECTIONAL
SURVEY

PURE OIL COMPANY
COMPANY

RED HILLS UNIT WELL NO. 1
WELL NAME

WILDCAT FIELD
LEA COUNTY, NEW MEXICO
LOCATION

JOB NUMBER	TYPE OF SURVEY	DATE
WT-85964	MAGNETIC	AUGUST 13, 1964

SURVEY BY
JACK B. JONES

OFFICE
ODESSA, TEXAS

RECORD OF SURVEY

CHECKED BY ASSUMED VERTICAL TO 16,900' JOB NO. WT-85964 DATE August 13, 1964

STATION	MEASURED DEPTH	DRIFT ANGLE	TRUE VERTICAL DEPTH	VERTICAL SECTION	COURSE DEVIATION	DRIFT DIRECTION	RECTANGULAR COORDINATES NORTH	SOUTH	EAST	WEST
1	17000 00	0° 30'			87	S 09 W		0 86		0 14
2	17100 00	3° 15'			5 67	N 74 E	0 70		5 31	
3	17200 00	6° 00'			10 45	N 67 E	4 78		14 93	
4	17300 00	4° 30'			7 85	N 67 E	7 85		22 15	
5	17400 00	2° 00'	17398 92		3 49	EAST	7 85		25 64	
6	17500 00	1° 45'			3 05	S 84 E	7 53		28 68	
7	17600 00	2° 15'			3 93	N 82 E	8 08		32 57	
8	17700 00	1° 00'			1 75	S 60 E	7 21		34 08	
9	17900 00	1° 00'			3 50	S 78 E	6 48		37 50	
10	18100 00	0 45'	18098 71		2 62	N 74 E	7 20		40 02	
11	18300 00	2° 15'			7 86	N 27 E	14 20		43 59	
12	18400 00	2° 00'			3 49	N 45 E	16 67		46 06	
13	18500 00	2° 00'			3 49	N 65 E	18 14		49 22	
14	18600 00	4° 00'			6 98	N 54 E	22 24		54 86	

EX. NO. 1

RESERVE AND ECONOMIC EVALUATION

WOLFCAMP-ATOKA DUAL COMPLETION

I - Atoka-Pennsylvanian Pool Reserve

(A)	Average Porosity	9.2%	
	Connate Water	32.2%	(?)
	Reservoir Pressure, psia	7,863	
	Reservoir Temperature	208 °F	
	Gas Deviation	1.229	
	Gas Gravity	0.580	
	Condensate, Bbls/MMcf	1.5	
	Pay Thickness, Ft.	84+	(42)

* * * * * * *

		Gas, MMcf	Cond., Bbls
(B)	Hydrocarbons In-Place per Ac-Ft.	0.9192	1.38
	Reserve per Ac-Ft. (90% Recovery)	0.8273	1.24
	Reserve per Acre	69.49	104.24
	W. I. Reserve per Acre (after 1/8 Royalty)	60.80	91.21

* * * * * * *

		640 Acres	320 Acres
(C)	Reserve: MMMcf	38.91	19.46
	Bbls.	58,374	29,187
(D)	Revenue: Gas @ $160/MMcf	$ 6,225,600	$3,113,600
	Cond. @ $2.70/Bbl.(15¢ transp.)	157,610	78,805
	Total	$ 6,383,210	$3,192,405

II - Wolfcamp-Atoka Dual Economic Evaluation

(D-a)	Revenue: Wolfcamp (Ex.____)	$ 8,921,620	$4,460,810
	Atoka	6,383,210	3,192,405
	Total	$15,304,830	$7,653,215
	Operating Expense (360 months)	(216,000)	(216,000)
	Production Tax - 2%	(306,100)	(153,100)
	Operating Income	$14,782,730	$7,284,115
	Investment - Well and Equipment	(900,000)	(900,000)
	Profit	$13,882,730	$6,384,115
	Profit - Investment Ratio	15.43	7.09
	Present Worth Profit (6%)	$ 6,558,063	$3,015,792
	Present Worth Profit - Investment Ratio	7.29	3.35

EX. NO. 2

RESERVE AND ECONOMIC EVALUATION

WOLFCAMP-DEVONIAN DUAL COMPLETION

I - Devonian Pool Reserve

(A)	Average Porosity	5.0%
	Connate Water	24.4%
	Reservoir Pressure, psia	7,632
	Reservoir Temperature	240 °F
	Gas Deviation	1.206
	Gas Gravity	0.58
	Condensate, Bbls/MMcf	0
	Pay Thickness, Ft.	62 (42)

* * * * * * *

		Gas, MMcf
(B)	Hydrocarbons In-Place per Ac-Ft.	0.5265
	Reserve per Ac-Ft. (90% Recovery)	0.4739
	Reserve per Acre	29.38
	W. I. Reserve per Acre (after 1/8 Royalty)	25.71

* * * * * * *

		640 Acres	320 Acres
(C)	Reserve: MMMcf	16.454	8.227
(D)	Revenue: Gas @ $160/MMcf	$ 2,632,640	$1,316,320

II - Wolfcamp-Devonian Dual Economic Evaluation

(D-a)	Revenue: Wolfcamp (Ex.___)	$ 8,921,620	$4,460,810
	Devonian	2,632,640	1,316,320
	Total	$11,554,260	$5,777,130
	Operating Expense (360 months)	(216,000)	(216,000)
	Production Tax - 2%	(231,100)	(115,500)
	Operating Income	$11,107,160	$5,445,630
	Investment - Well and Equipment	(1,150,000)	(1,150,000)
	Profit	$ 9,957,160	$4,295,630
	Profit - Investment Ratio	8.66	3.74
	Present Worth Profit (6%)	$ 4,703,634	$2,029,213
	Present Worth Profit - Investment Ratio	4.09	1.76

EX. NO. 3

RESERVE AND ECONOMIC EVALUATION

WOLFCAMP POOL

(A)	Average Porosity	7%	(10%)
	Connate Water	30%	(?)
	Reservoir Pressure, psia	11,304	
	Reservoir Temperature	190 °F	
	Gas Deviation	1.596	
	Gas Gravity	0.766	
	Condensate, Bbls/MMcf	40	
	Pay Thickness, Ft.	80+	(28)

* * * * * * * * *

		Gas, Mcf	Cond., Bbls
(B)	Hydrocarbons In-Place per Ac-Ft.	825	33.0
	Reserve per Ac-Ft. (90% Recovery)	743	29.72
	Reserve per Acre	59,440	2,378
	W. I. Reserve per Acre (after 1/8 Royalty)	52,010	2,081

* * * * * * * * *

			640 Acres	320 Acres
(C)	Reserve:	MMcf	33,286	16,643
		Bbls	1,331,800	665,900
(D)	Revenue:	Gas @ $160/MMcf	$5,325,760	$2,662,880
		Cond. @ $2.70 (15¢ transp.) 2.13	3,595,860	1,797,930
		Total	$8,921,620	$4,460,810
	Operating Expense (360 months)		(180,000)	(180,000)
	Production Tax - 2%		(178,400)	(89,200)
	Operating Income		$8,563,220	$4,191,610
	Investment - Well and Equipment		(600,000)	(600,000)
	Profit		$7,963,220	$3,591,610
	Profit - Investment Ratio		13.27	5.99
	Present Worth Profit (6%)		$3,761,745	$1,696,641
	Present Worth Profit - Investment Ratio		6.27	2.83

H. J. GRUY AND ASSOCIATES, INC.

SUMMARY OF EXHIBITS

Summary of Reservoir Data

Gas Deviation Factor Curve

Summary of Transient Test Analyses

Transient Test No. 1
- a. Data
- b. Computation
- c. Pressure build-up curve
- d. Least square fitting of linear portions

Transient Test No. 2
- a. Data
- b. Computation
- c. Pressure build-up curve
- d. Average pressure curve
- e. Conversion from WHP to BHP

Transient Test No. 3
- a. Data
- b. Computation
- c. Pressure build-up curve
- d. Average pressure curve
- e. Conversion from WHP to BHP

Transient Test No. 4
- a. Data
- b. Computation
- c. Pressure build-up curve
- d. Average pressure curve
- e. Least square fitting of linear portions

Plot of Average Reservoir Pressure divided by Gas Deviation Factor versus Cumulative Wet Gas Production

Example Calculations

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Exhibit No. 11
Case No. 3509

EXHIBIT NO. 11
PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

PERTINENT RESERVOIR DATA AND PARAMETERS USED IN CALCULATIONS

Wolfcamp Reservoir
Red Hills Field
Lea County, New Mexico

Depth (mid perfs.), feet	13,554
Average porosity,	4.8 percent
Net effective thickness, feet	25
Average connate water saturation	25 percent
Dew point	5200 psia
Initial reservoir pressure	11,376 psia
Initial liquid-gas ratio, bbls/M^2cf	45
Wet gas gravity at initial reservoir conditions	0.794
Reservoir temperature	185 degrees Fahrenheit
Condensate gravity	64 degrees API
Gas initially in place per Acre Feet	589.39
Initial gas deviation factor	1.624
Pressure base	15.025 psi

EXHIBIT NO. -13
PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

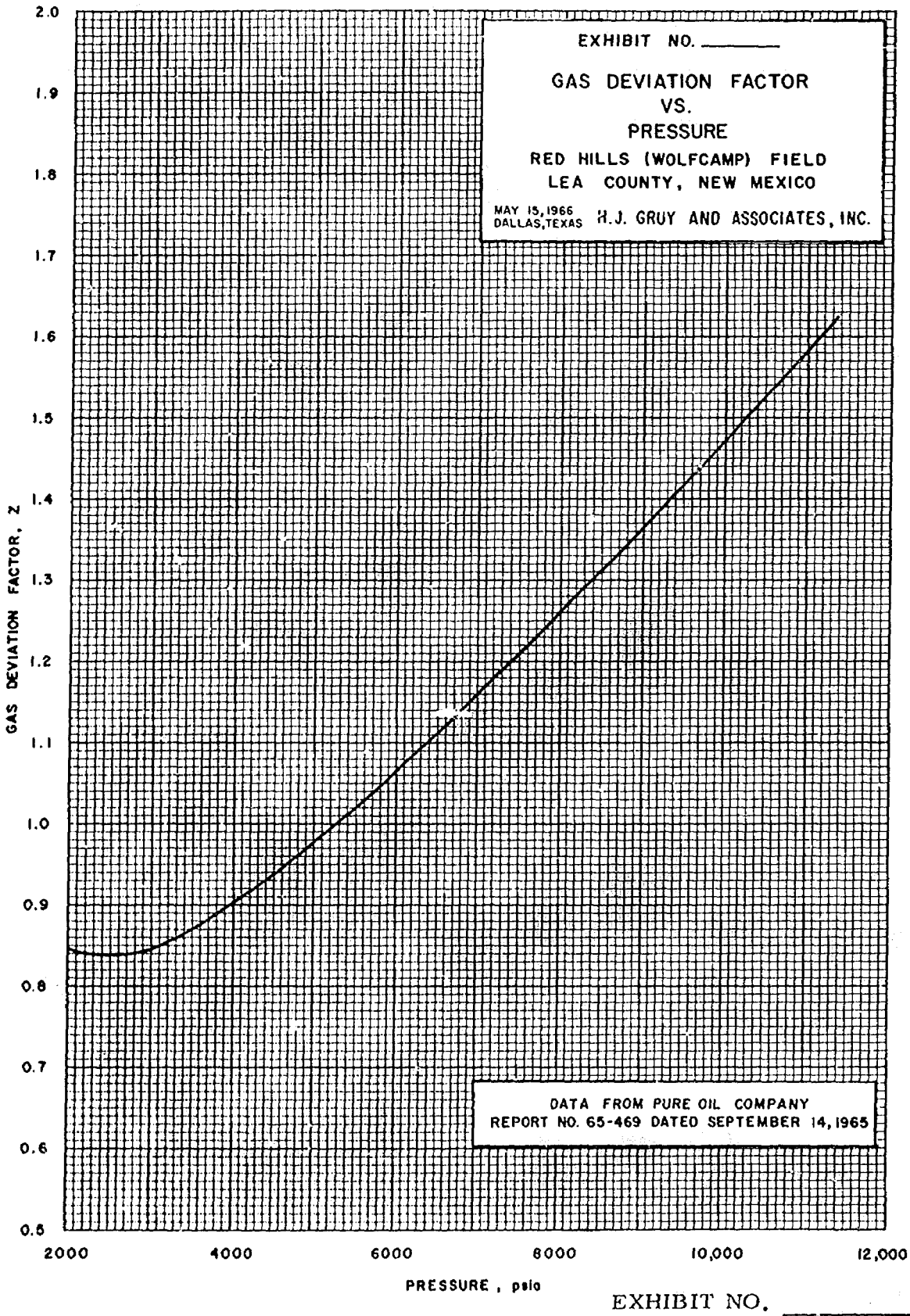


EXHIBIT NO. _____

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

SUMMARY OF PRESSURE BUILD-UP ANALYSES

Union Oil Company of California Well No. 1 Red Hills Unit

Red Hills (Wolfcamp) Field
Lea County, New Mexico

Test Date from	to	Length of Test (hours)	Pressure Datum	Calculated Effective Permeability to Wet Gas, md.	Calculated Stabilized Reservoir Pressure psia	Gas Deviation Factor Z	Calculated Wet Gas Initially In Place M^3cf	Cumulative Wet Gas Production M^3cf
1/15/65	1/18/65	74.50	Bottom hole	1.39	11,376	1.624	--	0.1934
4/17/65	5/ 2/65	334.00	Wellhead	--	9,500	1.416	--	1.0998
8/ 7/65	8/31/65	574.17	Wellhead	--	9,000	1.364	--	1.9350
2/ 2/66	2/ 7/66	122.75	Bottom hole	1.56	7,770	1.240	30.9	2.8450

EXHIBIT NO. 5

PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

TRANSIENT TEST NO. 1

From

January 15, 1965

To

January 18, 1965

EXHIBIT NO. _____

PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

TEFTELLER, INC.
RESERVOIR ENGINEERING DATA
Midland, Texas

Well : RED HILLS UNIT NO. 1

Field : UNDESIGNATED

File 3-1414-HU

CHRONOLOGICAL PRESSURE AND PRODUCTION DATA

1965 Date	Status of Well	Time	Elapsed Time Hrs.	Min.	BHP @ 12090' Psig	BHP @ 13554' Psig
1-15	On location	07:00				
"	Shut in	09:35				
"	Inst. at 12090'	10:15		40		
"	"	10:35	1	00	6957	7174
"	"	11:35	2	00	7735	7952
"	"	12:35	3	00	8113	8330
"	"	13:35	4	00	8362	8579
"	"	15:35	6	00	8672	8889
"	"	17:35	8	00	8861	9078
"	"	19:35	10	00	8989	9206
"	"	21:35	12	00	9087	9304
"	"	01:35	16	00	9231	9448
1-16	"	05:35	20	00	9337	9554
"	"	09:35	24	00	9420	9637
"	"	15:35	30	00	9510	9727
"	"	21:35	36	00	9594	9811
"	"	03:35	42	00	9654	9871
1-17	"	09:35	48	00	9707	9924
"	"	15:35	54	00	9760	9977
"	"	21:35	60	00	9805	10022
"	"	03:35	66	00	9850	10067
1-18	"	08:35	71	00	9888	10105
"	"	13:05	74	30	9918	10135
"	"					

EXHIBIT NO. 5

PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

PRESSURE BUILD UP DATA

PRESSURE BUILD-UP TEST FROM 1-15-65 TO 1-18-65
UNION OIL COMPANY OF CALIFORNIA WELL NO. 1 RED HILLS UNIT
RED HILLS(WOLFCAMP)FIELD-LEA COUNTY, NEW MEXICO

CUMULATIVE PRODUCTION = 193400.
LAST FLOW RATE = 11240.
PRODUCING TIME,TC,HRS. = 413.

POINT	TIME,MIN.	TIME,HRS.	PRESS. PSIA.	$(PRESS)^2 \times 10^6$	DT/TC+DT	TC+DT/DT
1	60.0	1.00	7189.	51.6817	.00241573	414.
2	120.0	2.00	7967.	63.4731	.00481981	207.
3	180.0	3.00	8345.	69.6390	.00721234	139.
4	240.0	4.00	8594.	73.8568	.00959339	104.
5	360.0	6.00	8904.	79.2812	.01432139	70.
6	480.0	8.00	9093.	82.6826	.01900446	53.
7	600.0	10.00	9221.	85.0268	.02364325	42.
8	720.0	12.00	9319.	86.8438	.02823837	35.
9	960.0	16.00	9463.	89.5484	.03730006	27.
10	1200.0	20.00	9569.	91.5658	.04619431	22.
11	1440.0	24.00	9652.	93.1611	.05492572	18.
12	1800.0	30.00	9742.	94.9066	.06772716	15.
13	2160.0	36.00	9826.	96.5503	.08018644	12.
14	2520.0	42.00	9886.	97.7330	.09231708	11.
15	2880.0	48.00	9939.	98.7837	.10413192	10.
16	3240.0	54.00	9992.	99.8401	.11564314	9.
17	3600.0	60.00	10037.	100.7414	.12686230	8.
18	3960.0	66.00	10082.	101.6467	.13780036	7.
19	4260.0	71.00	10120.	102.4144	.14670824	7.
20	4470.0	74.50	10150.	103.0225	.15283501	7.

EXHIBIT NO. C-6

PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

PRESSURE BUILD-UP TEST FROM 1-15-65 TO 1-18-65

UNION OIL COMPANY OF CALIFORNIA WELL NO. 1 RED HILLS UNIT

RED HILLS (WOLFCAMP) FIELD-LEA COUNTY, NEW MEXICO

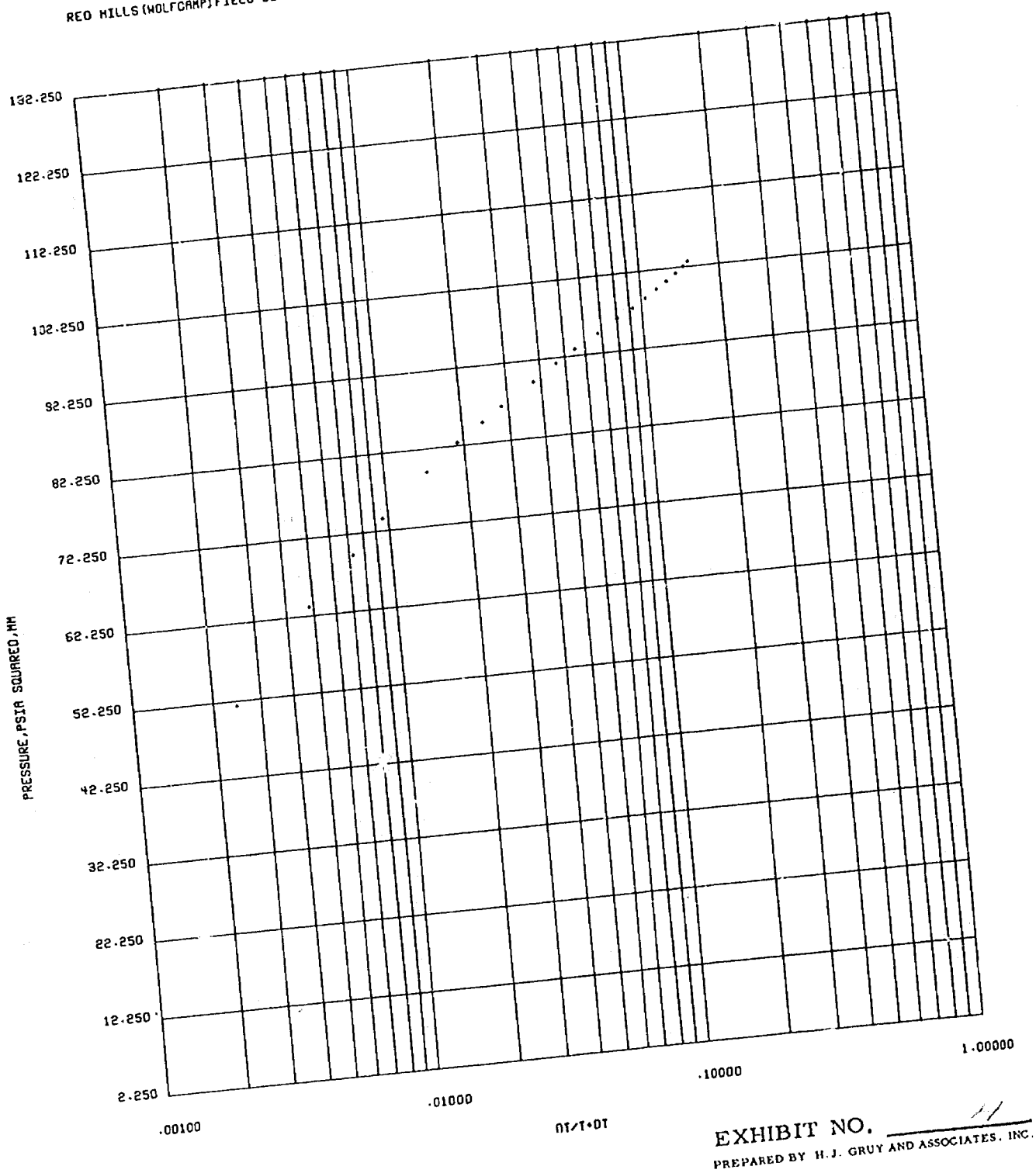


EXHIBIT NO. 11

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H.J. GRUY AND ASSOCIATES, INC.

ID...LEAST SQ FIT OF PRESS VS LOG TIME,BUILD-UP TEST OF 1-15-65
STARTING ORDER OF FITS= 1 ENDING ORDER OF FITS 1
ORDER OF POLYNOMIAL= 1
STANDARD DEVIATION= 3.19721640
COEFFICIENTS... .10993155E+05 .46400454E+03

ORIGINAL X	ORIGINAL Y	RE-CALCULATED Y	YDIFFERENCE,
-.32887619E+01	.94630000E+04	.94671550E+04	.41550000E+01
-.30727362E+01	.95690000E+04	.95673920E+04	-.16080000E+01
-.29017735E+01	.96520000E+04	.96467190E+04	-.52810000E+01
-.26922679E+01	.97420000E+04	.97439310E+04	.19310000E+01
-.25234008E+01	.98260000E+04	.98222860E+04	-.37140000E+01
-.23825261E+01	.98860000E+04	.98876530E+04	.16530000E+01
-.22620976E+01	.99390000E+04	.99435320E+04	.45320000E+01
-.21572462E+01	.99920000E+04	.99921830E+04	.18300000E+00
-.20646530E+01	.10037000E+05	.10035147E+05	-.18530000E+01

EXHIBIT NO. 2

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H.J. GRUY AND ASSOCIATES, INC.

ID...LEAST SQ FIT OF PRESS VS LOG TIME, BUILD-UP TEST OF 1-15-65
STARTING ORDER OF FITS= 1 ENDING ORDER OF FITS 1
ORDER OF POLYNOMIAL= 1
STANDARD DEVIATION= 1.46668760
COEFFICIENTS... .11375500E+05 .65306700E+03

ORIGINAL X	ORIGINAL Y	RE-CALCULATED Y	YDIFFERENCE,
-.19819493E+01	.10082000E+05	.10081155E+05	-.84500000E+00
-.19193094E+01	.10120000E+05	.10122063E+05	.20630000E+01
-.18783963E+01	.10150000E+05	.10148782E+05	-.12180000E+01

EXHIBIT NO. 7

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

TRANSIENT TEST NO. 2

From

April 17, 1965

To

May 2, 1965

EXHIBIT NO. K

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

SURFACE PRESSURE BUILDUP
RED HILLS UNIT, WELL NO.1

DATE	TIME	WELL STATUS	DEAD WEIGHT TESTER SURFACE PRESS.-psig
4-17-65	6:30 AM	Flowing	2190
	7:30 AM	Flowing	2193
	8:00 AM	Flowing	2195
	8:45 AM	Flowing	2195
	9:00 AM	Well Shut-in	-
	10:20 AM	Press.Element Seated	-
	11:00 AM	Shut-in	4852
	11:15 AM	Shut-in	4957
	11:30 AM	Shut-in	5015
	11:45 AM	Shut-in	5079
	12:00 PM	Shut-in	5140
	12:15 PM	Shut-in	5184
	12:30 PM	Shut-in	5230
	12:45 PM	Shut-in	5270
	1:00 PM	Shut-in	5305
	1:30 PM	Shut-in	5384
	2:00 PM	Shut-in	5435
	2:30 PM	Shut-in	5490
	3:00 PM	Shut-in	5534
	3:30 PM	Shut-in	5580
	4:00 PM	Shut-in	5616
4-18-65	2:45 PM	Shut-in	6163
	3:00 PM	Shut-in	6164
	3:15 PM	Shut-in	6168
	3:30 PM	Shut-in	6170
	3:45 PM	Shut-in	6175
4-19-65	3:15 PM	Shut-in	6352
	3:30 PM	Shut-in	6354
	3:45 PM	Shut-in	6356
	4:00 PM	Shut-in	6357
	4:15 PM	Shut-in	6358
4-20-65	9:15 AM	Shut-in	6458
	9:45 AM	Shut-in	6461
	10:15 AM	Shut-in	6464
4-21-65	8:45 AM	Shut-in	6574
	9:15 AM	Shut-in	6578
	9:55 AM	Shut-in	6581
4-23-65	8:30 AM	Shut-in	6762
	9:20 AM	Shut-in	6768
4-27-65	8:50 AM	Shut-in	7033
4-30-65	7:00 AM	Shut-in	7165
5- 2-65	7:00 AM	Shut-in	7199

EXHIBIT NO. 4

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

PRESSURE BUILD UP DATA

PRESSURE BUILD-UP TEST FROM 4-17-65 TO 5-2-65 (CONVERTED WHP)
UNION OIL COMPANY OF CALIFORNIA WELL NO. 1 RED HILLS UNIT
RED HILLS(WOLFCAMP)FIELD-LEA COUNTY, NEW MEXICO

CUMULATIVE PRODUCTION = 1099800.
LAST FLOW RATE = 8940.
PRODUCING TIME,TC,HRS. = 2952.

POINT	TIME,MIN.	TIME,HRS.	PRESS. PSIA.	$(PRESS)^2 \times 10^{-6}$	DT/TC+DT	TC+DT/DT
1	120.0	2.00	6730.	45.2929	.00067694	1477.
2	135.0	2.25	6840.	46.7856	.00076149	1313.
3	150.0	2.50	6904.	47.6652	.00084603	1182.
4	165.0	2.75	6978.	48.6925	.00093055	1075.
5	180.0	3.00	7047.	49.6602	.00101506	985.
6	195.0	3.25	7092.	50.2965	.00109956	909.
7	210.0	3.50	7150.	51.1225	.00118404	845.
8	225.0	3.75	7195.	51.7680	.00126851	788.
9	240.0	4.00	7236.	52.3597	.00135296	739.
10	270.0	4.50	7326.	53.6703	.00152182	657.
11	300.0	5.00	7384.	54.5235	.00169063	591.
12	330.0	5.50	7446.	55.4429	.00185937	538.
13	360.0	6.00	7495.	56.1750	.00202807	493.
14	390.0	6.50	7547.	56.9572	.00219670	455.
15	420.0	7.00	7587.	57.5626	.00236528	423.
16	1785.0	29.75	8194.	67.1416	.00997575	100.
17	1800.0	30.00	8195.	67.1580	.01005873	99.
18	1815.0	30.25	8200.	67.2400	.01014170	99.
19	1830.0	30.50	8202.	67.2728	.01022466	98.
20	1845.0	30.75	8207.	67.3548	.01030761	97.
21	3255.0	54.25	8400.	70.5600	.01804284	55.
22	3270.0	54.50	8402.	70.5936	.01812448	55.
23	3285.0	54.75	8404.	70.6272	.01820610	55.
24	3300.0	55.00	8405.	70.6440	.01828772	55.
25	3315.0	55.25	8406.	70.6608	.01836932	54.
26	4335.0	72.25	8514.	72.4882	.02388640	42.
27	4365.0	72.75	8517.	72.5393	.02404773	42.
28	4395.0	73.25	8520.	72.5904	.02420901	41.
29	5745.0	95.75	8638.	74.6150	.03141164	32.
30	5775.0	96.25	8642.	74.6842	.03157049	32.
31	5815.0	96.92	8645.	74.7360	.03178221	31.
32	7170.0	119.50	8837.	78.0926	.03889995	26.
33	7220.0	120.33	8844.	78.2163	.03916060	26.
34	12950.0	215.83	9120.	83.1744	.06812240	15.
35	17160.0	286.00	9257.	85.6920	.08831295	11.
36	20040.0	334.00	9292.	86.3413	.10162839	10.

