BEFORE THE

Oil Conservation Commission

SANTA FE, NEW MEXICO

IN THE MATTER OF:

CASE NO. 673 (Special Hearing)
May 10, 11, 1954

TRANSCRIPT OF PROCEEDINGS

ADA DEARNLEY AND ASSOCIATES
COURT REPORTERS
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I N D E X

WITNESSES:

I N D E X Continued

R E G I S T E R

N.M. Oil Conservation Commission Case 673: Spec.Hearing May 10-11,1954

NAME	REPRESENTING	LOCATION
John C. Carrity	Sinclair O & G	Tulsa, Oklahoma
Ross L. Malone, Jr.	Gulf	Roswell, N.M.
Geo. Hirschfield	N.M. O& C.	Hobbs
R. L. Boss	Gulf Oil Corp.	Ft. Worth, Texas
E. E. Merkl, Jr.	Gulf Oil Corp.	Ft. Worth, Texas
G. E. Stahl	Permian Basin PL Co.	Omaha, Nebraska
G. L. Tribble	Permian Basin PL Co.	Omaha, Nebraska
R. S. Hunt	Cities Service Oil	Roswell
A. L. Holland, Jr.	Gulf Oil	Ft. Worth, Texas
C. A. Hull	Shell Oil Co.	Midland
J. L. Ross	Gulf Oil	Ft. Worth, Texas
C. M. Bumpass	Gulf Oil	Hobbs
S. J. Stanley	O.C.C.	Hobbs
W. E. Hubbard	Humble	Houston
R. M. Richardson	Humble	Midland
J. W. House	Humble	Midland
C. S. Neel, Jr.	Humble	Midland
J. Bwaid	Humble	Midland
R. S. Dewey	Humble	Midland
Clarence E. Hinkle	Humble	Roswell
J. N. Dunlavey	Skelly Oil	Hobbs
Max E. Curry	Skelly Oil	Hobbs
B. L. Anderson	Skelly Oil	Hobbs
Don Walker	Gulf Oil	Ft. Worth
R. El Batts	Gulf	Ft. Worth

R E G I S T E R (Continued)

NAME	REPRESENTING	LOCATION
Dyer Moore	Gulf	Roswell
R. D. Grimm	Phillips Pet. Co.	Bartlesville, Okla.
D. M. Hankins	Phillips	Odessa, Texas
R. C. Sears	Warren Pete Corp.	Tulsa, Oklahoma
W. A. Blankenship,Jr.	Stanolind	Roswell, N.M.
Ben R. Howell	EPNG Co.	El Paso
J. W. Baulch, Jr.	EPNG Co.	Jal, N.M.
W. M. Flood	EPNG Co.	El Paso
R. T. Wright	EPNG Co.	Jal, N.M.
E. J. Pierce	Mid-Cont.Pete Cor.	Midland
F. Norman Woodruff	EPNG Co.	Houston
A. L. Hill	EPNG Co.	Houston
E. H. Forte	Phillips "66"	Amarillo, Texas
J. A. Veeder	Amerada	Midland, Texas
R. L. Mackley	Amerada	Monument, N.M.
W. G. Abbott	Amerada	Monument, N.M.
L. A. Hanson	O.C.C.	Artesia
L. White	Texas	Santa Fe
E. T. Cotham	The Atlantic Ref. Co.	Midland
E. R. Philipp	The Atlantic Ref. Co.	Dallas
John A. Woodward	Amerada	Tulsa
Jack H. Vickery	Atlantic	Midland
R. A. Montgomery	O.C.C.	Hobbs
A. M. WiederBehr	Southern Union Gas	Dallas
H. T. White	Phillips Pet. Ct.	Bartlesville, Okla.
W.D. Lua, Jr.	MeTex	Hobbs, N.M.

----------R e g i s t e r (Continued)----------

NAME	REPRESENTING	LOCATION
J. K. Smith	Stanolind Oil & Gas	Ft. Worth, Texas
R. G. Hiltz	Stanolind Oil & Gas	Ft. Worth, Texas
Homer Dailey	Continental Oil Co.	Ft. Worth, Texas
A. Cummings	R. Olsen Oil Co.	Jal, N.M.
Harry G. Dippel	Continental Oil Co.	Ft. Worth, Texas
V. T. Lyon	Continental Oil Co.	Ft. Worth, Texas
James W. Kellahin	Attorney	Santa Fe
Matt Gebel	Gulf Oil Corp.	Roswell
Max H. Christensen	The Texas Co.	Midland, Texas
J. E. Bagouell	T. P. Coal and Oil	Midland, Texas
John Yuronka	T. P. Coal and Oil	Hobbs, N.M.
H. F. Steen	E.P.N.G. Co.	El Paso
William Pudge	Conoco	Hobbs
Wichelmann	EPNG Co.	El Paso
R. S. Christie	Amerada	Tulsa
George W. Selinger	Skelly	Tulsa
J. D. Cooper	Skelly	Tulsa
Earl Ainsworth	Permian Basin PL	Osnoba, Nebraska
Jack M. Campbell	T P Coal andOil Co.	Roswell, N.M.
John. F. Russell	T.P. Coal & Oil Co.	Roswell, N.M.
Elvis A. Coty	N.M. OCC	Santa Fe
J. Terrell Couch	The Ohio Oil Co.	Houston, Tex
John W. Higgins	The Ohio Oil Co.	Roswell, N.M.
Don K. Spellman, Jr.	The Ohio Oil Co.	Midland, Texas
John R. Brack	The Ohio Oil Co.	Midland, Texas
Sid Noble	Samedan Oil Corp.	Tulsa, Oklahoma
J. A. Warren	Southern Calif.Pet.	Midland, Texas
A. S. Grenier	Southern Union Gas	Dallas, Texas

MR. SPURRIER: The meeting will come to order, please. There is some confusion as usual, about who shall be first on the program today. Some of you seem to feel if certain people go first it will save a lot of time. I think that there are a lot of serious people who have done a lot of serious thinking about these problems. Speaking for myself, I would like to hear as much testimony as can come before the Commission and be available. Of course, that is the problem, when we can stop putting on testimony and decide the case and still not miss some good testimony. As I remember Gulf was prepared to testify at the time that we quit at the last hearing.

Some people seem to think that the Commission staff should put on their case first. They are erroneous in their feeling that if the Commission's staff puts on a certain amount of testimony that is it. In fact, if that is what they do think, I think we will start definitely with the companies first and let the Commission put theirs on last, because we certainly want to know what you companies are thinking about these matters. Continental put on the testimony in the original cases, the original testimony and frankly, we don't know who should go on first, Mr. Malone, did you have something?

MR. MALONE: Ross Malone, if it please the Commission, Gulf felt that inasmuch as they were ready to go to bat last time they perhaps had some claim to the right to open the hearing. We recognize the position of Continental of having put on the original testimony that a more orderly basis for proceeding would be to put on their testimony. Under those circumstances Gulf is agreeable to Continental presenting its

testimony first with the provision that Gulf then would follow Continental.

I might facetiously say that Gulf inadvertently showed its own card now and we would like a new card down and we will check the Continental.

MR. SPURRIER: I think the Commission's cards are on the table, perhaps I should say, the Commission staff. El Paso Natural has asked me if they might make a short statement at the very beginning. I am presuming that they mean just what they say. It is a matter of these minimum take contracts. They feel that if they make their statement that that will tend to shorten the testimony. Mr. Howell.

MR. HOWELL: Gentlemen, a number of people have come to us and suggested that the hearing could possibly be shortened if we would make a statement with reference to the contracts. The typical contracts in the Permian area and in Lea County require the company to take certain daily minimum volumes averaged on a yearly basis, either to take or to pay for those volumes at the end of the year with the four year makeup period which, if having paid for the gas in succeeding years, we are permitted to make up out of any excess that is taken in the next four year period. The question that has seemed to bother some people would be whether or not the company would think that if it failed to nominate sufficient quantities of gas to reach its contractual minimums that the company might claim that the application of proration rules relieved it of a contractual liability.

We think the contracts generally speak for themselves and a matter of contracts is a matter between the two parties

and actually is not properly before a hearing on proration. But a good many people have suggested that possibly an explanation of the companies position would clear the air and reduce the length of the hearing.

So, I have here a letter from Mr. Paul Kyser, the president of El Paso Natural Gas Company, which is addressed to me. In order that you may be acquainted with our plans in respect to nominations for gas from Lea County for our market in compliance with proration orders, we wish to state to you that we expect to make nominations each month for gas that we will require from the so-called dry gas wells in Lea County, New Mexico, the nominations to be made for the entire area. These nominations will be made as far as possible so that the average quantity that is taken throughout the year will be at least as much as the minimum quantities that we are required to take under all of our contracts covering dry gas from Lea County, New Mexico. Under our contracts, we have the right to make up deficiencies over certain periods of time. In the event we are unable to make nominations in any year for the full minimum requirements of all of our contracts, we would expect to preserve the right to make up such deficiencies. In the event that we are unable to make up such deficiencies within the period of time covered by the contracts, we will expect to pay the producers in accordance with the terms of the contract.

It might be simply stated that the company feels that unless it nominates volumes of gas that are equal to the contractual minimums that it cannot say that it was proration rather than its own failure to nominate that prevented it from taking

contractual minimums.

MR. SPURRIER: Thank you, Mr. Howell.

MR. CAMPBELL: May I ask if that letter can be introduced in this case?

MR. HOWELL: Yes, I will be very happy to turn it over to the Commission.

MR. SPURRIER: Is there objections? Without objections it will be admitted.

MR. CAMPBELL: I would like to ask Mr. Howell just a couple of questions. First, I want to preface it by saying that my questions do not indicate at all that Texas Pacific Coal and Oil Company doubts the good faith of El Paso Natural Gas Company in connection with this matter. However, some of these contracts have 16 years to run, as you know. In order to try to set this matter, this contractual matter at rest, I would like to be enlightened a little bit on what that letter actually means. It is my understanding that the present purchase contract with Texas Pacific Coal and Oil Company and with other producers contain a provision that the purchasing company will take or pay for five hundred thousand cubic feet of gas per unit on a yearly basis with the right to make up over a four year period for gas for which they had paid but have not taken. Your letter makes reference to nominations and indicates that El Paso Natural Gas Company will try to keep its nominations above that point, or at that point and if they do not keep their nominations at that point, that they will consider that is their fault and comply with the minimum take or pay provisions of the contract.

MR. HOWELL: Preserving the make up rights, of course?

MR. CAMPBELL: Preserve the make up rights, of course, with no reference to the nominations but referring to the allowables adjusted as the Commission has been adjusting them, the actual authorized production from any of these units over the yearly period averages less than five hundred cubic feet per unit.

Do I understand it then that El Paso will waive its right to contend that since they would not have been able to take the gas they will nevertheless pay for it under the contract?

MR.HOWELL: When the company is prevented from taking gas, not by its failure to nominate sufficient quantities but by the imposition of a location under proration rules, it, of course, expects to rely upon the provisions of the contract which makes those contracts subject to legal orders of the Commission.

MR. CAMPBELL: Your statement is solely based on what you chose to nominate and not on what the Commission may set as the allowable for any particular proration unit.

MR.HOWELL: If the Commission's orders reduce our nominations to the point that we can't take the gas we nominated we expect to be relieved of the obligation or take those minimums.

MR. CAMPBELL: Or to pay for them?

MR.HOWELL: Or to pay for them.

MR. CAMPBELL: I think that answers my question. In the light of that, it will be necessary that Texas Pacific Coal and Oil Company put in some testimony with reference to minimum allowables before the hearing is over.

(OFF THE RECORD)

MR. SPURRIER: Does anyone have a motion as to who shall put on the testimony first, it makes no difference to the Commission.

MR. DIPPLE: Continental is prepared to go first. I would like to make this little statement in that connection. It has come to our attention that there has been some comment to the effect that it is somewhat isgnificant that Continental, who put on the original testimony hasn't been heard from since the storm blew up. About the only thing about that is that we felt like that maybe we were wrong, that we had discharged our responsibility to the Commission when we put this testimony in April of 1951.

It will be recalled that the reason Continental put it on was that the four member companies of the New Mexico Federal Unit joined in compiling the data and Continental, as the operator of the unit put the testimony on, but only after the data assembled by the member companies of the New Mexico Federal Unit had afforded all the operators in the area an opportunity to inform themselves as to what it was that would be offered as evidence and testimony.

I think that the record in that April, 1951 hearing will show that everybody without exception was in substantial agreement. We have tried to refrain from injecting ourselves further into this thing because we wanted to avoid controversy in the first place, and the second place maybe I have got them in the wrong order. I think in the first place we felt that the orders that the Commission adopted and the rules that were adopted by

the Commission were reasonable under the circumstances and during the short period of time that they have been in operation have shown that they are permitting the Commission and the operators to move in the right direction toward proration.

The case that we are prepared to put here now, is substantially the case we put on in 1951. We intend, we tried to design it to support the present order of the Commission. Our testimony, as I said, will be substantially that offered in 1951 with minor revisions or I should think improvements where experience has taught us that perhaps some little refinement could be made. We should like to proceed first.

MR. MALONE: May it please the Commission, Gulf would like to follow Continental's presentation.

MR. CAMPBELL: If the Commission please, do I understand that Continental intends to put on only additional testimony, the testimony and the record of the case in 1951, is all a part of this record. All of Case 582 was incorporated in this record, and in Case 582 the transcript in that other case was offered in evidence.

MR. SPURRIER: Case 245.

MR. CAMPBELL: Whatever the case was that defined the pools. It is in the record, it seems to me that since the Commission has apparently compiled a considerable amount of information based on not just one company's wells or a few companies wells, but all over the area that all of us would be in a better position to analyze the testimony and evidence of both Continental and Gulf if we knew what these things are.

The Commission is the one that is going to have to make

the decision. As far as I am concerned I would like to know what their position is and what their geologists feel about it. I don't think it precludes or excludes the Continental or Gulf or Texas Pacific or anything else of arguing with the Commission. I think it would certainly give us a better understanding of the overall picture in the area down there, if the Commission's testimony and exhibits were to be explained to us before we got off again on Case 245.

MR. DIPPLE: I do not want to get in an argument with anybody. I don't, maybe I shouldn't make this statement, but I think it is a fact, we are, in Continental, somewhat in doubt that the Commission's staff is in position to testify in support of these exhibits here as being exhibits prepared by them. As I understand it they are for the main part at least exhibits that were introduced in Case 245. There, I am wrong about that, I realize that they were not introduced. I meant to say that they were testified about but never actually introduced into the record. We have duplicates of them and intend to produce them in the record. If I remember right some of the operators made an attack on Case 245 that, among other things, pointed out perhaps that the case isn't properly supported by exhibits. We want to supply those exhibits. All we are trying to do is uphold the Commission's hands and then let the others do what they want to.

MR. YOST: You can argue, there seems to be some disagreement about who is going to start. I think the Commission should rule that somebody start and proceed with it. As far as we are concerned it is all right if Continental goes first.

MR. SPURRIER: In other words, you will yield to Continental and Gulf?

MR. YOST: We are not yielding but it will be all right.

MR. SPURRIER: I think under the circumstances Continental may proceed.

MR. DIPPLE: We will not have over two witnesses. Maybe only one. Mr. Homer Daily will be our principal witness and Mr. Daily in preparation for this thing has written out in substance what he proposes to testify to. I have three additional copies of what he wrote out. I would be glad to give one to the Commission and on e to the lawyers over there, and one to the reporter with the understanding that it is not a statement that is in such form that we can introduce it into the record because at certain points Mr. Dailey will deviate from it. I thought it might be of some assistance to the Commission's staff if you had a copy of it before you.

I would like to have Mr.Homer Dailey and Mr.V. T. Lyons sworn.

(Witnesses sworn.)

MR. KELLAHIN: Will it be all right if Mr. Randolph points to the exhibits as Mr. Dailey testifys? It will save time. We will let Mr. Dailey make his statement under oath.

H O M E R D A I L E Y

the witness, having been first duly sworn, testified as follows:

DIRECT EXAMINATION

By: MR. KELLAHIN:

Q State your name, please? A Homer Dailey.

Q By whom are you employed?

A Continental Oil Company.

Q What is your position?

A Regional petroleum engineer.

Q How long have you held that position?

A I have held that position approximately two years.

Q Have you been with Continental for some period of time?

A Approximately 18 years.

Q Have you testified before this Commission as an expert before? A Yes.

Q Have your qualifications been accepted?

A Yes.

MR. KELLAHIN: Are Mr. Dailey's qualifications acceptable to the Commission?

MR. SPURRIER: They are.

Q In connection with your work with Continental, have you had occasion to make any study of the gas pools which are involved in this hearing in the Eumont, Arrow, Langmat and Jalco?

A I have.

Q In connection with that study have you prepared or worked with other companies in the preparation of any exhibits and testimony which you can offer at this time?

A Yes, sir.

Q Would you state to the Commission the substance of your testimony at this time, Mr. Dailey?

A The majority of the exhibits were prepared in 1951 for Case 245. Exhibit 1 is a contour map on the top of the Yates in Township 19 South through Township 26 South and Ranges 35 East through 38 East, inclusive. Starting at the south along

the dividing line between Ranges 36 and 37 East, and extending in a northerly direction to Section 6, Township 22, South, Range 36 East is a long, narrow ridge. This general ridge is broken up into a number of small local highs. We believe this ridge to be the approximate eastern limit of Capitan Reef development in the area.

From south to north, the Eaves Cooper-Jal and the west half of the South Eunice Pool lie on this ridge. Oil production is found chiefly on the west flank of the ridge. Producing formations consist of the Yates and Seven Rivers in the south and Queen, and possibly upper Grayburg, in the north. Porosity and permeability in the lower Yates, Seven Rivers and Queen formations are found mainly in dolomite. The upper Yates, which is in general less productive than the others, contains chiefly gas which appears to be contained in the Sands.

Approximately six miles to the east, and roughly paralelling the ridge previously described, there is a second general high running through Townships 23, 24, 25, and 26, South. On the west flank of this high, and extending into the trough area between the reef high in Townships 24 and 25, South, lies the Langlie Mattix oil pool. After crossing the ridge going eastward, the dolomites of the Seven Rivers formation lose their porosity and permeability rapidly. The lithology of the formation likewise changes and numerous sand lenses are found. Oil production in the Langlie Mattix is found in the sands of the Queen and lower Seven Rivers formation. The Yates and upper Seven Rivers contain chiefly gas. In a few places, notably the Falby Yates oil pool as presently designated, oil is found in

the middle Yates.

In Townships 21 and 22 South, Range 37 East, there is a broad general high on which lies the Penrose-Skelly Pool. Production in the Penrose-Skelly Pool is chiefly from Queen sands in the south and sandy dolomites of the Grayburg formation in the north. To the west of this, and connected to it by a saddle, is the Arrowhead Pool. This pool produces oil from the Grayburg formation. Gas has been found in some of the wells in the Yates, Seven Rivers and Queen formations.

In Township 21 South, Range 36 East may be seen the southern end of the Eunice Monument high. It extends into the eastern half of Township 20 South, Range 36 East and the western half of Township 20 South, Range 37 East, and the southeastern portion of Township 19 South, Range 36 East, and southwestern portion of Township 19 South, Range 37 East. Oil production in the southern portion occurs chiefly in the Grayburg formation with a few wells along the south and west flanks producing from the Queen and Seven Rivers formations. In the high portions of the Monument end of the field, oil production is found in the San Andres with the remainder producing from the Grayburg. In the higher wells the Grayburg contains gas which is gas cap gas. The Queens contains gas over most of the structure. The Yates and Seven Rivers are gas productive in the southwestern portion of Township 21 South, Range 36 East, and in the higher parts of the Monument Pool.