EXHIBIT NO. 11

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H.J. GRUY AND ASSOCIATES, INC.

AVERAGE RESERVOIR PRESSURE CALCULATIONS

PBAR ASSUMED =		9300.	9400.	9500.	9600.	9700.	9800.	9900.
POINT	TIME,HRS.	PBAR - PW	PBAR - PW	PBAR - PW	PBAR - PW	PBAR - PW	PBAR - PW	PBAR - PW
1	2.00	2570.	2670.	2770.	2870.	2970.	3070.	3170.
2	2.25	2460.	2560.	2660.	2760.	2860.	2960.	3060.
3	2.50	2396.	2496.	2596.	2696.	2796.	2896.	2996.
4	2.75	2322.	2422.	2522.	2622.	2722.	2822.	2922.
5	3.00	2253.	2353.	2453.	2553.	2653.	2753.	2853.
6	3.25	2208.	2308.	2408.	2508.	2608.	2708.	2808.
7	3.50	2150.	2250.	2350.	2450.	2550.	2650.	2750.
8	3.75	2105.	2205.	2305.	2405.	2505.	2605.	2705.
9	4.00	2064.	2164.	2264.	2364.	2464.	2564.	2664.
10	4.50	1974.	2074.	2174.	2274.	2374.	2474.	2574.
11	5.00	1916.	2016.	2116.	2216.	2316.	2416.	2516.
12	5.50	1854.	1954.	2054.	2154.	2254.	2354.	2454.
13	6.00	1805.	1905.	2005.	2105.	2205.	2305.	2405.
14	6.50	1753.	1853.	1953.	2053.	2153.	2253.	2353.
15	7.00	1713.	1813.	1913.	2013.	2113.	2213.	2313.
16	29.75	1106.	1206.	1306.	1406.	1506.	1606.	1706.
17	30.00	1105.	1205.	1305.	1405.	1505.	1605.	1705.
18	30.25	1100.	1200.	1300.	1400.	1500.	1600.	1700.
19	30.50	1098.	1198.	1298.	1398.	1498.	1598.	1698.
20	30.75	1093.	1193.	1293.	1393.	1493.	1593.	1693.
21	54.25	900.	1000.	1100.	1200.	1300.	1400.	1500.
22	54.50	898.	998.	1098.	1198.	1298.	1398.	1498.
23	54.75	896.	996.	1096.	1196.	1296.	1396.	1496.
24	55.00	895.	995.	1095.	1195.	1295.	1395.	1495.
25	55.25	894.	994.	1094.	1194.	1294.	1394.	1494.
26	72.25	786.	886.	986.	1086.	1186.	1286.	1386.
27	72.75	783.	883.	983.	1083.	1183.	1283.	1383.
28	73.25	780.	880.	980.	1080.	1180.	1280.	1380.
29	95.75	662.	762.	862.	962.	1062.	1162.	1262.
30	96.25	658.	758.	858.	958.	1058.	1158.	1258.
31	96.92	655.	755.	855.	955.	1055.	1155.	1255.
32	119.50	463.	563.	663.	763.	863.	963.	1063.
33	120.33	456.	556.	656.	756.	856.	956.	1056.
34	215.83	180.	280.	380.	480.	580.	680	780.
35	286.00	43.	143.	243.	343.	443.	543.	643.
36	334.00	8.	108.	208.	308.	408.	508.	608.

EXHIBIT NO. V

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

PRESSURE BUILD-UP TEST FROM 4-17-65 TO 5-2-65 (CONVERTED MHF)

UNION OIL COMPANY OF CALIFORNIA WELL NO. 1 RED HILLS UNIT

RED HILLS(WOLFCAMP)FIELD-LEA COUNTY, NEW MEXICO

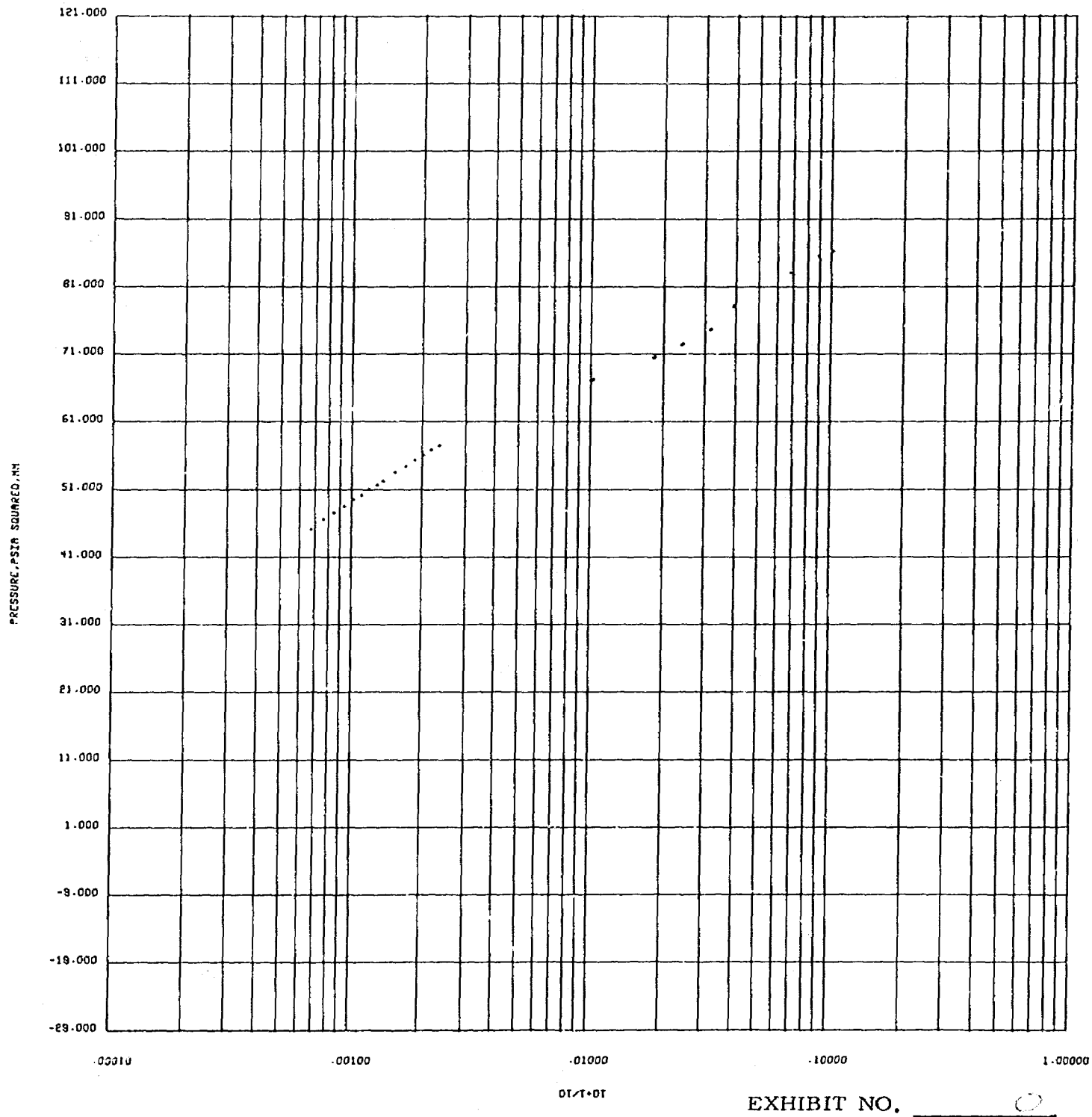


EXHIBIT NO. ( )

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H.J. GRUY AND ASSOCIATES, INC.

PRESSURE BUILD-UP TEST FROM 4-17-65 TO 5-2-65 (CONVERTED WHP)

UNION OIL COMPANY OF CALIFORNIA WELL NO. 1 RED HILLS UNIT

RED HILLS (WOLFCAMP) FIELD-LEA COUNTY, NEW MEXICO

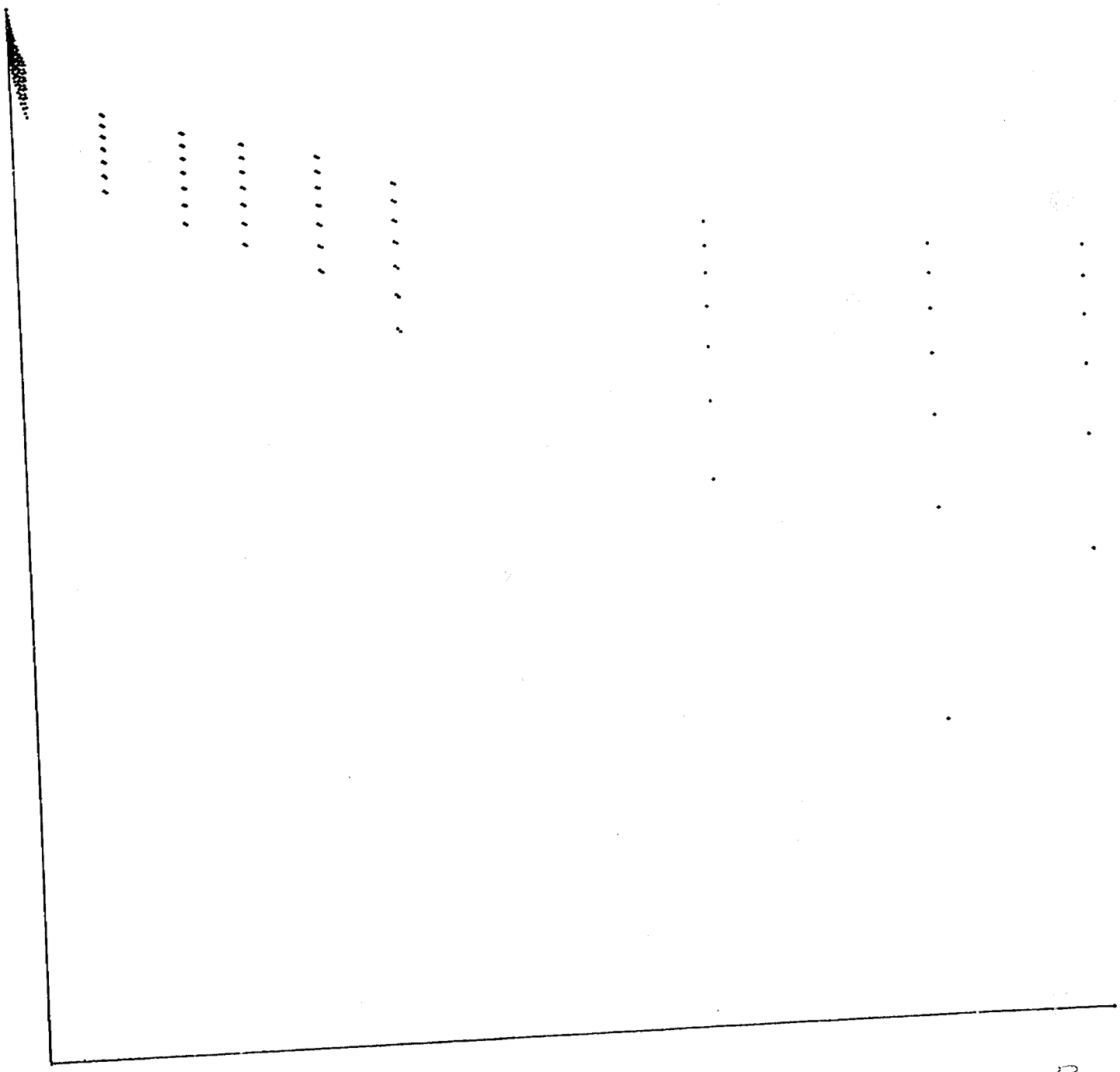


EXHIBIT NO. P

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

CONVERSION OF WHP TO BHP
BUILD-UP TEST FROM 4-17-65 TO 5-2-65
WELL NO. 1 RED HILLS UNIT

BHP = 9302 PSIA @ WHP = 7214 PSIA
UNION OIL CO. OF CALIFORNIA
RED HILLS(WLFCP)FIELD LEA CO., N.M.

DATA
VERTICAL FLOW CALCULATIONS

SPECIFIC GRAVITIES		DEPTH TO MID-PERFS, FT	13544.	TEMPERATURES		NON-HYDROCARBONS, MOLE FRACTION	
STOCK TANK LIQUID	64.00	LIQUID/GAS RATIO, B/MMCF	45.0	SURFACE, F	62.	HYDROGEN SULFIDE	0.0000
SEPARATOR GAS	.6500	FLOWRATE, MCF/DAY,	0.	RESERVOIR, F	178.	CARBON DIOXIDE	.0001
RESERVOIR FLUID	0.0000	CRITICAL PRESSURE, PSIA	0.	CRITICAL, R	0.	NITROGEN	.0054

COMPUTED VALUES FOR STATIC CONDITIONS

CRITICAL TEMPERATURE, R 397.

CRITICAL PRESSURE, PSIA 658.

RESERVOIR FLUID GRAVITY .770

WELLHEAD PRESSURE PSIA	WELLHEAD Z FACTOR	WHP/Z PSIA	BOTTOMHOLE PRESSURE PSIA	BOTTOMHOLE Z FACTOR	BHP/Z PSIA
4867.0	.9150	5319.0	6730.3	1.1337	5936.6
4972.0	.9282	5356.7	6839.8	1.1441	5978.3
5030.0	.9356	5376.5	6903.9	1.1503	6001.6
5094.0	.9438	5397.4	6977.5	1.1576	6027.3
5155.0	.9517	5416.5	7047.4	1.1647	6050.6
5194.0	.9569	5428.2	7092.0	1.1693	6065.0

EXHIBIT NO. 6

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

CONVERSION OF WHP TO BHP
BUILD-UP TEST FROM 4-17-65 TO 5-2-65
WELL NO. 1 RED HILLS UNIT

BHP = 9302 PSIA @ WHP = 7214 PSIA
UNION OIL CO. OF CALIFORNIA
RED HILLS(WLFCP)FIELD LEA CO., N.M.

DATA
VERTICAL FLOW CALCULATIONS

SPECIFIC GRAVITIES		DEPTH TO MID-PERFS, FT 13544.	TEMPERATURES		NON-HYDROCARBONS, MOLE FRACTION	
STOCK TANK LIQUID	64.00	LIQUID/GAS RATIO, B/MMCF 45.0	SURFACE, F	62.	HYDROGEN SULFIDE	0.0000
SEPARATOR GAS	.6500	FLOWRATE, MCF/DAY, 0.	RESERVOIR, F	178.	CARBON DIOXIDE	.0001
RESERVOIR FLUID	0.0000	CRITICAL PRESSURE, PSIA 0.	CRITICAL, R	0.	NITROGEN	.0054

COMPUTED VALUES FOR STATIC CONDITIONS

CRITICAL TEMPERATURE, R 397.

CRITICAL PRESSURE, PSIA 658.

RESERVOIR FLUID GRAVITY .770

WELLHEAD PRESSURE PSIA	WELLHEAD Z FACTOR	WHP/Z PSIA	BOTTOMHOLE PRESSURE PSIA	BOTTOMHOLE Z FACTOR	BHP/Z PSIA
5245.0	.9636	5443.0	7150.3	1.1755	6083.0
5285.0	.9690	5454.1	7195.9	1.1803	6096.6
5320.0	.9737	5463.5	7235.8	1.1846	6108.1
5399.0	.9846	5483.6	7325.5	1.1945	6132.6
5450.0	.9917	5495.7	7383.3	1.2011	6147.4
5505.0	.9995	5508.0	7445.5	1.2082	6162.3
5549.0	1.0058	5517.2	7495.1	1.2141	6173.6
5595.0	1.0124	5526.3	7546.9	1.2203	6184.7
5631.0	1.0177	5533.1	7587.3	1.2252	6192.9
6178.0	1.0944	5645.1	8194.2	1.3080	6264.5
6179.0	1.0945	5645.4	8195.3	1.3082	6264.6
6183.0	1.0950	5646.5	8199.6	1.3089	6264.7
6185.0	1.0953	5647.0	8201.8	1.3092	6264.8
6190.0	1.0959	5648.3	8207.3	1.3100	6265.0
6367.0	1.1181	5694.5	8399.5	1.3404	6266.3
6369.0	1.1183	5695.0	8401.6	1.3408	6266.2
6371.0	1.1186	5695.5	8403.8	1.3411	6266.2
6372.0	1.1187	5695.8	8404.9	1.3413	6266.2
6373.0	1.1189	5696.0	8406.0	1.3415	6266.1
6473.0	1.1315	5720.9	8513.7	1.3595	6262.3
6476.0	1.1318	5721.7	8516.9	1.3601	6262.1
6479.0	1.1322	5722.4	8520.1	1.3606	6261.9
6589.0	1.1462	5748.7	8637.8	1.3812	6253.9
6593.0	1.1467	5749.7	8642.1	1.3819	6253.5
6596.0	1.1471	5750.4	8645.3	1.3825	6253.3
6777.0	1.1702	5791.3	8837.1	1.4181	6231.8
6783.0	1.1710	5792.6	8843.5	1.4193	6230.9
7048.0	1.2054	5846.9	9120.4	1.4752	6182.4
7180.0	1.2229	5871.4	9256.7	1.5048	6151.3
7214.0	1.2274	5877.5	9291.6	1.5126	6142.7

EXHIBIT NO. 2

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

TRANSIENT TEST NO. 3

From

August 7, 1965

To

August 31, 1965

EXHIBIT NO. 5

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

SURFACE PRESSURE BUILDUP
RED HILLS (WOLFCAMP) FIELD
RED HILLS UNIT, WELL NO. 1

DATE	TIME	WELL STATUS	DEAD WEIGHT TESTER SURFACE PRESS.-psig
8-7-65	8:45 AM	Flowing	2185
	8:50 AM	Well Shut-in	----
	9:00 AM	Shut-in	3198
	9:10 AM	Shut-in	3490
	9:20 AM	Shut-in	3690
	9:30 AM	Shut-in	3845
	9:40 AM	Shut-in	3980
	9:50 AM	Shut-in	4115
	10:00 AM	Shut-in	4230
	10:10 AM	Shut-in	4303
	10:20 AM	Shut-in	4359
	10:30 AM	Shut-in	4420
	10:40 AM	Shut-in	4470
	10:50 AM	Shut-in	4530
	11:00 AM	Shut-in	4566
	11:45 AM	Shut-in	4730
	12:00 AM	Shut-in	4778
	12:30 PM	Shut-in	4860
	1:00 PM	Shut-in	4936
	1:30 PM	Shut-in	4985
	2:00 PM	Shut-in	5035
	2:30 PM	Shut-in	5081
	3:00 PM	Shut-in	5124
	3:30 PM	Shut-in	5150
	4:00 PM	Shut-in	5190
	4:30 PM	Shut-in	5215
	5:00 PM	Shut-in	5234
8-8-65	6:00 AM	Shut-in	5525
	6:00 PM	Shut-in	5610
8-9-65	6:00 AM	Shut-in	5707
	6:00 PM	Shut-in	5765
8-10-65	6:00 AM	Shut-in	5820
	5:15 PM	Shut-in	5853
8-11-65	6:00 AM	Shut-in	5901
	6:30 PM	Shut-in	5945

EXHIBIT NO. 7

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

SURFACE PRESSURE BUILDUP
RED HILLS (WOLFCAMP) FIELD
RED HILLS UNIT, WELL NO. 1
(continued)

DATE	TIME	WELL STATUS	DEAD WEIGHT TESTER SURFACE PRESS.-psig
8-12-65	6:30 AM	Shut-in	5982
	5:45 PM	Shut-in	6018
8-13-65	7:00 AM	Shut-in	6055
	3:15 PM	Shut-in	6076
8-14-65	7:00 AM	Shut-in	6116
8-15-65	7:00 AM	Shut-in	6173
8-16-65	7:00 AM	Shut-in	6232
8-17-65	7:00 AM	Shut-in	6281
8-18-65	7:00 AM	Shut-in	6328
8-19-65	7:00 AM	Shut-in	6367
8-20-65	7:00 AM	Shut-in	6407
8-21-65	7:00 AM	Shut-in	6438
8-22-65	7:00 AM	Shut-in	6470
8-23-65	7:00 AM	Shut-in	6500
8-24-65	7:00 AM	Shut-in	6530
8-25-65	7:00 AM	Shut-in	6560
8-26-65	7:00 AM	Shut-in	6589
8-27-65	7:00 AM	Shut-in	6616
8-28-65	7:00 AM	Shut-in	6638
8-30-65	7:00 AM	Shut-in	6680
8-31-65	7:00 AM	Shut-in	6689

EXHIBIT NO. 6

PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

PRESSURE BUILD UP DATA

PRESSURE BUILD-UP TEST FROM 8-7-65 TO 8-31-65 (CONVERTED WHP)
UNION OIL COMPANY OF CALIFORNIA WELL NO 1 RED HILLS UNIT
RED HILLS (WOLFCAMP)FIELD-LEA COUNTY, NEW MEXICO

CUMULATIVE PRODUCTION = 1935000.
LAST FLOW RATE = 7530.
PRODUCING TIME,TC,HRS. = 6167.

POINT	TIME,MIN.	TIME,HRS.	PRESS. PSIA.	$(PRESS)^2 \times 10^{-6}$	DT/TC+DT	TC+DT/DT
1	10.0	.17	4724.	22.3162	.00002702	37005.
2	20.0	.33	5097.	25.9794	.00005405	18503.
3	30.0	.50	5348.	28.6011	.00008107	12336.
4	40.0	.67	5540.	30.6916	.00010808	9252.
5	50.0	.83	5705.	32.5470	.00013510	7402.
6	60.0	1.00	5866.	34.4100	.00016212	6168.
7	70.0	1.17	6002.	36.0240	.00018913	5287.
8	80.0	1.33	6087.	37.0516	.00021615	4626.
9	90.0	1.50	6151.	37.8348	.00024316	4113.
10	100.0	1.67	6221.	38.7008	.00027017	3701.
11	110.0	1.83	6278.	39.4133	.00029718	3365.
12	120.0	2.00	6345.	40.2590	.00032418	3085.
13	130.0	2.17	6385.	40.7682	.00035119	2847.
14	175.0	2.92	6565.	43.0992	.00047270	2116.
15	190.0	3.17	6618.	43.7979	.00051319	1949.
16	220.0	3.67	6706.	44.9704	.00059418	1683.
17	250.0	4.17	6786.	46.0498	.00067515	1481.
18	280.0	4.67	6837.	46.7446	.00075610	1323.
19	310.0	5.17	6894.	47.5272	.00083705	1195.
20	340.0	5.67	6947.	48.2608	.00091798	1089.
21	370.0	6.17	6997.	48.9580	.00099889	1001.
22	400.0	6.67	7027.	49.3787	.00107980	926.
23	430.0	7.17	7073.	50.0273	.00116069	862.
24	460.0	7.67	7101.	50.4242	.00124157	805.
25	490.0	8.17	7123.	50.7371	.00132243	756.
26	1270.0	21.17	7454.	55.5621	.00342032	292.
27	1990.0	33.17	7550.	57.0025	.00534903	187.
28	2710.0	45.17	7659.	58.6603	.00727029	138.
29	3430.0	57.17	7724.	59.6602	.00918414	109.
30	4150.0	69.17	7785.	60.6062	.01109063	90.
31	4825.0	80.42	7822.	61.1837	.01287131	78.
32	5590.0	93.17	7875.	62.0156	.01488167	67.
33	6340.0	105.67	7924.	62.7898	.01684468	59.
34	7060.0	117.67	7965.	63.4412	.01872183	53.
35	7735.0	128.92	8006.	64.0960	.02047516	49.
36	8530.0	142.17	8046.	64.7381	.02253217	44.
37	9025.0	150.42	8069.	65.1088	.02380859	42.
38	9970.0	166.17	8113.	65.8208	.02623616	38.
39	11410.0	190.17	8175.	66.8306	.02991219	33.
40	12850.0	214.17	8240.	67.8976	.03356057	30.
41	14290.0	238.17	8293.	68.7738	.03718160	27.
42	15730.0	262.17	8344.	69.6223	.04077561	25.
43	17170.0	286.17	8386.	70.3250	.04434288	23.
44	18610.0	310.17	8429.	71.0460	.04788372	21.
45	20050.0	334.17	8462.	71.6054	.05139842	19.
46	21490.0	358.17	8497.	72.1990	.05488726	18.
47	22930.0	382.17	8529.	72.7438	.05835053	17.
48	24370.0	406.17	8561.	73.2907	.06178852	16.
49	25810.0	430.17	8593.	73.8396	.06520149	15.
50	27250.0	454.17	8624.	74.3734	.06858972	15.
51	28690.0	478.17	8652.	74.8571	.07195348	14.
52	30130.0	502.17	8676.	75.2730	.07529303	13.
53	33010.0	550.17	8720.	76.0384	.08190054	12.
54	34450.0	574.17	8729.	76.1954	.08516901	12.

EXHIBIT NO. 1

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

AVERAGE RESERVOIR PRESSURE CALCULATIONS

PBAR ASSUMED =		8800.	9000.	9200.	9400.	9600.	9800.	10000.
POINT	TIME,HRS.	PBAR - PW	PBAR - PW	PBAR - PW	PBAR - PW	PBAR - PW	PBAR - PW	PBAR - PW
1	.17	4076.	4276.	4476.	4676.	4876.	5076.	5276.
2	.33	3703.	3903.	4103.	4303.	4503.	4703.	4903.
3	.50	3452.	3652.	3852.	4052.	4252.	4452.	4652.
4	.67	3260.	3460.	3660.	3860.	4060.	4260.	4460.
5	.83	3095.	3295.	3495.	3695.	3895.	4095.	4295.
6	1.00	2934.	3134.	3334.	3534.	3734.	3934.	4134.
7	1.17	2798.	2998.	3198.	3398.	3598.	3798.	3998.
8	1.33	2713.	2913.	3113.	3313.	3513.	3713.	3913.
9	1.50	2649.	2849.	3049.	3249.	3449.	3649.	3849.
10	1.67	2579.	2779.	2979.	3179.	3379.	3579.	3779.
11	1.83	2522.	2722.	2922.	3122.	3322.	3522.	3722.
12	2.00	2455.	2655.	2855.	3055.	3255.	3455.	3655.
13	2.17	2415.	2615.	2815.	3015.	3215.	3415.	3615.
14	2.92	2235.	2435.	2635.	2835.	3035.	3235.	3435.
15	3.17	2182.	2382.	2582.	2782.	2982.	3182.	3382.
16	3.67	2094.	2294.	2494.	2694.	2894.	3094.	3294.
17	4.17	2014.	2214.	2414.	2614.	2814.	3014.	3214.
18	4.67	1963.	2163.	2363.	2563.	2763.	2963.	3163.
19	5.17	1906.	2106.	2306.	2506.	2706.	2906.	3106.
20	5.67	1853.	2053.	2253.	2453.	2653.	2853.	3053.
21	6.17	1803.	2003.	2203.	2403.	2603.	2803.	3003.
22	6.67	1773.	1973.	2173.	2373.	2573.	2773.	2973.
23	7.17	1727.	1927.	2127.	2327.	2527.	2727.	2927.
24	7.67	1699.	1899.	2099.	2299.	2499.	2699.	2899.
25	8.17	1677.	1877.	2077.	2277.	2477.	2677.	2877.
26	21.17	1346.	1546.	1746.	1946.	2146.	2346.	2546.
27	33.17	1250.	1450.	1650.	1850.	2050.	2250.	2450.
28	4. 17	1141.	1341.	1541.	1741.	1941.	2141.	2341.
29	57. .7	1076.	1276.	1476.	1676.	1876.	2076.	2276.
30	69.17	1015.	1215.	1415.	1615.	1815.	2015.	2215.
31	80.42	978.	1178.	1378.	1578.	1778.	1978.	2178.
32	93.17	925.	1125.	1325.	1525.	1725.	1925.	2125.
33	105.67	876.	1076.	1276.	1476.	1676.	1876.	2076.
34	117.67	835.	1035.	1235.	1435.	1635.	1835.	2035.
35	128.92	794.	994.	1194.	1394.	1594.	1794.	1994.
36	142.17	754.	954.	1154.	1354.	1554.	1754.	1954.
37	150.42	731.	931.	1131.	1331.	1531.	1731.	1931.
38	166.17	687.	887.	1087.	1287.	1487.	1687.	1887.
39	190.17	625.	825.	1025.	1225.	1425.	1625.	1825.
40	214.17	560.	760.	960.	1160.	1360.	1560.	1760.
41	238.17	507.	707.	907.	1107.	1307.	1507.	1707.
42	262.17	456.	656.	856.	1056.	1256.	1456.	1656.
43	286.17	414.	614.	814.	1014.	1214.	1414.	1614.
44	310.17	371.	571.	771.	971.	1171.	1371.	1571.
45	334.17	338.	538.	738.	938.	1138.	1338.	1538.
46	358.17	303.	503.	703.	903.	1103.	1303.	1503.
47	382.17	271.	471.	671.	871.	1071.	1271.	1471.
48	406.17	239.	439.	639.	839.	1039.	1239.	1439.
49	430.17	207.	407.	607.	807.	1007.	1207.	1407.
50	454.17	176.	376.	576.	776.	976.	1176.	1376.
51	478.17	148.	348.	548.	748.	948.	1148.	1348.
52	502.17	124.	324.	524.	724.	924.	1124.	1324.
53	550.17	80.	280.	480.	680.	880.	1080.	1280.
54	574.17	71.	271.	471.	671.	871.	1071.	1271.