Exhibit Number 2 is a map of Townships 19 through 26 South and Ranges 35 through 38 East. This is a key map for most of the cross sections to be introduced. The East-west

sections are labeled with the Township through which they pass. The map is also colored similar to the Exhibit which we introduced in Case 245, showing our recommended gas pool areas. Exhibit Nos. 3 through 12 are east-west cross sections through each Township from 19 Sout h through 25 South.

Exhibit No. 3 is an east-west cross section through Township 19 South. Exhibit No. 4 is an east-west section through Township 20 South. Exhibit No. 5 is an east-west section through Township 21 South. The top of only the Yates and Queen are shown. The Queen in this area is approximately 250 feet thick. Using this interval, it can be seen that the oil wells, with three exceptions at the west end of the Township 21 South section, are producing from below the top of the Grayburg.

Exhibit No. 6 is an east-west section across the north end of Township 22 South. This section has sample logs and electrical and radioactivity surveys on a few of the wells. The top of the Yates and the top of the Queen are shown. Using a thickness of 250 feet for the Queen, it indicates Grayburg oil production in the Penrose-Skelly pool at the east end and in the Arrowhead Pool in the central portion. To the west is the South Eunice Pool producing chiefly from the Queen with the extreme west wells producing from the Seven Rivers. That is oil.

Exhibit No. 7 is an east-west cross section through the northern portion of Township 23 South and southern Portion of Township 22 South. Exhibit No. 7 shows Queen oil production from the southernmost end of the Penrose-Skelly Pool on the east, gas from the Yates-Seven Rivers formations in the center, and oil from the Seven Rivers, plus gas in the Yates, on the

extreme west.

Exhibit No. 8 is a portion of the west end of Exhibit No. 7 with radioactivity logs of the six westernmost wells. It shows the change in the section in going across the reef ridge. The increase in sand in the Seven Rivers between Meyer B-33 No. 1 and No. 2 can be seen as can the difference through the Yates in the three west wells from the three east wells. The lack of permeability in Meyer B-33 No. 2 through the Seven Rivers as compared with Meyer B-33 No. 1 as evidenced by drill stem tests can also be seen. Meyer B-33 No. 1 tested 2,480,000 cubic feet per day on drill stem test in Seven Rivers while the No. 2 tested dry. The Meyer B-33 No. 2 was finally completed as a Yates oil well after shooting the formation with 195 quarts of Nitro.

Exhibit No. 9 is an east-west cross section through Township 23 South. On the eastern portion of Exhibit 9 are shown Langlie Mattix Pool oil wells producing from the Queen and lower Seven Rivers. Farther west are gas wells producing from the Yates and Seven Rivers. On the west is shown a well, now plugged and abandoned, which produced oil from the Seven Rivers.

Exhibit No. 10 is a section with radioactivity logs of five of the wells on Exhibit No. 9. The sixth well on the west end is not on Exhibit 9. The exhibit again shows the sandy character of the Seven Rivers to the east of the reef high.

Exhibit No. 11 is an east-west cross section through Township 24 South. On the east it shows Langlie-Mattix oil wells producing from the Queen and the lower Seven Rivers. The highest well on the east side, the Gulf Bertha Knight No. 1 is a Queen gas well. The Continental Jack A-21 No. 1 is now re-

completed as a Yates gas well. There are two gas wells shown close to the center of the section. The Western Gas Company Harrison No. 2 originally completed as a Seven Rivers gas well, and the Continental Jack B-30 No. 1 completed in the Yates and upper Seven Rivers. The section crosses the Falby-Yates pool. These wells produce oil from the Yates. Drill stem tests on the Amerada Falby No. 2 indicates dry gas in the lower Yates or upper Seven Rivers with oil in the middle and upper Yates.

The extreme west portion of the section shows Cooper-Jal oil wells producing mainly from the Seven Rivers. The data on these is original completion data. Many of the wells in this vicinity have been recompleted or plugged. Between the Cooper-Jal oil wells and the Falby Yates Pool is shown a gas well producing from the Yates and Seven Rivers.

Q Would you come over and point out to the Commission the wells to which you are referring in your testimony. I think it would be helpful.

A The first specific well I referred to was the Gulf-Bertha Knight No. 1 which was completed as a gas well in the Queen. With this line being the top of the Queen. The second well was the Continental Jack A-21 No. 1, originally completed as an oil well in the Lower Seven River and the Queen and since recompleted as a gas well in the Yates formation.

The next well referred to specifically was the western gas company Harrison No. 2 completed in the Seven Rivers as a gas well. This section shows the various drill stem tests taken on the well, nine of these listed fairly accurately shows where the gas is coming from in that well.

The next well is the Continental Jack B-30 No. 1, pipe set just above the top of the Yates and completed in an open hole through the Yates and into the Seven Rivers. The next well specifically referred to is the Amerada Falby No. 2 in which we have a record of three drill stem tests. The first of which flowed oil, the second one of which had gas in 20 minutes but no measurement was taken and the bottom one of which flowed at the rate of 360 MCF gas per day with no oil.

The Cooper-Jal oil wells lie in these last four. With the gas well referred to at the end of the testimony on this section being this well here, the Hamilton No. 1.

Exhibit No. 12 is the east-west cross section through Township 25 South. On the west it shows first a Yates oil well which has now been plugged and abandoned. Next a Yates-Seven Rivers well which has been plugged and abandoned. A well which was originally completed as a Seven Rivers oil producer but after several recompletions is now producing gas from the upper Yates. I might add it is a rather small producer. The next is Seven Rivers oil well. The next is a Yates gas well. The next is a well originally completed as a Yates gas well which now produces some oil. Next the Leonard and Leonard Justice No. 1-A, a Yates gas well. Leonard and Leonard Justice which is likewise a gas well, next there are four Yates oil wells, a Yates gas well, three Queens oil wells, a Queen gas well and a deep dry hole which is merely in there for proration purposes.

Exhibit No. 13 is a north-south cross section starting in the south end of the Eunice Pool, right through here would be the Eunice Pool, continuing and running through the South

Eunice, Cooper-Jal and Eaves Pools. Oil production at the north end in the Eunice Pool is from the Grayburg with a few of the Eunice Pool wells producing from the Queen. The Queen then goes below the water table between the Eunice and South Eunice pools. The section then shows South Eunice Pools producing oil from the Queen with a Queen again going below the water table immediately south of the Continental State E-17 No. 6. Production further south consists of oil and gas from the Yates and Seven Rivers formations. That is from here to the end, we do not have any wells producing from what we can correlate as the Queen.

Exhibit No. 14 is a north-south cross section up the reef ridge and follows the same general trend as Exhibit No. 13. The two exhibits show essentially the same information; however, exhibit No. 14 has radioactivity or electrical logs of the wells which make it possible to study the trend in greater detail. The southernmost log is of a well in the Henricks Pool, Winkler County, Texas. Continental Ida Hendricks No. 1. The change in the stratigraphy between the South Eunice and Eunice Pools can be seen by comparing the logs of Continental Lockhart B-31 No. 4 and State E-17 No. 5 with the wells to the north. To the south the stratigraphy of the Yates and Seven Rivers formations, that is from the Continental Lockhart B-31 No. 4 all the way down the section, remains the same the entire length of the section.

Q Are these cross sections shown on your base map up here by number with reference to these Exhibits?

A This one is not.

Q Would you have Mr. Randolph point out where this cross

section is?

MR. RANDOLPH: It starts up here and goes off the map down here.

A Referring again to Exhibits 8 and 10, this long strip of continuity as shown in Exhibit No. 14 should be compared with the discontinuity of the east-west sections. The Seven Rivers and Yates zones can be traced approximately 50 miles north and south, but in one or two locations to the east the lithology of the formations has changed.

Exhibit No's. 15, 16 and 17 are a three piece north-south cross section from the north end of the Monument Pool to the south end of the Rhodes Pool. The section is approximately midway between the eastern and western limits of the shallow oil production. I believe that is 15, the north end of the section. 16 is the middle portion, through Townships 21, 2 and 3 South. I believe that is all there is on that.

Exhibit No. 17 is that portion which runs through Townships 24, 25 and 26 South.

Exhibit No's 18, 19, and 20 are a three piece north-south cross section from the north end of Monument Pool south to the Leonard Pool. This section runs to the east of the one shown on Exhibits 15, 16, 17.

Exhibit 18 is that portion of it in Townships 19 and 20 South. Exhibit 19 is that portion of the section through Townships 21, 22, and 23 South. Exhibit 20 is that portion of the section which runs through Townships 24, 25, and into the portion of 26 South.

The San Andres formation is oil productive in the area

under consideration in this case only in the center portion of the Monument Pool. In a few of the highest wells, the upper portion of the San Andres is above the gas-oil contact. The Grayburg formation produces oil in the Eunice Pool and around the edges of the Monument Pool. In the higher portions of the Monument Pool, the entire Grayburg formation is above the gas-oil contact and is gas productive. The upper portions of it contain gas through most of the Monument Pool. The Grayburg is also oil productive in the Skaggs and Arrowhead and North portion of the Penrose-Skelly Pool.

The Queen formation contains chiefly gas under the Eunice Monument structure except as previously mentioned along the south and west edges of the Eunice Pool. The north end of the south Eunice Pool also produces some oil and some gas in the Queen formation. The southern portion of the Penrose-Skelly and the Langlie-Mattix Pools produce oil from the Queen. Also, there are some wells in the Langlie-Mattix area which have only gas in the Queen formation. These wells are chiefly structural wells.

The Seven Rivers along the reef ridge produces chiefly oil from the west flank with gas in the higher wells. At the extreme north end the Seven Rivers dolomites contain almost all gas. To the east of the ridge in the lower wells, the bottom portion of the Seven Rivers contains some oil, while the rest of the formation contains gas. Gas is also found in the Seven Rivers in the south and west portions of Township 21 South, Range 36 East. The sands in the Seven Rivers back of the reef area appear to be lenses with the longest dimensions north and

south. Most of the sands pinch out as the top of the back reef high is approached. The Seven Rivers also produces gas in the central portion of the Monument Pool.

The Yates formation produces oil in some of the lower wells west of the reef ridge. In the higher wells along the reef ridge, it contains gas. Back of the reef, with the exception of several small lows, it contains gas. Production in the Eunice Monument Fields from the Yates appears to be limited to the same general area as that which produces from the Seven Rivers. In general, along the reef ridge, the lower Yates is more prolific than the upper Yates.

Studies and work in southeastern Lea County by Continental Oil Company indicate the pay horizons to be either lensed or zoned in most of the producing formations. By this it is meant that the producing formations consist of a series of permeable layers separated by impermeable layers within the formation. These layers in practically all cases follow the structure. Initially, the water-oil contact in all formations varied from approximately -275 feet subsea at the south end to approximately -325 feet at the north end. Likewise, the gas-oil contact in all formations was approximately 100 feet above the water-oil contact. Apparently, over geologic times fluids have reached a state of equilibrium throughout the shallow formations with the exception of the oil accumulations in low spots in the Yates. During the producing life of the fields, however, these various zones have performed as separate reservoirs.

MR. SPURRIER: We will take a recess.

(RECESS)

MR. KELLAHIN: Mr. Dailey.

A Initially, bottom hole pressure of the Eunice Pool is believed to have been approximately 1,450 pounds per square inch. The average bottomhole pressure of 55 Grayburg oil wells taken in August of 1953, was 541 pounds per square inch. These were a total of 47 gas wells in the Eunice part of the Eumont gas field carried on the February, 1954 proration schedule. Shut in pressures taken in October, 1953 were obtained on 27 of these wells. The average shut in pressure was 1,029 pounds per square inch or a difference of 488 pounds per square inch above that of the average pressures for the oil wells in the Eunice Pool. Sulfur content on nine Continental gas wells completed in the Yates, Seven Rivers or Queen in the area covered by the Eunice Oil Pool show an average sulfur content of 69 grains per 100 cubic feet.

Sulfur content of seven oil wells producing from the Grayburg in the Eunice Pool, that is gas casinghead gas from the seven oil wells, show an average content of 753 grains per one hundred cubic feet. These two facts prove the separation between the Grayburg oil and the Yates, Seven Rivers-Queen gas formations in this area.

In the Langlie Mattix Pool, the Continental Oil Company Jack A-21 No. 1 had a shut in bottomhole pressure in the Queen formation of 210 pounds per square inch in 1943. It has since been recompleted as a dry gas well in the Yates and upper Seven Rivers. The latest pressure, taken during 1953 was 903 pounds per square inch.

Similarly, in 1943, the Continental Jack A-29 No. 3 had

a bottom hole pressure in the Queen and lower Seven Rivers of 340 pounds per square inch. It has since been recompleted as a gas well with a shut in pressure during the latter part of 1953 of 851 pounds per square inch. Shut in gas well pressures most of which were taken in October, 1953, are shown on Exhibit 21.

Q Mr. Dailey, do the figures show the shut in pressures on these wells?

A That is correct, and also shows some sulfur content where available. It is difficult on the print to tell the difference between the sulfur contents and the--the upper figures is the shut in pressure and the lower figure is the sulfur content where available. We don't have the sulfur content on all the wells.

Q By upper and lower figures you are referring to the two figures that appear by the well location?

A That is correct. This map was prepared, the base map was prepared by someone else and the abbreviation of letters alongside of this purports to show the producing horizon. That producing horizon may not agree with what we believe, but is merely taken from what was reported to be the producing horizon.

Exhibit 22 is a section drawn through Continental's State J-2 lease in Section 2, Township 22 South, Range 36 East. On it are shown tracings of the radioactivity surveys run in conjunction with workovers on six of the twelve wells on the lease. These wells are all producing from the Grayburg formation. The remedial work was done on these wells to shut off water production. In every case, after the workover, the water

production was eliminated or substantially reduced.

We have picked two of the wells for examples to show what the others also similarly show. The State J-2 No. 11 was producing 22 barrels of oil, in 254 barrels of water a day from open hole, with 5½" pipe set at approximately 3, 710 at a total depth of 3,852. A packer was set at 3,838 and the interval below the packer was acidized with 1,000 gallons. Following the workover, the well produced from below the packer 122 barrels oil, 8 barrels water per day, flowing through an 11/64" choke. In other words, in that case the water was above the oil.

Well No. 7, prior to the workover, tested 22 barrels oil, 356 barrels water, in 24 hours from open hole, with 5½" casing set at approximately 3,720 and the total depth at 3,781. The well was deepened to 3,825 and a liner cemented on bottom. The liner was perforated from 3,808 to 3,812 and 3,819 to 3,822 and the well acidized with 500 gallons. It was recompleted for an initial potential of 211 barrels of oil, no water, in 24 hours, flowing through 20/64" choke. Similar experiences were had with the other wells shown on that section.

This evidence, to our minds, shows that the various permeable zones within the Grayburg formation in that area performed during the course of production like separate reservoirs. It definitely shows that there must be some impermeable barriers within the Grayburg formation in the Arrowhead Pool.

Exhibit 23 is a log of the Continental Ida Hendricks No. 1 in the Hendricks Pool of Winkler County, Texas. The Hendricks Pool is a southern extension of the reef ridge on which lie the Eaves, Cooper-Jal, South Eunice Pools. The well was originally

completed in 1928 at a total depth of 2,880 for an initial potential of 240 barrels of oil per day from open hole between 8¼" casing at 2,316 and a total depth of 2,880. In August, 1930, the well tested 30 barrels of oil, 1,500 barrels water, per day. During the month it was deepened to 2,973 and 7" casing set at 2,870. After the work, the well tested 300 barrels oil, no water, per day.

Exhibit 24 is a log comparison of six wells in Sections 29, and 32, Township 22 South, Range 36 East and Section 5, Township 23 South, Range 36 East. These wells indicate reversals of the normal sequence of fluids to be expected in reservoirs. In the Continental Meyer A-29 No. 4 the well was completed through perforations 3636-3648 for initial potential of 314 barrels of oil, 35 barrels of water, per day. These perforations are immediately below an interval in which a drill stem test recovered 720 feet sulfur water and 120 feet of mud.

The Continental State A-32 No. 3 was perforated from 3,526 to 3,540, and after being acidized, tested 6,510,000 cubic feet of gas per day. A retainer was set at 3,510 and the well then perforated from 3,470 to 3,490. After being acidized, it was completed for an initial potential of 322 barrels of oil per day with a gas-oil ratio of 598.

The data on these six wells, plus the Continental Hendricks, indicates that there must be impermeable barriers within the Yates and Seven Rivers formations. I believe that the formations, Yates, Seven Rivers, Queen, Grayburg and San Andres, were separate reservoirs in their initial conditions, although they were probably one accumulation.

At the April, 1951 hearing of the New Mexico Oil Conservation Commission, Continental Oil Company presented testimony and a recommendation for delineation of four shallow gas pools in southeastern Lea County, New Mexico.

Q Are you referring to Case 245?

A That is correct. Prior to presenting the testimony, engineers for Continental, and for three orther companies in partnership with Continental in certain acreage in the area, made a study of the area which continued over a period of six or eight months. A number of cross sections were made which have been presented in evidence at the present hearing; also, a structure map of the area which was presented as Exhibit I in April of 1951, and again at this hearing, and a map showing shut in pressures and sulfur contents as obtained from the El Paso Natural Gas Company similar to Exhibit 21 in this case were studied.

In studying these various items, it appeared that in crossing the reef ridge there was a major change in stratigraphy in the Seven Rivers formation and that in the Yates formation the individual sand lenses did not appear to be continuous. There was, also, at that time a differential pressure of approximately 200 pounds between wells in what is now designated as the Langmat Pool and in wells now designated as the Jalco Pool. There was, in general a difference in sulfur content the wells in Langmat running less than one grain per 100 cubic feet while those in Jalco ran up to 300. The change in pressure, sulfur contents and stratigraphy appeared to follow rather closely the low spot immediately behind the reef ridge and the boundary line

between the Jalco and Langmat Pools was placed on the combination of structure sulfur content and gas well pressures.

The boundary between the Jalco and Eumont Pools, as originally recommended by Continental was placed approximately at the boundary line between the Eunice and South Eunice Oil Pools. The area where it was drawn was comparatively undeveloped for gas at that time. There appeared to be also a division in Queen formation in the area. A similar situation existed between the Eumont and Langmat Pools. Included in the Arrow Pool was an area of which little was known so far as gas possibilities was concerned.

In re-studying the area, it was decided that certain requirements were an absolute necessity: (1) that there should not be major pressure differentials between any of the formation included within any one pool. (2) since the basic proration unit is a governmental quarter section, the boundaries should follow quarter section lines.

At the time of the original study, it was believed necessary and it is still believed necessary, to segregate the Queen and lower Seven Rivers from the Yates and upper Seven Rivers in the vicinity of the Langlie Mattix Oil Pool because of the pressure differential previously testified to.

Designating the Langmat Gas Pool as the Yates and all but the lower 100 feet of the Seven Rivers and the Langlie Mattix Oil Pool as the lower 100 feet of the Seven Rivers and all of the Queen, maintains the necessary segregation between the high pressure gas and the low pressure oil zones. The result is an oil pool with comparatively few gas wells and a gas

pool with a comparatively small oil productive area. From an administrative standpoint, it is believed that it would be easier to set up field rules for these two pools than for one big oil and gas pool.