EXHIBIT NO. 11

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

PRESSURE BUILD-UP TEST FROM 6-7-55 TO 6-31-65 (CONVERTED MMP)

UNION OIL COMPANY OF CALIFORNIA WELL NO 1 RED HILLS UNIT

RED HILLS (WOLFCAMP)FIELD-LEA COUNTY, NEW MEXICO

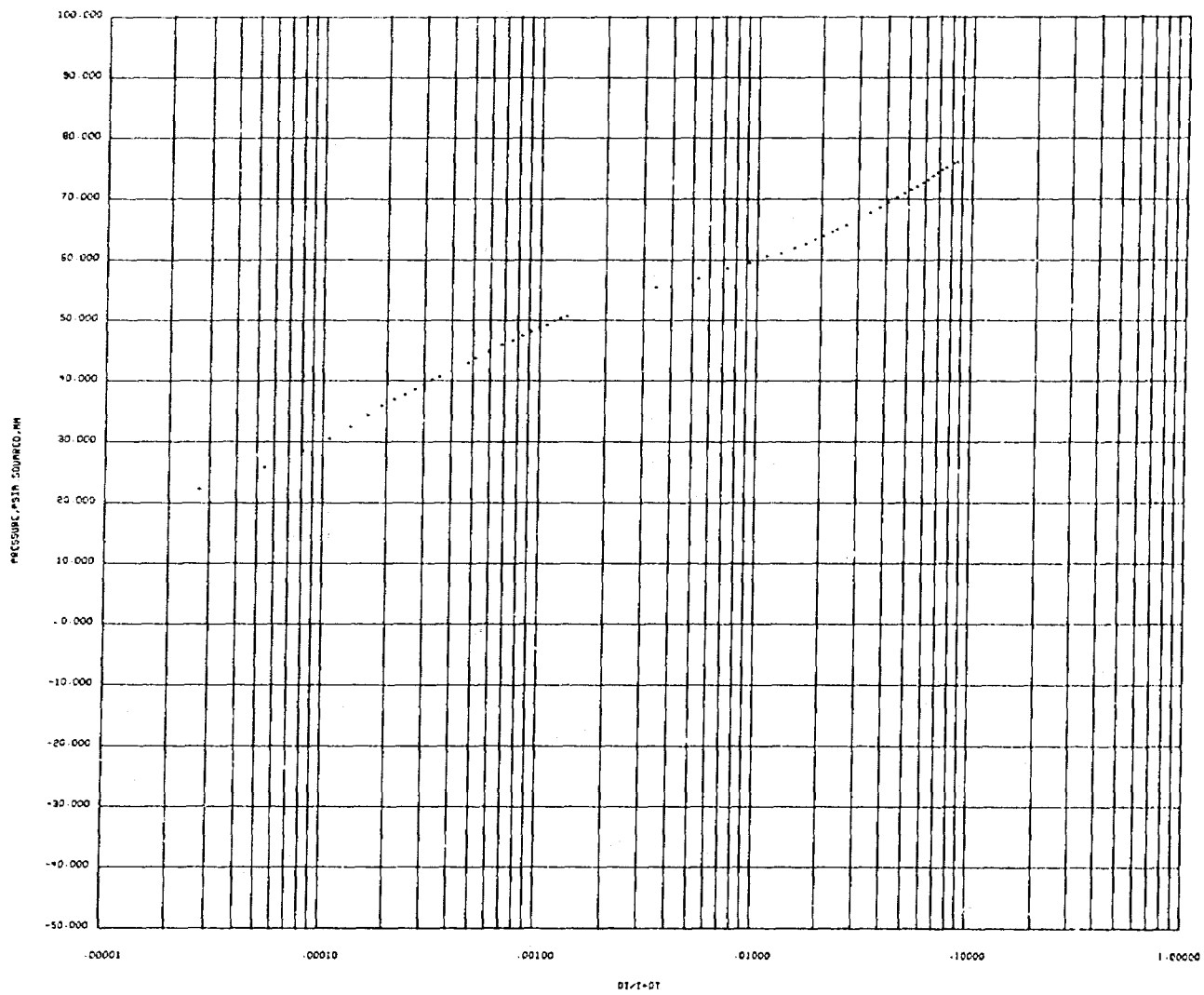


EXHIBIT NO. X

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

PRESSURE BUILD-UP TEST FROM 8-7-65 TO 8-31-65 (CONVERTED MMP)

UNION OIL COMPANY OF CALIFORNIA WELL NO 1 RED HILLS UNIT

RED HILLS (WOLFCAMP)FIELD-LEA COUNTY, NEW MEXICO

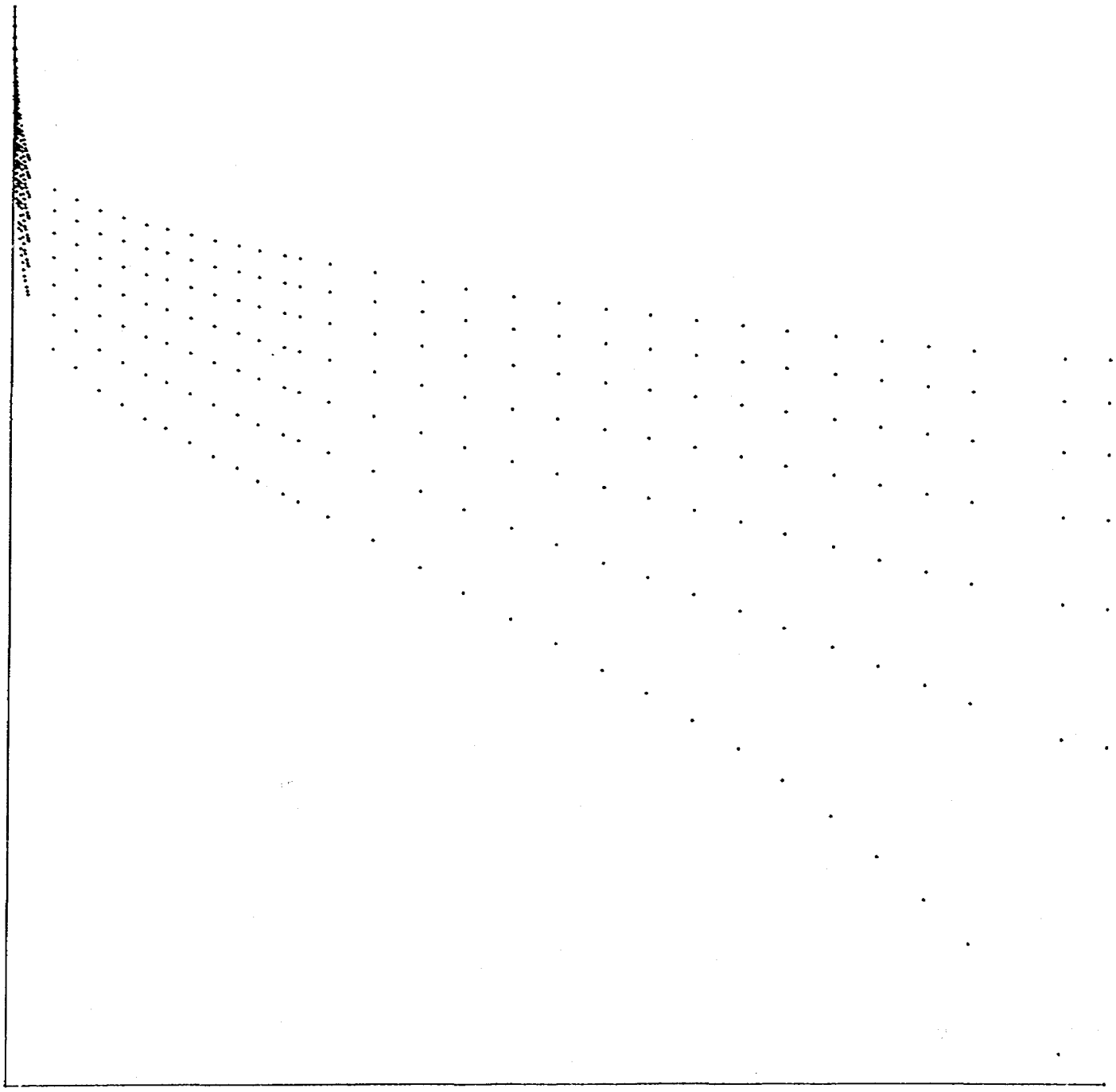


EXHIBIT NO. 7

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H.J. GRUY AND ASSOCIATES, INC.

CONVERSION OF WHP TO BHP
BUILD-UP TEST FROM 8-7-65 TO 8-31-65
WELL NO. 1 RED HILLS UNIT

BHP = 8714 PSIA @ WHP = 6704 PSIA
UNION OIL CO. OF CALIFORNIA
RED HILLS(WLFCP)FIELD LEA CO., N.M.

DATA
VERTICAL FLOW CALCULATIONS

SPECIFIC GRAVITIES				TEMPERATURES		NON-HYDROCARBONS, MOLE FRACTION	
STOCK TANK LIQUID	64.00	DEPTH TO MID-PERFS, FT	13544.	SURFACE, F	80.	HYDROGEN SULFIDE	0.0000
SEPARATOR GAS	.6500	LIQUID/GAS RATIO, B/MMCF	45.0	RESERVOIR, F	180.	CARBON DIOXIDE	.0001
RESERVOIR FLUID	0.0000	FLOWRATE, MCF/DAY,	0.	CRITICAL, R	0.	NITROGEN	.0054
		CRITICAL PRESSURE, PSIA	0.				

COMPUTED VALUES FOR STATIC CONDITIONS

CRITICAL TEMPERATURE, R 397.

CRITICAL PRESSURE, PSIA 658.

RESERVOIR FLUID GRAVITY .770

WELLHEAD PRESSURE PSIA	WELLHEAD Z FACTOR	WHP/Z PSIA	BOTTOMHOLE PRESSURE PSIA	BOTTOMHOLE Z FACTOR	BHP/Z PSIA
3213.0	.7363	4363.6	4724.2	.9432	5008.6
3505.0	.7650	4581.6	5097.1	.9716	5245.9
3705.0	.7859	4714.3	5347.8	.9947	5376.6
3860.0	.8045	4798.1	5540.3	1.0151	5457.9
3995.0	.8211	4865.6	5705.0	1.0348	5513.0
4130.0	.8350	4946.0	5866.1	1.0564	5553.0
4245.0	.8470	5012.1	6001.7	1.0709	5604.2
4318.0	.8546	5052.8	6086.7	1.0778	5647.2
4374.0	.8605	5083.3	6151.3	1.0831	5679.2
4435.0	.8669	5115.9	6221.0	1.0889	5713.2
4485.0	.8722	5142.0	6277.7	1.0936	5740.2
4545.0	.8787	5172.6	6345.2	1.0993	5771.8
4581.0	.8826	5190.6	6385.3	1.1028	5790.2
4745.0	.9007	5268.4	6565.4	1.1185	5869.6
4793.0	.9061	5289.9	6618.2	1.1233	5891.8
4875.0	.9155	5325.1	6705.9	1.1313	5927.5
4951.0	.9244	5356.1	6786.1	1.1388	5958.9
5000.0	.9302	5375.2	6837.3	1.1437	5978.2
5050.0	.9362	5393.9	6894.0	1.1492	5999.1
5096.0	.9419	5410.5	6947.1	1.1544	6017.9
5139.0	.9472	5425.3	6996.6	1.1593	6035.0
5165.0	.9505	5434.1	7026.6	1.1624	6045.1
5205.0	.9556	5447.0	7072.5	1.1671	6060.2

EXHIBIT NO. 2

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

CONVERSION OF WHP TO BHP
BUILD-UP TEST FROM 8-7-65 TO 8-31-65
WELL NO. 1 RED HILLS UNIT

BHP = 8714 PSIA @ WHP = 6704 PSIA
UNION OIL CO. OF CALIFORNIA
RED HILLS(WLFCP)FIELD LEA CO., N.M.

DATA
VERTICAL FLOW CALCULATIONS

SPECIFIC GRAVITIES		DEPTH TO MID-PERFS, FT 13544.	TEMPERATURES		NON-HYDROCARBONS, MOLE FRACTION	
STOCK TANK LIQUID	64.00	LIQUID/GAS RATIO, B/MMCF 45.0	SURFACE, F	80.	HYDROGEN SULFIDE	0.0000
SEPARATOR GAS	.6500	FLOWRATE, MCF/DAY, 0.	RESERVOIR, F	180.	CARBON DIOXIDE	.0001
RESERVOIR FLUID	0.0000	CRITICAL PRESSURE, PSIA 0.	CRITICAL, R	0.	NITROGEN	.0054

COMPUTED VALUES FOR STATIC CONDITIONS

CRITICAL TEMPERATURE, R 397.

CRITICAL PRESSURE, PSIA 658.

RESERVOIR FLUID GRAVITY .770

WELLHEAD PRESSURE PSIA	WELLHEAD Z FACTOR	WHP/Z PSIA	BOTTOMHOLE PRESSURE PSIA	BOTTOMHOLE Z FACTOR	BHP/Z PSIA
5230.0	.9588	5454.9	7101.2	1.1700	6069.3
5249.0	.9612	5460.7	7123.0	1.1723	6076.2
5540.0	1.0010	5534.5	7454.3	1.2088	6166.5
5625.0	1.0135	5550.3	7550.2	1.2202	6187.7
5722.0	1.0282	5565.2	7659.2	1.2336	6208.9
5780.0	1.0372	5572.4	7724.0	1.2418	6220.0
5835.0	1.0461	5578.1	7785.4	1.2497	6229.6
5868.0	1.0514	5581.0	7822.1	1.2546	6234.8
5916.0	1.0594	5584.4	7875.3	1.2617	6241.8
5960.0	1.0649	5596.6	7924.0	1.2684	6247.5
5997.0	1.0693	5608.5	7964.9	1.2740	6251.7
6033.0	1.0735	5620.0	8005.5	1.2797	6255.6
6070.0	1.0778	5631.6	8046.2	1.2856	6258.9
6091.0	1.0803	5638.2	8069.3	1.2889	6260.6
6131.0	1.0850	5650.7	8113.1	1.2953	6263.5
6188.0	1.0917	5668.1	8175.4	1.3046	6266.6
6247.0	1.0987	5686.0	8239.7	1.3144	6268.8
6296.0	1.1045	5700.5	8292.9	1.3227	6269.7
6343.0	1.1100	5714.3	8343.8	1.3308	6269.8
6382.0	1.1146	5725.6	8385.9	1.3376	6269.4
6422.0	1.1194	5737.0	8428.9	1.3447	6268.5
6453.0	1.1231	5745.8	8462.2	1.3502	6267.4
6485.0	1.1269	5754.7	8496.6	1.3560	6265.9
6515.0	1.1305	5763.0	8528.6	1.3615	6264.3
6545.0	1.1341	5771.3	8560.7	1.3670	6262.4
6575.0	1.1377	5779.4	8592.7	1.3726	6260.2
6604.0	1.1411	5787.2	8623.5	1.3780	6257.9
6631.0	1.1444	5794.4	8652.2	1.3831	6255.4
6653.0	1.1470	5800.1	8675.5	1.3873	6253.3
6695.0	1.1521	5811.1	8719.9	1.3955	6248.8
6704.0	1.1532	5813.4	8729.4	1.3972	6247.8

EXHIBIT NO. 11
PREPARED BY H J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

TRANSIENT TEST NO. 4

From

February 2, 1966

To

February 7, 1966

EXHIBIT NO. B23

PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

H.J. GRUY AND ASSOCIATES, INC.

TEFTELLER, INC.
RESERVOIR ENGINEERING DATA
Midland, Texas

Well : RED HILLS UNIT NO. 1

File 8-1927-EU

Field : UNDESIGNATED

CHRONOLOGICAL PRESSURE AND PRODUCTION DATA

1966 Date	Status of Well	Time	Elapsed Time Hrs.	Min.	Wellhead Pressure DWT Tubing	BHP @ 12080' Psig	BHP @ 13554' Psig
2-2	On location	08:00			2310		
"	Well flowing	08:30			2310		
"	Shut in well	11:30	0	00	3325		
"	"	11:45	0	15	3670		
"	"	12:00	0	30	3920		
"	"	12:15	0	45	4100		
"	"	12:30	1	00	4225		
"	"	12:45	1	15	4352		
"	"	13:00	1	30	4442		
"	"	13:15	1	45	4632		
"	"	14:00	2	30	4680		
"	"	14:15	2	45	4712		
"	"	14:30	3	00		6261	6444
"	Inst. @ 12080'	14:37	3	07	4757	6290	6473
"	"	14:45	3	15	4795	6319	6502
"	"	15:00	3	30	4828		
"	"	15:25	3	55	4842	6362	6545
"	"	15:30	4	00	4872		
"	"	15:45	4	15	4895	6420	6603
"	"	16:00	4	30	4935		
"	"	16:30	5	00	4975		
"	"	17:00	5	30	5004	6543	6726
"	"	17:30	6	00	5033		
"	"	18:00	6	30	5058	6608	6791
"	"	18:30	7	00	5078		
"	"	19:00	7	30	5098	6652	6835
"	"	19:30	8	00	5117		
"	"	20:00	8	30	5135	6695	6878
"	"	20:30	9	00	5162	6728	6911
"	"	21:30	10	00	5187		
"	"	22:30	11	00	5210	6782	6965
"	"	23:30	12	00			

EXHIBIT NO. CC

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

TEFTELLER, INC.
RESERVOIR ENGINEERING DATA
Midland, Texas

Well : RED HILLS UNIT NO. 1 Page 2 of 4

Field : UNDESIGNATED File 8-1927-EU

CHRONOLOGICAL PRESSURE AND PRODUCTION DATA

1966 Date	Status of Well	Time	Elapsed Time Hrs.	Min.	Wellhead Pressure DWT Tubing	BHP @ 12080' Psig	BHP @ 13554' Psig
2-3	"	00:30	13	00	5228		
"	"	01:30	14	00	5242		
"	"	02:00	14	30	5247		
"	"	02:30	15	00	5255		
"	"	03:30	16	00	5270	6858	7041
"	"	07:30	20	00	5313	6906	7089
"	"	11:30	24	00	5340	6946	7129
"	"	15:30	28	00	5367		
"	"	19:30	32	00	5393	7007	7190
"	"	23:30	36	00		7025	7208
2-4	"	11:30	48	00	5467	7084	7267
"	"	23:30	60	00		7130	7313
2-5	"	11:30	72	00	5539	7166	7349
"	"	23:30	84	00		7203	7386
2-6	"	11:30	96	00	5596	7236	7419
"	"	23:30	108	00		7266	7449
2-7	"	08:30	117	00		7282	7465
"	"	11:15	119	45		7293	7476
"	"	14:15	122	45	5646	7301	7484

EXHIBIT NO. DD

PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

PRESSURE BUILD UP DATA

PRESSURE BUILD-UP TEST FROM 2-2-66 TO 2-7-66
UNION OIL COMPANY OF CALIFORNIA WELL NO. 1 RED HILLS UNIT
RED HILLS(WOLFCAMP)FIELD-LEA COUNTY, NEW MEXICO

CUMULATIVE PRODUCTION = 2845000.
LAST FLOW RATE = 6290.
PRODUCING TIME,TC,HRS. = 10855.

POINT	TIME,MIN.	TIME,HRS.	PRESS. PSIA.	$(PRESS)^2 \times 10^6$	DT/TC+DT	TC+DT/DT
1	187.0	3.12	6459.	41.7187	.00028703	3484.
2	195.0	3.25	6488.	42.0941	.00029930	3341.
3	210.0	3.50	6517.	42.4713	.00032232	3103.
4	240.0	4.00	6560.	43.0336	.00036835	2715.
5	270.0	4.50	6618.	43.7979	.00041437	2413.
6	360.0	6.00	6741.	45.4411	.00055242	1810.
7	420.0	7.00	6806.	46.3216	.00064443	1552.
8	480.0	8.00	6850.	46.9225	.00073642	1358.
9	540.0	9.00	6893.	47.5134	.00082840	1207.
10	600.0	10.00	6926.	47.9695	.00092036	1087.
11	720.0	12.00	6980.	48.7204	.00110423	906.
12	960.0	16.00	7056.	49.7871	.00147176	679.
13	1200.0	20.00	7104.	50.4668	.00183903	544.
14	1440.0	24.00	7144.	51.0367	.00220602	453.
15	1920.0	32.00	7205.	51.9120	.00293920	340.
16	2160.0	36.00	7223.	52.1717	.00330538	303.
17	2880.0	48.00	7282.	53.0275	.00440233	227.
18	3600.0	60.00	7328.	53.6996	.00549686	182.
19	4320.0	72.00	7364.	54.2285	.00658899	152.
20	5040.0	84.00	7401.	54.7748	.00767872	130.
21	5760.0	96.00	7434.	55.2644	.00876606	114.
22	6480.0	108.00	7464.	55.7113	.00985103	102.
23	7020.0	117.00	7480.	55.9504	.01066319	94.
24	7185.0	119.75	7491.	56.1151	.01091109	92.
25	7365.0	122.75	7499.	56.2350	.01118138	89.

EXHIBIT NO. 25

PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

AVERAGE RESERVOIR PRESSURE CALCULATIONS

PBAR ASSUMED =		7800.	8000.	8200.	8400.	8600.	8800.	9000.
POINT	TIME,HRS.	PBAR - PW	PBAR - PW	PBAR - PW	PBAR - PW	PBAR - PW	PBAR - PW	PBAR - PW
1	3.12	1341.	1541.	1741.	1941.	2141.	2341.	2541.
2	3.25	1312.	[illegible]	1712.	1912.	2112.	2312.	2512.
3	3.50	1283.	1483.	1683.	1883.	2083.	2283.	2483.
4	4.00	1240.	1440.	1640.	1840.	2040.	2240.	2440.
5	4.50	1182.	1382.	1582.	1782.	1982.	2182.	2382.
6	6.00	1059.	1259.	1459.	1659.	1859.	2059.	2259.
7	7.00	994.	1194.	1394.	1594.	1794.	1994.	2194.
8	8.00	950.	1150.	1350.	1550.	1750.	1950.	2150.
9	9.00	907.	1107.	1307.	1507.	1707.	1907.	2107.
10	10.00	874.	1074.	1274.	1474.	1674.	1874.	2074.
11	12.00	820.	1020.	1220.	1420.	1620.	1820.	2020.
12	16.00	744.	944.	1144.	1344.	1544.	1744.	1944.
13	20.00	696.	896.	1096.	1296.	1496.	1696.	1896.
14	24.00	656.	856.	1056.	1256.	1456.	1656.	1856.
15	32.00	595.	795.	995.	1195.	1395.	1595.	1795.
16	36.00	577.	777.	977.	1177.	1377.	1577.	1777.
17	48.00	518.	718.	918.	1118.	1318.	1518.	1718.
18	60.00	472.	672.	872.	1072.	1272.	1472.	1672.
19	72.00	436.	636.	836.	1036.	1236.	1436.	1636.
20	84.00	399.	599.	799.	999.	1199.	1399.	1599.
21	96.00	366.	566.	766.	966.	1166.	1366.	1566.
22	108.00	336.	536.	736.	936.	1136.	1336.	1536.
23	117.00	320.	520.	720.	920.	1120.	1320.	1520.
24	119.75	309.	509.	709.	909.	1109.	1309.	1509.
25	122.75	301.	501.	701.	901.	1101.	1301.	1501.

EXHIBIT NO. 15

PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

H.J. GRUY AND ASSOCIATES, INC.