It was believed the gas in the area designated as Jalco is primarily gas cap gas. There are numerous wells producing oil from the Yates, Seven Rivers and Queen formations. At least a portion of these formations has a water drive along the west flank and it is believed the water is coming from the west. A proration system in the pool should not allow gas wells to void more space than oil wells.

The designation as originally made is believed to have recognized the problems peculiar to each area and allows the pecularities to be recognized in establishing field rules. This should help to prevent waste and permit equitable withdrawals.

Q The Exhibits you have used in connection with your testimony, were they prepared under your direction and supervision?

A That is correct.

Q Did you work on them with anyone else?

A Yes.

Q Who was that?

A Mr. Forbis, who testified in Case 245.

Q Is Mr. Forbis available to testify in this present case?

A No, he is not.

Q For what reason?

A He is deceased.

MR. KELLAHIN: Continental offers in evidence, its Exhibits Nos. 1 through 24, inclusive.

MR. SPURRIER: Is there objection? Without objections

they will be admitted.

Q Mr. Dailey, in connection with your study in previous cases and in this present case, have you arrived at any conclusions and recommendations that you can offer to the Commission at this time?

A Yes, our original recommendation is outlined on our Exhibit 2 in which you would have a Eunice Monument Oil Pool--

Q (Interrupting) Do you mind stepping up there and pointing that out as you go along? I believe it would be easier.

A (Continuing)--which is colored in blue which would be producing oil from the Grayburg-San Andres formations and a gas pool which would include Yates, Seven Rivers and Queen. The green area would include a gas pool producing from the Yates and upper Seven Rivers formations. The orange area would be an oil and gas pool producing from the Yates, and the entire Seven Rivers formations. The pink area would be an oil pool for the Grayburg and a gas pool for the Yates, Seven Rivers and Queen. Wait a moment, yes. In addition in the vicinity of the Langmat, Langlie-Mattix Oil Pool in Townships, primarily Township 24 South, Range 36 East, there would be a Queen, lower Seven Rivers oil pool.

In the vicinity of the present South Eunice Pool, there would be a Queen oil pool. That would be my recommendation. That is substantially the same as the pools are now designated.

Q The recommendation that you just made, does it conform to present pool delineation?

A Not one hundred per cent.

Q Under the present Commission's orders?

A Not one hundred per cent but fairly close to it.

Q Would you have any objection to the present pool delineation as defined by the Commission?

A It would be necessary to remove the oil horizons or to remove the gas horizons from the Langlie-Mattix Oil Pool as presently defined. I believe the similiar situation may exist in the Eunice Monument Area as regards to the Queen.

Q Would you have any objection to the changes, I mean to leaving the areal delineation the same to take care of leases which may be bisected by the lines that you proposed?

A What are you getting at? Do you mean to move it to take care of the leases?

Q Yes.

A I would see no objections.

MR. KELLAHIN: I believe that is all.

MR. SPURRIER: Does anyone have a question of Mr.Dailey?

MR. CAMPBELL: If the Commission please, I wonder if we could defer the cross examination of this witness until the other two matters with reference to pool delineations are put before the Commission? It is my understanding that some of these Exhibits are on the same cross sections with different interpretations. I would like to request that if possible, Mr. Dailey, I am sure will be here if we could examine him after the rest of the geologists testify?

MR.KELLAHIN: We have no objections.

MR. SPURRIER: Does anyone have a question of Mr.Dailey?

MR. STANLEY: May I ask several questions?

CROSS EXAMINATION

By: MR. STANLEY:

Q I just want some information. When you talk about the reef front here in the vicinity of your Continental Jack A-29 No. 3, isn't it a true characteristic of the reservoir here that you have an active water drive?

A That is correct. We have some recent pressures on those wells which indicate a pressure of between 1,000 and 1,100 pounds which is considerably higher, I believe, than any of the other wells shown on that section.

Q I just wanted that for my own information when I testify. How would you dispose of the Queen gas wells, would you prorate them as gas wells or prorate them as oil wells?

A Mr. Lyons and I think several of the other people around here have some proposed rules. I believe that by putting in a limiting ratio factor and perhaps a definition of a gas well that those wells can be handled without any trouble.

Q In other words, they would be prorated as oil wells primarily, if you apply the gas-oil ratio?

A I don't think it would make any difference which way they were applied.

MR. STANLEY: Okay, thank you.

MR. SPURRIER: Anyone else?

By: MR. MALONE:

Q You testified, I believe, that the Grayburg contains gas which is gas cap gas in the Monument area?

A That is correct.

Q If the lower vertical limit were used in delineating a gas pool in that area which included that gas cap gas, what

would be the result insofar as dissipating the reservoir energy is concerned?

A It would result in waste in that Grayburg oil along the edges of the sides, the sides and edges of the structure would have a tendency to move into the gas cap area and saturate that with oil which would never be recovered.

Q The ultimate recovery of oil would therefore be reduced to that extent? A That is right.

MR. MALONE: That is all.

MR. SPURRIER: Anyone else? Mr. Foster.

By: MR. FOSTER:

Q I believe under the way you have delineated the area, is it true that you will find some oil wells in what you have delineated as gas pools producing oil and some gas wells in what you have delineated as oil pools producing gas, is that true?

A If I have got your question straight, that would be true.

Q In those areas where you find an oil well in what you delineated as a gas pool, do you consider the production of the oil from the oil well to the gas pool and the gas from the gas well to be coming from a common source of supply?

A Are you referring, for instance, to the Falby-Yates Pool which would be located--

Q (Interrupting) I am not referring to any one particularly, just wherever you find that situation?

A There would be places where that would be true.

Q And then on what basis would you classify one of them an oil pool and another one a gas pool when they are both com-

mon sources of supply?

A In the case of what I have recommended as, well, what would now be the Langmat oil pool which would also include the Falby, or the Langmat gas pool which would also include the Falby-Yates oil pool, the area relative, the relative area of the gas production is comparatively minor as compared to the area of oil production. I would say that the gas is the primary product.

Q Well, that might be true but what I am trying to find out is, if you have production of oil and gas from a common source of supply, both oil and gas from the same reservoir, on what basis could you classify the oil production as being from an oil reservoir and the gas production from a gas reservoir

A I am not doing that. I am calling it all one reservoir.

Q Then, you would call it all one reservoir?

A That is right.

Q Then--

A (Interrupting) And I have not made any recommendations on rules.

Q I am going to ask you for that in a minute.

A I don't have any.

MR. KELLAHIN: Just what pool are you talking about, Judge? Are you asking a hypothetical question without referenee to any of the testimony or are you referring to something in this area, if so, I believe Mr. Dailey could answer, if you pin it down.

MR. FOSTER: Mr. Dailey testified that in some of the areas that he would suggest that you designate as a gas pool

that you find you would have production from oil wells and vice versa and that in some of the areas that you designate as oil reservoirs you would have wells that produced only gas. That is what I am asking you about. Whether in those instances where you have both the oil production and the gas production from the same common source of supply, whether he would designate that as a common reservoir as I understand he says he would, but he doesn't have any suggestion on how it ought to be done.

MR. SPURRIER: Anyone else have a question of Mr. Dailey?

MR. WOODWARD: Mr. Woodward for Amerada.

MR. SPURRIER: Mr. Woodward.

By: MR. WOODWARD:

Q I believe you testified, Mr. Dailey, that in the area between the Eunice and South Eunice fields you had two wells where the Queen went below the water table, is that correct?

A That is correct.

Q If that condition extends east-west across the areas that you have shaded on your Exhibit 2, I believe, in your opinion, would you expect any communication of oil or gas laterally through the Queen as it passes below the water table?

A I would not.

Q There would be no lateral communication then from Eunice to South Eunice or South Eunice to Eunice?

A If it is below the water table there should not be.

MR. WOODWARD: That is all.

MR. SPURRIER: Anyone else? Mr. Macey.

MR. MACEY: I would like to find out if we can cross examine or if it is deferred or what we are supposed to be doing?

MR. SPURRIER: You may do so, Mr. Campbell wants permission to call him back, which he may do.

MR. MACEY: I would like to ask some clarifying questions on the pool definitions.

By: MR. MACEY:

Q Mr. Dailey, referring to the blue area on your Exhibit 2, am I right in assuming that the Eunice Monument Oil Pool as presently defined would be re-defined as being productive from the Grayburg and San Andres? A That is correct.

Q The Eumont gas pool would be the Yates, Seven Rivers and Queen? A That is correct.

Q The boundary, of course, would be the base of the Queen?

A That is correct.

Q Now, in the Langmat pool or the Langlie-Mattix Pool area, the Langmat Gas Pool would be the Yates and the upper Seven Rivers and by upper Seven Rivers I mean all but the lower 100 feet of the Seven Rivers?

A Yes, I did not specify that 100 feet exactly. I understand there is some objection to that exact terminology. I believe that could be varied somewhat to make it more readily applied than the exact term presently used.

Q Your Langlie-Mattix Oil Pool would include the Queen and the lower Seven Rivers so to speak?

A And it would include, of course, what is presently defined as the Langlie-Mattix Oil Pool.

Q Now, would you do away with the Falby-Yates Pool?

A I would include it in the Langmat Gas Pool.

Q And prorate it as an oil bearing zone in that gas pool?

A That is right.

Q The area that you have designated in orange, you may have to correct me on this, you want to call it one oil and gas pool to include all of the Yates and all of the Seven Rivers and prorate it as an oil and gas pool? A That is correct.

Q What about where that so-called oil and gas pool conflicts with the Eaves and Rhodes area as presently defined? What are you going to do with them?

A I believe that you find that the Eaves is included in that.

Q Not all of it? A I thought it was.

Q What about the portion, referring to this Exhibit, you don't have to refer to it, but this is the boundary of the Eaves Pool?

A The person would in that case extend that as far on the west side to include your productive limits.

Q In other words, the orange zone would include all of the presently defined Eaves Oil Pool? A That is right.

Q What about the Rhodes?

A The Rhodes, the El Paso can testify to that better than I am qualified to. The Rhodes, this portion of the Rhodes has pretty well been determined by the El Paso before they started their injection program, that it was separated from the Eaves Pool in here and also that there is some sort of a barrier to the north here. Such an area as that would be a separate pool designation.

Q Then, if--

A (Interrupting) It would be up to them. They are the

ones that would be most directly affected by it.

Q Let me ask you one other point. You mentioned the Queen production in 22, 26? A That is correct.

Q That is presently more or less in the general area of the South Eunice Oil Pool? A That is right.

Q Would you define the South Eunice Oil Pool as being productive from entirely the Queen zone? A That is right.

Q You redefine it? A That is right.

Q Since you have--

A (Interrupting) Whatever you call this big long one.

Q Yes, whatever you want to call it?

A That is right.

Q Is there any possibility of any Queen production under the orange acreage?

A With the possible exception of right in the vicinity of, well, it would be the north portion, the very extreme north portion of it, I would say not. That would be in the vicinity of say, Section 5, 6, 7, 17, and 18 of 22, 36 and the southeastern portion of the 31-21-36. There would be a possibility in there, I believe. There is a little disagreement as to how that Queen, exactly where the Queen point is in that area. The way we have interpreted by some of those wells would be producing from the Queen.

Q One more point, on your Arrow and Arrowhead area, the Arrow pool would include the Yates, Seven Rivers and Queen as presently defined, that is the horizontal limits and the Arrowhead Oil Pool would be the Grayburg, am I correct?

A As presently developed.

Q As far as your gas wells which are presently within the boundaries of your oil area here, is it your contention that the Commission should not allow a greater withdrawal of gas on a volumetric basis than the oil wells producing in that area?

A Of course, for waste purposes that would be correct. Or rather for purposes of preventing waste, let me put it that way.

Q You mean that in order to prevent waste, the Commission should not allow a greater withdrawal of gas from gas wells in that pool than from oil wells on a volumetric basis?

A That is right.

Q If that wasn't done, it might mean waste?

A That is correct.

MR. MACEY: That is all.

MR. SPURRIER: Anyone else? Mr. Howell.

MR. HOWELL: We would like to reserve the right to ask him some questions after we hear the proposed rules for certain pools. We might just be spinning our wheels to question the witness at this time until we hear their proposal.

MR. SPURRIER: Would you be available for cross examination at a later time, that is later today or tomorrow?

A That is later today or tomorrow, yes.

MR. SPURRIER: The witness maybe excused.

(Witness excused.)

MR. DIPPLE: If the Commission please, we wondered whether it would be appropriate to go forward with the presentation of our proposed rules at this time. We feel that whatever other testimony might come in with respect to pool delineations might possibly have some bearing on our conclusions as to

what the rules ought to be. We are not going to try to be obstinate about it. If the Commission wants us to go ahead and present our rules, we will do it. We prefer not to at this particular point.

MR. SPURRIER: The Commission feels that it is proper to put these rules in evidence all at the same time after we have taken the rest of the evidence.

MR. DIPPLE: We think so, too.

MR. SPURRIER: Do you have another witness?

MR. KELLAHIN: No, that completes our presentation at this time with the ruling of the Commission in regard to the rules.

MR. SPURRIER: We will recess until one o'clock.

(RECESS)

AFTERNOON SESSION
May 10, 1954 1:00 P.M.

MR. SPURRIER: The meeting will come to order, please. Mr. Malone.

MR. SELINGER: Mr. Selinger before Mr. Malone gets to his feet. I would like to have leave of the Commission for permission to cross examine Mr. Dailey at the time that he is returned for cross examination.

MR. SPURRIER: I guess we didn't make it clear. Mr. Dailey will be available for cross examination later by anyone.

MR. SELINGER: Thank you.

MR. SPURRIER: Mr. Malone.

MR. MALONE: May it please the Commission in response to the invitation which the Commission tacitly extended when they opened these rules for reconsideration, Gulf undertook

several studies in an effort to arrive at a solution for the problem of gas prorationing in the area under consideration which might help to eliminate some of the rather vexing problems which the Commission had met and the operators had met in attempting to put in an effective system of gas prorationing in areas where the development is as historically complete as in this area.

That study among other things included a study of the possibility of treating the entire area above the base of the Queen formation which is now included in the Eumont, Arrow, Langmat, Jalco Gas Pools as a single reservoir. At the time of the hearing last month, Gulf was prepared to present to the Commission the result of its studies to that date in connection with the possibility of so treating the area.

When the matter did not come on for hearing, the proposed plan which Gulf had under consideration at that time, was further analyzed and was applied to various portions of the field and various operators in the field in an effort to further arrive at some conclusion as to how many problems might be created by such a change. As a result of that subsequent testing of the proposal, Gulf has reached the conclusion that the problems which it would raise exceed those which it would solve, and that in general the program which will be presented today is the best solution which is available under the circumstances.

That program, I might say, primarily consists of a recognition of the existing areal and vertical limits of the gas pools in this area, with the exception of the boundary between the Jalco and Langmat Pools. I would like to also say

that Gulf heartily supports the Commission in its efforts to put into effect an allocation of gas production in this area and wishes to assist in any way that it can.

The evidence which Gulf will present today will, as I say, support the existing vertical and areal limits of the present pools with the exception of the boundary between Jalco and Langmat and some minor exceptions as far as the analysis is concerned. It will support the existing limits, lower vertical limit insofar as the basis of the Queen is concerned, and will prove we feel conclusively that the Grayburg and San Andres constitute a separate reservoir which must be treated and prorated as such, that no portion of those formations should be included in the orders which may be issued or the pools which may be recognized above the base of the Queen.

We also have prepared some pressure studies and some geological studies which will be presented in that connection. We have to suggest some minor changes in the rules as they now exist which we hope might eliminate some of the difficulties that the Commission is now encountering. I ask Mr. Boss and Mr. Ross and Mr. Walker be sworn.

(Witnesses sworn.)

R. L. B O S S

the witness, having been first duly sworn, testified as follows:

DIRECT EXAMINATION

By: MR. MALONE:

Q Will you state your name to the Commission?

A R. L. Boss.

Q Where do you live, Mr. Boss?

A Fort Worth, Texas.

Q By whom are you employed?

A Gulf Oil Corporation.

Q In what capacity?

A As assistant division geological supervisor.

Q How long have you been employed by Gulf, Mr. Boss?

A Between 25 and 26 years.

Q Were you located in Lea County for a substantial period of time?

A Yes, sir, I was transferred to the Hobbs office in January of 1936.

Q How long did you continue to be in charge of that office?

A Until my transfer to the Fort Worth office in the early part of 1952, I was in charge of the geological office in New Mexico, except for the first two years between '36 and '38.

Q Could you estimate, Mr. Boss, the number of wells that were drilled by Gulf in this general Lea County area under your supervision while you were in Hobbs?

A It would approach somewhere between four hundred and five hundred wells, I believe.

Q You are familiar with the development of the area and the geological information disclosed by that development?

A Yes, sir.

Q Have you, in connection with a study of the reconsideration of the rules in these four pools made a study of the geology as it would relate primarily to the designation of gas pools?

A I have.

Q Have you made that in preparation for testimony at this

hearing? A That is correct.

Q As a basis for that testimony, will you briefly summarize your conception of the general geology of this area referring to Gulf's Exhibit 1, which is on the wall over here to the right of the stage?

A The stratigraphy of this particular area under consideration is relatively complex, particularly the late Permian. There has been some reference to the problems that develop as a result of the complexities by some of the earlier testimony. However, I think, possibly an enlargment might be in order.

The Permian reefs that grew around the margin of the Delaware basin during the time in which the sediments were deposited during the Tansil, Yates, Seven Rivers, Grayburg and San Andres time materially effected the type of deposits that occurrred throughout this area. The great Capitan Reef, particularly, had a very dominant influence. Different types of sediments were being deposited at the same time in closely associated areas so that in attempting to establish correlations from one to the other, we go through a rapid gradation which makes correlation very difficult. While we recognize a number of the formations in certain areas, there are others that the characteristic lithology has been entirely changed through this gradation.

Southwest of Carlsbad, in the Guadelupe Mountains where the reef comes to the surface and is exposed through the steeply disected canyons that traverse it, we have an example found few other places in the world to study reef development and here the complexity of these gradations can be observed. Although a

great deal of work has been done on the surface area there is still a great many controversies rage as to the correlations to be established in these beds that were apparently being deposited at the same time. We do recognize however that these gradations do occur and in carrying beds from the back reef into the reef, they can be traced and disappear entirely into the massive reef complex.

We have this same problem in southeastern New Mexico here in the area with which we are concerned. Although the Yates can be recognized, the Yates and Seven Rivers over much of this area, apparently we are a little, just a little back reef here so that the Yates has not disappeared entirely into the reef complex. However, the older formations, the Queen, Grayburg, in the area we are concerned with appear to show the effect of this gradation and cannot be definitely identified through a great portion of the immediately back reef province, particularly through the Jalco, what is not the Jalco area.

Unfortunately, most of the wells don't go deep enough to augment this study but the few that have penetrated the upper Permian sequence indicate or suggest that these complexities do exist. Although we do recognize the Yates and Seven Rivers through this area, or they can be identified, we do recognize these poor gradations and they effect the reservoir characteristics of these formations very much. The grade from the reef area through the Yates sands, particularly, grade eastward they shale out, the dolomites in the Yates grade eastward, I am speaking in the southeastern part of the county or in the direction at right angles to the reef, let me put it this way, so that the

maxium gradation occurs at right angles to the reef and this gradation occurrs very rapidly. The gradation through the Yates and Seven Rivers accounts for the pinch out of the porosity in those members and accounts for the eastern limits of the gas pools that are set up.

Q Would you now take the pointer and go up and explain to the Commission the information which is shown on Gulf's Exhibit 2?