PRESSURE BUILD-UP TEST FROM 2-2-66 TO 2-7-66

UNION OIL COMPANY OF CALIFORNIA WELL NO. 1 RED HILLS UNIT

RED HILLS(WOLFCAMP)FIELD-LEA COUNTY, NEW MEXICO

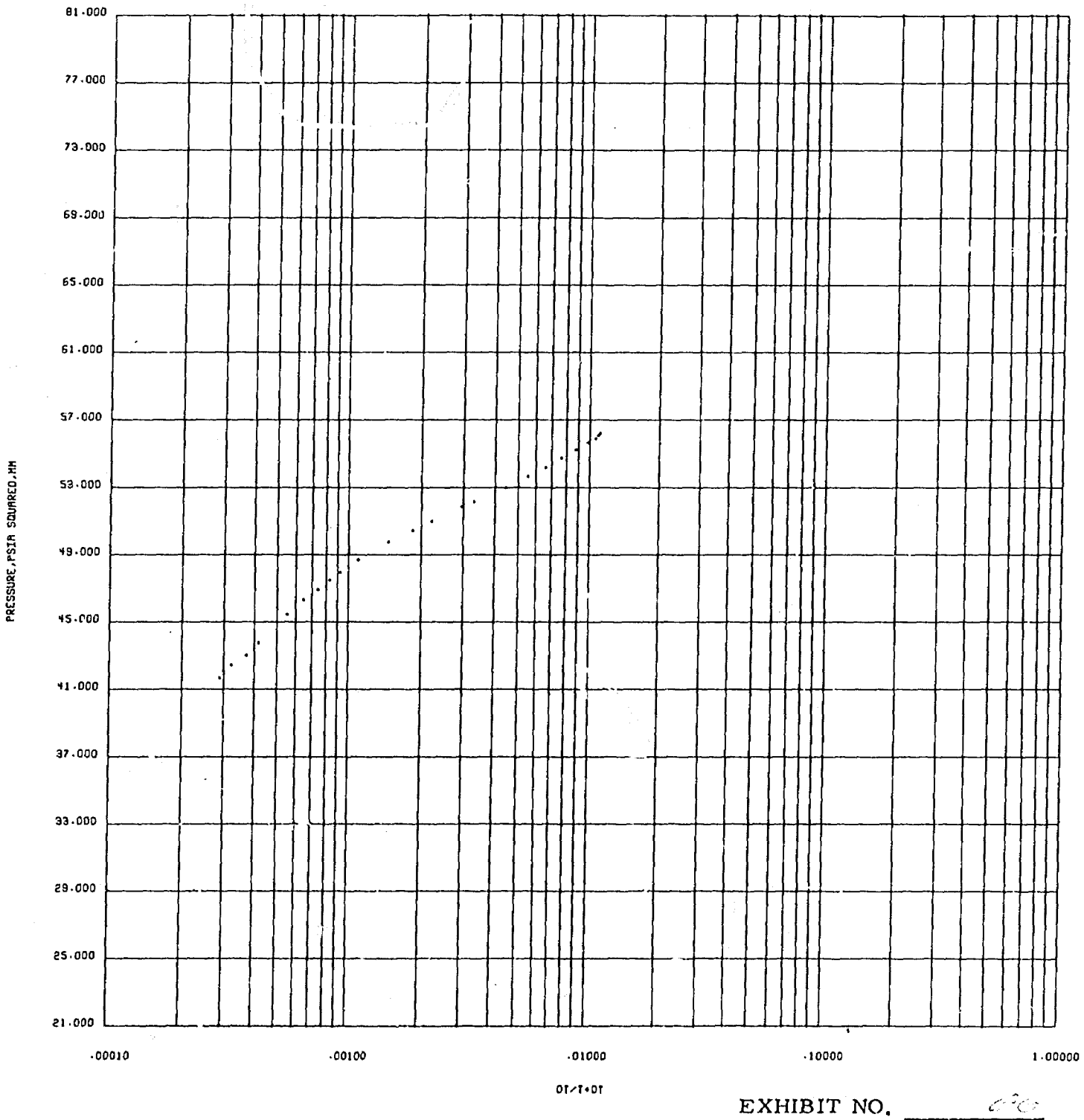


EXHIBIT NO. [illegible]

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

PRESSURE BUILD-UP TEST FROM 2-2-66 TO 2-7-66

UNION OIL COMPANY OF CALIFORNIA WELL NO. 1 RED HILLS UNIT

RED HILLS (WOLFCAMP) FIELD-LEA COUNTY, NEW MEXICO

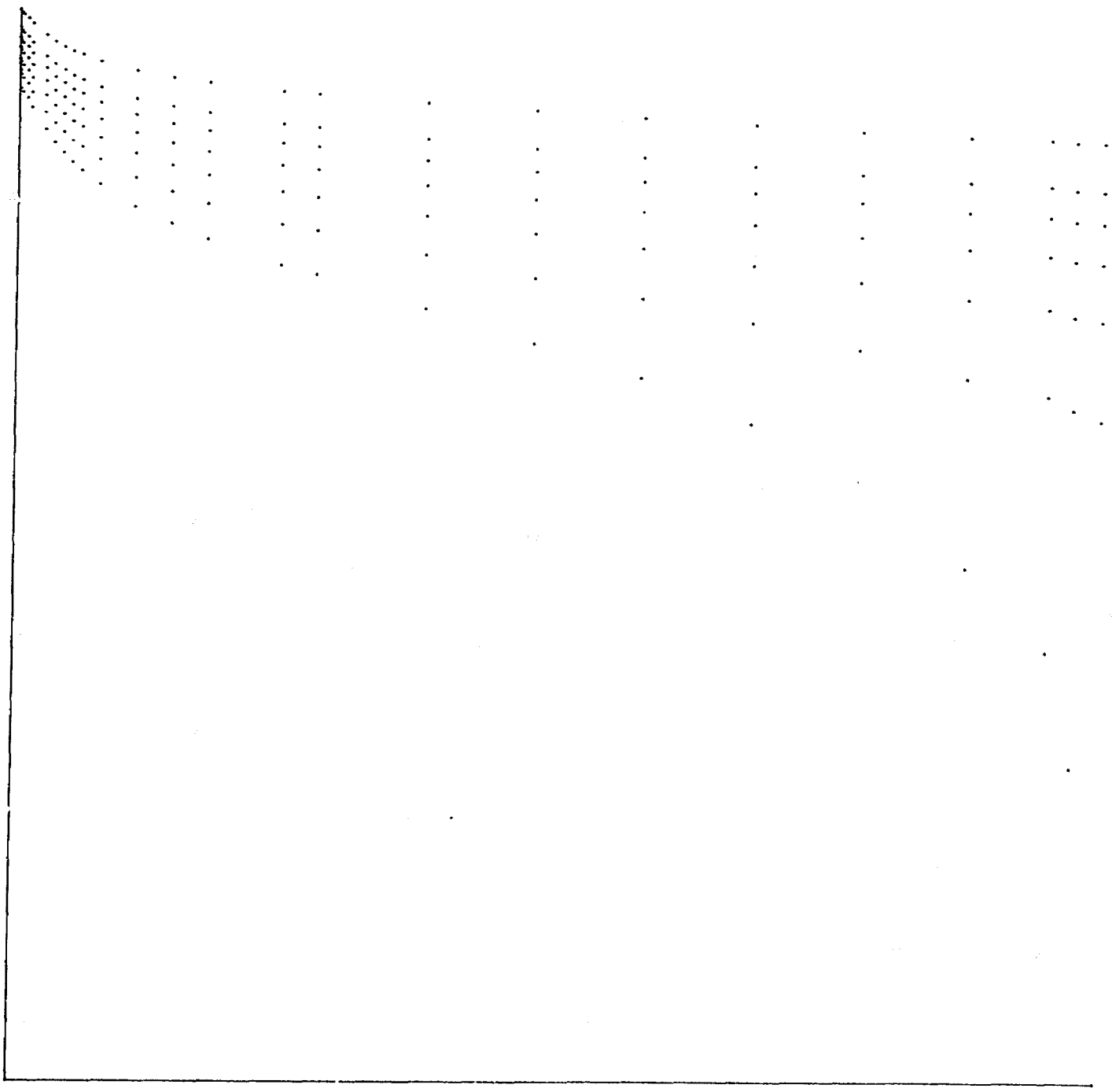


EXHIBIT NO. 111

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H.J. GRUY AND ASSOCIATES, INC.

ID...LEAST SQ FIT OF PRESS VS LOG TIME,BUILD-UP TEST OF 2-2-66
STARTING ORDER OF FITS= 1 ENDING ORDER OF FITS 1
ORDER OF POLYNOMIAL= 1
STANDARD DEVIATION= 2.25214390
COEFFICIENTS... .83914749E+04 .20433228E+03

ORIGINAL X	ORIGINAL Y	RE-CALCULATED Y	YDIFFERENCE,
-.65212963E+01	.70560000E+04	.70589636E+04	.29636000E+01
-.62985170E+01	.71040000E+04	.71044846E+04	.48460000E+00
-.61165652E+01	.71440000E+04	.71416632E+04	-.23368000E+01
-.58296178E+01	.72050000E+04	.72002959E+04	-.47041000E+01
-.57122038E+01	.72230000E+04	.72242873E+04	.12873000E+01
-.54256213E+01	.72820000E+04	.72828454E+04	.84540000E+00
-.52035782E+01	.73280000E+04	.73282160E+04	.21600000E+00
-.50223552E+01	.73640000E+04	.73652457E+04	.12457000E+01

EXHIBIT NO. II
PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H.J. GRUY AND ASSOCIATES, INC.

ID...LEAST SQ FIT OF PRESS VS LOG TIME,BUILD-UP TEST OF 2-2-66
STARTING ORDER OF FITS= 1 ENDING ORDER OF FITS 1
ORDER OF POLYNOMIAL= 1
STANDARD DEVIATION= 2.08721710
COEFFICIENTS... .86429885E+04 .25519224E+03

ORIGINAL X	ORIGINAL Y	RE-CALCULATED Y	YDIFFERENCE,
-.48693024E+01	.74010000E+04	.74003804E+04	-.61960000E+00
-.47368678E+01	.74340000E+04	.74341766E+04	.17660000E+00
-.46201792E+01	.74640000E+04	.74639547E+04	-.45300000E-01
-.45409576E+01	.74800000E+04	.74841714E+04	.41714000E+01
-.45179755E+01	.74910000E+04	.74900363E+04	-.96370000E+00
-.44935044E+01	.74990000E+04	.74962811E+04	-.27189000E+01

EXHIBIT NO. [illegible]
PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

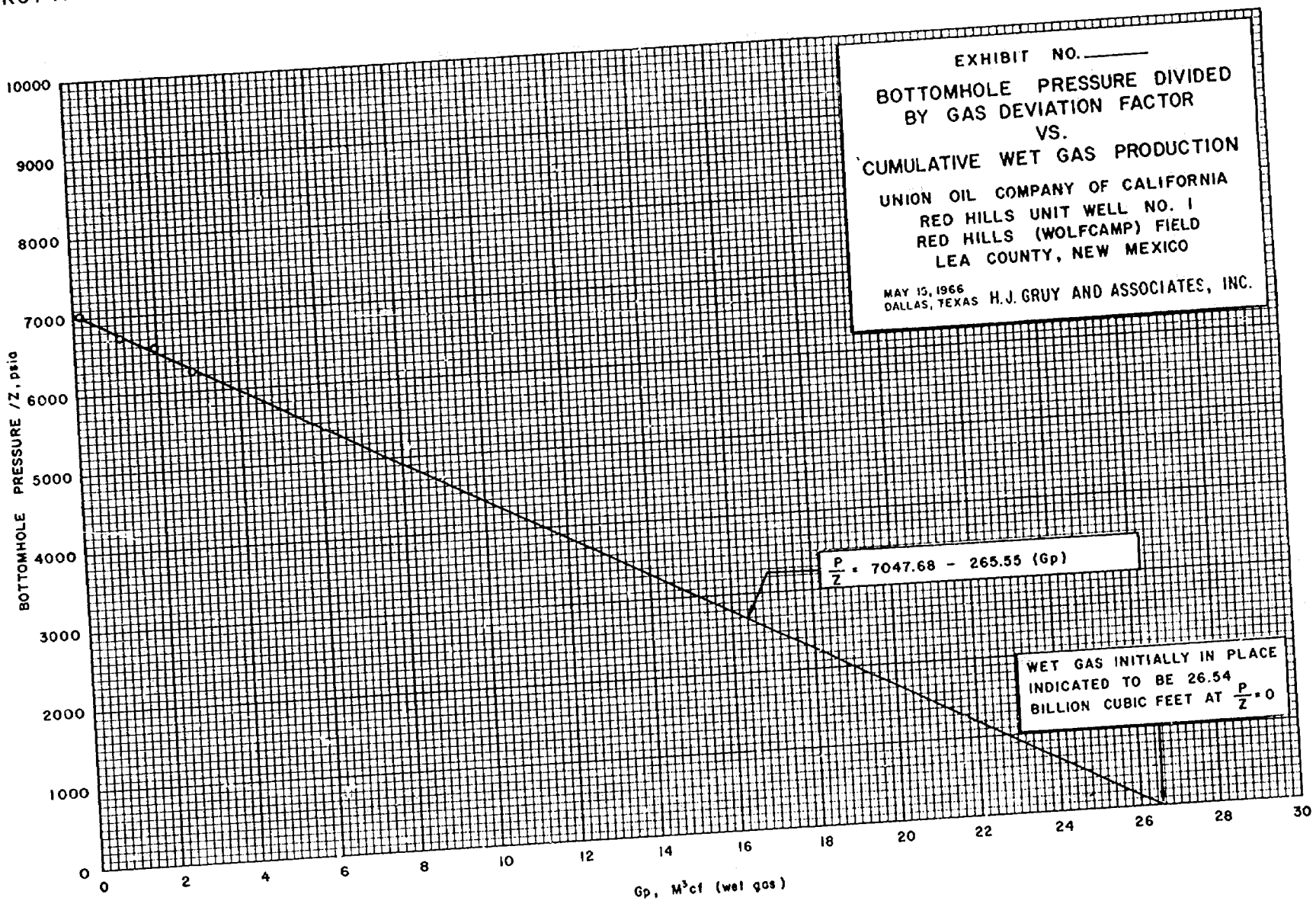


EXHIBIT NO. XV

PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

EXAMPLE CALCULATIONS
Based On
TEST DATED FEBRUARY 2, 1966

UNION OIL COMPANY OF CALIFORNIA WELL NO. 1
RED HILLS UNIT
Red Hills (Wolfcamp) Field
Lea County, New Mexico

I. Effective Permeability to Wet Gas

$$= \frac{1664.85\, q_g\, \mu_g\, T z}{h\, m}$$

where:

q_g = last flow rate, mcf/day
μ_g = gas viscosity, centipoise
T = reservoir temperature, absolute
z = gas deviation factor
h = formation net thickness
m = slope of build-up curve in Δ psia^2/cycle

$$= \frac{1664.85\,(6290)\,(0.0358)\,(645)\,(1.240)}{(25)\;(7.6749 \times 10^6)} = 1.56 \text{ md.}$$

II. Calculated Radius of Investigation
(approximation because of layered system)

$$r_d = \left[\frac{k\,\Delta t}{967\,\phi\,\mu_g\,c_t}\right]^{1/2}$$

where:

k = formation effective permeability, md
Δt = time, hours = 122.75
ϕ = formation porosity, decimal = 0.048
c_t = total system compressibility, vol./vol./psi
$= 4.3234 \times 10^{-5}$

$$r_d = \left[\frac{(1.56)\,(122.75)}{(967)\,(0.048)\,(0.0358)\,(4.3234 \times 10^{-5})}\right]^{1/2} = 1634 \text{ feet}$$

EXHIBIT NO. 1-L
PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

III. Gas Initially in Place - Dimensionless Calculations

$\bar{p}$, estimated average system pressure, = 7770 psia

m, slope of pressure build-up curve = 470.49 psi/cycle

$$C, \text{ constant} = \frac{1.147}{m} = \frac{1.147}{470.49} = 2.4379 \times 10^{-3}$$

Dimensionless Build-Up Data

Time Δt hours	Pressure, p_{ws} psia	$\bar{p} - p_{ws}$ psi	Δp_{Dw} $C(\bar{p} - p_{ws})$
16	7056	714	1.74
20	7104	666	1.62
24	7144	626	1.53
32	7205	565	1.38
36	7223	547	1.33
48	7282	488	1.19
60	7328	442	1.08
72	7364	406	0.99

Based on overlay of above dimensionless data on graph published in "Bottom Hole Pressure Analysis - Field Examples", by Norman, Lamont, Norman and McAnnally, presented at short course in formation evaluation, April, 1965, Texas Tech. University.

t real = 100
t dimensionless = .0198

$$t_{rd} = \frac{100}{0.0198} = 5050.5$$

$$\text{Gas in place} = \frac{(1-S_w)\ 0.02399\ q_g\ t_{rd}}{c_t\ m}$$

$$= \frac{(1 - .25)\ (0.02399)\ (6290\text{mcf})\ (5050.5)}{(4.3234 \times 10^{-5})\ (470.49)}$$

= 28.099 Billion remaining
+ 2.845 Billion cumulative production
30.944 Billion cubic feet

EXHIBIT NO. 11

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

IV. Gas in Place per Acre Foot

$$MMcf/AF = \frac{1507.5\ p_o\ \phi\ (1 - S_w)}{1000\ z\ T}$$

where:

p_o = initial reservoir pressure, psia
ϕ = average formation porosity, fraction
S_w = average water saturation
z = gas deviation factor
T = reservoir temperature, absolute

$$= \frac{1507.5\ (11,376)\ (0.048)\ (.75)}{(1.624)\ (645)}$$

$$= 0.58939\ \text{MM cf/AF}$$

V. Reservoir Volume and Area

Based on gas initially in place = 26,540 million cubic feet

$$\text{Acre feet} = \frac{26,540}{0.58939} = 45,030\ \text{acre feet}$$

Assuming 25 feet average thickness

$$\frac{45,030\ \text{acre feet}}{25\ \text{feet}} = 1801.2\ \text{acres}$$

Assuming radial pattern

$$\text{Radius} = \left[\frac{(1801.2 \times 43560)}{3.1416}\right]^{1/2}$$
$$= 4998\ \text{feet}$$

EXHIBIT NO. IV/V
PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

VI. Calculated Average Reservoir Pressure

Based on a reservoir radius of 4998 feet and a radial finite system.

$$x = \frac{83.8 \times 10^{-6}\ k\ t_p}{c_t\ \mu_g\ \phi\ r_e^2}$$

where:

k = effective permeability, md
t_p = time produced prior to shut in, hrs
c_t = total system compressibility vol./vol./psi
μ_g = gas viscosity, centipoise
ϕ = formation porosity, decimal
r_e = reservoir radius, feet

$$x = \frac{(83.8 \times 10^{-6})\ (1.56)\ (10,855)}{(4.3234 \times 10^{-5})\ (0.0358)\ (0.048)\ (4998)^2}$$

$$= .76$$

y from Matthews Graph published in SPE-TP 3876

$$= 3.2$$

$$\bar{p} = \left[(p^*)^2 - \frac{my}{2.303}\right]^{1/2}$$

where:

m = slope of build-up curve psi^2/cycle
p^* = extrapolated boundary pressure, psia

$$\bar{p} = 74.701 \times 10^6 - \left[\frac{(9.838 \times 10^6)\ (3.2)}{2.303}\right]^{1/2}$$

$$\bar{p} = 74.701 \times 10^6 - \left[13.670 \times 10^6\right]^{1/2}$$

$$\bar{p} = 7812 \text{ psia}$$

EXHIBIT NO. 20

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

Initial gas in place determination

Based on the calculated average pressure of 7812 psia.

$$\text{Initial } p/z = \frac{11376}{1.624} = 7004.92$$

$$\text{Last test } p/z = \frac{7812}{1.243} = 6284.79$$

$$\Delta (p/z) = 720.13$$

$$\frac{(2.845 \text{ billion cubic feet})\ (7004.92)}{720.13} = 27.67 \text{ billion cubic feet}$$

VII. Summary of Gas in Place Calculations

	Wet Gas Initially In Place M^3cf	Acre feet	Area	Radius
1. Dimensionless Calculation	30.90	52,427	2097	5392
2. Pressure Performance Curve	26.50	44,962	1798	4994
3. Material Balance on Computed Average Fressure From Last Test	27.67	46,947	1878	5103

EXHIBIT NO. [illegible]

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

NEW MEXICO OIL CONSERVATION COMMISSION
P. O. BOX 2088
SANTA FE, NEW MEXICO

PRELIMINARY GAS NOMINATIONS FOR PERIOD JULY 1 THROUGH DECEMBER 31, 1966

SOUTHEAST

Pools	
Atoka-Pennsylvanian	3,633,000 MCF
Bagley-Lower Pennsylvanian	355,800 MCF
Bagley-Upper Pennsylvanian	265,000 MCF
Blinebry	7,000,700 MCF
Crosby-Devonian	2,232,000 MCF
Eumont	24,414,200 MCF
Indian Basin-Morrow	2,566,804 MCF
Indian Basin-Upper Pennsylvanian	24,443,916 MCF
Jalmat	24,036,862 MCF
Justis	1,533,300 MCF
Monument McKee-Ellenburger	1,454,020 MCF
Todd-San Andres	1,482,920 MCF
Tubb	9,282,600 MCF
TOTAL	102,701,122 MCF

NEW MEXICO OIL CONSERVATION COMMISSION
P. O. BOX 2088
SANTA FE, NEW MEXICO

GAS NOMINATIONS FOR JUNE, 1966

SOUTHEAST

Pools	
Atoka-Pennsylvanian	524,000 MCF
Bagley-Lower Pennsylvanian	58,700 MCF
Bagley-Upper Pennsylvanian	37,100 MCF
Blinebry	999,000 MCF
Crosby-Devonian	360,000 MCF
Eumont	3,535,900 MCF
Indian Basin-Morrow	418,100 MCF
Indian Basin-Upper Pennsylvanian	4,003,500 MCF
Jalmat	3,394,600 MCF
Justis	213,100 MCF
Monument McKee-Ellenburger	225,500 MCF
Todd-San Andres	241,800 MCF
Todd-San Andres - Estimate	227,695 MCF
Tubb	1,336,300 MCF
TOTAL	15,347,600 MCF
TOTAL ON TODD-SAN ANDRES - ESTIMATE	15,333,495 MCF

NORTHWEST

Pools	
Blanco-Mesaverde	14,590,500 MCF
Basin-Dakota	16,991,200 MCF
Aztec-Pictured Cliffs	792,500 MCF
Ballard-Pictured Cliffs	763,500 MCF
South Blanco-Pictured Cliffs	2,540,600 MCF
Fulcher Kutz-Pictured Cliffs	303,800 MCF
West Kutz-Pictured Cliffs	252,400 MCF
Tapacito-Pictured Cliffs	1,156,100 MCF
Devils Fork-Gallup	130,500 MCF
Devils Fork-Gallup - Estimate	157,950 MCF
TOTAL	37,521,100 MCF
TOTAL ON DEVILS FORK-GALLUP - ESTIMATE	37,548,550 MCF
TOTAL ADJUSTED NOMINATIONS - BOTH AREAS	52,882,045 MCF

EXHIBIT A
GAS ALLOWABLE HEARING
MAY, 1966

EXHIBIT NO. 6

CORE LABORATORIES, INC. *Petroleum Reservoir Engineering*

COMPANY THE PURE OIL COMPANY FIELD WILDCAT FILE WP-1-6809

WELL RED HILLS UNIT NO. 1 COUNTY LEA DATE 5-5-66

LOCATION 530' FSL 2310' FEL SEC. 32 STATE NEW MEXICO ELEV. 2819' GR 2849' RT
T-25-S R-35-E

CORE-GAMMA CORRELATION

SLABBED CORE

CORE-GAMMA SURFACE LOG
(PATENT APPLIED FOR)

GAMMA RAY
RADIATION INCREASE →

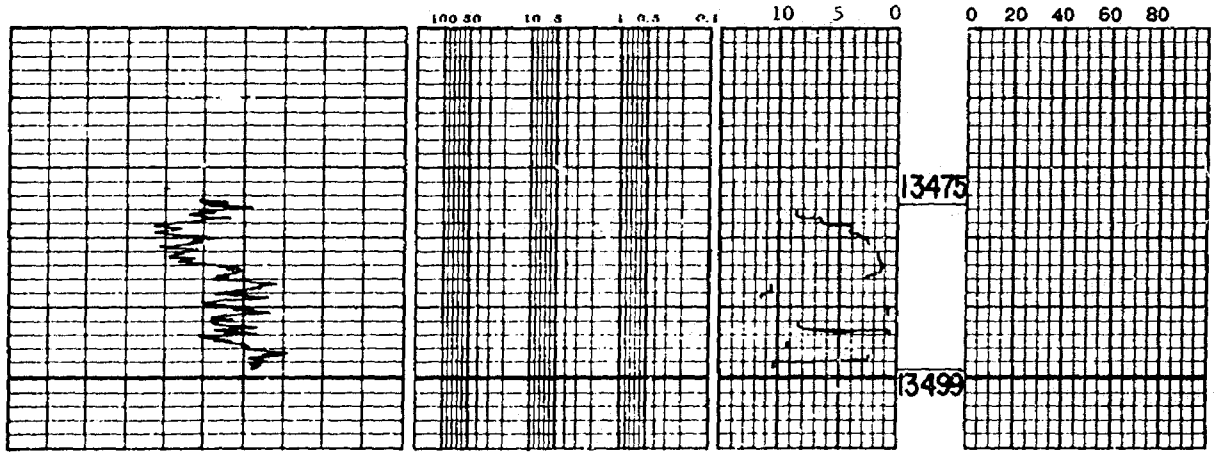
COREGRAPH

TOTAL WATER ——
PERCENT TOTAL WATER
80 60 40 20 0

PERMEABILITY ——
MILLIDARCYS
100 50 10 5 1 0.5 0.1

POROSITY ——
PERCENT
10 5 0

OIL SATURATION - - - - -
PERCENT PORE SPACE
0 20 40 60 80



H. J. GRUY AND ASSOCIATES, INC.

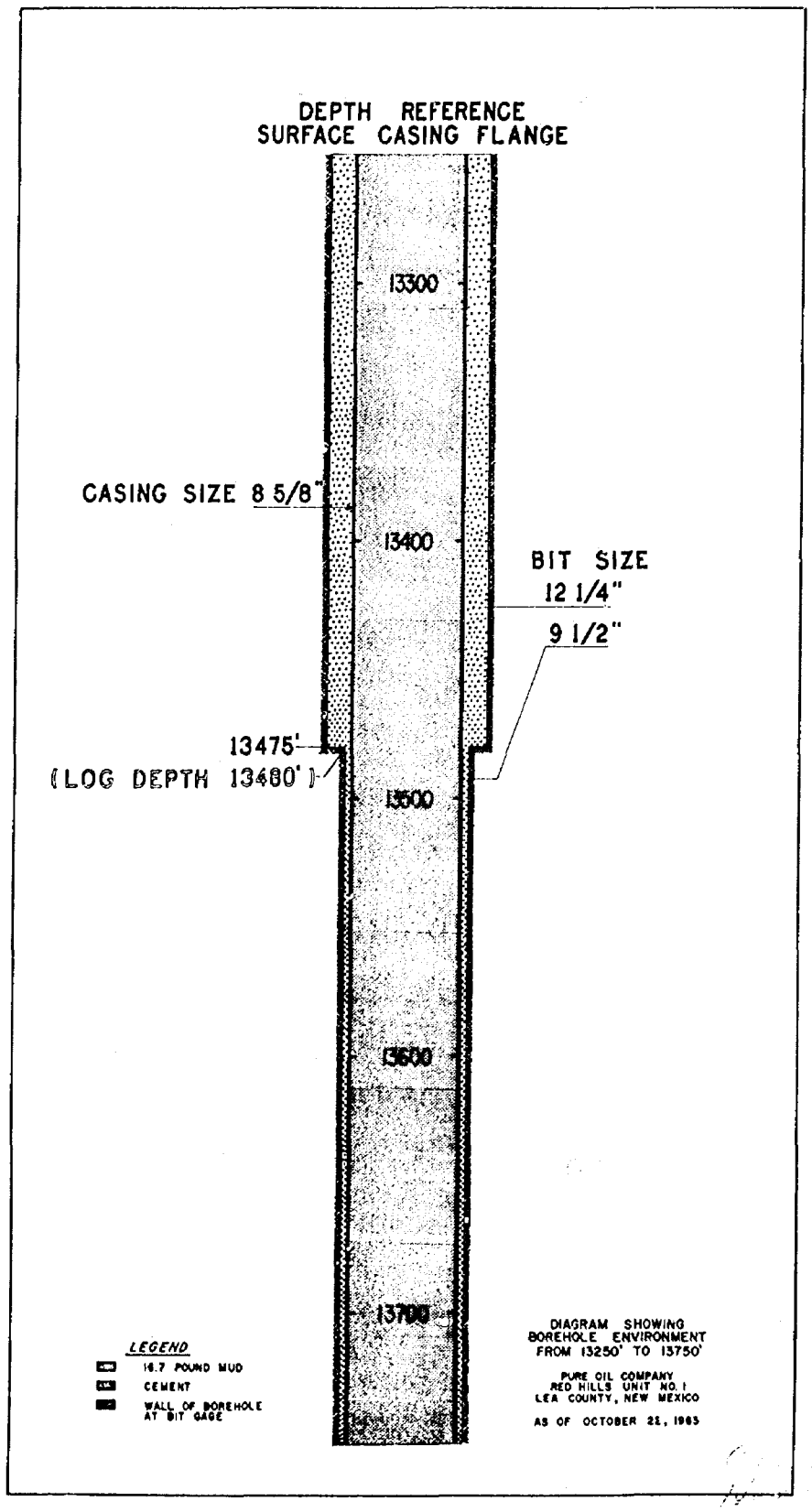


EXHIBIT NO. Union 4

PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

CA-20H

CORE LABORATORIES, INC.