A To continue with some of the structural features of this area, there are two dominant structural north, south trends that were pointed out earlier. One along the western margin here and one through Range 37 East, approximately toward the eastern part in the south and greatly diverging toward the north. These two trends culminate or coalesce and culminate at Monument in the formation of the Monument structure. At that point or that area we have the highest structural elevations of any place in the entire area. Although there are local highs along these trends, the general picture is one from Monument southward, a general southerly gradient. Oil and gas accumulated in the porous members of the formations, the shallow Permian formations, up to the Yates and, pecularlarly enough to this area, the gas-oil contact occurred at a relatively uniform point with reference to sea level. Throughout most of the area this average datum is approximately minus 200 feet. Similarly, there is a fairly uniform oil water contact which can be identified over much of this area and that is in the magnitude of 350, 375 feet below sea level.

This is not a hard and fast rule, of course. In the

first place porous beds had to occur at that depth before oil would occur in them. Also there are notable variations of oil occurring above that depth. The most pronounced or local areas which are enclosed lows comparable to the Falby-Yates, the Leonard Lane Hart area just east of Jal and some local areas along in what is now the Cooper-Jal field.

Also on the extreme western limits of the producing areas there are similiar regular datums that do not conform to this general average that is so common throughout most of the area. This uniformity would argue that over past periods of geologic time there must have been some communication between the formations. However, for the present or at least the life of these fields, we think there is ample evidence to indicate that no longer does communication exist and we intend to introduce evidence to support that contention.

This Exhibit No. 1 merely shows the presently defined limits of the gas pools in southeastern Lea County. In addition are shown the general area of the oil pools which are found in this same area. The key to the cross sections which will be introduced later are also shown on this Exhibit.

Q Will you identify in the area shown on the Exhibit the formations which are producing gas and oil in the area at the present time?

A In the Eumont gas area, the presently defined gas limits are the Yates, Seven Rivers and Queen formations. The Eunice and Monument oil fields are producing primarily from the Grayburg and San Andres formations. As pointed out by previous testimony there are, along the margin, some wells producing oil

from shallower horizons. However, in general the major producing formations are those as stated.

Similarly in the Arrowhead areathe Arrowhead Pool produces oil from the Grayburg formation except on the extreme western margin where some of the basil Queen beds are in the oil column. However, by far the greater portion of the field is Grayburg. The gas produced in the Arrow field which occupies essentially the same position is generally from the Yates, Seven Rivers and the regulations specify the top 200 feet, I believe, of the Queen. There is the difference between Arrow and Eumont in the lower portion of the Queen not being present or constituting the gas pay of the Arrow field.

In the Hardy area the production there, the oil production is primarily from beds of Queen Age. There may be some Grayburg on the margins but that is another local low area in which the Queen is productive. The Penrose-Skelly is producing oil from the Grayburg in the northern portion and the Queen in the southern portion. The Langlie-Mattix Oil Field is primarily a Queen sand production although on the extreme western margins there is some lower Seven Rivers sand production.

Leonard and South Leonard are Queen, the Falby-Yates is a local low or the Yates is productive of oil. South Eunice oil field is primarily Seven Rivers production. There maybe some Queen in the northern end but there again it is a matter of correlation or interpretation as to what portion of the section is productive. Cooper-Jal again is Seven Rivers with some eratic up Seven Rivers or Yates locally. The Eaves the same way. Throughout the Jalco gas pool, the presently defined limits are

the Yates and the Seven Rivers excepting the lower 100 feet. Similarly the Langmat is the Yates and upper 200 feet of the Seven Rivers.

Q Directing your attention now, Mr. Boss, to the boundary which delineates the Langmat, the common boundary between the Langmat and Jalco gas pools, have you made a study to determine whether or not you can support, from a geological point of view, the existence of that boundary as between these pools?

A During the initial stages of the development of delineations for these pools that was one of the major points of controversy among a number of the operators. Actually, based on geologic facts, it is very difficult to have any sound basis for that line. It is Gulf's original statement that they felt that that line could not be substantiated by geologic evidence although they would have no objections if it was generally felt that it should be placed there.

Q Has your opinion as to the lack of geologic evidence changed in the meantime?

A No, sir.

Q You were the chairman of the Geologic Committee which made recommendation with reference to the proposed rules?

A Yes, sir.

Q Can you state the basis on which that line was recommended by that Committee?

A Well, the committee merely took a previous recommendation that had been made by members of the various operators and since they were generally acceptable they were recommended with slight modifications. There was considerable discussion about

the validity of that line but at the time the original recommendations of Continental and the other members of the Federal Unit were recognized and no particular objection was raised.

Q Did the existence or non-existence of sulfur and gas in the area have anything to do with that original delineation?

A That was primarily the basis for which the separation was made since there was very little geologic evidence to substantiate it. In view of that there was some evidence to support the line initially. However, it certainly would be difficult to prove on a sound geologic basis that the line should be there.

Q In the light of that testimony what would be your recommendation to the Commission insofar as the continuation of that boundary is concerned?

A Our opinion in that matter has remained essentially the same except before where we said we would go either way in this instance, we are recommending that that line be removed.

Q Turning now to Gulf's Exhibit 2, will you designate Gulf's Exhibit 2, with your pointer up there, please?

A This is Exhibit 2, which is a stratrigraphic cross section extending from the central portion of Township 35, 37 East in the Langmat field extending northward up through the Langlie-Mattix, Penrose-Skelly and across into the Eunice and the northern boundary of the Monument Field.

Q Indicate the wells shown on Exhibit 2 on Exhibit 1 as they come down through those fields.

A This line of red dots are the wells in the section and are connected by this black line and represent this series of

wells in Exhibit No. 2.

This Exhibit was constructed from sample logs, representative sample lots throughout this area. I might point out that the southern half or approximately the southern half are cable tool logs. The northern section which is primarily up through the Eunice Monument field have few cable tool logs available, so these are rotary samples.

This cross section shows in general this relationship extending from the crest of the Monument structure southward, the major structural elevation here in Monument and the southern gradient, the oil and gas referred to this red line, the oil and gas contact, this average oil and gas contact as indicated here at a depth of 200 feet below sea level. In the Eunice and Monument fields that was found a very practical point to set pipe without having excessive rations. By the same token the lower limit of 300 or so feet was set up just arbitrarily. You would figure your total depth of your well to that point and the wells were drilled to that area regardless of what formation they might have bottomed up in. The cross section attempts to portray the intersection of various formations with this gas-oil contact, such that you could have depended on the structural position of the well, find oil in various formations.

It is particularly important to note that at no point south of the Eunice area, we modify that, except for one local point south of the Eunice area in the northern part of Hardy, the Grayburg is not productive of oil. It occurs at too low, generally too low below the oil-water contact or where it might occur in a proper position such as here which is in

Gulf's A Munion area in the Teague field here in 23, 37 or at this Buffington well which is here in 25, 37. There the Grayburg did not have sufficient porosity developed to afford a reservoir, as a consequence it carried no fluids.

Q Based entirely, Mr. Boss, on your geology of the area and without reference to Gulf's Exhibit 2, at the moment, what was your opinion as to whether or not the Grayburg and San Andres were part of a common reservoir with the Queens formations above it?

A In attempting to make correlations this section was extended along the eastern limits here where this gradational phenomena does not interfere with the recognition of the various formational units. They can be correlated satisfactorily. Here, you are going in a direction parallel to the general reef trend and rather uniform conditions existed there and you can correlate with some degree of purity to the various formations.

As a consequence we have no trouble in recognizing the top of the Yates across here. Also, in that major sandy sequence which most of us in the early days and, I think, at present recognize as the top of the Queen. This upper sand was designated by various companies by their own particular terminology. The Amerada called that sand, I believe, the Steward Sand because of the oil production down in the Langlie-Mattix on the Steward well.

The Gulf called it the Knight Sand because of the production on the Knight lease, but in general it is a re-

cognized unit and is recognized by most observers now, on the top of the Queen. There are two major sand members in the Queen, the upper one and the lower one which has been rather uniformly referred to as the Penrose Sand Member. Now, unfortunately the entire Queen formation has not been described adequately in the literature or anywhere else, so that just what constitutes the entire Queen sequence is still somewhat controversial.

However, many of the early workers were generally agreed that the base of this sandy sequence was about the top of the Grayburg. It was easily recognizable in many places and because of the distinct change in lithology. In one of the most sidespread and diagnostic things lithologic suite that occurred here was a series of bentonitic shales that occur. They can be traced over a great scope of country at this approximate position. There are other bentonitic in the section. There is one zone here at the top of the Queen that is fairly persistent, but this one particularly here seems such a persistent thing and occurs at the same approximate stratrigraphic position that it was used by us in helping identify the top of the Grayburg.

Q Will you describe that shale to which you have referred. What is the general nature of the formation?

A Well, it is generally a waxy green shale. It is readily identified from any type of samples. In the cable tool wells here it shows up very nicely. It is this elitrope color bed or beds indicated on the secion, possibly it came

to agree and that is why it is represented so well in the cable tool wells.

In the rotary wells, it is usually represented by possibly only five to ten percent of the sample. It is pretty persistent and we feel that is is generally in place at that point in the section. The only cores we have through that contract are here at this Buffington well which was drilled back in the early part of 1937, I believe or the late part of 1936 and that section was cored, drilled with cable tools down to some point within the Queen here and then, because of mechanical difficulties, we had to move in a rotary and the remainder was drilled with rotary tools.

But this portion of it was cored and although we had very poor recoveries with those conventional cores, we did recover enough here to indicate that those shales were present. In fact, in this one well, we have one zone up to four inches in thickness of these bentonitic shales. We have illustrated this zone since we think it is a persistent zone and an impervious zone from its very lithologic character by this cross hatched section.

We don't mean to infer there is a zone some 60 feet in thickness uniformly across the whole area that separates the two but within that interval you usually find these bentonites and for that reason we think it represents an impermeable barriers because of its lithologic character and its continuity Since that occurs at the top of the Grayburg and throughout the Monument, Eunice Monument area, the Grayburg is a major oil producer, the Grayburg in the underlying San Andres. We feel

then that affords a definite separation between the Grayburg and the overlying sequence. As pointed out by earlier testimony of Continental at the crest of the Monument structure much or most of the Grayburg which would be right here is in gas cap. That is nicely illustrated by this section where even the upper part of the San Andres might be in the gas cap at this particular well.

Q May I inquire right there, Mr. Boss, if a lower vertical limit for a gas pool included that gas cap portion of the Grayburg, what would result so far as the energy for producing oil is concerned?

A Of course, the oil in the Grayburg reservoir would not be fully recovered by the loss of the energy which would be dissipated by the production of that gas.

Q Is it your opinion then that the impervious zone to which you have testified constitutes a division and a barrier between the Queen formation and the Grayburg formation and could serve as a lower vertical limit for a gas pool in the Queen?

A That is true. We have additional evidence to be introduced by our following witness to substantiate that through reservoir performance. So, that we then strongly recommend that the Grayburg and San Andres in what is now defined as the Eunice Monument oil field be designated as an oil reservoir.

Q What is your opinion as to practicability of the use of a datum in that Eunice Monument area as a delineation or vertical limit of the pool?

A Well, in view of the steepness of the structure and

also the somewhat irregular shape of the Monument structure, there is two sort of loands. If you would recall from one of these earlier structure maps it makes it a very difficult matter to set up any datum or series of datums that would satisfy this condition of eliminating the Grayburg. In other words, it might have to be done on a quarter section basis or some such plan as that which would make it very tedious and very complicated.

Q It is then, as I understand your recommendation, that the lower vertical limit of the gas pool should be at the base of the Queen?

A That is correct.

Q Will you refer to Gulf's Exhibit 3 and state its relation to Exhibit 2?

A Exhibit 3 is merely another cross section across the Monument to illustrate the same point that was brought out here. It was merely drawn to indicate that you could make the same correlations and put the same markers across and you have the identical relationships here that you have in this section here.

Q Did you find the bentonitic shale to be present in those samples in substantially the same amount?

A Yes, sir, we did.

Q Referring back now to Gulf's Exhibit 1 for a moment. I failed to ask you with reference to the vertical limits of the existing gas pools. You have recommended that the common boundary between Jalco and Langmat be eliminated. What, if any recommendations, do you have with reference to the vertical limits of the existing pool?

A I think that the present vertical limits of the Eumont field should be retained. They appear practical and they have been followed by the operators in completing wells in that pool to date and represent the most feasible solution to retain those in their present status.

In the Arrow gas field since essentially the same conditions exist, it would be my recommendation to extend the lower limits also to include the entire Queen formation. You have the identical conditions in Arrow that you have in Eumont with respect to Grayburg being the major oil producer and along the fringe you might have a little basic production.

As to the other gas pools, it is my recommendation that they remain essentially as stated in the present regulations with the possible exception of the upper most limits. The present limits in all of them start with the Yates formation.

Now, in the, particularly the Jalco, what is now the Jalco area, the Tansil formation or the Brown lime as it is frequently called, is gas bearing. During the early days of the drilling of the Cooper and Jal fields wells blew out when they encountered that Brown lime. Due to the gradational phenomena that dolomite in the Tansil isn't present in Eumont or much of some of the other fields, but through Jalco and Langmat it is present and could be a source of gas and since there appears to be no reason to separate it from the underlying Yates, I think that it would be my recommendation to include the Tansil as part of the gas pay. That, also has a

practical application in a number of instances. The Commission has gotten after a number of us operators for exceeding the vertical, the lower limits of some of these gas pools. We have had to plug back wells even though we thought they weren't producing any gas from the lower limits.

By the same token a number of wells have casing set up in the Tansil. It would certainly be waste to cause them to run a liner or packer or something to case off that portion of the Tansil which is thereby exposed. So, it would be our recommendation to include the Tansil in all the presently defined gas fields.

Q With reference to the area which is now included in the Jalco Gas Pool, do I understand it to be your recommendation that the present vertical limits of the Jalco Gas Pool be retained and that the separate oil pool as now classified be likewise retained?

A That is correct. The Jalco Gas Pool, by the elimination of this line, we would have then one separate pool combining both Jalco and Langmat.

Q It is your recommendation that the present delineation of oil pools in the area be retained as at present?

A That is correct.

MR. MALONE: That is all.

MR. MALONE: We offer in evidence Gulf's Exhibits 1, 2, & 3.

MR. SPURRIER: Without objections they will be admitted.

MR. MALONE; We ask the Commission indulgence for not asking whether the Commission felt that Mr. Boss's qualifica-

tions were acceptable to the Commission.

MR. SPURRIER: Does anyone have a question of Mr. Boss?

MR. FOSTER: I have a few questions.

MR. SPURRIER: Judge Foster.

CROSS EXAMINATION

By: MR. FOSTER:

Q Mr. Boss, you testified about the sample logs that you examined there in connection with your Exhibits 2 and 3, I believe?

A Yes, sir.

Q How did you classify those logs, as interpretive or percentage logs?

A Those are percentage logs.

Q Percentage logs?

A Yes, sir.

Q Just one other question. If I understood Mr. Malone correctly at the last hearing, Gulf at that time was prepared to present testimony to the effect that the productive area in these gas pools and their underlying oil pools comprising the Yates, Seven Rivers and the Queens was all one common reservoir, did I understand that?

A I don't believe that was introduced as evidence.

Q I don't think it was either, but he made a statement to that effect. That is what I am asking you about.

A I beg your pardon.

Q I believe Mr. Malone made a statement at the beginning of Gulf's case here that since last month, the last hearing, that they had decided not to recommend that the Jalco, Eumont,

Arrow and Langmat be considered as all one reservoir.

MR. MALONE: If it please the Commission, I believe my statement was that we were making a study as to the feasibility of treating it as one, and we concluded that the problems exceeded the solution.

MR. FOSTER: I understand that. That carries with it the implication, of course, that could be more advantageous as far as the problems are concerned to treat it as separate pools rather than to treat it as one.

MR. MALONE: That is our recommendation.

MR. FOSTER: That carries with it the implication to me that it is in fact all one pool, otherwise there would be necessity for treating the matter on the necessity end of it rather than the actual fact, actual situation. That is what I was inquiring about and from this witness.

Q (By Mr. Foster) I understand at the previous hearing that Gulf would have testified they would have recommended that the gas pools that we are talking about, the four gas pools be treated as one pool and regulated as such, is that correct?

A We had investigated the possibility and while we recognized that there were undoubtedly barriers between various formations, we didn't feel that we could introduce adequate testimony to indicate that they might be separated.

Q You had prepared a suggested set of rules embodying that, had you not?

A I believe that is correct, however none of this was introduced as testimony. I fail to see--

Q (Interrupting) It is getting in there now. You had

prepared a set of rules to submit to the Commission based upon the fact and the statement that Jalco, Eumont, Arrow and Langmat were all one pool above the Grayburg San Andres?

MR.MALONE: I have no objections to Mr. Boss's answering any questions that he can answer along the line that Judge Foster is asking, but I merely want to suggest that we have later witnesses who have personal knowledge of the matters to which he is inquiring that can testify to those facts. I believe Mr. Boss had nothing to do with the rule.

MR. FOSTER: If he don't know, he can testify to that, if that be the situation.

Q You had prepared those rules, that is Gulf had?

A Gulf had prepared a set of rules.

Q That contained the setup that I have suggested here and recognized that the four gas pools I am talking about were all one common source of supply?

A I believe that is essentially true.

Q Now, then, you say your further study of the matter has convinced you that you would run into more problems by treating it as one common source of supply than you would by treating each one of these pools as a separate source of supply, is that correct?

A I am not qualified to answer that question.

MR. FOSTER: Okay, that is all I have.

MR. SPURRIER: Anyone else? Mr. Selinger.

By: MR. SELINGER:

Q As I understand your testimony, as a geologist, you are recommending from a geological point of view that the pre-

sent vertical and horizontal limits as now classified by the Commission be retained except in three instances. One, that in the Arrow gas pool that the lower limits of the classified gas vertical limits be lowered to include the lower portion of the Queen. Second,that in the Eumont Gas Pool that the Tansil be included as part of the gas pay and Third, that the present vertical limits of the Jalco be followed in the combined Jalco and Langmat gas pool. Is that correct?

A That is correct, yes.

MR.SELINGER: Thank you.

A There is a slight variation there, George. I think my statement was that the Tansil should be included in all the gas pools.

Q (By Mr. Selinger) Whether it is in Eumont or otherwise?

A That is right.

Q But substantially then your testimony, from your investigation at this time as a geologist, is that the present limits except for these three or four demarcations be continued by the Commission?

A That is correct.

MR. SELINGER: Thank you.

MR. SPURRIER: Anyone else have a question of this witness, Mr. Stahl.

By: MR. STAHL:

Q Mr. Boss, in your examination of the Jalco pool, also the Langmat Pool, did you have opportunity to examine the effective communication that might exist in the Jalco Pool as between the northern portion of it and the southern portion of it?

A Do you mean the effective vertical communication that might--

Q (Interrupting) No horizontal communication in the reservoir?

A In the northern part of what is now identified as the Jalco field, the present separation was based on attempting to separate the area where the Yates, Seven Rivers and Queen would be productive of gas as opposed to this area where just the Yates, and Seven Rivers would be productive of gas. It was felt that that constituted a sufficient or valid enough separation since possibly the increased reservoir by the addition of the Queen should separate it from an area where just the Yates, and Seven Rivers was productive.

Q I don't think we are together, Mr. Boss. Taking what is now the Jalco reservoir or the Jalco Gas Pool by itself, in your opinion, is there effective communication between the northern portion of it and the southern portion of it?