Petroleum Reservoir Engineering

DALLAS, TEXAS

Company THE PURE OIL COMPANY File WP-1-6809

Well RED HILLS UNIT NO. 1 Date 5-5-66

Field WILDCAT Elevation 2819' GF 2849' RT

County LEA State NEW MEXICO Drlg. Fluid

Location 330' FSL 2310' FEL SEC. 32 T-25-S R-33-E

Lithological Abbreviations

SAND-SS	DOLOMITE-DOL	ANHYDRITE-ANHY	SANDY-SDY	FINE-FN	CRYSTALLINE-XLN	BROWN-BRN	FRACTURED-FRAC	SLIGHTLY-SL/
SHALE-SH	CHERT-CHT	CONGLOMERATE-CONG	SHALY-SHY	MEDIUM-MED	GRAIN-GN	GRAY-GRY	LAMINATED-LAM	VERY-V/
LIME-LM	GYPSUM-GYP	FOSSILIFEROUS-FO	LIMY-LMY	COARSE-CRSE	GRANULAR-GNR	VUGGY-VGY	STYLOLITIC-STYC	WITH-W/

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY MILLIDARCYS MAX	PERMEABILITY MILLIDARCYS 90°	POROSITY PERCENT	RESIDUAL SATURATION PERCENT PORE OIL	RESIDUAL SATURATION PERCENT PORE WATER	DESCRIPTION
				GRAIN DENSITY			
1	13476	*		8.8	2.76		SH, SL/LMY
2	13477	<0.1		6.8	2.78		SH, SL/LMY
3	13478	<0.1		4.2	2.80		LM, SHY
4	13479	<0.1		4.1	2.84		LM, SHY
5	13479 A	<0.1		3.3	2.80		LM, SHY
6	13480	<0.1		2.8	2.79		LM, SHY
7	13482	<0.1		1.8	2.69		LM, SLY/SHY
8	13483	<0.1		1.6	2.73		LM, SLY/SHY
9	13484	<0.1		1.4	2.73		LM, SLY/SHY, FO
10	13485	<0.1		2.6	2.72		LM, SLY/SHY
11	13487	*		10.4	2.77		SH
12	13488	*		11.4	2.77		SH
13	13490	<0.1		0.9	2.64		LM, SHY
14	13492	*		8.2	2.71		SH
15	13493	<0.1		0.9	2.67		LM, SLY/SHY, FO
16	13495	*		9.0	2.74		SH
17	13497	<0.1		2.3	2.67		LM, SHY
18	13498	*		10.2	2.74		SH

* NO PERMEABILITY MEASUREMENT MADE - PLUG FRACTURED

THE ANALYSIS AND CORE GAMMA LOG WERE ANALYSED AND PROCESSED ON SLABBED CORE.

These analyses, opinions or interpretations are based on observations and materials supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories, Inc. (all errors and omissions excepted); but Core Laboratories, Inc. and its officers and employees, assume no responsibility and make no warranty or representations, as to the productivity, proper operations, or profitableness of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

5-18-66

Union Ef 2

H. J. GRUY AND ASSOCIATES, INC.

SUMMARY OF EXHIBITS

Summary of Reservoir Data

Gas Deviation Factor Curve

Summary of Transient Test Analyses

Transient Test No. 1
- a. Data
- b. Computation
- c. Pressure build-up curve
- d. Least square fitting of linear portions

Transient Test No. 2
- a. Data
- b. Computation
- c. Pressure build-up curve
- d. Average pressure curve
- e. Conversion from WHP to BHP

Transient Test No. 3
- a. Data
- b. Computation
- c. Pressure build-up curve
- d. Average pressure curve
- e. Conversion from WHP to BHP

Transient Test No. 4
- a. Data
- b. Computation
- c. Pressure build-up curve
- d. Average pressure curve
- e. Least square fitting of linear portions

Plot of Average Reservoir Pressure divided by Gas Deviation Factor versus Cumulative Wet Gas Production

Example Calculations

EXHIBIT NO. 11-A

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

PERTINENT RESERVOIR DATA AND PARAMETERS USED IN CALCULATIONS

Wolfcamp Reservoir
Red Hills Field
Lea County, New Mexico

Depth (mid perfs.), feet	13,554
Average porosity,	4.8 percent
Net effective thickness, feet	25
Average connate water saturation	25 percent
Dew point	5200 psia
Initial reservoir pressure	11,376 psia
Initial liquid-gas ratio, bbls/M^2cf	45
Wet gas gravity at initial reservoir conditions	0.794
Reservoir temperature	185 degrees Fahrenheit
Condensate gravity	64 degrees API
Gas initially in place per Acre Feet	589.39
Initial gas deviation factor	1.624
Pressure base	15.025 psi

EXHIBIT NO. 8

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

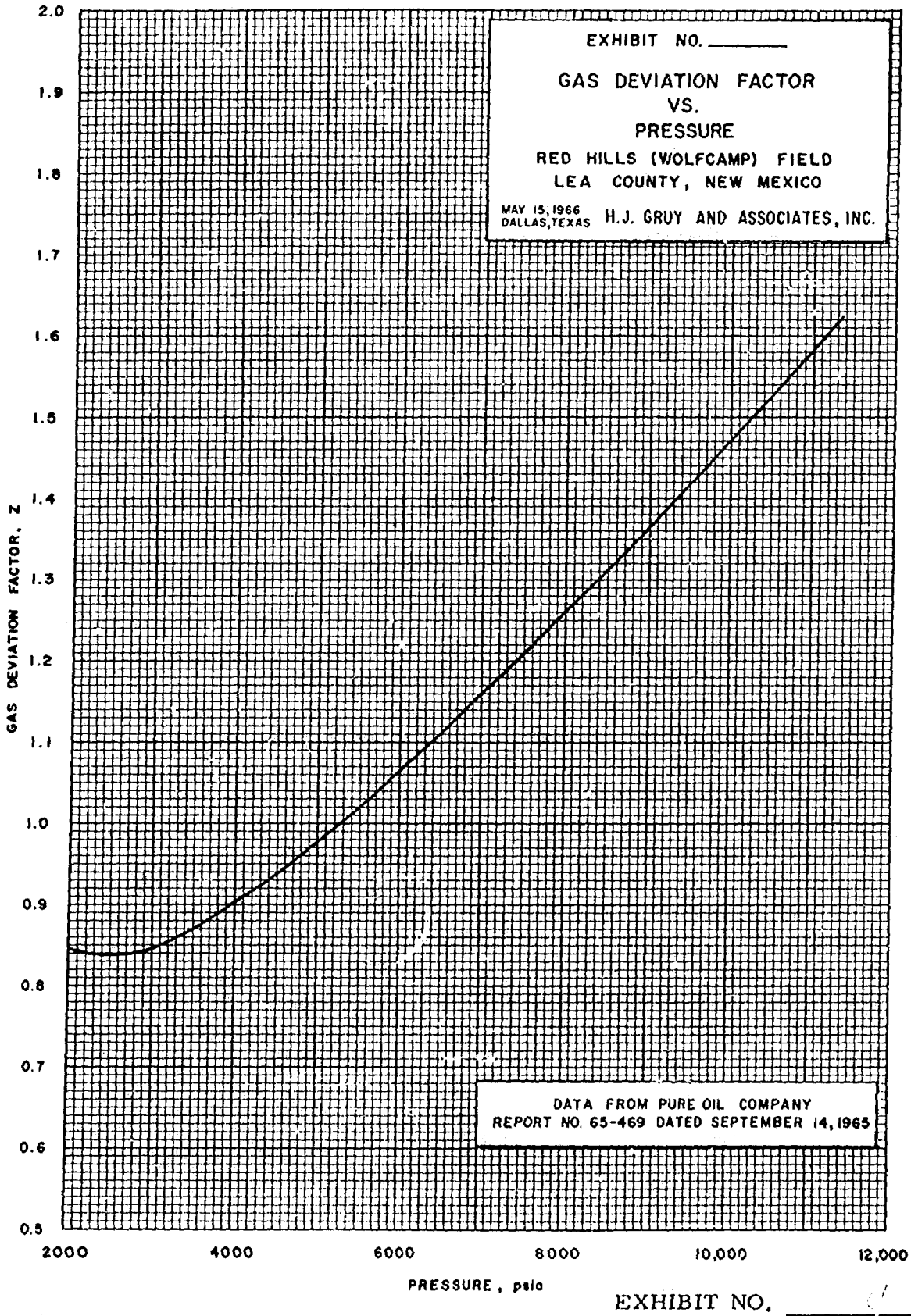


EXHIBIT NO. 4

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

SUMMARY OF PRESSURE BUILD-UP ANALYSES

Union Oil Company of California Well No. 1 Red Hills Unit

Red Hills (Wolfcamp) Field
Lea County, New Mexico

Test Date from	Test Date to	Length of Test (hours)	Pressure Datum	Calculated Effective Permeability to Wet Gas, md.	Calculated Stabilized Reservoir Pressure psia	Gas Deviation Factor Z	Calculated Wet Gas Initially In Place M^3cf	Cumulative Wet Gas Production M^3cf
1/15/65	1/18/65	74.50	Bottom hole	1.39	11,376	1.624	--	0.1934
4/17/65	5/ 2/65	334.00	Wellhead	--	9,500	1.416	--	1.0998
8/ 7/65	8/31/65	574.17	Wellhead	--	9,000	1.364	--	1.9350
2/ 2/66	2/ 7/66	122.75	Bottom hole	1.56	7,770	1.240	30.9	2.8450

EXHIBIT NO. 7

PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

TRANSIENT TEST NO. 1

From

January 15, 1965

To

January 18, 1965

EXHIBIT NO. A

PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

H.J. GRUY AND ASSOCIATES, INC.

TEFTELLER, INC.
RESERVOIR ENGINEERING DATA
Midland, Texas

Well : RED HILLS UNIT NO. 1

Field : UNDESIGNATED

File 3-1414-BU

CHRONOLOGICAL PRESSURE AND PRODUCTION DATA

1965 Date	Status of Well	Time	Elapsed Time Hrs.	Min.	BHP @ 12090' Psig	BHP @ 13554' Psig
1-15	On location	07:00				
"	Shut in	09:35				
"	Inst. at 12090'	10:15		40	6957	7174
"	"	10:35	1	00	7735	7952
"	"	11:35	2	00	8113	8330
"	"	12:35	3	00	8362	8579
"	"	13:35	4	00	8672	8889
"	"	15:35	6	00	8861	9078
"	"	17:35	8	00	8989	9206
"	"	19:35	10	00	9087	9304
"	"	21:35	12	00	9231	9448
1-16	"	01:35	16	00	9337	9554
"	"	05:35	20	00	9420	9637
"	"	09:35	24	00	9510	9727
"	"	15:35	30	00	9594	9811
"	"	21:35	36	00	9654	9871
1-17	"	03:35	42	00	9707	9924
"	"	09:35	48	00	9760	9977
"	"	15:35	54	00	9805	10022
"	"	21:35	60	00	9850	10067
1-18	"	03:35	66	00	9888	10105
"	"	08:35	71	00	9918	10135
"	"	13:05	74	30		

EXHIBIT NO. 1-E

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

PRESSURE BUILD UP DATA

PRESSURE BUILD-UP TEST FROM 1-15-65 TO 1-18-65
UNION OIL COMPANY OF CALIFORNIA WELL NO. 1 RED HILLS UNIT
RED HILLS(WOLFCAMP)FIELD-LEA COUNTY, NEW MEXICO

CUMULATIVE PRODUCTION = 193400.
LAST FLOW RATE = 11240.
PRODUCING TIME,TC,HRS. = 413.

POINT	TIME,MIN.	TIME,HRS.	PRESS. PSIA.	$(PRESS)^2 \times 10^6$	DT/TC+DT	TC+DT/DT
1	60.0	1.00	7189.	51.6817	.00241573	414.
2	120.0	2.00	7967.	63.4731	.00481981	207.
3	180.0	3.00	8345.	69.6390	.00721234	139.
4	240.0	4.00	8594.	73.8568	.00959339	104.
5	360.0	6.00	8904.	79.2812	.01432139	70.
6	480.0	8.00	9093.	82.6826	.01900446	53.
7	600.0	10.00	9221.	85.0268	.02364325	42.
8	720.0	12.00	9319.	86.8438	.02823837	35.
9	960.0	16.00	9463.	89.5484	.03730006	27.
10	1200.0	20.00	9569.	91.5658	.04619431	22.
11	1440.0	24.00	9652.	93.1611	.05492572	18.
12	1800.0	30.00	9742.	94.9066	.06772716	15.
13	2160.0	36.00	9826.	96.5503	.08018644	12.
14	2520.0	42.00	9886.	97.7330	.09231708	11.
15	2880.0	48.00	9939.	98.7837	.10413192	10.
16	3240.0	54.00	9992.	99.8401	.11564314	9.
17	3600.0	60.00	10037.	100.7414	.12686230	8.
18	3960.0	66.00	10082.	101.6467	.13780036	7.
19	4260.0	71.00	10120.	102.4144	.14670824	7.
20	4470.0	74.50	10150.	103.0225	.15283501	7.

EXHIBIT NO. 9

PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

PRESSURE BUILD-UP TEST FROM 1-15-65 TO 1-18-65

UNION OIL COMPANY OF CALIFORNIA WELL NO. 1 REO HILLS UNIT

REO HILLS (WOLFCAMP) FIELD-LEA COUNTY, NEW MEXICO

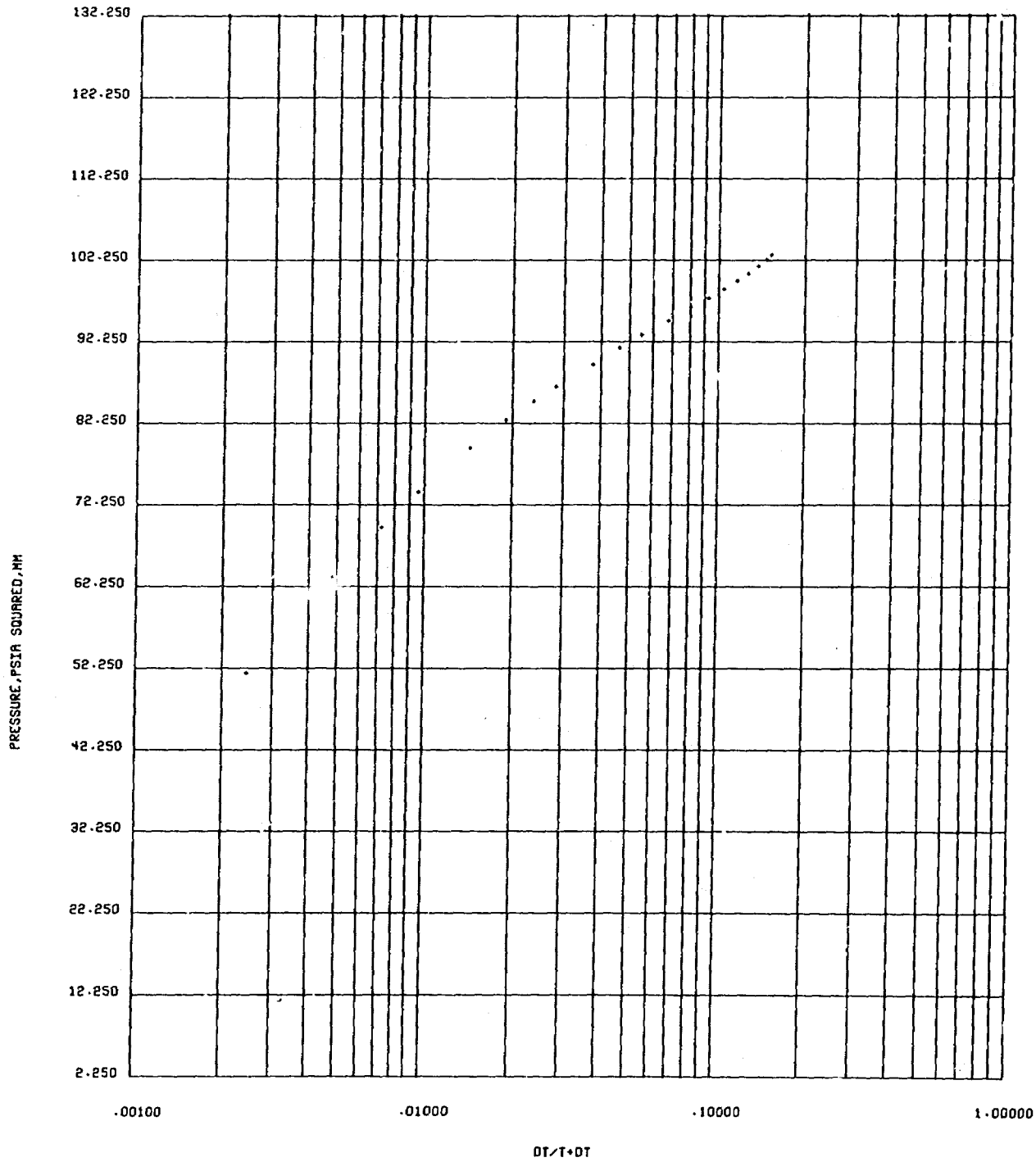


EXHIBIT NO. //

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

ID...LEAST SQ FIT OF PRESS VS LOG TIME,BUILD-UP TEST OF 1-15-65
STARTING ORDER OF FITS= 1 ENDING ORDER OF FITS 1
ORDER OF POLYNOMIAL= 1
STANDARD DEVIATION= 3.19721640
COEFFICIENTS... .10993155E+05 .46400454E+03

ORIGINAL X	ORIGINAL Y	RE-CALCULATED Y	YDIFFERENCE,
-.32887619E+01	.94630000E+04	.9467155JE+04	.41550000E+01
-.30727362E+01	.95690000E+04	.95673920E+04	-.16080000E+01
-.29017735E+01	.96520000E+04	.96467190E+04	-.52810000E+01
-.26922679E+01	.97420000E+04	.97439310E+04	.19310000E+01
-.25234008E+01	.98260000E+04	.98222860E+04	-.37140000E+01
-.23825261E+01	.98860000E+04	.98876530E+04	.16530000E+01
-.22620976E+01	.99390000E+04	.99435320E+04	.45320000E+01
-.21572462E+01	.99920000E+04	.99921830E+04	.18300000E+00
-.20646530E+01	.10037000E+05	.10035147E+05	-.18530000E+01

EXHIBIT NO. 7

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H.J. GRUY AND ASSOCIATES, INC.

ID...LEAST SQ FIT OF PRESS VS LOG TIME,BUILD-UP TEST OF 1-15-65
STARTING ORDER OF FITS= 1 ENDING ORDER OF FITS 1
ORDER OF POLYNOMIAL= 1
STANDARD DEVIATION= 1.46668760
COEFFICIENTS... .11375500E+05 .65306700E+03

ORIGINAL X	ORIGINAL Y	RE-CALCULATED Y	YDIFFERENCE,
-.19819493E+01	.10082000E+05	.10081155E+05	-.84500000E+00
-.19193094E+01	.10120000E+05	.10122063E+05	.20630000E+01
-.18783963E+01	.10150000E+05	.10148782E+05	-.12180000E+01

EXHIBIT NO. J

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H.J. GRUY AND ASSOCIATES, INC.

TRANSIENT TEST NO. 2

From

April 17, 1965

To

May 2, 1965

EXHIBIT NO. K

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

SURFACE PRESSURE BUILDUP
RED HILLS UNIT, WELL NO.1

DATE	TIME	WELL STATUS	DEAD WEIGHT TESTER SURFACE PRESS.-psig
4-17-65	6:30 AM	Flowing	2190
	7:30 AM	Flowing	2193
	8:00 AM	Flowing	2195
	8:45 AM	Flowing	2195
	9:00 AM	Well Shut-in	-
	10:20 AM	Press.Element Seated	-
	11:00 AM	Shut-in	4852
	11:15 AM	Shut-in	4957
	11:30 AM	Shut-in	5015
	11:45 AM	Shut-in	5079
	12:00 PM	Shut-in	5140
	12:15 PM	Shut-in	5184
	12:30 PM	Shut-in	5230
	12:45 PM	Shut-in	5270
	1:00 PM	Shut-in	5305
	1:30 PM	Shut-in	5384
	2:00 PM	Shut-in	5435
	2:30 PM	Shut-in	5490
	3:00 PM	Shut-in	5534
	3:30 PM	Shut-in	5580
	4:00 PM	Shut-in	5616
4-18-65	2:45 PM	Shut-in	6163
	3:00 PM	Shut-in	6164
	3:15 PM	Shut-in	6168
	3:30 PM	Shut-in	6170
	3:45 PM	Shut-in	6175
4-19-65	3:15 PM	Shut-in	6352
	3:30 PM	Shut-in	6354
	3:45 PM	Shut-in	6356
	4:00 PM	Shut-in	6357
	4:15 PM	Shut-in	6358
4-20-65	9:15 AM	Shut-in	6458
	9:45 AM	Shut-in	6461
	10:15 AM	Shut-in	6464
4-21-65	8:45 AM	Shut-in	6574
	9:15 AM	Shut-in	6578
	9:55 AM	Shut-in	6581
4-23-65	8:30 AM	Shut-in	6762
	9:20 AM	Shut-in	6768
4-27-65	8:50 AM	Shut-in	7033
4-30-65	7:00 AM	Shut-in	7165
5- 2-65	7:00 AM	Shut-in	7199

EXHIBIT NO. 2

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

PRESSURE BUILD UP DATA

PRESSURE BUILD-UP TEST FROM 4-17-65 TO 5-2-65 (CONVERTED WHP)
UNION OIL COMPANY OF CALIFORNIA WELL NO. 1 RED HILLS UNIT
RED HILLS(WOLFCAMP)FIELD-LEA COUNTY, NEW MEXICO

CUMULATIVE PRODUCTION = 1099800.
LAST FLOW RATE = 8940.
PRODUCING TIME,TC,HRS. = 2952.

POINT	TIME,MIN.	TIME,HRS.	PRESS. PSIA.	$(PRESS)^2 \times 10^{-6}$	DT/TC+DT	TC+DT/DT
1	120.0	2.00	6730.	45.2929	.00067694	1477.
2	135.0	2.25	6840.	46.7856	.00076149	1313.
3	150.0	2.50	6904.	47.6652	.00084603	1182.
4	165.0	2.75	6978.	48.6925	.00093055	1075.
5	180.0	3.00	7047.	49.6602	.00101506	985.
6	195.0	3.25	7092.	50.2965	.00109956	909.
7	210.0	3.50	7150.	51.1225	.00118404	845.
8	225.0	3.75	7195.	51.7680	.00126851	788.
9	240.0	4.00	7236.	52.3597	.00135296	739.
10	270.0	4.50	7326.	53.6703	.00152182	657.
11	300.0	5.00	7384.	54.5235	.00169063	591.
12	330.0	5.50	7446.	55.4429	.00185937	538.
13	360.0	6.00	7495.	56.1750	.00202807	493.
14	390.0	6.50	7547.	56.9572	.00219670	455.
15	420.0	7.00	7587.	57.5626	.00236528	423.
16	1785.0	29.75	8194.	67.1416	.00997575	100.
17	1800.0	30.00	8195.	67.1580	.01005873	99.
18	1815.0	30.25	8200.	67.2400	.01014170	99.
19	1830.0	30.50	8202.	67.2728	.01022466	98.
20	1845.0	30.75	8207.	67.3548	.01030761	97.
21	3255.0	54.25	8400.	70.5600	.01804284	55.
22	3270.0	54.50	8402.	70.5936	.01812448	55.
23	3285.0	54.75	8404.	70.6272	.01820610	55.
24	3300.0	55.00	8405.	70.6440	.01828772	55.
25	3315.0	55.25	8406.	70.6608	.01836932	54.
26	4335.0	72.25	8514.	72.4882	.02388640	42.
27	4365.0	72.75	8517.	72.5393	.02404773	42.
28	4395.0	73.25	8520.	72.5904	.02420901	41.
29	5745.0	95.75	8638.	74.6150	.03141164	32.
30	5775.0	96.25	8642.	74.6842	.03157049	32.
31	5815.0	96.92	8645.	74.7360	.03178221	31.
32	7170.0	119.50	8837.	78.0926	.03889995	26.
33	7220.0	120.33	8844.	78.2163	.03916060	26.
34	12950.0	215.83	9120.	83.1744	.06812240	15.
35	17160.0	286.00	9257.	85.6920	.08831295	11.
36	20040.0	334.00	9292.	86.3413	.10162839	10.

EXHIBIT NO. III

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

AVERAGE RESERVOIR PRESSURE CALCULATIONS

PBAR ASSUMED =		9300.	9400.	9500.	9600.	9700.	9800.	9900.
POINT	TIME,HRS.	PBAR - PW	PBAR - PW	PBAR - PW	PBAR - PW	PBAR - PW	PBAR - PW	PBAR - PW
1	2.00	2570.	2670.	2770.	2870.	2970.	3070.	3170.
2	2.25	2460.	2560.	2660.	2760.	2860.	2960.	3060.
3	2.50	2396.	2496.	2596.	2696.	2796.	2896.	2996.
4	2.75	2322.	2422.	2522.	2622.	2722.	2822.	2922.
5	3.00	2253.	2353.	2453.	2553.	2653.	2753.	2853.
6	3.25	2208.	2308.	2408.	2508.	2608.	2708.	2808.
7	3.50	2150.	2250.	2350.	2450.	2550.	2650.	2750.
8	3.75	2105.	2205.	2305.	2405.	2505.	2605.	2705.
9	4.00	2064.	2164.	2264.	2364.	2464.	2564.	2664.
10	4.50	1974.	2074.	2174.	2274.	2374.	2474.	2574.
11	5.00	1916.	2016.	2116.	2216.	2316.	2416.	2516.
12	5.50	1854.	1954.	2054.	2154.	2254.	2354.	2454.
13	6.00	1805.	1905.	2005.	2105.	2205.	2305.	2405.
14	6.50	1753.	1853.	1953.	2053.	2153.	2253.	2353.
15	7.00	1713.	1813.	1913.	2013.	2113.	2213.	2313.
16	29.75	1106.	1206.	1306.	1406.	1506.	1606.	1706.
17	30.00	1105.	1205.	1305.	1405.	1505.	1605.	1705.
18	30.25	1100.	1200.	1300.	1400.	1500.	1600.	1700.
19	30.50	1098.	1198.	1298.	1398.	1498.	1598.	1698.
20	30.75	1093.	1193.	1293.	1393.	1493.	1593.	1693.
21	54.25	900.	1000.	1100.	1200.	1300.	1400.	1500.
22	54.50	898.	998.	1098.	1198.	1298.	1398.	1498.
23	54.75	896.	996.	1096.	1196.	1296.	1396.	1496.
24	55.00	895.	995.	1095.	1195.	1295.	1395.	1495.
25	55.25	894.	994.	1094.	1194.	1294.	1394.	1494.
26	72.25	786.	886.	986.	1086.	1186.	1286.	1386.
27	72.75	783.	883.	983.	1083.	1183.	1283.	1383.
28	73.25	780.	880.	980.	1080.	1180.	1280.	1380.
29	95.75	662.	762.	862.	962.	1062.	1162.	1262.
30	96.25	658.	758.	858.	958.	1058.	1158.	1258.
31	96.92	655.	755.	855.	955.	1055.	1155.	1255.
32	119.50	463.	563.	663.	763.	863.	963.	1063.
33	120.33	456.	556.	656.	756.	856.	956.	1056.
34	215.83	180.	280.	380.	480.	580.	680.	780.
35	286.00	43.	143.	243.	343.	443.	543.	643.
36	334.00	8.	108.	208.	308.	408.	508.	608.

EXHIBIT NO. N

PREPARED BY H.J. GRUY AND ASSOCIATES. INC.