A That would be difficult to say over an area that extensive. I think you have over that scope of country, you have enough gradation in your lithologies there that it would be difficult to establish if there was a communication entirely through that in the same zones.

Q Since it is a rather unusually shaped pool in that it is rather narrow and quite long, is it possible that there might be some permeability barriers existing in it, even though they may be rather localized?

A Oh, I think definitely there are.

MR. STAHL: Thank you.

MR. SPURRIER: We will take a short recess.

(RECESS)

MR. SPURRIER: Are there any other questions of Mr. Boss, Mr. Macey.

By: MR. MACEY:

Q In the Arrowhead, Arrow area, your recommendation was to change the present vertical limits of the Arrow gas pool to include the entire Queen section. Are there any oil wells producing from that lower Queen section within the present defined limits of the Arrow gas pool?

A The wells on the extreme western limit possibly have the basal portions of the Queen exposed. However, it is my opinion that where they are exposed, where that portion of the Queen is exposed that the gas is coming from the interbedded porous dolomites rather than from the sands and that the sands are the gas bearing formations in the Arrow field. In their explotation undoubtedly the sand portion would be that part of the formation that would be exposed.

MR. SPURRIER: Anyone else have a question of Mr. Boss? If not the witness may be excused.

(Witness excused.)

J O H N L. R O S S

the witness, having been first duly sworn, testified as follows:

DIRECT EXAMINATION

By: MR. MALONE:

Q Will you state your name, please?

A John L. Ross.

Q Where do you live, Mr. Ross?

A Fort Worth, Texas.

Q By whom are you employed?

A Gulf Oil Corporation, Fort Worth Production Division.

Q What capacity?

A Special Petroleum Engineer in charge of the Reservoir Engineering Activity.

Q How long have you been so engaged?

A I have been employed by Gulf, approximately, 6 years.

Q You have testified previously before the Commission?

A I have.

MR. MALONE: Are the witness'es qualifications acceptable to the Commission?

MR. SPURRIER: They are.

Q In preparation for this hearing, Mr. Ross, have you made any study to determine the engineering validity or the validity from an engineering standpoint of the present common boundary between the Jalco and the Langmat Gas Pools?

A I have.

Q Will you state the nature of the study and conclusions which you have reached?

A We made an investigation to try to determine if the line separating the Jalco and the Langmat gas Pools could be substantiated from a reservoir engineering standpoint. We found from an investigation of pressures that line as it is so placed could not be substantiated. We recognize the fact that the Jalco Pool in general, is lower pressure than the Langmat Gas Pool. However, we believe that is due to withdrawals, relative withdrawals from the two areas. If you examine pressures

directly across the line now separating the two pools you find very little pressure differential directly across the line. The pressure change is a gradational effect occurring west to east.

Therefore from a reservoir engineering standpoint, we can not substantiate the line between the two pools and recommend that it be eliminated.

Q Have you, in that connection, considered the possibility that varying sulfur content of gas might be the basis for such a delineation?

A We also investigated that phase of it and by that investigation we were not able to substantiate the line as it is currently drawn between the two pools.

Q Is that also a very gradual gradation?

A It appears to be a gradual gradation. It is very hard to determine the cause of the varying H-2 content within both areas.

Q From an engineering standpoint, what is your recommendation to the Commission insofar as that boundary is concerned?

A That the boundary between Jalco and Langmat Gas Pools be eliminated and the two pools be combined as one.

Q Have you, Mr. Ross, in preparation for this hearing made any study with reference to the lower vertical reservoir now included in the Eumont, Arrow, Langmat and Jalco Gas Pools?

A I have.

Q Will you state the nature of the investigation which you have made?

A Reservoir engineer has three tools that he can use to determine whether reservoirs are in communication. One of the

tools we have mentioned briefly is a fluid content or fluid characteristic, another of the tools would be core analysis and another tool would be pressure performance.

The Gulf Oil Corporation has cored several wells in this particular area that we are discussing. As Mr. Boss has pointed out we have cored contacts between formations. It is not our policy in the engineering laboratory to analyze the contacts if from a visual inspection, they are apparently barren of any oil or gas production. In our laboratory we will analyze that portion of the pay that from a visual inspection appears to be pay, for that reason we do not have any actual permeability measurements of the contacts between these various formations but we are fairly well assured that, particularly between the Queen and the Grayburg, that bentonitic shale is impermeable from visual inspection of cores.

Q Were the studies which you made designed to either support or refute the existence of the barrier to which Mr. Boss has testified?

A Mr. Boss has testified that there is a barrier existing between the Queen and the Grayburg formations. Now, if that is true from a reservoir engineering standpoint, we should be able to substantiate that barrier and we have been able to do so, and subsequent testimony I think will prove the fact.

Q Will you now, go up to the platform and refer to Gulf's Exhibit No. 4. State what that Exhibit is and in what connection it was prepared?

A Gulf's Exhibit No. 4, is a map outlining the Eunice Monument Oil Field in blue and the Arrowhead Oil Field in green.

Posted on this map in brown are oil well pressures from a 1953 bottom oil pressure survey. In addition in particular areas are posted bottomhole pressure measurements of gas wells producing from the Eumont gas field.

The purpose of this and the following Exhibits is to prove that a pressure differential exists between the Yates, Seven Rivers and Queen, and the Grayburg-San Andres formations. These Exhibits are designed to show that that pressure differential is such that communication vertically between these two reservoirs is not possible during the producing life of these fields. If you just take a general look at the pressure performance you might not establish that fact.

In the Monument Field, for example, we have relatively high bottom hole pressures even today. Pressures range as high as 1200 pounds in the Monument Pool. The reason being a very effective water drive in certain areas. Now, if you were to examine an oil well pressure of 1200 pounds and by the same token know there was an offsetting gas well there of the Queen that had a shut in rock pressure of 1200 pounds, you might assume that there was no segregation between the Queen and the Grayburg.

In order to fully analyze the problem, it is necessary to break the entire area down and investigate particular areas and these yellow blocks designate particular areas that we have investigated and have drawn pressure performance curves for. We have Exhibits 5 through 11, pressure performance curves for each of the areas designated in yellow on Exhibit No. 4.

Q Will you continue then with your presentation of the pressure differentials which were disclosed by your study?

A The average arithmetic bottom hole pressure of the well designated on this map in brown in the Eunice Monument Oil Field is 854 pounds. The average arithmetic shut in surface pressures of gas wells located in the Eumont gas field during 1953 was approximately 854 pounds. I am sorry was, approximately 1,009 pounds, therefore there is a pressure differential using those arithmetic averages of 155 pounds per square inch between the Grayburg Oil Reservoir and the upper overlying gas reservoir. That doesn't appear to be much of a pressure differential. But now when we examine these particular areas we find that we described it this water drive, high pressure area in the middle of the Monument Pool and when we do that we find that a considerable pressure differential does exist between the Grayburg Oil Reservoir and the Queen and overlying gas reservoirs. The first area, I would like to call your attention to, is the Gulf, the Shipp No. 1, located in Section 21, 19 South, Range 37 East. On this pressure performance curve which is a plot of reservoir pressure in pounds per square inch, all bottom hole pressure measurements versus time, the bottom hole pressure of the gas well which is completed in the Yates, Seven Rivers and Queen is designated by the red on this performance curve.

The arithmetic average bottom hole pressure of the Monument Oil Pool is denoted on this Exhibit in brown. The pressure performance of Shell State H No. 1 oil well which is two offsets to the southwest from the Shipp gas well is shown in green. Now, this performance curve indicates that between

the Gulf Shipp gas well producing gas from the upper horizons and the Shell State H No. 1 oil well producing oil from the Grayburg or lower horizon, there existed a pressure differential of 530 pounds. There existed a pressure differential from the Shipp producing from the Queen and the Monument Pool, average bottom hole pressure, there was a pressure differential of 366 pounds. That indicates beyond any reason of doubt that those two reservoirs aren't in communication vertically.

The next area, I would like to call your attention to is the area of the Gulf Bell Ramsey B No. 1 gas well located in Section 29, 20, 37. Its pressure performance is denoted in red on this performance curve. The average arithmetic bottom hole pressure of the Eunice Oil field is denoted in brown and the pressure performance of the Gulf Sunshine No. 2 Oil Well producing from the Grayburg is designated in green.

The Sunshine well is located 4 locations west of the Bell Ramsey B-No. 1 gas well. This curve shows that between the Sunshine Grayburg oil well, the Bell Ramsey B- No. 1 gas well producing from the Queen there exists a pressure differential of 575 pounds. Between the Eunice arithmetic average bottom hole pressure and the Gulf Bell Ramsey No. 1 gas well, there was a pressure differential of 315 pounds.

I would like to call your attention to the fact there is an increase in bottom hole pressure shown on these curves in the Eunice field. The reason for that in January, 1953, the operators turned to a key well survey in the Eunice field utilizing the most efficient wells, the wells that weren't pumping to reduce the cost of obtaining those pressures. There-

fore, during this survey the more efficient the wells having the higher bottom hole pressure were pressured and only 55 wells were so tested during this last survey and that accounts for this increased bottom hole pressure.

The next area, I would like to call your attention to is the area of the Gulf Orchid B-No. 2 gas well. We have used bottom hole pressures. In order to use bottom hole pressures both for the gas and oil section, we have used Gulf gas wells entirely. Those were the only wells, only gas wells on which we have bottom hole pressure measurements, that is the reason for our using the Gulf gas wells. The Orchid B-No. 1 gas well is located in Section 5, 21 South, 36 East, as shown in this yellow square. Its pressure performance, bottom hole pressure performance, is denoted by the red line on the performance curve. Again the bottom hole pressure curve for the Eunice Pool is in brown.

The orange curve reflects the bottom hole pressure of Orchid B-No. 2 oil well producing from the Grayburg which is a direct east offset from the gas well we are analyzing. In addition to that in green on this performance curve, we have posted the pressure performance of Orchid B-No. 1 when it was producing as an oil well. That well was plugged back from the Grayburg and converted to gas well in the Queen in 1951. As a result of that conversion the pressure increased in that well bore, the bottom hole pressure increased in that well hore approximately 500 pounds. That is the most conclusive evidence I know of to show that there is no vertical communication between the reservoirs in question.

In other words, within the same well bore a pressure differential of approximately 500 pounds was noted at the recompletion of the well plugging back from the Grayburg and exposing the Queen if there were communication. If there was communication between the Queen, the Yates, the Seven Rivers and Queen and the Grayburg, such a pressure differential could not exist. Exhibit No. 8 reflects the same type information showing the bottom hole pressure history of the Gulf Molly Campbell No. 2 gas well located in Section 7, 21, 36. The Gulf Houston No. 2 oil well producing from the Queen is shown in orange and it is two offsets to the east. The arithmetic average Eunice Pool bottom hole pressure again is reflected by the brown line.

Now, I would like to call your attention here to this green line on this performance curve. Molly Cambpell No. 2 was another oil well that was converted to a gas well by plug back operations. It was converted June, 1951. You will note that there was no increase in bottom hole pressure as a result of that plug back. The reason is, being on the southwestern flank of the Eunice structure, it had basal Queen exposed when it was producing as an oil well. All our bottom hole pressure measurement reflected the higher pressure in the well bore or the pressure of the Queen formation. That is the reason here that we didn't experience a pressure increase because the Queen was exposed, but between the Houston Oil Well from the Grayburg and the Campbell gas well from the Queen there exists now a pressure differential of 567 pounds per square inch.

Exhibit No. 9 shows the same type information with

regard to Gulf's Leonard A. No. 3 gas well located in Section 22, Township 21, Range 36. Again, its the performance bottom hole pressure performance is indicated in red.

I would like to point out one more thing. The performance of our gas wells you will note is shown over only two years life. The reason for that is we didn't start taking bottom hole pressures on these gas wells until two years ago. On this curve is shown the bottom hole pressure of the Gulf Janda C-No. 3 oil well designated in the orange line. That well is a diagonal north west offset to the Queen, Yates, Seven Rivers gas well. You will note between these two wells a pressure differential of 685 pounds exists. This curve also has posted the performance and history of the Eunice Oil Field and in addition it also reflects the bottom hole pressure performance of the Gulf Leonard A No. 3 oil well, when it was producing oil from the Grayburg. It was plugged back in 1951, converted to a gas well from the upper Queen, Yates and Seven Rivers. As a result of that plug back we experienced the same pressure increase that I called your attention to on a previous Exhibit.

There was a pressure increase of 696 pounds within that well bore. Again that established the fact that there can't be pressure communication between the two reservoirs.

Exhibit No. 10 shows the bottom hole pressure performance of the Gulf Ramsey B No. 2 located in Section 25, 21 South 36 East. We have gone now from the Eumont gas field to the Arrow gas field. These last two Exhibits are in the Arrow gas field. They reflect there a pressure differential between the Yates,

Seven Rivers and Queen in the Arrow Gas Field with respect to the underlying Grayburg Oil formation in the Arrowhead Oil Field. On this curve we have the bottom hole pressure of the Arrowhead Oil Pool, arithmetic average bottom hole pressure in brown. We have in green the bottom hole pressure of Gulf Ramsey B No. 1 Oil Well. This well, I don't see it on my Exhibit, it is a direct east offset, the bottom hole pressure history of Humble State G No. 2, which is reflected by the yellow line which is a diagonal, two diagonals to the southwest. Between the Gulf Ramsey B No. 1 and the Gulf Ramsey B No. 2 or between the Queen gas, the Grayburg Oil there exists a pressure differential of 707 pounds.

In other words, the same situation exists here as has existed throughout the area of the Eunice Monument Oil Field. The final pressure comparison is between the Gulf W. A. Ramsey No. 12 oil well located in the Arrowhead Oil Field in Section 35, 21, 36 and other oil wells nearby located in the Arrowhead Oil field and the arithmetic average bottom hole pressure of the Arrowhead Oil Field.

We show this exhibit to show that this oil well has a high bottom hole pressure relative to the other oil wells. The reason being there is Queen exposed in W. A. Ramsey No. 12 oil well. So, that even where there might be some oil in the lower basal Queen in some of these wells, those wells have high bottom hole pressure. So,that within the oil column there is a pressure differential which further substantiates that the Queen is segregated and separated from the Grayburg.

Q Based upon this study which you have presented, Mr. Ross,

what is your conclusion as to the existence or non-existence of a continuous and impervious barrier between the top of the Grayburg and the base of the Queen throughout this area?

A Based on this study because we found the situation existing throughout the Eunice Monument Oil Field and the Eumont Gas Field, I think that the barrier as Mr. Boss has testified exists throughout and serves as a permeability break between the Yates, Seven Rivers, Queen and the Grayburg-San Andres and during the productive history of these fields or during the productive life that barrier is such that these reservoirs will not produce as if they were common reservoirs.

Q In the light of that fact, what would be your recommendation to the Commission as to the treating of these two reservoirs as separate reservoirs for the purposes of oil and gas proration?

A I would concur with Mr. Boss's recommendation that the vertical limits of the Yates, Seven Rivers, and Queen gas reservoir or the vertical limits for the Eumont gas field extend to the base of the Queen, but certainly not extend into the Grayburg formation.

Q If the lower vertical limit of the gas pool was extended in the Eumont area to a point below the top of the Grayburg, what would result from gas production in that area?

A Well, as Mr. Boss has called your attention to the fact that there is quite, there are many acre feet of Grayburg section exposed above the gas-oil content, so that a large portion of the Grayburg reservoir is gas productive.

Now, if you withdraw and I will go further, the Eunice

Monument Field is producing under a combined drive mechanism, it is producing under a water drive, gas cap drive mechanism. As such the driving mechanism is relatively efficient. If you withdrew gas from this gas cap on the Grayburg, you would take away energy that can be used to produce oil from that Grayburg San Andres section.

You would therefore probably reduce the ultimate recovery of oil by the same token, if you took gas from this gas cap in the Grayburg, if you took volumetricaly more gas from that zone than you took oil from the lower zone, you would deplete the gas cap faster than the oil zone. You would permit then oil to expand and be driven into it as a result of the water drive so that you would saturate the now gas saturated section with oil and a portion of the oil that is saturated, that rock could never be recovered and that in itself would result in waste. Therefore it is essential that we keep on the Grayburg and San Andres Oil reservoirs the gas within the Grayburg gas cap.

Q The present existing vertical limits of the pools do protect that, do they not?

A They do, they extend to the base of the Queen.

Q Were you, at the time of the April hearing of the Commission, Mr. Ross, engaged in a study of the effect on various wells in the area of treating them for proration purposes as being all in one oil and gas reservoir?

A Yes. Mr. Boss and the Continental this morning has put on testimony to show that we have an unusual set of geologic circumstances here in this collection of hydro-carbons. Every

one is very well aware of the difficulties that have been encountered in trying to prorate this area. We did investigate the possibilities of calling the Yates, Seven Rivers and Queens throughout the area a common reservoir for proration purposes.

Q Was that study continuing at the time of the April hearing of the Commission?

A That study was not completed at that time. We have continued and have investigated the problem up until the time we came for this hearing.

Q In applying the proposed administrative provisions which were under consideration at that time, what result did you find would acrue insofar as oil production in the area is concerned?

A Well, we found that if you attempted to treat, we were aware that even though we might prorate and regulate this gas reservoir this Yates, Seven Rivers and Queen, we were aware that even though we might try to prorate it and regulate it as a common source of supply, we were aware that there were barriers within, vertical barriers within horizontal barriers within. We were aware of that fact. We were only attempting to devise a method, a practical method for proration, because of past practices, unvalid rules and regulations that method that we were investigating would have created undue hardships on certain and many operators.

Q Would Gulf have been one of the operators?

A No, it so happens that Gulf was not effected, had it been combined into a single gas reservoir for the rules and regulations.

Q What would the result have been with reference to oil

production?

A With reference to oil production, I hesitate--

Q (Interrupting) Or did your study extend to that?

A Well, we were primarily concerned with what would happen to gas production. With respect to gas production we found that treating this area as a large common source of supply, we found that approximately 5,000 acres and that is a minimum . . acreage, approximately 5,000 acres currently credited as gas wells would have to be deleted. It would amount to a reduction of acreage credited to gas wells of some 5,000 acres. We found it would result in a reduction in current dry gas production based on March proration schedules of approximately 30,000,000 cubic feet of gas a day. We found that there were 65 particular leases effected where acreage would be lost as a result of treating this as a common reservoir. We found a multitude of operators so effected.

Q Is that one of the considerations on the basis of which the proposed single reservoir was abandoned?

A That is true. We were visualizing the rules and regulations for this common reservoir but before we were going to before this hearing, we investigated to see what would happen as a result of trying to put such a proposal in force and when we found that this situation existed, we abandoned that entirely because we feel that these operators had developed their properties according to rules and regulations and to now drastically curtail his production, even shut his wells, we felt that we could not recommend such a plan as that from a practical view point because of past operations. I don't think the Com-

mission can consider a plan of that nature. If this were a conversion oil and gas country, it is possible that such a plan might be put in force.

Q Your remarks are corrected then to the practicability and feasibility of administering such a single reservoir?

A Because of our current completion status and our current operating status.

Q You heard the testimony of Mr. Boss and his recommendation to the Commission as to the vertical and areal limits of the four gas pools here involved, do you concur in that recommendation then?

A I do.

MR. MALONE: That is all. One other question, sir.

Q Were the exhibits used in your testimony prepared by you or under your supervision?

A They were.

MR. MALONE: We offer in Evidence Gulf Exhibits No's. 4, 5, 6, 7, 8, 9, 10 & 11.

MR. SPURRIER: Without objection they will be admitted.

MR. SPURRIER: Is there cross examination of Mr. Ross?

MR. STANLEY: I would like to ask a couple.

CROSS EXAMINATION

By: MR. STANLEY:

Q In your study of bottom hole pressure data, further south in the Langlie-Mattix or--

A (Interrupting) I haven't made an extensive, I haven't--

Q (Interrupting) You are aware of some bottom hole pressures?

A Yes, I am.

Q You have shown us there is a differential in bottom hole pressure between the Yates, Seven Rivers and Queen on the one hand and the Grayburg on the other. Do you think that it is possible to have a pressure differential further south between the Yates, and Seven Rivers on one hand the Queen on the other hand?

A I do.

Q You don't have--

A (Interrupting) I have prepared no exhibits reflecting that fact, no.

MR. SPURRIER: Anyone else? Mr. Foster.

By: MR. FOSTER:

Q Your recommendation here that you have made is based on the difficulties that you find that would occur administratively in prorating this area as one common source of supply?

A Not entirely, no, sir. That wasn't the exact basis. We knew that treating it as a common source of supply wasn't the ideal solution to the problem, even as such for getting past development. We knew it wasn't the most ideal method of proration. We investigated it as a method.

Q Let me ask you this question. Were you present here last month, prepared to testify as a witness in this Case?

A Yes, sir.

Q Were you then prepared to testify in support of a set of proposed field rules prepared by Gulf?

A Yes, sir.

Q Do you know that those field rules that were then pro-

posed by Gulf did delineate this entire area here as one common reservoir?

A Yes, sir.

Q If you had testified last month, would you have testified that this area was one common reservoir?

A No, sir, I would not have.

Q Then, you would not have testified in support of the set of rules that Gulf had prepared?

A Yes, sir, but I would have testified that it might have been treated as a common source of supply. I would not have tried to prove in any way, shape or form that it was a common reservoir throughout vertical and areally.

Q How would you have treated it as one common source of supply when in fact, it wasn't?

A We were, Mr. Foster, I think you are very well aware and I think it has been pointed out here time and time again that we have an unusual set of circumstances here. We have a very difficult problem to solve. If we are going to try to let the exceptions be the rule, we will never settle this matter. We have got to set up some general rules knowing that there are exceptions that will exist. Now, anyone could point out exceptions to the Rules we have proposed today. We are aware of them and every one else is.

It is a problem that we are only trying to solve on a practical basis, the most practical method we know. That is our recommendation today.

Q Well, I don't want to argue with you, Mr. Ross, but what I am trying to get at is this. That this area that we are

talking about, these four gas pools both horizontally and vertically either is or is not a common source of supply. Now, that is one determination I think that we are all trying to make here, is it not?

A Would you state the question again, please.

MR. SPURRIER: It wasn't a question, it was a statement, speak up, Judge.

Q I will try to ask it in the form of a question. I take it that one of our purposes here in this hearing is to try to determine whether this area that we are talking about is or is not a common source of supply?

A The entire area?

Q Yes.

A I think we have established that there are portions of the area that are not common source of supply.

Q I am not contraverting that with you. I am saying that one of the purposes, one of the reasons that we are here is for the purpose of determining whether that area is or is not a common source of supply?

A That is correct.

Q All right. Now, if it is a common source of supply that would furnish one basis for prorating the area if there are no other objections or difficulties--

A (Interrupting) What area are you speaking about?

Q I am talking about the four gas pools, the Eumont, Arrow Jalco and Langmat.

A What vertical limits are you speaking of now?

Q I am talking about down through the Queen?

A All right.

Q I understand that that is what the Gulf proposed last month. I am talking about the Gulf's proposal last month.

MR. MALONE: Gulf made no proposal, if it please the Commission. The witness should not be questioned on that basis.

MR. SPURRIER: Objection sustained.

Q I will ask you if that is what the Gulf was going to propose last month, that is correct, isn't it? I say that is what the Gulf was going to propose last month if it had gotten to testify?

A That is true.

Q It would be beneficial to know, would it not, whether this area that we are talking about is or is not one common source of supply?

A Yes, sir.

Q All right. Now, of course, it follows that there may be difficulties involved in administering the area as one common source of supply and to such an extent that you might want to zone it off into separate areas for the purpose of prorating it. That is true, is it not?

A Well, if you are going to zone it off for the purposes of proration, then it no longer is a common source of supply. We have it zoned off now for the purposes of proration into these four gas fields.

Q Of course, that don't necessarily follow. It may still be one common source of supply but for various reasons you might want to zone it for administrative purposes is what I am saying?

A May I clarify myself in that, I don't think I have gone on record by saying and if I have, I wish to clarify the record to state that I do not know whether the Yates, Seven Rivers and Queen are a common source of supply. I have not been able to prove that fact or disprove that fact. It is my opinion that they are not over this whole area a common source of supply in the strict sense of the word.

Q Let me ask you, you testified with respect to certain bottom hole pressure information here which you say shows that the Grayburg and San Andres formations is not included in this common source of supply that we are talking about. I take it that if you had testified last month you would have also testified at that time--

A (Interrupting) No, sir.

Q Do you mind if I finish my question. That these two formations these two low formations were not included within this common source of supply?

A Yes, sir, I would have testified to that.

Q You would have testified to that. But you would have testified that all of the formations above those two were included in a common source of supply?

A I would have testified, sir, that we might treat them as such for rules and regulations and proration purposes. I would not have testified to the fact that they were in the strict sense of the word one common source of supply.

Q What would you have based that testimony on?

A Because I have not been able to prove that they are a common source of supply.

Q But you say you would have testified that they were, what would you have based that testimony on?

A My testimony would have been qualified by saying we could treat them as such for certain purposes.

Q Why would you have treated them that way?

A As a practical solution to this problem that we are faced with.

Q What problem? I mean, what problem in your mind, not what problem might be in someone else's mind.

A The problem of how to treat and handle a group of formations, oil and gas in Lea County, New Mexico where you have reef complexities, a multitude impression and operators who have operated for a number of years under no rules and regulations. I don't know of any more complex problem than that to be faced with myself.

Q I know the problem is complex but all I am trying to sa what I am trying to find out is on what factual information would you have based that testimony last month?

MR. SPURRIER: Judge, what he would have testified last month is not before this hearing.

MR. FOSTER: Of course, the Commission is the Judge of that. It is not for me to say about that. But I would like to say this to the Commission that I think it is important to understand that here we have a company who, last month at the State-wide hearing was prepared to testify in support of the proposition that the area that we are now talking about designated above the San Andres and the Grayburg formation was all one common source of supply, who are today testifying that it isn't.

MR. MALONE: May it please the Commission, I would like to make a restrained observation if I can restrain myself. I am sure that Judge Foster has no intention of reflecting upon the truthfulness of the witnesses that have appeared before this Commission today under oath. I am sure that he has no intention of reflecting upon the case which Gulf has presented. I am perfectly willing to let the Commission and the members of the industry present judge whether or not Gulf is in good faith in this proceeding but I am not willing to have our motives impugned as they have been impugned before this Commission.

MR. SMITH: I should like at this time since I am more or less an innocent bystander, to inquire of Mr. Foster his purpose, his line of cross examination, if you would profer your point that you are trying to make to the Commission, perhaps the rest of us could understand better exactly what you are driving at.

MR. FOSTER: My point is, if I understand it, it has been stated here that Gulf, and I didn't make the statement, Gulf made the statement, that they have prepared a proposed set of rules to present to this Commission last month which would have delineated these four gas pools as one gas pool down through the Queen formation. That during the time elapse since last month up to now, that they have re-examined this situation and found that the complexities are such that they are now saying that it should not be regarded as one common source of supply.

MR. WOODWARD: If it please the Commission, to clarify the record, I would like to state that Amerada is prepared to

forgive Gulf for what it did not say last month and to forgive them for what they did not recommend. We are also prepared to forgive them for changing their mind if they have done so on the basis of additional information.

MR. MALONE: Thank you.

MR. SMITH: I believe that basically I maybe misinterpreting Judge Foster here, I believe, he, basically has supported what Mr. Woodward has said. There has been a change of mind. I agree with Mr. Malone I am sure that Judge Foster would say that he is not impugning the witnesses of Gulf. I made my observation to clarify the point which has been made, there has been a change in direction due to the development of additional facts.

MR. SPURRIER: I think the document speaks for itself. I can speak for myself at least on this Commission. I understand from what Mr. Ross has said that he had intended to recommend to the Commission that it would be one pool for purposes of proration. He did not say it was one pool. We are wasting valuable time. Does anyone have a question of this witness?

By: MR. GRENIER: A. V. Grenier, of Southern Union Gas Company.

Q I am afraid I didn't fully understand the basis for your statement, that if all the pools were to be put together, some 5,000 acres and 65 leases would be adversely effected, and several, what was it, 30,000,000 MCF of production loss. Just how would that work?

A If you are to treat it as a common source of supply you can't credit the same acreage with production from within two zones of the same common source of supply. Now, there exists

gas production from the Yates, Queen, Seven Rivers or retract that statement. There exists gas production in the Yates, oil production in the Yates, oil production in the Seven Rivers and there exists four oil wells on 160 acre tract producing from Seven Rivers and one gas well from the Yates. In order to produce as common source of supply you must shut the gas zone for example. There are a multitude of problems that arise like that and to make a detailed study to know exactly what would happen only to us, the investigation that there would have been approximately 5,000 acres loss to gas production, acres now credited to existing gas wells.

Q Thank you. Now, another point, I wasn't quite clear on, do you recognize any pressure differential at the present time as between the Jalco and the Langmat field as indicated on your exhibit?

A As I said, if you take an arithmetic average pressure, shut in pressure in the Jalco Pool compare that with an arithmetic average surface shut in pressure of the pools in the Langmat pools, there does exist a differential.

Q Is there also any differential to be observed to the south in the Jalco Pool, taking it by itself?

A In the Jalco Pool, being in the weak area, you have what has been called to your attention, several times today, this reef erratic production, you will find existing in that area a great variation, not a great but considerable variation in pressure.

Q Is that also true in the Langmat?

A To a certain extent because there you are going east-

ward away from your reef area.

MR. SPURRIER: Anyone else? Mr. Stahl.

By: MR. STAHL:

Q Your study of the Eumont gas pool, the pressures, bottom hole pressure study there, did you find that there were some permeability barriers existing vertically within the confines of the Eumont gas field?

A The wells that we investigated from a bottom hole pressure view point were wells that weren't completed in any one of these three zones by Gulf. In other words, we had, we didn't investigate any wells completed only in the Yates. With respect to wells completed in the Queen, the wells in that area generally speaking are completed through the whole section. Therefore, we did not make an investigation between formations in the Eumont area.

Q Let me phrase my question this way. As between the wells, you did study in the Eumont field completed in one of the three sands that comprise the Eumont gas pool, is there a difference in bottom hole pressure of substantial magnitude between some of these wells?

A Now, what do you mean by substantial?

Q Enough so that in your mind it is indicative that there may be some vertical permeability barriers even though they may be localized.

A I don't understand your relationship of vertical permeability barriers and pressure differentials between wells. Are you speaking of a horizontal permeability barrier?

Q No, my point is this. As I understand your testimony,

you said that there was some or in going through your testimony, I got the impression that the bottom hole pressures of the gas wells that you studied was not identical. All the wells do not have the same bottom hole pressure that are completed in the Eumont gas field that you studied. What I am attempting to get from you is why in your mind it is not the same? As I understand it, if it was absolutely effective communication there would be a very close to a common bottom hole pressure in these gas wells. So, in your mind is there sufficient permeability barrier or other barriers of some sort to indicate that there maybe some localized areas which do not have fully effective communication.

A Well, sir, may I call your attention to this, there will be pressure differentials existing even if the reservoirs are in communication throughout. Bottom hole pressure measurements are a function of shut-in time. Perhaps, these wells, none of them in 24 hours were permitted to build up to a maximum. They are a function of depletion and withdrawal. If you have withdrawn from a particular area relatively speaking, much more than another area, it might take a long time for your pressure to be communitized throughout that area. So, there does exist pressure variations within the area not substantially but a variation. Now, I have not found from my investigation of bottom hole pressures any indication that in the Eumont area, the reservoir is separated horizontally by vertical barriers but I want to call your attention to the fact that we have relatively few bottom hole pressures. If you investigate the surface pressures in the area you find a wide variation in

surface pressure, but that is to be expected because surface pressures are not a measure of bottom hole pressure, depending on the fluid in the hole and other conditions. You may be referring to surface pressure and the variation there which I don't think is the true variation of the measurement.

Q I was referring to bottom hole measurement. I do not mean to mislead you. I did not want to ask you whether it was a complete barrier all the way across. Do you have an opinion whether there are any localized--

A (Interrupting) We don't have enough bottom hole pressure information to substantiate whether they are or not.

MR. SPURRIER: Anyone else?

MR. FOSTER: I don't want the record closed without stating that the questions were not designed to impugn bad faith to anybody. Certainly, there is enough factual situation here to afford ground for honest difference of opinion between operators in this area. If tempers flare and feelings get exposed I am sorry for that. I have no intention of impugning improper motives to anyone in this matter.

MR. MALONE: Thank you, Judge Foster.

MR. SPURRIER: Thank you. If no further questions--Mr. Selinger.

By: MR. SELINGER:

Q I want to ask him a question. Mr. Ross, calling your attention to your recommendation of dropping the line of separation between the Jalco and Langmat Pools. You stated on direct examination that there was not engineering basis such as pressures and sulfur content to make these separations between

those two fields. Is there any other basis such as proration or rate of withdrawal that would sustain any separation between the Jalco and Langmat Pools?

A I perhaps am not qualified to talk about the proration problems in themselves. In my opinion, I do not know of any.

MR. SPURRIER: Anyone else? Mr. Kelly.

By: MR. KELLY:

Q I would like to ask a question. Referring back to your statement that some 5,000 acres and 30,000,000 cubic feet might be loss if the area was considered one common source of supply. This gas that might be lost is mainly coming from dual completion wells, is it not?

A There has been a fifth well drilled on 160 acres.

Q But mainly from dually completed wells?

A No, I don't have a break down of just what the effect of the duals were but you see there were, there have been wells recompleted in the area where you had four oil wells on the 160 and recompleted one and now assigned it 160 acres. If you treated it as a common source of supply that well that now has 160 acres could only have 40 acres, so it would have lost 120 acres. There are a multitude of conditions that made up the conditions of 5,000 acres.

Q It is coming from the dually and recompleted wells and fifth wells on the 160? A Right.

Q If it is a common source of supply. You feel from your testimony, I take it that you feel that the Commission should continue to recognize the dual completions and fifth wells and the recompleted wells in drawing up an order, is that true?

A Yes, sir.

MR. SPURRIER: Thank you. Anyone else?

MR. MONTGOMERY: I have a short question to clarify something on the same line, Mr. Kelly was talking about.

By: MR. MONTGOMERY:

Q If these anomalous situations of oil accumulations hwere the gas pools and the oil pools contain the same vertical limits, if those could be separated then would we have any problem such as you stated in proration?

A Yes, you would because they haven't been developed as separated.

Q They haven't what?

A They haven't been developed as separated.

Q Well, if it is proven that they are separate, then, would you have the problem? Wouldyou like me to restate it?

A You mean separate as we now propose a gas reservoir and an oil reservoir?

Q Well, I am thinking of my own testimony that is getting ready to come up possibly. If it is possible and it is proven that we can't separate the oil from the gas and these anomalous accumulations be named as separate pools with distinct and separate vertical limits not overlapping them, would we have that problem, that proration problem?

A That is what we have proposed today.

Q Do you understand my question?

A I think I do. You would not have those problems as we have proposed today.

MR. MONTGOMERY: Thank you.

By: MR. MACEY:

Q You say you wouldn't have the oil pools and the gas pools overlapping?

A No, I didn't say that.

Q I thought that is what he asked you.

A No, sir, he didn't. He asked me if you treated them as two sources of supply, would you have this problem that has been called to our attention today and I said no.

Q That is all. I want to ask you another question. On your Exhibit No. 4, you have listed bottom hole pressures on that map. Are all those pressures taken on wells that are producing from the Grayburg formation?

A No, no, those are pressures as taken from key wells during the 1953 surveys for the Eunice and Monument fields, the brown are, any key well so pressured during that survey.

Q Well now, what I am trying to get at is, you were comparing the Queen gas reservoir I took it with the Grayburg, so-called Grayburg pressure, weren't you?

A Yes.

Q If all those average pressures aren't Grayburg, I don't see how you can compare them?

A Well, I made some comparisons, I think if you will recall of some Queen oil wells. I made those comparisons to show that those pressures were relatively high and were considerably higher than the wells known to be producing from the Grayburg in itself.

MR. MACEY: That is all.

MR. SPURRIER: Anyone else?

MR. MONTGOMERY: I would like to ask one more question.

By: MR. MONTGOMERY:

Q You made a statement that you compared the pressures in the Arrowhead and in the Eunice Monument area, I believe your testimony earlier in your evidence on the charts up there, I believe you said that they reflected the same condition?

A No, I didn't relate Arrowhead well pressures with Eunice Monument Oil pressures at all. Neither did I relate Arrow gas pressures with Eumont gas pressures. I said that there existed a pressure differential in the Arrowhead oil pool area much the same as that pressure differential existed in the Eunice Monument area.

Q Does that prove that they are separate reservoirs, the Eumont and the Arrow? A The Eumont & Arrow

Q Could you interpret that from your information?

A No, sir.

Q Could you prove that they are the same from that information? A No, sir.

MR. SPURRIER: Anyone else? If not the witness may be excused. (Witness excused.)

MR. SPURRIER: We will recess until 3:40.

(RECESS)

MR. SPURRIER: The next victim I have on the list is the Oil Conservation Commission staff, Mr. Yost.

MR. YOST: If the Commission please, we would like at this time to put on the testimony of Mr. Montgomery concerning the gas pool delineation. We have other testimony on other matters. We would like to reserve that until a later time in the hearing in order not to ruin the chain of thought, chain of continuity.

R A N D A L L F I E L D M O N T G O M E R Y ,

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

DIRECT EXAMINATION

By MR. YOST:

Q State your name, please?

A Randolph Fields Montgomery, Geologist, New Mexico Oil Conservation Commission.

Q Mr. Montgomery, have you made a study of the problem of gas pool delineations now under consideration before the Commission?

A Yes, sir, I have.

Q In general what did that study consist of?

A Well, my study consisted of numerous cross sections which you see around the wall. The ones on the wall in front of me are the east to west cross sections, the ones behind me are the south to north cross sections.

Q How many wells are involved approximately?

A I studied many wells that are not on the cross sections, but approximately 550 to 600 wells.

Q How many wells are there in the shallow oil zone, the gas pool?

A Well, appearing on the present gas proration schedule there are 2400, as I recall.

Q You have studied ~~there~~ then A.D. and are prepared to testify about approximately 20 percent of the wells?

A Yes, I am.

Q You say you studied the well, just what did that study

consist of?

A Well, these excellent cross sections which were prepared by the Committee in the original hearing in Case 245. I used those as the basis to start and checked the information on each and every one, using records that were on file with the New Mexico Oil Conservation Commission and the United States Geological Survey in Hobbs, New Mexico, plus radioactive logs and electric logs and sample logs.

Q Directing your attention to Commission's Exhibit No. 3, did you prepare that Exhibit? A Yes, sir, I did.

Q Would you please explain it?