H. J. GRUY AND ASSOCIATES, INC.

PRESSURE BUILD-UP TEST FROM 4-17-65 TO 5-2-65 (CONVERTED WHP)

UNION OIL COMPANY OF CALIFORNIA WELL NO. 1 RED HILLS UNIT

RED HILLS (WOLFCAMP) FIELD-LEA COUNTY, NEW MEXICO

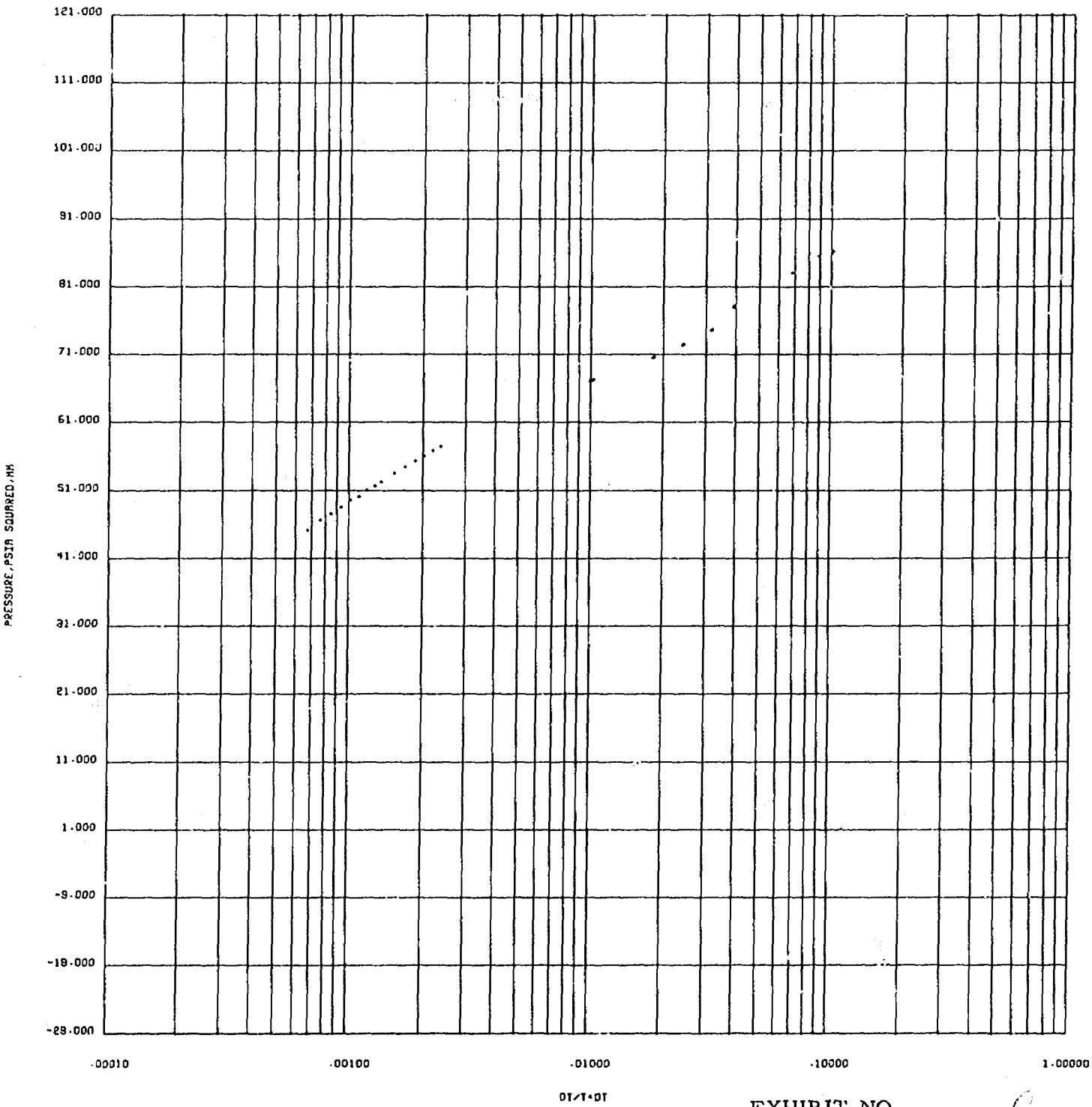


EXHIBIT NO. 6

PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

PRESSURE BUILD-UP TEST FROM 4-17-65 TO 5-2-65 (CONVERTED WHP)

UNION OIL COMPANY OF CALIFORNIA WELL NO. 1 RED HILLS UNIT

RED HILLS (WOLFCAMP) FIELD-LEA COUNTY, NEW MEXICO

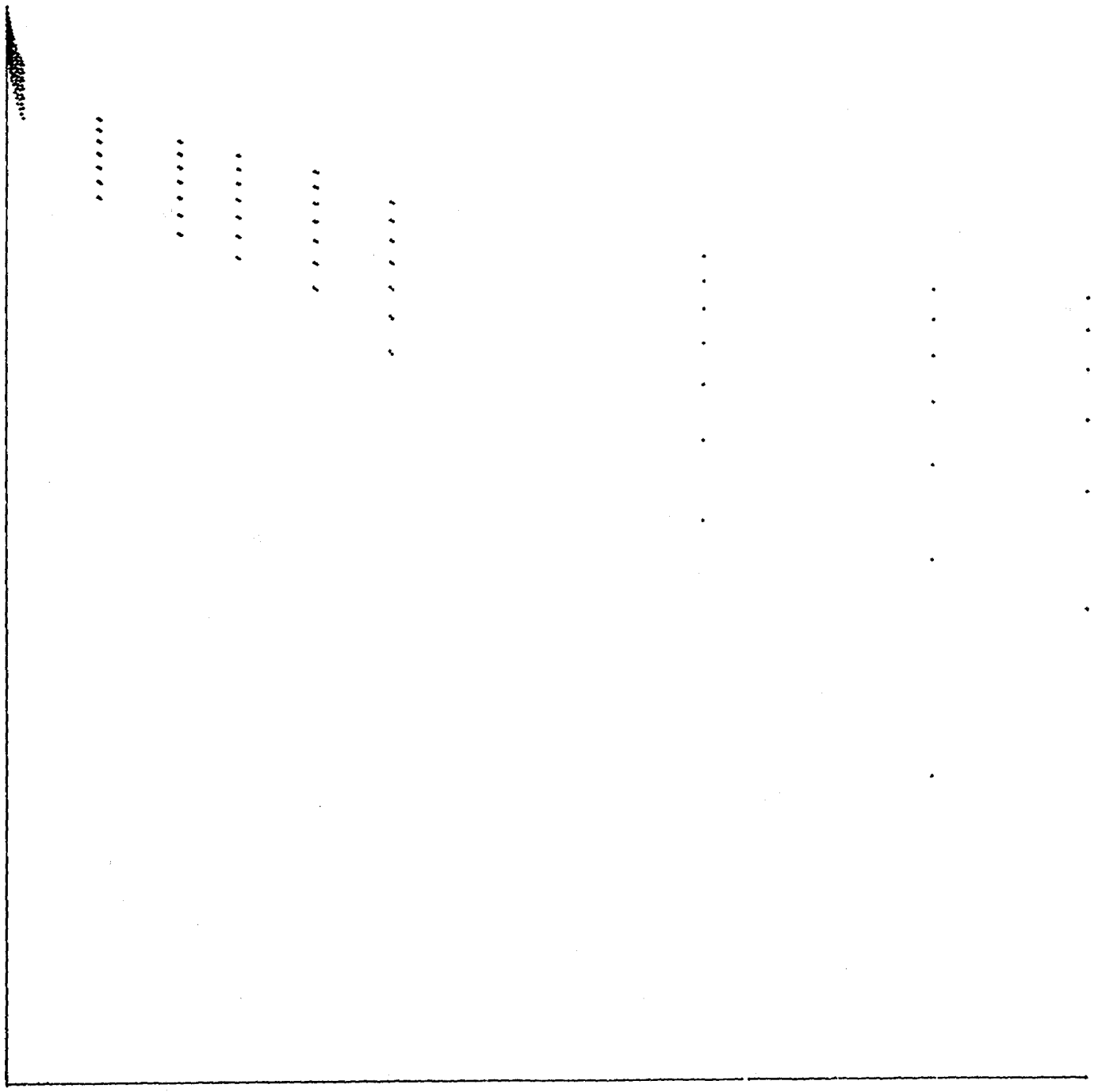


EXHIBIT NO. P

PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

CONVERSION OF WHP TO BHP
BUILD-UP TEST FROM 4-17-65 TO 5-2-65
WELL NO. 1 RED HILLS UNIT

BHP = 9302 PSIA @ WHP = 7214 PSIA
UNION OIL CO. OF CALIFORNIA
RED HILLS(WLFCP)FIELD LEA CO., N.M.

DATA
VERTICAL FLOW CALCULATIONS

SPECIFIC GRAVITIES		DEPTH TO MID-PERFS, FT 13544.	TEMPERATURES		NON-HYDROCARBONS, MOLE FRACTION	
STOCK TANK LIQUID	64.00	LIQUID/GAS RATIO, B/MMCF 45.0	SURFACE, F	62.	HYDROGEN SULFIDE	0.0000
SEPARATOR GAS	.6500	FLOWRATE, MCF/DAY, 0.	RESERVOIR, F	178.	CARBON DIOXIDE	.0001
RESERVOIR FLUID	0.0000	CRITICAL PRESSURE, PSIA 0.	CRITICAL, R	0.	NITROGEN	.0054

COMPUTED VALUES FOR STATIC CONDITIONS

CRITICAL TEMPERATURE, R 397.

CRITICAL PRESSURE, PSIA 658.

RESERVOIR FLUID GRAVITY .770

WELLHEAD PRESSURE PSIA	WELLHEAD Z FACTOR	WHP/Z PSIA	BOTTOMHOLE PRESSURE PSIA	BOTTOMHOLE Z FACTOR	BHP/Z PSIA
4867.0	.9150	5319.0	6730.3	1.1337	5936.6
4972.0	.9282	5356.7	6839.8	1.1441	5978.3
5030.0	.9356	5376.5	6903.9	1.1503	6001.6
5094.0	.9438	5397.4	6977.5	1.1576	6027.3
5155.0	.9517	5416.5	7047.4	1.1647	6050.6
5194.0	.9569	5428.2	7092.0	1.1693	6065.0

EXHIBIT NO. 9

PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

CONVERSION OF WHP TO BHP
BUILD-UP TEST FROM 4-17-65 TO 5-2-65
WELL NO. 1 RED HILLS UNIT

BHP = 9302 PSIA @ WHP = 7214 PSIA
UNION OIL CO. OF CALIFORNIA
RED HILLS(WLFCP)FIELD LEA CO., N.M.

DATA
VERTICAL FLOW CALCULATIONS

SPECIFIC GRAVITIES		DEPTH TO MID-PERFS, FT 13544.	TEMPERATURES		NON-HYDROCARBONS, MOLE FRACTION	
STOCK TANK LIQUID	64.00	LIQUID/GAS RATIO, B/MMCF 45.0	SURFACE, F	62.	HYDROGEN SULFIDE	0.0000
SEPARATOR GAS	.6500	FLOWRATE, MCF/DAY, 0.	RESERVOIR, F	178.	CARBON DIOXIDE	.0001
RESERVOIR FLUID	0.0000	CRITICAL PRESSURE, PSIA 0.	CRITICAL, R	0.	NITROGEN	.0054

COMPUTED VALUES FOR STATIC CONDITIONS

CRITICAL TEMPERATURE, R 397.

CRITICAL PRESSURE, PSIA 658.

RESERVOIR FLUID GRAVITY .770

WELLHEAD PRESSURE PSIA	WELLHEAD Z FACTOR	WHP/Z PSIA	BOTTOMHOLE PRESSURE PSIA	BOTTOMHOLE Z FACTOR	BHP/Z PSIA
5245.0	.9636	5443.0	7150.3	1.1755	6083.0
5285.0	.9690	5454.1	7195.9	1.1803	6096.6
5320.0	.9737	5463.5	7235.8	1.1846	6108.1
5399.0	.9846	5483.6	7325.5	1.1945	6132.6
5450.0	.9917	5495.7	7383.3	1.2011	6147.4
5505.0	.9995	5508.0	7445.5	1.2082	6162.3
5549.0	1.0058	5517.2	7495.1	1.2141	6173.6
5590.0	1.0124	5526.3	7546.9	1.2203	6184.7
5631.0	1.0177	5533.1	7587.3	1.2252	6192.9
6178.0	1.0944	5645.1	8194.2	1.3080	6264.5
6179.0	1.0945	5645.4	8195.3	1.3082	6264.6
6183.0	1.0950	5646.5	8199.6	1.3089	6264.7
6185.0	1.0953	5647.0	8201.8	1.3092	6264.8
6190.0	1.0959	5648.3	8207.3	1.3100	6265.0
6367.0	1.1181	5694.5	8399.5	1.3404	6266.3
6369.0	1.1183	5695.0	8401.6	1.3408	6266.2
6371.0	1.1186	5695.5	8403.8	1.3411	6266.2
6372.0	1.1187	5695.8	8404.9	1.3413	6266.2
6373.0	1.1189	5696.0	8406.0	1.3415	6266.1
6473.0	1.1315	5720.9	8513.7	1.3595	6262.3
6476.0	1.1318	5721.7	8516.9	1.3601	6262.1
6479.0	1.1322	5722.4	8520.1	1.3606	6261.9
6589.0	1.1462	5748.7	8637.8	1.3812	6253.9
6593.0	1.1467	5749.7	8642.1	1.3819	6253.5
6596.0	1.1471	5750.4	8645.3	1.3825	6253.3
6777.0	1.1702	5791.3	8837.1	1.4181	6231.8
6783.0	1.1710	5792.6	8843.5	1.4193	6230.9
7048.0	1.2054	5846.9	9120.4	1.4752	6182.4
7180.0	1.2229	5871.4	9256.7	1.5048	6151.3
7214.0	1.2274	5877.5	9291.6	1.5126	6142.7

EXHIBIT NO. 1

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

TRANSIENT TEST NO. 3

From

August 7, 1965

To

August 31, 1965

EXHIBIT NO. _____

PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

SURFACE PRESSURE BUILDUP
RED HILLS (WOLFCAMP) FIELD
RED HILLS UNIT, WELL NO. 1

DATE	TIME	WELL STATUS	DEAD WEIGHT TESTER SURFACE PRESS.-psig
8-7-65	8:45 AM	Flowing	2185
	8:50 AM	Well Shut-in	----
	9:00 AM	Shut-in	3198
	9:10 AM	Shut-in	3490
	9:20 AM	Shut-in	3690
	9:30 AM	Shut-in	3845
	9:40 AM	Shut-in	3980
	9:50 AM	Shut-in	4115
	10:00 AM	Shut-in	4230
	10:10 AM	Shut-in	4303
	10:20 AM	Shut-in	4359
	10:30 AM	Shut-in	4420
	10:40 AM	Shut-in	4470
	10:50 AM	Shut-in	4530
	11:00 AM	Shut-in	4566
	11:45 AM	Shut-in	4730
	12:00 AM	Shut-in	4778
	12:30 PM	Shut-in	4860
	1:00 PM	Shut-in	4936
	1:30 PM	Shut-in	4985
	2:00 PM	Shut-in	5035
	2:30 PM	Shut-in	5081
	3:00 PM	Shut-in	5124
	3:30 PM	Shut-in	5150
	4:00 PM	Shut-in	5190
	4:30 PM	Shut-in	5215
	5:00 PM	Shut-in	5234
8-8-65	6:00 AM	Shut-in	5525
	6:00 PM	Shut-in	5610
8-9-65	6:00 AM	Shut-in	5707
	6:00 PM	Shut-in	5765
8-10-65	6:00 AM	Shut-in	5820
	5:15 PM	Shut-in	5853
8-11-65	6:00 AM	Shut-in	5901
	6:30 PM	Shut-in	5945

EXHIBIT NO. 1

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

SURFACE PRESSURE BUILDUP
RED HILLS (WOLFCAMP) FIELD
RED HILLS UNIT, WELL NO. 1
(continued)

DATE	TIME	WELL STATUS	DEAD WEIGHT TESTER SURFACE PRESS.-psig
8-12-65	6:30 AM	Shut-in	5982
	5:45 PM	Shut-in	6018
8-13-65	7:00 AM	Shut-in	6055
	3:15 PM	Shut-in	6076
8-14-65	7:00 AM	Shut-in	6116
8-15-65	7:00 AM	Shut-in	6173
8-16-65	7:00 AM	Shut-in	6232
8-17-65	7:00 AM	Shut-in	6281
8-18-65	7:00 AM	Shut-in	6328
8-19-65	7:00 AM	Shut-in	6367
8-20-65	7:00 AM	Shut-in	6407
8-21-65	7:00 AM	Shut-in	6438
8-22-65	7:00 AM	Shut-in	6470
8-23-65	7:00 AM	Shut-in	6500
8-24-65	7:00 AM	Shut-in	6530
8-25-65	7:00 AM	Shut-in	6560
8-26-65	7:00 AM	Shut-in	6589
8-27-65	7:00 AM	Shut-in	6616
8-28-65	7:00 AM	Shut-in	6638
8-30-65	7:00 AM	Shut-in	6680
8-31-65	7:00 AM	Shut-in	6689

EXHIBIT NO. 6

PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

PRESSURE BUILD UP DATA

PRESSURE BUILD-UP TEST FROM 8-7-65 TO 8-31-65 (CONVERTED WHP)
UNION OIL COMPANY OF CALIFORNIA WELL NO 1 RED HILLS UNIT
RED HILLS (WOLFCAMP)FIELD-LEA COUNTY, NEW MEXICO

CUMULATIVE PRODUCTION = 1935000.
LAST FLOW RATE = 7530.
PRODUCING TIME,TC,HRS. = 6167.

POINT	TIME,MIN.	TIME,HRS.	PRESS. PSIA.	$(PRESS)^2 \times 10^6$	DT/TC+DT	TC+DT/DT
1	10.0	.17	4724.	22.3162	.00002702	37005.
2	20.0	.33	5097.	25.9794	.00005405	18503.
3	30.0	.50	5348.	28.6011	.00008107	12336.
4	40.0	.67	5540.	30.6916	.00010808	9252.
5	50.0	.83	5705.	32.5470	.00013510	7402.
6	60.0	1.00	5866.	34.4100	.00016212	6168.
7	70.0	1.17	6002.	36.0240	.00018913	5287.
8	80.0	1.33	6087.	37.0516	.00021615	4626.
9	90.0	1.50	6151.	37.8348	.00024316	4113.
10	100.0	1.67	6221.	38.7008	.00027017	3701.
11	110.0	1.83	6278.	39.4133	.00029718	3365.
12	120.0	2.00	6345.	40.2590	.00032418	3085.
13	130.0	2.17	6385.	40.7682	.00035119	2847.
14	175.0	2.92	6565.	43.0992	.00047270	2116.
15	190.0	3.17	6618.	43.7979	.00051319	1949.
16	220.0	3.67	6706.	44.9704	.00059418	1683.
17	250.0	4.17	6786.	46.0498	.00067515	1481.
18	280.0	4.67	6837.	46.7446	.00075610	1323.
19	310.0	5.17	6894.	47.5272	.00083705	1195.
20	340.0	5.67	6947.	48.2608	.00091798	1089.
21	370.0	6.17	6997.	48.9580	.00099889	1001.
22	400.0	6.67	7027.	49.3787	.00107980	926.
23	430.0	7.17	7073.	50.0273	.00116069	862.
24	460.0	7.67	7101.	50.4242	.00124157	805.
25	490.0	8.17	7123.	50.7371	.00132243	756.
26	1270.0	21.17	7454.	55.5621	.00342032	292.
27	1990.0	33.17	7550.	57.0025	.00534903	187.
28	2710.0	45.17	7659.	58.6605	.00727029	138.
29	3430.0	57.17	7724.	59.6602	.00918414	109.
30	4150.0	69.17	7785.	60.6062	.01109063	90.
31	4825.0	80.42	7822.	61.1837	.01287131	78.
32	5590.0	93.17	7875.	62.0156	.01488167	67.
33	6340.0	105.67	7924.	62.7898	.01684468	59.
34	7060.0	117.67	7965.	63.4412	.01872183	53.
35	7735.0	128.92	8006.	64.0960	.02047516	49.
36	8530.0	142.17	8046.	64.7381	.02253217	44.
37	9025.0	150.42	8069.	65.1088	.02380859	42.
38	9970.0	166.17	8113.	65.8208	.02623616	38.
39	11410.0	190.17	8175.	66.8306	.02991219	33.
40	12850.0	214.17	8240.	67.8976	.03356057	30.
41	14290.0	238.17	8293.	68.7738	.03718160	27.
42	15730.0	262.17	8344.	69.6223	.04077561	25.
43	17170.0	286.17	8386.	70.3250	.04434288	23.
44	18610.0	310.17	8429.	71.0480	.04788372	21.
45	20050.0	334.17	8462.	71.6054	.05139842	19.
46	21490.0	358.17	8497.	72.1990	.05488726	18.
47	22930.0	382.17	8529.	72.7438	.05835053	17.
48	24370.0	406.17	8561.	73.2907	.06178852	16.
49	25810.0	430.17	8593.	73.8396	.06520149	15.
50	27250.0	454.17	8624.	74.3734	.06858972	15.
51	28690.0	478.17	8652.	74.8571	.07195348	14.
52	30130.0	502.17	8676.	75.2730	.07529303	13.
53	33010.0	550.17	8720.	76.0384	.08190054	12.
54	34450.0	574.17	8729.	76.1954	.08516901	12.

EXHIBIT NO. V

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

AVERAGE RESERVOIR PRESSURE CALCULATIONS

PBAR ASSUMED =		8800.	9000.	9200.	9400.	9600.	9800.	10000.
POINT	TIME,HRS.	PBAR - PW	PBAR - PW	PBAR - PW	PBAR - PW	PBAR - PW	PBAR - PW	PBAR - PW
1	.17	4076.	4276.	4476.	4676.	4876.	5076.	5276.
2	.33	3703.	3903.	4103.	4303.	4503.	4703.	4903.
3	.50	3452.	3652.	3852.	4052.	4252.	4452.	4652.
4	.67	3260.	3460.	3660.	3860.	4060.	4260.	4460.
5	.83	3095.	3295.	3495.	3695.	3895.	4095.	4295.
6	1.00	2934.	3134.	3334.	3534.	3734.	3934.	4134.
7	1.17	2798.	2998.	3198.	3398.	3598.	3798.	3998.
8	1.33	2713.	2913.	3113.	3313.	3513.	3713.	3913.
9	1.50	2649.	2849.	3049.	3249.	3449.	3649.	3849.
10	1.67	2579.	2779.	2979.	3179.	3379.	3579.	3779.
11	1.83	2522.	2722.	2922.	3122.	3322.	3522.	3722.
12	2.00	2455.	2655.	2855.	3055.	3255.	3455.	3655.
13	2.17	2415.	2615.	2815.	3015.	3215.	3415.	3615.
14	2.92	2235.	2435.	2635.	2835.	3035.	3235.	3435.
15	3.17	2182.	2382.	2582.	2782.	2982.	3182.	3382.
16	3.67	2094.	2294.	2494.	2694.	2894.	3094.	3294.
17	4.17	2014.	2214.	2414.	2614.	2814.	3014.	3214.
18	4.67	1963.	2163.	2363.	2563.	2763.	2963.	3163.
19	5.17	1906.	2106.	2306.	2506.	2706.	2906.	3106.
20	5.67	1853.	2053.	2253.	2453.	2653.	2853.	3053.
21	6.17	1803.	2003.	2203.	2403.	2603.	2803.	3003.
22	6.67	1773.	1973.	2173.	2373.	2573.	2773.	2973.
23	7.17	1727.	1927.	2127.	2327.	2527.	2727.	2927.
24	7.67	1699.	1899.	2099.	2299.	2499.	2699.	2899.
25	8.17	1677.	1877.	2077.	2277.	2477.	2677.	2877.
26	21.17	1346.	1546.	1746.	1946.	2146.	2346.	2546.
27	33.17	1250.	1450.	1650.	1850.	2050.	2250.	2450.
28	45.17	1141.	1341.	1541.	1741.	1941.	2141.	2341.
29	57.17	1076.	1276.	1476.	1676.	1876.	2076.	2276.
30	69.17	1015.	1215.	1415.	1615.	1815.	2015.	2215.
31	80.42	978.	1178.	1378.	1578.	1778.	1978.	2178.
32	93.17	925.	1125.	1325.	1525.	1725.	1925.	2125.
33	105.67	876.	1076.	1276.	1476.	1676.	1876.	2076.
34	117.67	835.	1035.	1235.	1435.	1635.	1835.	2035.
35	128.92	794.	994.	1194.	1394.	1594.	1794.	1994.
36	142.17	754.	954.	1154.	1354.	1554.	1754.	1954.
37	150.42	731.	931.	1131.	1331.	1531.	1731.	1931.
38	166.17	687.	887.	1087.	1287.	1487.	1687.	1887.
39	190.17	625.	825.	1025.	1225.	1425.	1625.	1825.
40	214.17	560.	760.	960.	1160.	1360.	1560.	1760.
41	238.17	507.	707.	907.	1107.	1307.	1507.	1707.
42	262.17	456.	656.	856.	1056.	1256.	1456.	1656.
43	286.17	414.	614.	814.	1014.	1214.	1414.	1614.
44	310.17	371.	571.	771.	971.	1171.	1371.	1571.
45	334.17	338.	538.	738.	938.	1138.	1338.	1538.
46	358.17	303.	503.	703.	903.	1103.	1303.	1503.
47	382.17	271.	471.	671.	871.	1071.	1271.	1471.
48	406.17	239.	439.	639.	839.	1039.	1239.	1439.
49	430.17	207.	407.	607.	807.	1007.	1207.	1407.
50	454.17	176.	376.	576.	776.	976.	1176.	1376.
51	478.17	148.	348.	548.	748.	948.	1148.	1348.
52	502.17	124.	324.	524.	724.	924.	1124.	1324.
53	550.17	80.	280.	480.	680.	880.	1080.	1280.
54	574.17	71.	271.	471.	671.	871.	1071.	1271.