A Exhibit No. 3 is a base map of Southeastern New Mexico. On the map I have superimposed the gas pools over the oil pools. The oil pools are shaded in with a solid color. The Eunice Monument being in the shade of red, the Skaggs in the shade of green, the Hardy in yellow, the Penrose-Skelly in green, Arrowhead in gray, South Eunice in the shade of violet, Cooper-Jal in green, the Langlie-Mattix in yellow, Rhodes in the shade of blue, Eaves in the shade of brown, Leonard and the South Leonard. Superimposed over those oil fields are the oil lines of the gas pools.

The Eumont is outlined in a broad blue band which overlaps all of the Eunice Monument area and some other areas that are not within the Eunice Monument Oil Pool at this time. The Jalco Gas Pool is outlined in a broad red color which goes clear to the State line and has a common boundary on the east with the Langmat Gas Pool and then the Langmat is outlined with a broad brown color

and stops at this point and then from there northward has a common boundary with the Jalco. Also on this map, I have illustrated with lines the cross sections that are on the walls there where they pass through the area. Also on this map, I have in the large green numerals over above the well symbol, have put in the shut-in well head pressures as reported by El Paso Natural and Permian Basin Pipeline Company. Beneath the well, I have a smaller numeral which is in red, which indicates sulfur content in grains per hundred cubic feet. Also on the map I have shaded in other colors which overlie some of these pools, within those there is a numeral which are pools that I will recommend be named as new areas.

Q Before we go into these other Exhibits based on your study, have you reached certain conclusions?

A Yes, sir, I have.

Q Would you please state those conclusions?

A The conclusions were that nowhere was I able to find in general, nowhere was I able to find oil above a minus 100 feet below sea level with certain exceptions which I will point out as we go along. Those exceptions can be named and explained on a sound scientific basis, geologically and engineering wise. The oil then, for what I will refer to as Number One reservoir, would lie from a point 100 feet below sea level to a point 450 feet below sea level. I recommend that the vertical limits of each pool, as illustrated on this map that I named earlier, be redefined in this manner.

My next recommendation was on the gas, that nowhere was I

able to find, I say nowhere with one exception, was I able to find dry gas below a minus 75 feet below sea level.. My recommendations on the dry gas would be at the top of the Tansil formation to a point minus 75 feet below sea level.

Q Directing your attention to Commission's Exhibit 13 A to H, inclusive, which appear on the wall over here. Would you relate again the source of those Exhibits?

A Those were prepared by the Committee which set up the present gas pools in Case 245. I would like to, at this time, compliment that Committee on the amazing accuracy, and almost complete lack of human error in such a preponderous project. I have changed those Exhibits slightly, made additions due to workovers and recompletions, dual completions and a very few human errors that did exist on these cross sections.

Q You have personally checked the Exhibits for accuracy?

A Yes, sir, I have personally checked each and every well.

Q And to your knowledge they are substantially accurate?

A Yes, sir, they are.

Q Would you please explain the red and the green that appears on these Exhibits?

A The shade of red represents the zone of oil production. I do not want to leave the impression that it necessarily represents the thickness of the pay zone because it does not. It does represent the zone of oil production. The green represents, I would like to point out, on the oil that I did not illustrate any, I believe there would be exceptions. For the purpose of illustra-

tion, the well that was plugged and abandoned was a commercial well, but they did get a show of oil in that interval. I put it in there for purposes of illustration only. In each and every well the well besides that has produced oil, gas well and has been an economic gas well and produced from that zone.

Q You put the red and green on the Exhibit yourself?

A Yes, sir, the green represents gas. I have only indicated the green in every case where it has produced gas, the well has produced gas.

Q Directing your attention specifically to Exhibit 13 A, which is over here.

A Yes, sir, this is Exhibit 13 A.

Q Would you explain that Exhibit?

A This is a west to east cross section, west being on this side and east which is in the northern part of the Eunice Monument Oil Pool and represented on the base map by a black line. This is slightly north to the apex of the Eunice Monument structure. The highest portion, I would like to point out, if you will notice that nowhere does the oil occur above a minus 100 feet in the area.

Q Minus 100 feet below sea level?

A Yes, sir, 100 feet below sea level.

Q I do notice that you show gas here which is down below 75 feet?

A Yes, I recommended that the vertical be from the top of the Transil to a minus 75 feet. This is the one exception on the

first Exhibit that I have found in my survey, but even though this is the Gulf Ship No. 1, which was illustrated on Gulf's impressive testimony and, even so, our records are not clear and I am not sure that all of this zone is productive down here. Irregardless of that, the evidence they presented today indicates that that gas is definitely separated from the oil reservoir which underlies.

Q How would you handle that type of situation?

A Since seeing Gulf's testimony in regard to this, and it is definitely separated from the oil zone, possibly we might have to make one exception. If it is proven that it is dry gascap gas that it be limited in the oil ratio in the oil pool that it lies.

Q Anything further on that Exhibit?

A I would like to point out, it is not well to illustrate it on this Exhibit, but the oil accumulation is nowhere controlled by structure.

Q In connection with 13 B, would you please explain your interpretation of that Exhibit?

A 13 B is another west-east cross section which passes t rough Township 20 South and represented on the base map with a black line, and is just slightly south of the apex of the structure. Again, the red represents oil and the green gas. Nowhere in this area, it is better illustrated, the structure has no control whatsoever over the accumulations of oil, and that everywhere it lies below a minus 100 feet from sea level. The gas is everywhere above a minus 75 feet.

Q Directing your attention to 13 C, explain that Exhibit?

A 13 C is a cross section, Township 21 South, and it passes through, perhaps I had better show it, it passes through this, being the Jalco Gas Pool in this area, this being the Eumont Gas Pool here.

This cross section crosses the boundary of the Jalco-Eumont Gas Pool and then crosses the boundary of the Eunice Monument Oil Pool into the Penrose-Skelly Oil Pool. I have indicated here, for purposes of illustration, I would like to point out that this boundary between the Eunice Monument and the Penrose-Skelly apparently has no basis from this information, that the oil zone everywhere occurs below a minus 70 to 100 feet below sea level. I would like to point out that the oil zone crosses formational boundaries. The oil in this area is probably all Grayburg and passes from the Grayburg into the Queen and then into the Seven Rivers within three miles. In other words, the formation in the middle is in one formation, on either side, both west and east is in another formation.

Q Moving to Exhibit 13 D?

A I have thought of something I would like to say here. One of the wells in this area is producing from the Transil formation and my recommendations will validate that well production.

Q Moving to 13 D, will you please explain that?

A 13 D passes through Township 22 South and is illustrated again by a black line on the map and begins in the South Eunice Oil Pool and goes into the Jalco Gas Pool and then passes into the Langmat Gas Pool, and then passes from the South Eunice Oil Pool

into the Eunice Monument Oil Pool and back out again into the Arrowhead and the Arrow Gas Pool, and then into the Penrose-Skelly Oil Pool.

MR. HINKLE: I would like to ask Mr. Montgomery one question so we can better understand the plats. Why is there a variance in the red sections you have colored red in the thickness there?

A Mr. Hinkle, these were pay zones that were reported by the company. They do not mean to leave the connotation that that entire thickness was the pay zone, but that is what they reported in their well records as being the pay zone. Now, much of it would not be productive and possibly some of them, if they keep them a little bit, would net more production. Does that clear that up?

MR. HINKLE: I think so.

A Starting from west to east in this area here, as I explained on the map, the different pools that it passes through, I would like to point out the accumulation of oil that occurs in this well, in portions of the Yates and Seven Rivers and these wells are in the Seven Rivers and then into the Queen and a portion of it back into the Seven Rivers and back into the Queen again, this beginning the boundaries of the South Eunice.

The South Eunice is identified as the Seven Rivers vertically. As you can see here, only small portions of the well represented on the cross section actually produce from the Seven Rivers formations. There are wells in the South Eunice Pool that are not

illustrated in this cross section that produces from the Yates formation. Then we pass from the Jalco Pool lying in this area and go into Langmat from which the Gulf Ramsey State No. 1, which we had testimony on earlier, then into the Arrowhead Oil Pool, which extends for this distance in here. Then we go, (indicating) jumping here quite a bit. Also we pass from the Langmat Gas Pool into the Arrow Gas Pool. I would like to point out that in the Arrow Gas Pool again that the gas is everywhere above the minus 75 feet from sea level, and that the oil is everywhere below a minus 100 feet below sea level. This being the boundary that went between two wells, the boundary between the Arrowhead and Penrose-Skelly Oil Pool.

Q Do you have anything further in Exhibit D, if not please explain 13-E?

A Exhibit 13 E is in the portion of the southern part of Township 22 South. Again, I would like to point that out on the base map. It starts in this area here in the South Eunice Pool and then passes into the Langlie-Mattix Oil Pool and then into the Penrose-Skelly Oil Pool. Also, a portion of it here is in the Jalco Gas Pool and a portion here in the Langmat Gas Pool.

Q I notice in this Exhibit you show oil above 100 feet below sea level? A Yes, sir, I have.

Q How do you account for that?

A Here on the west side this is the higher portion of the line build-up which many of us refer to as the reef. In this area and immediately to the west we have no more control in the wells,

but we have a very active water drive from the west and due to the lithology of the Seven Rivers formations in this immediate area the porosity and permeability was developed. There was a very active water drive from the west and a porosity pinch out to the east. We have oil controlled by structure which was not true in any of the other previous illustrations.

Q Would you define that as a separate reservoir?

A Yes, sir, I would.

Q I believe you have that numbered 2 on this Exhibit?

A Yes, sir, I have it numbered 2 and it is also colored in the horizontal dimension on the map

Q You also have another reservoir of that type, No. 3, or similar to it.

A Reservoir No. 3 is a different type of an occurrence. It violates the rule of being below a line that is 100 feet of sea level. It is a distinct and separate reservoir from Reservoir No. 3. Reservoir 3 is a synclinal occurrence of Yates oil. There is no water drive active in this occurrence but there is a very active gas drive.

Q Do you have any comment to make concerning the sulfur content of the gas as shown in the Jalco as compared with the Langmat?

A Yes, sir, generally you can say in the Jalco area, the sulfur content is considerably higher than the sulfur content in the Langmat, but we can, I think, have an explanation for that, possibly.

Q Give your explanation.

A As I stated earlier, these are on the very western side of the oil and gas pools and we have a very active water drive from the west. This water drive is very high in sulfur content, and many of these wells produce this sulfur water, many of these gas wells produce this sulfur water, that plus the lithology over over the reef in this particular area, I believe, has contaminated the gas with the H_2S and that is the reason for a higher sulfur content in the general area of the Jalco as opposed to the Langmat Pool.

Q Do you have any comment you care to make concerning pressures which appear on the Jalco side as compared with the Langmat side?

A Generally, again the pressures in the Jalco area are lower than those pressures in the Langmat area but we can also, this is also generally true that the lower the pressure the higher the sulfur content and we also know wells, gas wells that are producing water and that lower pressure is a result of lifting fluid.

Q What kind of pressures are we talking about?

A These are shut-in well head pressures.

Q Do you find anything at all in your study in relation to this Exhibit that show a barrier to prevent the communication of gas on the Jalco side of this line and the Langmat side?

A No, sir, I do not.

Q You don't show any gas on here immediately to the right

of the line between the two pools, why is that?

A I will ask you to remember that we are looking at only one dimension here and that one location directly south of this well here, and one location north of the same well, we have dry gas wells producing from this same section. This oil accumulation is in a synclinal area, goes in a northerly direction as outlined on the base map. I recommend that it be named as a new pool.

Q This pinch out that you were talking about applies to the reservoir in No. 2, is that correct?

A Yes, sir, that is right.

Q There is nothing that you know of to prevent the gas from communicating between the Jalco and Langmat at that point?

A No, sir, there is nothing.

Q Any further explanation regarding this Exhibit?

A I would like to point out after some more of Gulf's testimony, I believe Mr. Ross said that if these sections were named separate and distinct reservoirs we would not have the proration problem that he has stated, something like 50,000,000 cubic feet a day, or some such figure. I don't exactly remember.

MR. SPURRIER: Thirty.

A I have recommended that these be named separate reservoirs.

Q We will move on then to Exhibit 13 F.

A It passes east through Township 23 South. This cross section begins in the Cooper-Jal Oil Pool and passes eastward into the Langlie-Mattix Oil Pool and then also passes east in the Jalco Gas Pool and the Langmat Gas Pool. Starting from west to east,

the Cooper-Jal, the boundary of the Jalco-Langmat boundary lies between these two areas here (indicating). We have another occurrence of oil that is very similar to that occurrence which I call Reservoir No. 2 on Exhibit E. I have designated that as Reservoir No. 4. It is the same type of oil accumulation that we had on the previous Exhibit, an active water drive from the west, a porosity pinch out to the east. It is definitely controlled by structure as opposed to Reservoir No. 1. I have indicated the horizontal limits on the base map and recommended that be named as a new oil pool, overlying Reservoir No. 1.

Q On this Exhibit, do you find any gas below 75 feet of sea level? A No, sir, I do not.

Q And except for that reservoir, there is no oil above 100 feet below sea level?

A No, sir, there is not. I would like to add at this time that in these reservoirs on the west side of this oil that is controlled by structure, that the gas pool be limited by the vertical limits of the oil pool which this will only cover a very small area.

Q If you have nothing further on Exhibit 13 F, please explain 13 G?

A I just happened to think of something else I would like to say about that. We had testimony earlier today that states that roughly in the Jalco area it should be called an oil and gas reservoir, but this is the dual completed well from the Seven

Rivers oil zone in this dry gas section. These wells are very expensive. The well is presently receiving two allowables, as it should, and since they are distinct and separate reservoirs, proof of those distinct reservoirs is in the pressures. The shut-in tubing pressure for the gas zone was 698 pounds and the bottom hole pressure for the oil zone was 1,027 pounds.

Q Will you please explain Exhibit 13 G?

A Exhibit 13 G passes through Township 24 South and also runs from west to east direction. It is illustrated on the map as passing through Cooper-Jal, then into Falby-Yates and out of the Falby into the Langlie-Mattix and also is in the Jalco and Lagmat Gas Pools. I would like to point out that if you will notice the Reservoir No. 1, which overlies 100 feet below sea level, is present throughout this area. Also, on the west side, that in some areas, in the Falby-Yates area presently defined we do have oil that occurs above the minus 100 feet below sea level. This is another synclinal occurrence of Yates oil as Reservoir No. 3. It only covers a larger lateral extent. I recommend that the Falby-Yates Oil Pool be retained and that Reservoir No. 1 be extended throughout the area of the Falby-Yates to overlie that pool. This will validate some of the Queen wells in that area at this time, and will permit them to receive two oil allowables, which they should since they are a separate and distinct reservoir.

Q Explain what you mean by validate.

A Due to the way the vertical limits are presently described on many of our present oil pools, they do not take into account

all these anomalous occurrences and it is almost impossible by a formational basis to include them on a formational basis, which is due to the occurrence of the oil. These wells I say validate -- The Langlie-Mattix Oil Pool presently does not underlie the Falby-Yates Oil Pool and we have wells in the Falby-Yates Oil Pool that are producing from this lower reservoir. That will, I say, validate.

Q Bring them within the defined limits of the pool?

A Yes, sir, bring them in, yes, sir.

Q You also show on this Exhibit, I believe, do you show any gas on this Exhibit at all, 75 feet below sea level?

A No, sir, all the gas lies above 75 feet below sea level. I did illustrate in one place that the gas is not being produced. I illustrated that for the purpose of showing that oil is overlying gas.

Q Moving on to Exhibit 13 H, will you please explain that Exhibit?

A 13 H passes through Township 25 South and lies within the Cooper-Jal Oil Pool, this area here (indicating) and the Langlie-Mattix to the furtherest extent, and also in the Jalco Gas Pool and the Langmat Gas Pool. Again, on this cross section, we have another occurrence of oil which is above minus 100 feet from sea level and is controlled by structures. It is the same type of reservoir that I pointed out as Reservoir No. 4 and Reservoir No. 2. I recommended to the Commission that it be named as a separate oil pool and it is illustrated on the base map in its horizontal

extent.

Q That is Exhibit 3 that it is illustrated on?

A Yes, sir, that is Exhibit 3. Going eastward we run into the synclinal Yates occurrence again which Mr. Boss pointed out earlier today and I have numbered that as Reservoir No. 7, and recommend that it be named as a new reservoir. Then, it overlies the Reservoir No. 1 which lies below a minus 100 feet from sea level, also Reservoir No. 6, all of these reservoirs that I have named, these synclinaloccurrences and the occurrences that are controlled by structure, all of those will overlie Reservoir No. 1 which is this one. I have also outlined on Exhibit No. 3 the horizontal extent of this synclinal occurrence of Yates oil. Here is a well that lies, a gas well, its vertical limits being below a minus 75 feet from sea level.

This gas well is outside the present horizontal limits of the Langmat Gas Pool. The Commission is not able to prorate it at this time anyway, and I can see that it does not take from my testimony. A portion of this gas maybe gascap gas but I recommend that this type of occurrence be controlled by the limiting gas-oil ratio in the pool in which it falls.

Q Directing your attention to Exhibit 14-A to 14-G, inclusive, which appears on the opposite wall, what do those Exhibits represent?

A These are south and north cross sections passing through the identical area that the west-east cross sections did and illustrated on Exhibit 3, they are limed sections.

Q Do you have on these exhibits any place where gas occurs above 75 feet or below 75 feet?

A Yes, sir, there are a few occurrences.

Q I wish you would point those occurrences out. Refer to the Exhibit and explain those individual situations.

A On Exhibit 14-A, we have the Western Gas Wimberly No. 1, which is the same well that appeared on 13 H, which I pointed out earlier. It is probably gascap gas and should be controlled by the limiting gas-oil ratio in the oil pool in which it falls. It is not presently in any gas pool and the Commission is not able to prorate that well at this time, anyway I would like to point out that the well offsetting it to the north was originally drilled as a gas well, but through several years of production, they are now producing oil and the present allowable is 32 barrels a day.

Going further north, we have another well that is producing only dry gas and not making any oil at this time but probably will. I recommend that all of these wells be, the production be limited to the limiting gas-oil ratio in the pool in which they fall. That is true of this well here , which is apparently producing gascap gas, that is Conoco State A-2-1.

I would like to point out these other exceptions. Remember that these are on the east side of the area. They lie in this general region in here and they are outside the present defined horizontal limits of the Langmat Gas Pool. The Commission is not able to prorate those gas wells at this time anyway. This parti-

cular well here is shut-in (indicating).

This well here (indicating) was originally drilled, it is the W. J. Construction Company Jack W-Number 2, it was drilled as a dry gas well, but is now presently making 32 barrels of oil a day. The two wells which lie to the north, have not started making oil as yet, but they probably will and I recommend that their gas production be limited by the limiting gas-oil ratio. The last well here, the Gulf Bertha No. 1 is shut-in anyway, no, it isn't. I am sorry. We go on back, the porosity and permeability becomes more favorable for the accumulation of oil in this same horizon. We get oil production again. We are in the Penrose-Skelly Pool here. No, we are not, that Exhibit ends here and then the next one begins here in the northern part of the Langlie-Mattix Oil Pool, and then goes into the Penrose Skelly.

I would like for you to keep in mind again that we are outside the horizontal limits of the gas pool and that everywhere the oil occurs below minus 100 feel below sea level. We do have some gas indicated in the two wells, Gulf Elson No. 1 and the Skelly-Harrison 2-B. They are producing gascap gas and the gas production should be limited to the limiting gas-oil ratio in the pool in which they fall. I would like to say, very few of the wells on the eastern side are very good wells to begin with, as far as gas is concerned.