EXHIBIT NO. W

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

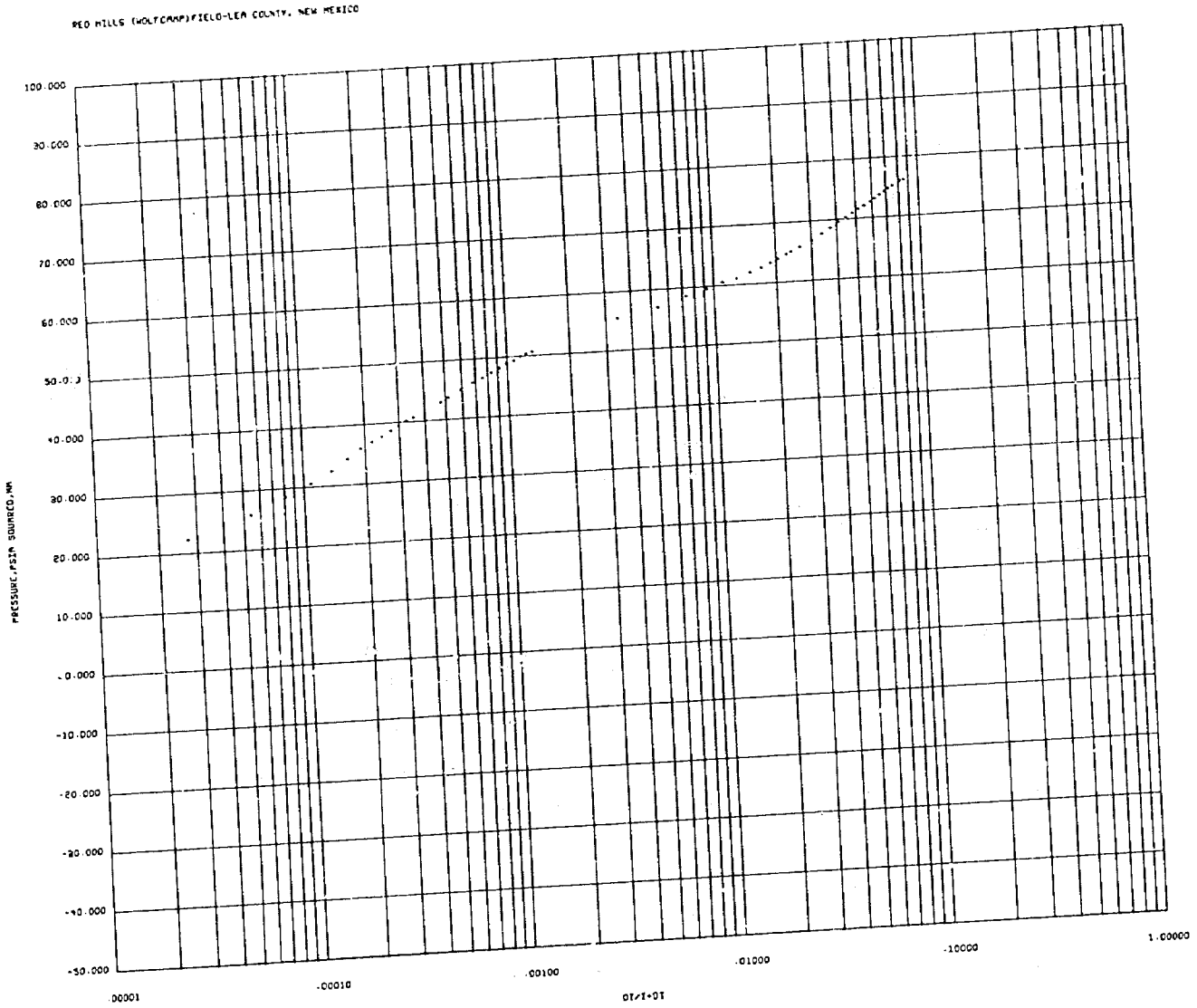


EXHIBIT NO. X

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

PRESSURE BUILD-UP TEST FROM 8-7-65 TO 8-31-65 (CONVERTED WHP)

UNION OIL COMPANY OF CALIFORNIA WELL NO 1 RED HILLS UNIT

RED HILLS (WOLFCAMP)FIELD-LEA COUNTY, NEW MEXICO

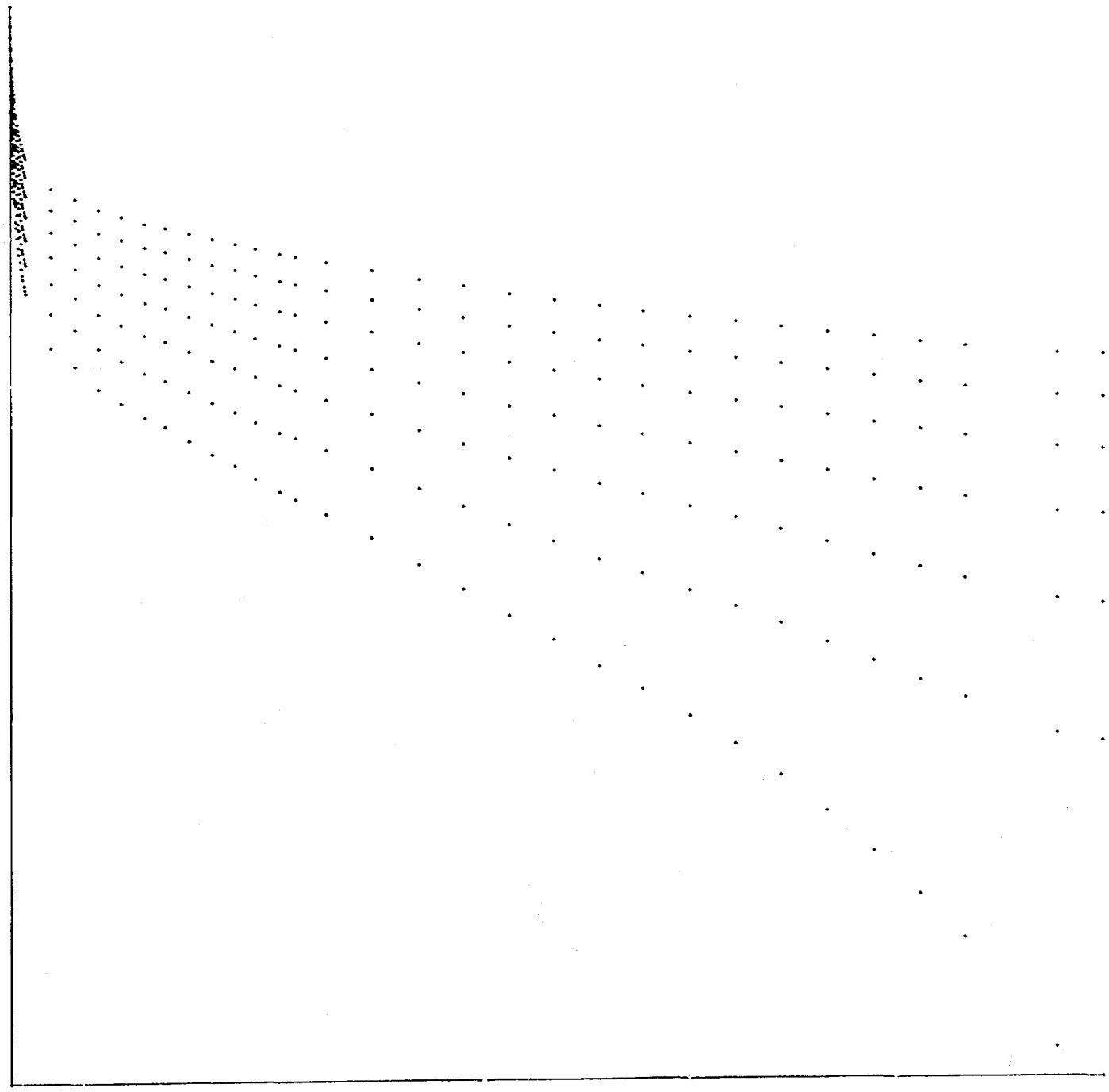


EXHIBIT NO. 4

PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

H.J. GRUY AND ASSOCIATES, INC.

CONVERSION OF WHP TO BHP
BUILD-UP TEST FROM 8-7-65 TO 8-31-65
WELL NO. 1 RED HILLS UNIT

BHP = 8714 PSIA @ WHP = 6704 PSIA
UNION OIL CO. OF CALIFORNIA
RED HILLS(WLFCP)FIELD LEA CO., N.M.

DATA
VERTICAL FLOW CALCULATIONS

SPECIFIC GRAVITIES		DEPTH TO MID-PERFS, FT	13544.	TEMPERATURES		NON-HYDROCARBONS, MOLE FRACTION	
STOCK TANK LIQUID	64.00	LIQUID/GAS RATIO, B/MMCF	45.0	SURFACE, F	80.	HYDROGEN SULFIDE	0.0000
SEPARATOR GAS	.6500	FLOWRATE, MCF/DAY,	0.	RESERVOIR, F	180.	CARBON DIOXIDE	.0001
RESERVOIR FLUID	0.0000	CRITICAL PRESSURE, PSIA	0.	CRITICAL, R	0.	NITROGEN	.0054

COMPUTED VALUES FOR STATIC CONDITIONS

CRITICAL TEMPERATURE, R 397.

CRITICAL PRESSURE, PSIA 658.

RESERVOIR FLUID GRAVITY .770

WELLHEAD PRESSURE PSIA	WELLHEAD Z FACTOR	WHP/Z PSIA	BOTTOMHOLE PRESSURE PSIA	BOTTOMHOLE Z FACTOR	BHP/Z PSIA
3213.0	.7363	4363.6	4724.2	.9432	5008.6
3505.0	.7650	4581.6	5097.1	.9716	5245.9
3705.0	.7859	4714.3	5347.8	.9947	5376.6
3860.0	.8045	4798.1	5540.3	1.0151	5457.9
3995.0	.8211	4865.6	5705.0	1.0348	5513.0
4130.0	.8350	4946.0	5866.1	1.0564	5553.0
4245.0	.8470	5012.1	6001.7	1.0709	5604.2
4318.0	.8546	5052.8	6086.7	1.0778	5647.2
4374.0	.8605	5083.3	6151.3	1.0831	5679.2
4435.0	.8669	5115.9	6221.0	1.0889	5713.2
4485.0	.8722	5142.0	6277.7	1.0936	5740.2
4545.0	.8787	5172.6	6345.2	1.0993	5771.8
4581.0	.9826	5190.6	6385.3	1.1028	5790.2
4745.0	.9007	5268.4	6565.4	1.1185	5869.6
4793.0	.9061	5289.9	6618.2	1.1233	5891.8
4875.0	.9155	5325.1	6705.9	1.1313	5927.5
4951.0	.9244	5356.1	6786.1	1.1388	5958.9
5000.0	.9302	5375.2	6837.3	1.1437	5978.2
5050.0	.9362	5393.9	6894.0	1.1492	5999.1
5096.0	.9419	5410.5	6947.1	1.1544	6017.9
5139.0	.9472	5425.3	6996.6	1.1593	6035.0
5165.0	.9505	5434.1	7026.6	1.1624	6045.1
5205.0	.9556	5447.0	7072.5	1.1671	6060.2

EXHIBIT NO. 7

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H.J. GRUY AND ASSOCIATES, INC.

CONVERSION OF WHP TO BHP
BUILD-UP TEST FROM 8-7-65 TO 8-31-65
WELL NO. 1 RED HILLS UNIT

BHP = 8714 PSIA @ WHP = 6704 PSIA
UNION OIL CO. OF CALIFORNIA
RED HILLS(MLFCP)FIELD LEA CO., N.M.

DATA
VERTICAL FLOW CALCULATIONS

SPECIFIC GRAVITIES		DEPTH TO MID-PERFS, FT 13544.		TEMPERATURES		NON-HYDROCARBONS, MOLE FRACTION	
STOCK TANK LIQUID	64.00	LIQUID/GAS RATIO, B/MMCF	45.0	SURFACE, F	80.	HYDROGEN SULFIDE	0.0000
SEPARATOR GAS	.6500	FLOWRATE, MCF/DAY,	0.	RESERVOIR, F	180.	CARBON DIOXIDE	.0001
RESERVOIR FLUID	0.0000	CRITICAL PRESSURE, PSIA	0.	CRITICAL, R	0.	NITROGEN	.0054

COMPUTED VALUES FOR STATIC CONDITIONS

CRITICAL TEMPERATURE, R 397.

CRITICAL PRESSURE, PSIA 658.

RESERVOIR FLUID GRAVITY .770

WELLHEAD PRESSURE PSIA	WELLHEAD Z FACTOR	WHP/Z PSIA	BOTTOMHOLE PRESSURE PSIA	BOTTOMHOLE Z FACTOR	BHP/Z PSIA
5230.0	.9588	5454.9	7101.2	1.1700	6069.3
5249.0	.9612	5460.7	7123.0	1.1723	6076.2
5540.0	1.0010	5534.5	7454.3	1.2088	6166.5
5625.0	1.0135	5550.3	7550.2	1.2202	6187.7
5722.0	1.0282	5565.2	7659.2	1.2336	6209.9
5780.0	1.0372	5572.4	7724.0	1.2418	6220.0
5835.0	1.0461	5578.1	7785.4	1.2497	6229.6
5868.0	1.0514	5581.0	7822.1	1.2546	6234.8
5916.0	1.0594	5584.4	7875.3	1.2617	6241.8
5960.0	1.0649	5596.6	7924.0	1.2674	6247.5
5997.0	1.0693	5608.5	7964.9	1.2740	6251.7
6033.0	1.0735	5620.0	8005.5	1.2797	6255.6
6070.0	1.0778	5631.6	8046.2	1.2856	6238.9
6091.0	1.0803	5638.2	8069.3	1.2889	6260.6
6131.0	1.0850	5650.7	8113.1	1.2953	6263.5
6188.0	1.0917	5668.1	8175.4	1.3046	6266.6
6247.0	1.0987	5686.0	8239.7	1.3144	6268.8
6296.0	1.1045	5700.5	8292.9	1.3227	6269.7
6343.0	1.1100	5714.3	8343.8	1.3308	6269.8
6332.0	1.1146	5725.6	8385.9	1.3376	6269.4
6422.0	1.1194	5737.0	8428.9	1.3447	6268.5
6453.0	1.1231	5745.8	8462.2	1.3502	6267.4
6485.0	1.1269	5754.7	8496.6	1.3560	6265.9
6515.0	1.1305	5763.0	8528.6	1.3615	6264.3
6545.0	1.1341	5771.3	8560.7	1.3670	6262.4
6575.0	1.1377	5779.4	8592.7	1.3726	6260.2
6604.0	1.1411	5787.2	8623.5	1.3780	6257.9
6631.0	1.1444	5794.4	8652.2	1.3831	6255.4
6653.0	1.1470	5800.1	8675.5	1.3873	6253.3
6695.0	1.1521	5811.1	8719.9	1.3955	6248.8
6704.0	1.1532	5813.4	8729.4	1.3972	6247.8

EXHIBIT NO. 111

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

TRANSIENT TEST NO. 4

From

February 2, 1966

To

February 7, 1966

EXHIBIT NO. 6B

PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

TEFTELLER, INC.
RESERVOIR ENGINEERING DATA
Midland, Texas

Well : RED HILLS UNIT NO. 1 Page 1 of 4

Field : UNDESIGNATED File 8-1927-EU

CHRONOLOGICAL PRESSURE AND PRODUCTION DATA

1966 Date	Status of Well	Time	Elapsed Time Hrs.	Min.	Wellhead Pressure DWT Tubing	BHP @ 12080' Psig	BHP @ 13554' Psig
2-2	On location	08:00					
"	Well flowing	08:30			2310		
"	Shut in well	11:30	0	00	2310		
"	"	11:45	0	15	3325		
"	"	12:00	0	30	3670		
"	"	12:15	0	45	3920		
"	"	12:30	1	00	4100		
"	"	12:45	1	15	4225		
"	"	13:00	1	30	4352		
"	"	13:15	1	45	4442		
"	"	14:00	2	30	4632		
"	"	14:15	2	45	4680		
"	"	14:30	3	00	4712		
"	Inst. @ 12080'	14:37	3	07		6261	6444
"	"	14:45	3	15	4757	6290	6473
"	"	15:00	3	30	4795	6319	6502
"	"	15:25	3	55	4828		
"	"	15:30	4	00	4842	6362	6545
"	"	15:45	4	15	4872		
"	"	16:00	4	30	4895	6420	6603
"	"	16:30	5	00	4935		
"	"	17:00	5	30	4975		
"	"	17:30	6	00	5004	6543	6726
"	"	18:00	6	30	5033		
"	"	18:30	7	00	5058	6608	6791
"	"	19:00	7	30	5078		
"	"	19:30	8	00	5098	6652	6835
"	"	20:00	8	30	5117		
"	"	20:30	9	00	5135	6695	6878
"	"	21:30	10	00	5162	6728	6911
"	"	22:30	11	00	5187		
"	"	23:30	12	00	5210	6782	6965

EXHIBIT NO. 11

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H.J. GRUY AND ASSOCIATES, INC.

TEFTELLER, INC.
RESERVOIR ENGINEERING DATA
Midland, Texas

Well : RED HILLS UNIT NO. 1 Page 2 of 4

Field : UNDESIGNATED File 8-1927-HU

CHRONOLOGICAL PRESSURE AND PRODUCTION DATA

1966 Date	Status of Well	Time	Elapsed Time Hrs.	Min.	Wellhead Pressure DWT Tubing	BHP @ 12080' Psig	BHP @ 13554' Psig
2-3	"	00:30	13	00	5228		
"	"	01:30	14	00	5242		
"	"	02:00	14	30	5247		
"	"	02:30	15	00	5255		
"	"	03:30	16	00	5270	6858	7041
"	"	07:30	20	00	5313	6906	7089
"	"	11:30	24	00	5340	6946	7129
"	"	15:30	28	00	5367		
"	"	19:30	32	00	5393	7007	7190
"	"	23:30	36	00		7025	7208
2-4	"	11:30	48	00	5467	7084	7267
"	"	23:30	60	00		7130	7313
2-5	"	11:30	72	00	5539	7166	7349
"	"	23:30	84	00		7203	7386
2-6	"	11:30	96	00	5596	7236	7419
"	"	23:30	108	00		7266	7449
2-7	"	08:30	117	00		7282	7465
"	"	11:15	119	45		7293	7476
"	"	14:15	122	45	5646	7301	7484

EXHIBIT NO. DD

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

PRESSURE BUILD UP DATA

PRESSURE BUILD-UP TEST FROM 2-2-66 TO 2-7-66
UNION OIL COMPANY OF CALIFORNIA WELL NO. 1 RED HILLS UNIT
RED HILLS(WOLFCAMP)FIELD-LEA COUNTY, NEW MEXICO

CUMULATIVE PRODUCTION = 2845000.
LAST FLOW RATE = 6290.
PRODUCING TIME,TC,HRS. = 10855.

POINT	TIME,MIN.	TIME,HRS.	PRESS. PSIA.	$(PRESS)^2 \times 10^6$	DT/TC+DT	TC+DT/DT
1	187.0	3.12	6459.	41.7187	.00028703	3484.
2	195.0	3.25	6488.	42.0941	.00029930	3341.
3	210.0	3.50	6517.	42.4713	.00032232	3103.
4	240.0	4.00	6560.	43.0336	.00036835	2715.
5	270.0	4.50	6618.	43.7979	.00041437	2413.
6	360.0	6.00	6741.	45.4411	.00055242	1810.
7	420.0	7.00	6806.	46.3216	.00064443	1552.
8	480.0	8.00	6850.	46.9225	.00073642	1358.
9	540.0	9.00	6893.	47.5134	.00082840	1207.
10	600.0	10.00	6926.	47.9695	.00092036	1087.
11	720.0	12.00	6980.	48.7204	.00110423	906.
12	960.0	16.00	7056.	49.7871	.00147176	679.
13	1200.0	20.00	7104.	50.4668	.00183903	544.
14	1440.0	24.00	7144.	51.0367	.00220602	453.
15	1920.0	32.00	7205.	51.9120	.00293920	340.
16	2160.0	36.00	7223.	52.1717	.00330538	303.
17	2880.0	48.00	7282.	53.0275	.00440233	227.
18	3600.0	60.00	7328.	53.6996	.00549686	182.
19	4320.0	72.00	7364.	54.2285	.00658899	152.
20	5040.0	84.00	7401.	54.7748	.00767872	130.
21	5760.0	96.00	7434.	55.2644	.00876606	114.
22	6480.0	108.00	7464.	55.7113	.00985103	102.
23	7020.0	117.00	7480.	55.9504	.01066319	94.
24	7185.0	119.75	7491.	56.1151	.01091109	92.
25	7365.0	122.75	7499.	56-2350	.01118138	89.

EXHIBIT NO. EE

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

AVERAGE RESERVOIR PRESSURE CALCULATIONS

PBAR ASSUMED =		7800.	8000.	8200.	8400.	8600.	8800.	9000.
POINT	TIME,HRS.	PBAR - PW	PBAR - PW	PBAR - PW	PBAR - PW	PBAR - PW	PBAR - PW	PBAR - PW
1	3.12	1341.	1541.	1741.	1941.	2141.	2341.	2541.
2	3.25	1312.	1512.	1712.	1912.	2112.	2312.	2512.
3	3.50	1283.	1483.	1683.	1883.	2083.	2283.	2483.
4	4.00	1240.	1440.	1640.	1840.	2040.	2240.	2440.
5	4.50	1182.	1382.	1582.	1782.	1982.	2182.	2382.
6	6.00	1059.	1259.	1459.	1659.	1859.	2059.	2259.
7	7.00	994.	1194.	1394.	1594.	1794.	1994.	2194.
8	8.00	950.	1150.	1350.	1550.	1750.	1950.	2150.
9	9.00	907.	1107.	1307.	1507.	1707.	1907.	2107.
10	10.00	874.	1074.	1274.	1474.	1674.	1874.	2074.
11	12.00	820.	1020.	1220.	1420.	1620.	1820.	2020.
12	16.00	744.	944.	1144.	1344.	1544.	1744.	1944.
13	20.00	696.	896.	1096.	1296.	1496.	1696.	1896.
14	24.00	656.	856.	1056.	1256.	1456.	1656.	1856.
15	32.00	595.	795.	995.	1195.	1395.	1595.	1795.
16	36.00	577.	777.	977.	1177.	1377.	1577.	1777.
17	48.00	518.	718.	918.	1118.	1318.	1518.	1718.
18	60.00	472.	672.	872.	1072.	1272.	1472.	1672.
19	72.00	436.	636.	836.	1036.	1236.	1436.	1636.
20	84.00	399.	599.	799.	999.	1199.	1399.	1599.
21	96.00	366.	566.	766.	966.	1166.	1366.	1566.
22	108.00	336.	536.	736.	936.	1136.	1336.	1536.
23	117.00	320.	520.	720.	920.	1120.	1320.	1520.
24	119.75	309.	509.	709.	909.	1109.	1309.	1509.
25	122.75	301.	501.	701.	901.	1101.	1301.	1501.

EXHIBIT NO. FF

PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

PRESSURE BUILD-UP TEST FROM 2-2-66 TO 2-7-66

UNION OIL COMPANY OF CALIFORNIA WELL NO. 1 RED HILLS UNIT

RED HILLS(WOLFCAMP)FIELD-LEA COUNTY, NEW MEXICO

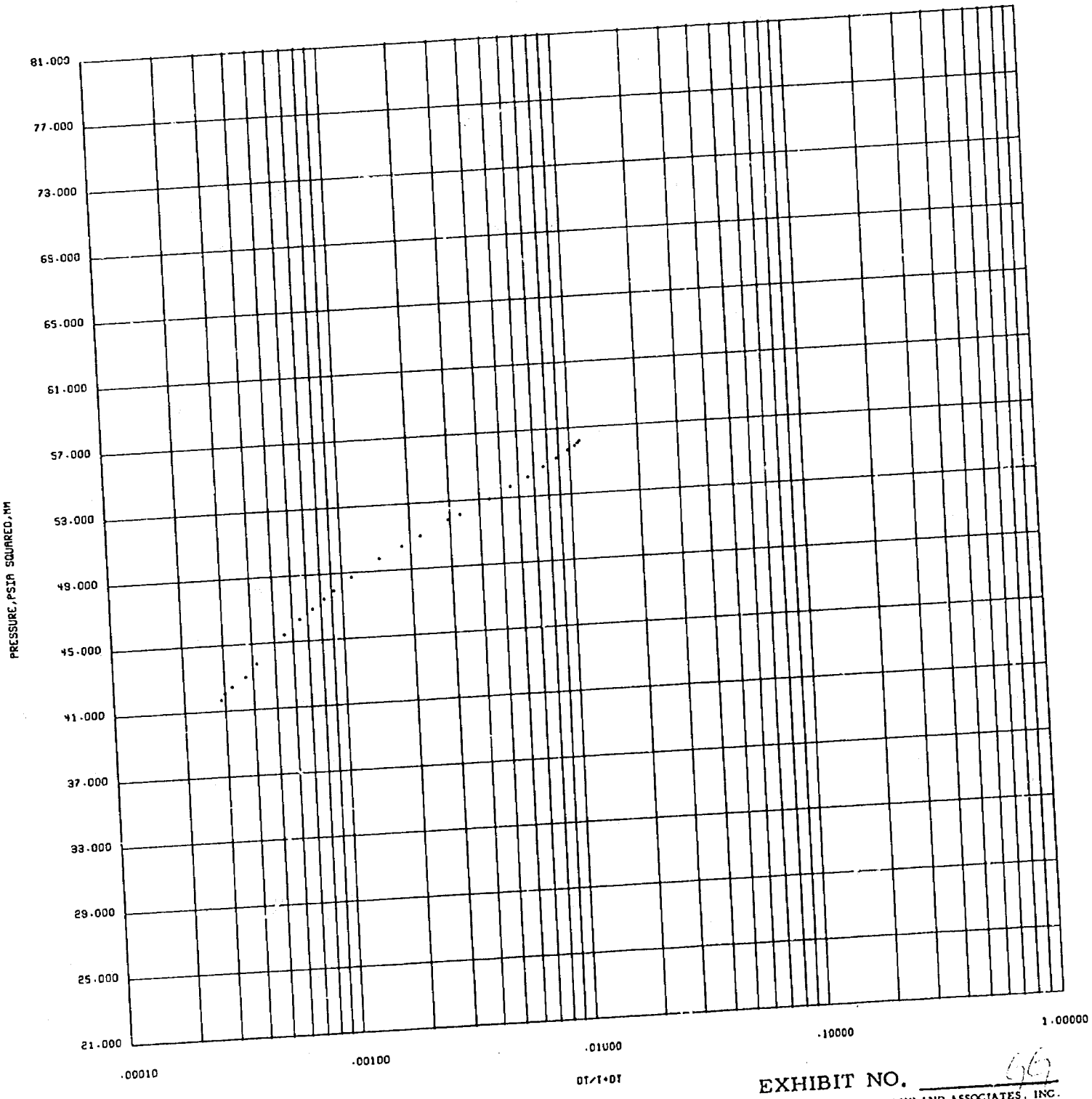


EXHIBIT NO. 6

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

PRESSURE BUILD-UP TEST FROM 2-2-66 TO 2-7-66

UNION OIL COMPANY OF CALIFORNIA WELL NO. 1 REO HILLS UNIT

REO HILLS(WOLFCAMP) FIELD-LEA COUNTY, NEW MEXICO

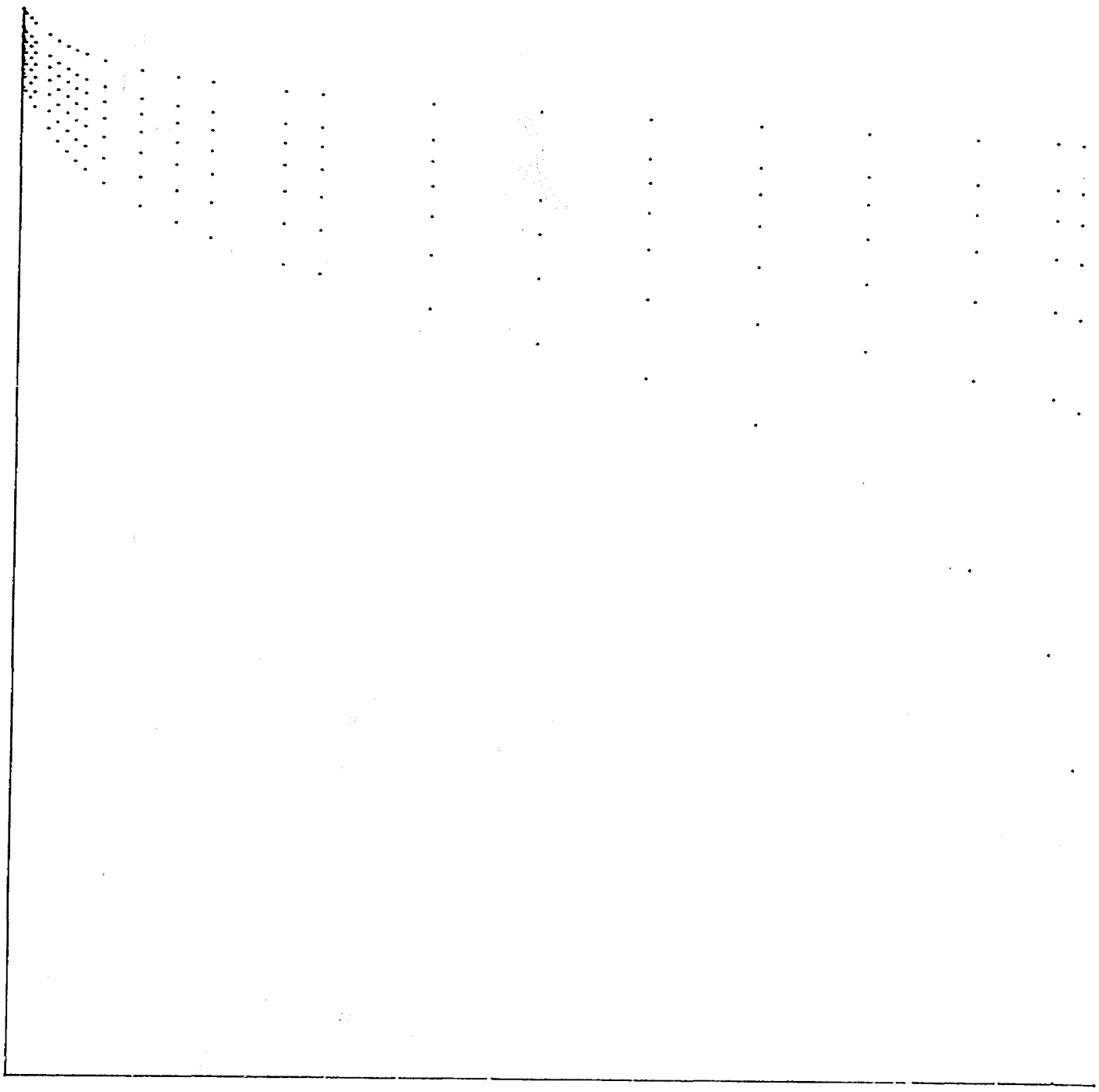


EXHIBIT NO. III

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H.J. GRUY AND ASSOCIATES, INC.

IO...LEAST SQ FIT OF PRESS VS LOG TIME,BUILD-UP TEST OF 2-2-66
STARTING ORDER OF FITS= 1 ENDING ORDER OF FITS 1
ORDER OF POLYNOMIAL= 1
STANDARD DEVIATION= 2.25214390
COEFFICIENTS... .83914749E+04 .20433228E+03

ORIGINAL X	ORIGINAL Y	RE-CALCULATED Y	YDIFFERENCE,
-.65212963E+01	.70560000E+04	.70[illegible]9636E+04	.29636000E+01
-.62985170E+01	.71040000E+04	.71044846E+04	.48460000E+00
-.61165652E+01	.71440000E+04	.71416632E+04	-.23368000E+01
-.58296178E+01	.72050000E+04	.72002959E+04	-.47041000E+01
-.57122038E+01	.72230000E+04	.72242873E+04	.12873000E+01
-.54256213E+01	.72820000E+04	.72828454E+04	.84540000E+00
-.52035782E+01	.73280000E+04	.73282160E+04	.21600000E+00
-.50223552E+01	.73640000E+04	.73652457E+04	.12457000E+01

EXHIBIT NO. 17

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

ID...LEAST SQ FIT OF PRESS VS LOG TIME,BUILD-UP TEST OF 2-2-66
STARTING ORDER OF FITS= 1 ENDING ORDER OF FITS 1
ORDER OF POLYNOMIAL= 1
STANDARD DEVIATION= 2.08721710
COEFFICIENTS... .86429885E+04 .25519224E+03

ORIGINAL X	ORIGINAL Y	RE-CALCULATED Y	YDIFFERENCE,
-.48693024E+01	.74010000E+04	.74003804E+04	-.61960000E+00
-.47368678E+01	.74340000E+04	.74341766E+04	.17660000E+00
-.46201792E+01	.74640000E+04	.74639547E+04	-.45300000E-01
-.45409576E+01	.74800000E+04	.74841714E+04	.41714000E+01
-.45179755E+01	.74910000E+04	.74900363E+04	-.96370000E+00
-.44935044E+01	.74990000E+04	.74962811E+04	-.27189000E+01

EXHIBIT NO. JJ

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

H. J. GRUY AND ASSOCIATES, INC.

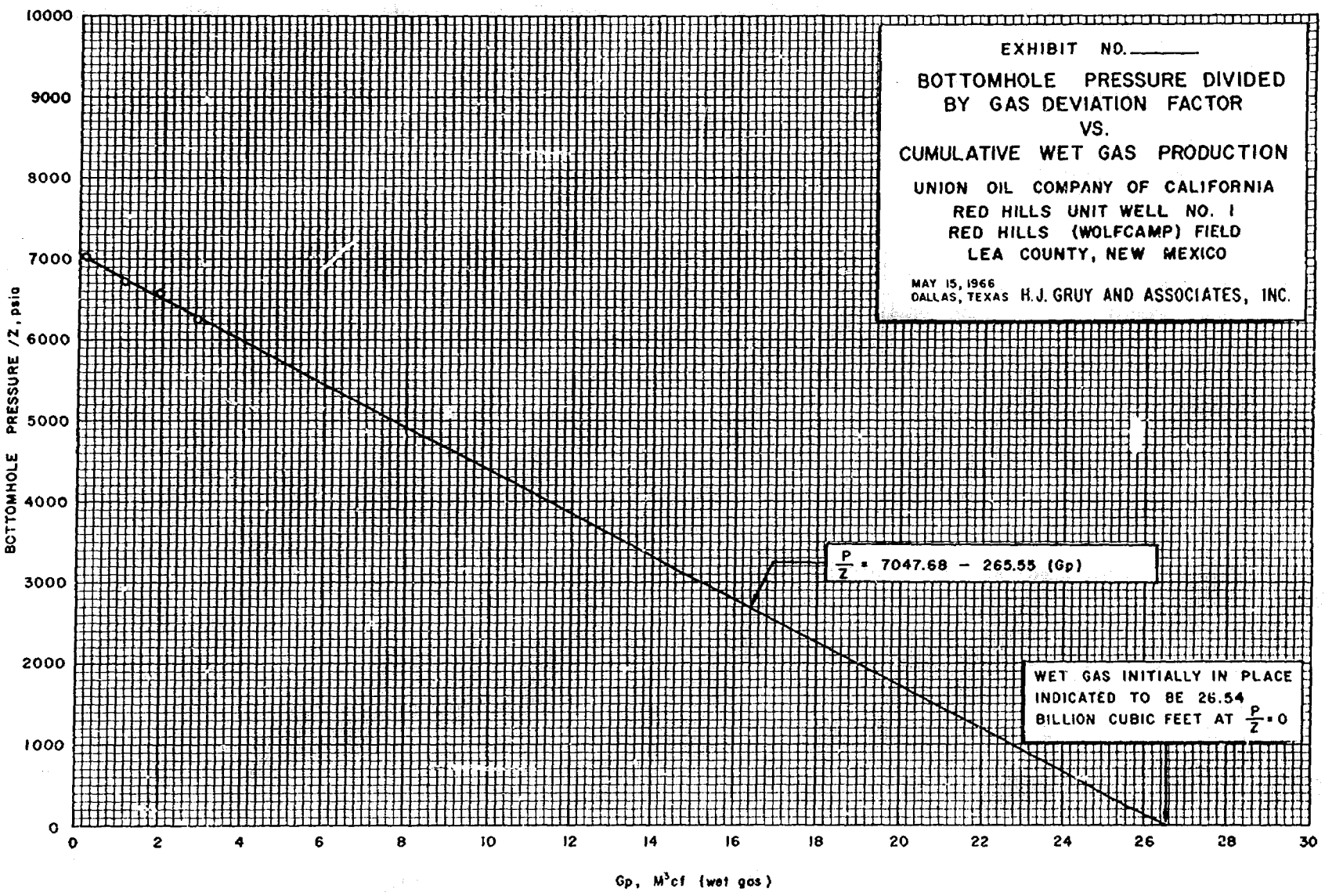


EXHIBIT NO. _____
PREPARED BY H. J. GRUY AND ASSOCIATES, INC.

K K

H.J. GRUY AND ASSOCIATES, INC.

EXAMPLE CALCULATIONS
Based On
TEST DATED FEBRUARY 2, 1966

UNION OIL COMPANY OF CALIFORNIA WELL NO. 1
RED HILLS UNIT
Red Hills (Wolfcamp) Field
Lea County, New Mexico

I. Effective Permeability to Wet Gas

$$= \frac{1664.85\, q_g \mu_g\, Tz}{h\, m}$$

where:

q_g = last flow rate, mcf/day
μ_g = gas viscosity, centipoise
T = reservoir temperature, absolute
z = gas deviation factor
h = formation net thickness
m = slope of build-up curve in $\Delta psia^2$/cycle

$$= \frac{1664.85\,(6290)\,(0.0358)\,(645)\,(1.240)}{(25)\,(7.6749 \times 10^6)} = 1.56 \text{ md.}$$

II. Calculated Radius of Investigation
(approximation because of layered system)

$$r_d = \left[\frac{k\,\Delta t}{967\,\phi\,\mu_g\,c_t}\right]^{1/2}$$

where:

k = formation effective permeability, md
Δt = time, hours = 122.75
ϕ = formation porosity, decimal = 0.048
c_t = total system compressibility, vol./vol./psi
$= 4.3234 \times 10^{-5}$

$$r_d = \left[\frac{(1.56)\,(122.75)}{(967)\,(0.048)\,(0.0358)\,(4.3234 \times 10^{-5})}\right]^{1/2} = 1634 \text{ feet}$$

EXHIBIT NO. L.J.
PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

III. Gas Initially in Place - Dimensionless Calculations

$\bar{p}$, estimated average system pressure, = 7770 psia

m, slope of pressure build-up curve = 470.49 psi/cycle

$$C, \text{ constant} = \frac{1.147}{m} = \frac{1.147}{470.49} = 2.4379 \times 10^{-3}$$

Dimensionless Build-Up Data

Time Δt hours	Pressure, p_{ws} psia	$\bar{p} - p_{ws}$ psi	Δp_{Dw} $C(\bar{p} - p_{ws})$
16	7056	714	1.74
20	7104	666	1.62
24	7144	626	1.53
32	7205	565	1.38
36	7223	547	1.33
48	7282	488	1.19
60	7328	442	1.08
72	7364	406	0.99

Based on overlay of above dimensionless data on graph published in "Bottom Hole Pressure Analysis - Field Examples", by Norman, Lamont, Norman and McAnnally, presented at short course in formation evaluation, April, 1965, Texas Tech. University.

t real = 100
t dimensionless = .0198

$$t_{rd} = \frac{100}{0.0198} = 5050.5$$

$$\text{Gas in place} = \frac{(1-S_w)\ 0.02399\ q_g\ t_{rd}}{c_t\ m}$$

$$= \frac{(1 - .25)\ (0.02399)\ (6290\text{mcf})\ (5050.5)}{(4.3234 \times 10^{-5})\ (470.49)}$$

= 28.099 Billion remaining
+ 2.845 Billion cumulative production
30.944 Billion cubic feet

EXHIBIT NO. MM

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

IV. Gas in Place per Acre Foot

$$MMcf/AF = \frac{1507.5\ p_o\ \phi\ (1 - S_w)}{1000\ z\ T}$$

where:

p_o = initial reservoir pressure, psia
ϕ = average formation porosity, fraction
S_w = average water saturation
z = gas deviation factor
T = reservoir temperature, absolute

$$= \frac{1507.5\ (11,376)\ (0.048)\ (.75)}{(1.624)\ (645)}$$

$$= 0.58939\ \text{MM cf/AF}$$

V. Reservoir Volume and Area

Based on gas initially in place = 26,540 million cubic feet

$$\text{Acre feet} = \frac{26,540}{0.58939} = 45,030 \text{ acre feet}$$

Assuming 25 feet average thickness

$$\frac{45,030 \text{ acre feet}}{25 \text{ feet}} = 1801.2 \text{ acres}$$

Assuming radial pattern

$$\text{Radius} = \left[\frac{(1801.2 \times 43560)}{3.1416}\right]^{1/2}$$

$$= 4998 \text{ feet}$$

EXHIBIT NO. NN

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

VI. Calculated Average Reservoir Pressure

Based on a reservoir radius of 4998 feet and a radial finite system.

$$x = \frac{83.8 \times 10^{-6}\ k\ t_p}{c_t\ \mu_g\ \phi\ r_e^2}$$

where:

k = effective permeability, md
t_p = time produced prior to shut in, hrs
c_t = total system compressibility vol./vol./psi
μ_g = gas viscosity, centipoise
ϕ = formation porosity, decimal
r_e = reservoir radius, feet

$$x = \frac{(83.8 \times 10^{-6})\ (1.56)\ (10,855)}{(4.3234 \times 10^{-5})\ (0.0358)\ (0.048)\ (4998)^2}$$

$$= .76$$

y from Matthews Graph published in SPE-TP 3876

$$= 3.2$$

$$\bar{p} = \left[(p^*)^2 - \frac{my}{2.303}\right]^{1/2}$$

where:

m = slope of build-up curve psi^2/cycle
p^* = extrapolated boundary pressure, psia

$$\bar{p} = 74.701 \times 10^6 - \left[\frac{(9.838 \times 10^6)\ (3.2)}{2.303}\right]^{1/2}$$

$$\bar{p} = 74.701 \times 10^6 - \left[13.670 \times 10^6\right]^{1/2}$$

$$\bar{p} = 7812 \text{ psia}$$

EXHIBIT NO. CO

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

Initial gas in place determination

Based on the calculated average pressure of 7812 psia.

$$\text{Initial } p/z = \frac{11376}{1.624} = 7004.92$$

$$\text{Last test } p/z = \frac{7812}{1.243} = 6284.79$$

$$\Delta (p/z) = 720.13$$

$$\frac{(2.845 \text{ billion cubic feet})\ (7004.92)}{720.13} = 27.67 \text{ billion cubic feet}$$

VII. Summary of Gas in Place Calculations

	Wet Gas Initially In Place M^3cf	Acre feet	Area	Radius
1. Dimensionless Calculation	30.90	52,427	2097	5392
2. Pressure Performance Curve	26.50	44,962	1798	4994
3. Material Balance on Computed Average Pressure From Last Test	27.67	46,947	1878	5103

EXHIBIT NO. FP

PREPARED BY H.J. GRUY AND ASSOCIATES, INC.

Wilfle
217

R. S. Cooke May 18, 1966

Midland, Texas
February 22, 1966

Reserve Determination
Red Hills (Wolfcamp) Field
Red Hills Unit, Well No. 1
Lea County, New Mexico

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Union Exhibit No. 12
Case No. 3158

Dear Sir:

Pressure data from a drill-stem test prior to well completion, from three build-up test, and from a reservoir fluid analysis, are now available for use in determining the above captioned reserve. A plot of reservoir pressure divided by the gas compressibility factor versus cumulative gas produced is attached. On the plot certain of the data is tabulated.

A straight line data fit using the method of least squares gives an in-place reserve of 39.4 MMMCF of original reservoir vapor. Data deviation would indicate a minimum reserve of 38.6 MMMCF and a maximum reserve of 40.4 MMMCF or -2.23% and +2.61% of the best fit respectively. Included in this original reservoir vapor volume is 1,717,000 STB of condensate-in-place, which has a vapor equivalent of 1.6 MMMCF.

An abandonment pressure of 1,000 psig for this reservoir is indicated by calculation. The fluid analysis determined that at this final condition 82.02% of the original reservoir vapor or 32.3 MMMCF will be produced as separator off gas, while 48.29% of the condensate-in-place or 829,400 STB will be recovered.

For take-or-pay, 83.92%, or 33.1 MMMCF, of the original reservoir vapor will have been produced at depletion. Based on a 1 MMCFD rate for each 8 MMMCF of recoverable reserve a take-or-pay quantity of 4,138 MMCFD is calculated.

You will recall that previous reserve determinations have calculated a reserve no greater than 32.0 MMMCF original reservoir vapor; however, for these calculations laboratory PVT data were not available. Comparison of the lab data with that used previously accounts for the larger reserve.

If this office can be of further assistance in this matter please advise.

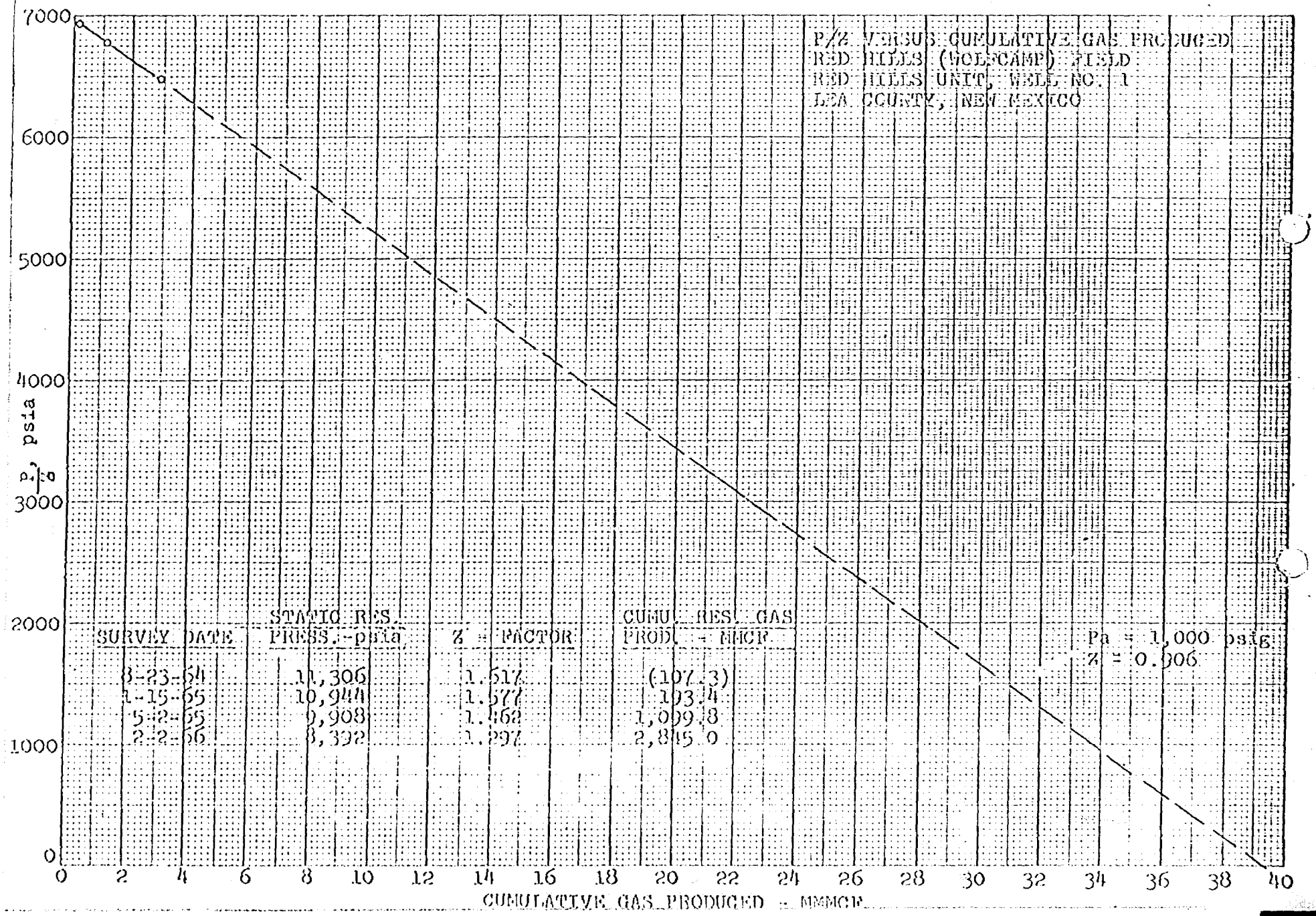
Yours very truly,

Charles W. Browning
District Engineer

CWB:SJB:rb

NO. 340R-20 DIETZGEN GR - PAPER
20 X 20 PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.



REMAINING RESERVES AND ECONOMIC FACTORS
RED HILLS (WOLFCAMP) FIELD
LEA COUNTY, NEW MEXICO

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Union Exhibit No. 13
Case No. 3158
May 18, 1966

I. PROVEN FIELD RESERVES

A. Original Reservoir Vapor Volume, OGIP, MMMCF	1,717,000
B. Original Condensate-in-Place, OCIP, Barrels (OGIP Equivalent of 1.6 MMMCF)	32.3 829,400
C. Recoverable Hydrocarbons at 1,000 psi Abandonment Pressure	
1. Producable Gas, 82.02% OGIP, MMMCF	4.9
2. Condensate, 48.29% OCIP, Barrels	211,000
D. Estimated Field Production at 1-1-67	
1. Sales Gas, MMMCF	27.4
2. Condensate, Barrels	618,400
E. Remaining Recoverable Hydrocarbons at 1-1-67	
1. Sales Gas, MMMCF	
2. Condensate, Barrels	

II. ECONOMIC FACTORS

A. Gas Price, $ per MCF	
1. FPC Area Price for New Gas	0.16500
2. BTU Adjustment (1050 BTU per MCF)	0.01190
TOTAL	0.17690
B. Condensate Price, $ per Barrel	
1. Base Price	2.79000
2. Trucking Charges	- 0.13000
TOTAL	2.66000

C. State and Local Taxes, Gas and Condensate

	$ per MCF	$ per Bbl	% of Gross Value After Royalty
1. Severance	0.00442	0.06325	2.50000
2. Emergency School	0.00451	0.06452	2.55000
3. Conservation at 14/100 of 1%	0.00025	0.00354	0.14000
4. Ad Valorem	0.00240	0.03432	1.35675
TOTAL	0.01158	0.16563	6.54675

D. Estimated Annual Operating Cost, $ per Well per Year 7,200

ESTIMATED COST FOR

14,200' RED HILLS WOLFCAMP TEST

LEA COUNTY, NEW MEXICO

INTANGIBLES

Labor				$ 10,000
Transportation				10,000
Prepare location and road				10,000
Contract Rig:	13,200'	@	$ 9.50/ft	125,400
	40 days	@	$1,300/day	52,000
Mud				50,000
Cement				25,000
Logging				25,000
Perforating				3,000
Acid, etc.				10,000
Bits (Day work)				3,500
Rental Tools, Coring, DST				10,000
Miscellaneous and District Expense				20,000
				$ 343,900

TANGIBLES

600'	13-3/8" Casing	$ 5,000
6,000'	9-5/8" Casing	35,000
13,200'	7" Casing	63,000
1,600'	5" Casing	6,000
Floats, etc.		5,000
Control equipment		35,000
Miscellaneous connections		10,000
14,000'	2-7/8" "CS" & PH-6 Tubing	35,000
Packer		2,000
		$ 196,000

TOTAL $ 539,900

RED HILLS UNIT
DEVELOPMENT ECONOMICS
FOR 14,200-FOOT WOLFCAMP WELL
UNION OIL COMPANY OF CALIFORNIA RESERVE ESTIMATE
RED HILLS (WOLFCAMP) FIELD
LEA COUNTY, NEW MEXICO

OGIP----------39.4 MMMcf
Acres----------2,200 Ac.
Porosity, ø----------6.5%
Water Saturation, Sw----------30.0%
Thickness, h----------24 Ft.
Unit Reserve----------624.2 Mcf per Ac-Ft.

	ASSUMED SPACING				
	2,200-Ac.	1,100-Ac.	640-Ac.	320-Ac.	160-Ac.
Recoverable Gas, MMcf	32,300	16,150	9,396	4,698	2,349
Recoverable Condensate, Barrels	829,400	414,700	241,280	120,640	60,320
Gross Gas Revenue, $	5,713,900	2,856,900	1,662,200	831,100	415,500
Gross Condensate Revenue, $	2,206,200	1,103,100	641,800	320,900	160,500
Total Gas & Condensate Revenue, $	7,920,100	3,960,000	2,304,000	1,152,000	576,000
Royalty & ORRI at 19.51098%, $	1,545,300	772,600	449,500	224,800	112,400
Gross Revenue after Royalty, $	6,374,800	3,187,400	1,854,500	927,200	463,600
State & Local Taxes at 6.54675%, $	417,300	208,700	121,400	60,700	30,400
Operating Cost for 22 Years, $	158,400	158,400	158,400	158,400	158,400
Total Taxes & Operating Cost, $	575,700	367,100	279,800	219,100	188,800
Operating Income, $	5,799,100	2,820,300	1,574,700	708,100	274,800
Annual Operating Income, $	263,600	128,200	71,600	32,200	12,500
Investment, $	569,900	569,900	569,900	569,900	569,900
Net Profit*, $	5,229,200	2,250,400	1,004,800	138,200	(295,100)
Payout, Years	2.2	4.4	8.0	17.7	none
Profit to Investment Ratio	9.2:1.0	3.9:1.0	1.8:1.0	0.2:1.0	(0.5):1.0
Present Value Profit @ 10%, $	1,854,100	609,000	88,300	(273,900)	(455,000)
Profitability Index @ 10%	3.2:1.0	1.1:1.0	0.2:1.0	(0.5):1.0	(0.8):1.0

*Profit before Federal Income Tax or Overhead

Case 3154
Exhibit 5-18-64
Union Ex 14

RED HILLS UNIT
DEVELOPMENT ECONOMICS
FOR 14,200-FOOT WOLFCAMP WELL
H. J. GRUY & ASSOC. INC. RESERVE ESTIMATE
RED HILLS (WOLFCAMP) FIELD
LEA COUNTY, NEW MEXICO

BEFORE THE
CONSERVATION COMMISSION
Santa Fe, New Mexico
Union Exhibit No. 15
Case No. 3158
May 18, 1966

OGIP----------26.540 MMMcf
Acres----------1,798 Ac.
Porosity, Ø----------4.8%
Water Saturation, Sw-------25.0%
Thickness, h----------25 Ft.
Unit Reserve----------590.42 Mcf per Ac-Ft.

	ASSUMED SPACING				
	1,798-Ac.	899-Ac.	640-Ac.	320-Ac.	160-Ac.
Recoverable Gas, MMcf	21,768	10,884	7,748	3,874	1,937
Recoverable Condensate, Barrels	558,500	279,250	198,800	99,400	49,700
Gross Gas Revenue, $	3,850,800	1,925,400	1,370,600	685,300	342,600
Gross Condensate Revenue, $	1,485,600	742,800	528,800	264,400	132,200
Total Gas & Condensate Revenue, $	5,336,400	2,668,200	1,899,400	949,700	474,800
Royalty & ORRI @ 19.51098%, $	1,041,200	520,600	370,600	185,300	92,600
Gross Revenue After Royalty, $	4,295,200	2,147,600	1,528,800	764,400	382,200
State & Local Taxes @ 6.54675%, $	281,200	140,600	100,100	50,000	25,000
Operating Cost for 22 Years, $	158,400	158,400	158,400	158,400	158,400
Total Taxes & Operating Cost, $	439,600	299,000	258,500	208,400	183,400
Operating Income, $	3,855,600	1,848,600	1,270,300	556,000	198,800
Annual Operating Income, $	175,200	84,000	57,700	25,300	9,000
Investment, $	569,900	569,900	569,900	569,900	569,900
Net Profit*, $	3,285,700	1,278,700	700,400	(13,900)	(371,100)
Payout, Years	3.3	6.8	9.9	None	None
Profit to Investment Ratio	5.8:1.0	2.2:1.0	1.2:1.0	0.0:1.0	(0.6):1.0
Present Value Profit @ 10%, $	1,041,700	202,800	(38,900)	(337,500)	(486,800)
Profitability Index at 10%	1.8:1.0	0.4:1.0	(0.1):1.0	(0.6):1.0	(0.9):1.0

*Profit Before Federal Income Tax or Overhead

SPECIAL RULES AND REGULATIONS
FOR THE
RED HILLS-WOLFCAMP GAS POOL

RULE 1. Each well completed in the Red Hills-Wolfcamp Gas Pool or in the Wolfcamp formation within one mile of the Red Hills-Wolfcamp Gas Pool, and not nearer to or within the limits of another designated Wolfcamp pool, shall be spaced, drilled, operated, and produced in accordance with these Special Rules and Regulations.

RULE 2. Each well completed in the Red Hills-Wolfcamp Gas Pool shall be located on a standard unit containing 640 acres, more or less, consisting of a single governmental section.

RULE 3. Each well completed in the Red Hills-Wolfcamp Gas Pool shall be located no nearer than 1650 feet to the outer boundary of the section and no nearer than 330 feet to any governmental quarter-quarter section line.

RULE 4. Any well presently drilling, being completed or now completed in the Red Hills-Wolfcamp Gas Pool is granted an exception to the well location requirements of Rule 3.

RULE 5. Any well completed in the Red Hills-Wolfcamp Gas Pool and located in Section 5, Township 26 South, Range 33 East, N.M.P.M., shall be located, as an exception to Rule 3, not closer than 660 feet to any outer boundary of said Section 5 nor closer than 330 feet to any quarter-quarter section or subdivision inner boundary nor closer than 1320 feet to the nearest well drilling to or capable of producing from the Red Hills-Wolfcamp Gas Pool.

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Union Exhibit No. 16
Case No. 3158

May 18, 1966