Q Directing your attention to Exhibit 14-D. That is this Exhibit here. Do you find any gas on that Exhibit below 75 feet below sea level?

A Yes, sir, a few of the wells as you see here, are below a minus 75 feet. I think that the maximum is minus 9, that is, they are plugged back and this particular well here and here (indicating), is actually producing gas. I don't know that it is actually producing gas out of that lower 20 feet. It violates my vertical limit, but it may be or may not be, I don't believe it is supporting since they are in no way endangering the oil horizon anyway.

Q Direct your attention to Exhibit 14-D?

A Exhibit 14-D is in the southern portion of the area and starts right on the State line and goes through the Rhodes Oil Pool into the Langlie-Mattix Oil Pool through Reservoir No. 7, which I pointed out earlier on one of the other Exhibits going northward, and it ends here in the Langlie-Mattix Oil Pool. Started northward here you notice that the oil is everywhere below a minus 100 feet with the exception of this reservoir here which is a synclinal occurrence in this area here, which I have already recommended be named as a new pool overlying Reservoir No. 1.

We do have gas below a minus 75 feet in this area also, but this area is exempt from present proration plan since it falls within the Rhodes storage area and is not a problem at this time. Going northward, the oil, of course, occurs below the minus 100 feet. We do have two wells here that violate the vertical limits of the gas pool that I have pointed out. They do fall within a

defined gas pool, but they are very apparently producing, at least this well, is very apparently producing gas cap gas and probably at this time is not favorable for oil production, but I predict that it probably will start making oil but I do recommend that its gas production be limited to the limiting gas-oil ratio in the pool in which it falls.

Q Do you have any further explanations on those exhibits?

A The rest of it is rather repetitious, Mr. Yost. All of the exceptions that you find where the oil lies above the minus 100 feet, I have recommended a new reservoir to be named to the Commission. My recommendations will keep the oil horizons and the gas horizons separate.

The administrative problems that the Gulf witnes pointed out as he said they will not effect this problem, and I just happened to think of something that I didn't mention that I would like to mention.

Gulf's testimony brought out that it would be a problem in that the Grayburg in some areas in a very small area, it probably wouldn't cover over a 160 to 640 acres in area that it would extend above the minus 75 feet below sea level.

In that area we should probably restrict the gas horizon to the top of the Grayburg formations. I also would like to point out and say that I agree almost one hundred percent with Gulf's testimony today and it supports my testimony in every way, I believe. Except for the recommendations. Gulf's testimony was very good but the recommendations did not follow the testimony as I interpreted it. I would like to point out on Exhibit 13-C the impervious zone that Gulf had illustrated

at the top of the Grayburg apparently is not present in this area because we have two wells producing both from the Grayburg and the Queen in this area.

Q Mr. Montgomery, would you please restate again your recommendations or conclusions?

A My conclusions are to redefine the vertical limits of all of the shallow oil pools in this area in Lea County to be from a minus 100 feet to a point 450 feet below sea level. That the dry gas pool be from the top of the Tansil formation to a point 75 feet below sea level and that these anomolous occurrences be named as separate and distinct reservoirs. I would like to point out at this time that people have been saying these little oil pools add accurrences and anomalous occurrences they are very important because they are some of the best oil pools we have in the entire area due to their character and the type of drive they have, they are among the most important wells we have in the area. Many of them are top allowable. I don't know what the average would be but if we average the production of them all together they would approach the top allowable well.

Q I believe you had a statement you wanted to read from a bulletin.

A I would like to read hastily from this New Mexico School of Mines Bulletin No. 18, this was published in 1942 and was compiled by Robert L. Bates. There were certain contributors from the oil industry who were selected because they figured that, well due to their professional experience and integrity that their word would carry some weight. On the

Arrowhead Pool it is by Rouel L. Boss, resident geologist of Gulf Oil Corporation, "As in most of the pools of the back-reef area in southeast Lea County, the general zone within which accumulation has occurred lies between 200 and 300 feet below sea level, rather than in intervals between stratigraphic horizons. Thus from the crest of the structure toward the flanks, progressively younger beds form the reservoir. This condition allows all wells to be drilled to approximately the same depth below sea level." This article is restricted to the Cooper-Jal and was written by P. W. Miller and Robert L. Bates, it says: "Toward the north, oil and gas are found in progressively older strata. Thus in the Jal pool production is chiefly from the limestones of the middle Seven Rivers, and in the Cooper field most of the porous producing limestones are in the lower Seven Rivers, and possibly in the uppermost Queen formations." This is rather redunant, this is Langlie-Mattix and written by P. W. Miller and Robert L. Bates, "This tendency of the oil and gas to occur in stratigraphically lower zones toward the north is also shown in the Cooper-Jal area to the west, where, however, the accumulations are in limestone rather than in sandstone." This article is on the Monument and written by Robert L. Bates. "The zone that produces oil at Monument occupies a definite position between a depth of 200 feet below sea level and a common water table at 360 feet below sea level. In this respect the pool is similar to a number of other pools to the south, including the Eunice pool. Probably in no well does the entire 160 feet produce oil, but all productive zones fall within this interval."

This article is on the South Eunice Pool was written by Delmar Quinn Cities Service, "The gas-oil contact and the oil-water contact seem to follow the sea-level datum more nearly than stratigraphic lines, but do not conform entirely to either of them."

Q Do you concur with the authors of those articles or do they concur with you?

A I concur with the authors.

MR. YOST: That is all. I would like to ask Mr. Montgomery to the stand for one more question.

Q Mr. Montgomery, would you please define horizontally, these ~~currents~~ occurrences A.B. of oil about which you have testified from your base map, Exhibit No. 3?

A Yes, sir, I will. The reservoir that I indicate with a numeral 3 which is a Yates accumulation, synclinal Yates accumulation, lies in the north half of Section 22 and the south west quarter of Section 22, Township 22 South, Range 36 East. Section 27, the west half same Township and Range, Section 28, the southeast quarter, Section 33, the east half, Section 34, the northwest quarter. The next reservoir they indicated with a numeral No. 9 is located in Section 32, Township 22 South, Range 36 East, lies in the southwest quarter and the east half of the north west quarter of Section 32.

The reservoir that I indicated with a numeral 4 which lies in Township 23 South, a portion of it that lies in 23 South, Range 36 East, is in Section 28, the north east quarter and 27 the southwest quarter and in Section 34, the west half. The portion of it extends into Township 24 South, Range 36 East,

as in Section 3 the northwest quarter.

I would like to point out that in these reservoirs in the synclinal Yates reservoirs that the gas production will be controlled by the limiting gas-oil ratio of the pool.

I recommend that the Falby-Yates be retained and the reservoir that I have designated with numeral 7 which is Yates accumulation of oil again in a synclinal area is in Township 25 South, Range 37 east, section 7, the southwest quarter. In section 18, the east half of the west half and all of the east half. In all of Section 17 and the west half of Section 16. In section 19 the north east quarter and the east half of the northwest quarter. In Section 20, the north half and all of Section 21. The reservoir that I indicated with a numeral No. 6 which lies in Township 25 South, Range 36 East, would be the southeast quarter of Section 13, the east half of Section 24, the east half of Section 25 and the northeast quarter of Section 26. As I recall I believe I gave the wrong range for the reservoir, that is 37 East Township 25, South. The reservoir that I have indicated with a numeral No. 8 lays in Township 26 South, Range 37 east, and would be the west half of Section 7, the west half of Section 18 and the southeast quarter of Section 19.

MR. YOST: That is all.

MR. SPURRIER: Does anyone care to cross examine the witness?

MR. DAILEY: I would like to ask one question right off to start.

CROSS EXAMINATION

By: MR. DAILEY:

Q Have you in effect testified that there is an impermeable barrier throughout most of the area between minus 75 feet subsea and minus 100 feet?

A I have said there is no accumulation of oil in those horizons other than the ones I pointed out.

Q What about the gas, there is no accumulation of gas in there, either?

A Yes, sir, there is possibly an accumulation of gas in there. That is the reason I had a so-called no-man's land between the vertical limits of the gas pool and the oil zone to prevent an operator from producing that gas cap gas and ruining the oil horizon.

Q Then, in the absence of that then all the gas must be gas cap gas?

A No, sir, it is not.

Q You have to have either an impermeable barrier between your oil or else it has to be gas cap gas?

A Well, it is probably impermeable to the extent that there is no production, yes, sir. It is not like the concrete, I feel sure of that or glass.

MR. DAILEY: That is all.

By: MR. SMITH:

Q Mr. Montgomery, as I understand the effect of your testimony you have taken the ccincedence of the respective locations at a point below which you find only oil and above which you find only gas and that you use that as your sole premise for basing those lines, is that a correct analysis of your testimony?

A May I elaborate, I am afraid that your question--

Q Surely.--

A I believe there is a horizontal porosity and permeability was developed throughout this entire area. It is evident from these cross sections that structure, that is in the normal sense that we refer to a name of structure, has no effect on the accumulation of oil. Now, I have heard the opinion that they think possibly these are oil rims in each separate unit, each separate formation or each little horizon within a formation.

It is beyond my comprehension the odds that could possibly be that each one of them is an oil ring with a gas cap occurring at almost identically the same horizon. There is a horizontal reservoir with horizontal porosity and permeability in which oil occurrs.

Q Then, simply figure elaboration, it is based purely on coincidence so far as determination of sub-sea line for your oil and gas?

A Well, I see nothing coincidental about it. That is the way the oil occurrs. I have illustrated it on my cross section.

Q The point I am trying to make is that you have stated a conclusion and you have stated that it is impossible for you to see how that could occur without their being permeability throughout?

A Yes, sir.

Q And that is your reason for it?

A Yes, sir.

Q I think a short time prior to the close of your testi-

mony you made some remarks about the northern end of the field with reference to the impermeable barrier about which the Gulf witnesses testified and, as I recall your testimony, you stated that it probably didn't exist because they had wells that were completed in both the Grayburg and in the Queens?

A Yes, sir.

Q And is that your reason for saying there is no impermeable barrier or do you have other reasons?

A May I elaborate some more. This impermeable barrier as Mr. Boss testified, he said that he did not believe it was a blanket occurrence as I recall. He said that it occurred at that horizon. If it occurrs at that horizon somewhere in there it has to dip through that oil zone and possibly that it is impermeable in small sections but due to the tortuous loops and the possible overlapping of the impermeable beds that the porosity and permeability was developed around the impermeable beds.

Q I guess I can't quite understand your answer. I will ask you this question. In completing an oil well into the Grayburg, it would be necessary to penetrate any impenetrable substance from the standpoint of permeability in order to get to the Grayburg, is that correct?

A Are you speaking--

Q (Interrupting) I am talking about the Bentonitic substance that they were testifying was approximately four inches thick that could afford a shield so far as the question of pressure or oil going through it or gas coming down through it?

A Yes, sir.

Q In order to complete an oil well in the Grayburg, you would have to penetrate that bentonitic shield, wouldn't they?

A Yes, sir, that is correct.

Q If you set your casing and all of your other paraphanali in the hole so as to be perforated above and beneath the benotonitic shield, you would have a completion of both zones, wouldn't you?

A Yes, sir, you would.

Q So, that the mere conclusion that you have a well completed in the Grayburg and also in the Queens, wouldn't necessarily follow as being the only reason why there is permeability?

A Well, Mr. Smith, if we go up structure from that well and where the Grayburg is on up above the zone of porosity and permeability the Queen is not productive there, it only becomes productive when it falls within that zone of porosity and permeability.

Q You don't have any geological evidence to establish that as the structure dips coming over on the side that the same bentonitic structure does or does not exist all the way down that sharply dipping structure?

A I will have to rely on Gulf's testimony for that. I will have to assume that it possibly does overlie the entire area. I don't know, I don't know that that is a problem. I can't see that it effects anything.

Q It is a problem if you find that there is that impermeable shield that does exist over the Grayburg and at a point above 100 feet below sea level or 75 feet you encounter gas,

because in that event you would have a localized gas cap in the Grayburg without communication with the Queens. Wouldn't it be your opinion if that condition did exist that the proration of gas in the zone, despite the fact that it is above the minus 75 feet, should be controlled with reference to the oil reservoir rather than just your general gas as if it were one continuous reservoir throughout the entire area?

A Yes, sir, you are completely correct and you will recall in my testimony that I recommended in this very small area where that would happen that the vertical limits be restricted to the top of the Grayburg formation. That is one of the exceptions of this.

Q The reason why I am getting into this, Mr. Montgomery, is to try to determine your idea, as to how localized or how small that area maybe?

A Well, I think the interval between the top of the Yates and the top of the Grayburg, about 1200 feet. Now, you notice on Gulf's Exhibit they had about a thousand feet. Those were sample logs and I don't know whether the time that was computed when they reached the surface or not, I don't know. Say, it is a thousand, all we have to do is look on the structure map and outline the area in appropriate manner and I don't care what figure you decide to choose for safety sake. Say, we will take a thousand feet that should cover it very well. Then on our structure map outline the area which would be relatively small in the Eunice Monument area and say that in that area that the gas pool would be restricted to the top of the Grayburg formation.

Q You have not made that analysis yet?

A I can in half a second, about half a minute.

Q I would like to have it.

A Which figure would you like to choose?

Q I think you are the witness and you choose.

A I will choose 1200.

Q 1200 being with reference to the--

A (Interrupting) The thickness of the Yates and the top of the Grayburg.

Q Can you identify, say from minus 75 feet sub-sea or some other. I think we could settle the whole thing by saying in your opinion if from a geologic basis it would be possible to identify the top of the Grayburg from any point in the Eumont area that as far as you are concerned, you would be willing to have that go as gas cap gas to be controlled with the Grayburg production?

A Yes, sir.

Q Don't you think then that it might be just as well to adopt Gulf's testimony in this respect insofar as the bentonitic substance or other pressure differential testimony which followed after the testimony with reference to bentonitic substance and say for the purposes of administering the proration here that all of the Grayburg gas or all of the gas produced with wells completed in the Grayburg which can be identified by geologic morpha be accepted from your sub-sea data?

A If we can use the sub-sea datum elsewhere.

Q We will come to that later. I am just talking about the Eumont area right now.

A Well, that may take another involved answer. I would make that recommendation if the minus datum was retained throughout the entire field and if at such a time that the Grayburg came within my vertical limits of the defined gas pool, defined on the sub-sea, that the sub-sea datum be restricted to the top of the Grayburg.

Q I assume that the Commission's records show the geological area in which the wells are completed, would you therefore assume as an automatic exception to your gas prorationing all wells that are shown to have been completed in the Grayburg or San Andres?

A I think they should be controlled by the limiting gas-oil ratio in the pool they fall.

Q The point I am trying to make without reference to the sub-sea datum, if the well has been completed in the Grayburg-San Andres, it would be automatically an oil well without reference to any necessity to look at a sub-sea data point to determine whether or not it is a gas and oil well?

A To my knowledge, I think there is possibly one well and it is a Gulf well that is producing so-called dry gas from the Grayburg formation. That is the only well that I know of.

Q If any other wells are completed and by relation to known geology morphus in the Grayburg, it would be your recommendation, I assume, that such well also be granted the same type of exceptions. In other words that it not be a gas well but be controlled by the gas-oil ratio?

A I am sorry, Mr. Smith, I lost you.

Q You say there is only one well that is producing dry

gas in the Grayburg. You have had that same rule, I assume, from your statement that it being a gas well in the Grayburg, it will be controlled by the gas-oil ratio rather than by listing it on the proration schedule as the base well?

A Yes, sir.

Q It would be your recommendation that any other wells completed in the known Grayburg below the top of the Grayburg marker would also have the same treatment?

A Yes, that is correct.

MR. SMITH: That is all.

By: MR. KELLY:

Q I would like to ask some questions along that line. You have given us your designations of what you call a gas zone and what you call an oil zone. In order to arrive at a gas zone, I presume you defined to yourself what a gas well was. I would like to know your definition of a gas well?

A Mr. Kelly, I do not have any. I have not made a study of that. I have no testimony but I understand that testimony will be given to that effect.

Q As to what a gas well is?

A Yes, that is my understanding.

Q If that is true, I will wait until that testimony comes on, otherwise I would like to repeat the question to you, because I feel that you had to define a gas well in order to get to a gas zone?

A No, sir, I don't follow you. If there is some doubt there, I would certainly like to clear it up. Above this zone with the exception of these areas, synclinal occurrences of

Yates oil and the Seven Rivers Section where oil is controlled by structure and which I named and are on the map, nowhere above that point is there any oil present. Those are dry gas wells and they are not producing any oil with the exception of a few wells that have penetrated the dry gas.

Q I am not asking for any specific area. I wonder what your general definition of the gas well was?

A I have no opinion on it. I haven't made a study of it.

By: MR. MACEY:

Q In your analysis of what a gas well was or what it wasn't, wasn't your simple thought on it being that a gas well was a well that produced gas and no oil?

A Oh, yes.

MR. KELLY: Would you say that a well that produced a 100,000 feet of gas to each barrel of oil would be a gas well?

MR. YOST: There is no definition of a gas well. I don't think that is within the scope of his testimony here. I object to the question.

MR. KELLY: I will withdraw the question.

MR. WOODWARD: If it please the Commission.

MR. SPURRIER: Mr. Woodward.

By: MR. WOODWARD:

Q We would like to ask you some questions about your No. 1 reservoir, will you describe it again, please?

A From a point minus 100 feet from sea level to a point 450 feet below the sea level.

Q What are the areal limits of the red form?

A The Eunice Monument Oil Pool, the Skaggs Oil Pool, the Hardy, the Penrose-Skelly, the Arrowhead Oil Pool, the South Eunice Oil, the Cooper-Jal, the Langlie-Mattix Oil, the Eaves, the Rhodes, and the Leonard and the South Leonard.

Q It is your opinion that that is all one common source of oil?

A In my opinion, yes, sir, it is. I didn't state that.

Q Well, I am trying to understand your definition of the word, reservoir.

A Yes, sir.

Q Is the word reservoir a common source--

A (Interrupting) Is what?

Q Is the term, "common source of supply" synomous with the term reservoir in your thinking?

A I believe it is, yes, sir.

Q Now, from what formations are the oil wells in this N_o. 1 reservoir producing in the Eumont field?

A In the Eumont?

Q Yes.

A Well, there is no oil producing in the Eumont Field.

Q In the Monument Eunice area?

A Eunice Monument area, I don't know whether some of the new completions have been brought in or not, but referring to your W. E. D., I am not sure but I believe it is the Seven Rivers. I do know that we have Queen, Grayburg, San Andres, Seven Rivers and wait, Queen, Seven Rivers; Queen, Grayburg and San Andres.

Q All those formations are productive of oil in the pre-

sent limit of the Monument field?

A I don't know of any field by the name of Monument.

Q Are you familiar with the Eunice pools?

A No, sir, I am not.

Q All right, is that your Eunice Monument area?

A Well, you are a lawyer, I was afraid you were going to do something.

Q I can ask legal questions as well as he can give legal answers.

A Would you restate the question again?

Q From what formation or formations is your oil production in this reservoir, this No. 1 reservoir coming from the Eunice Monument area?

A Well, I know definitely from the Queen, Grayburg and San Andres and Seven Rivers.

Q But you limit it definitely to the Queens, Grayburg and San Andres?

A Yes, sir.

Q Is that correct?

A Yes.

Q Do you know from what formations or formation your oil production is coming from in the south of this field?

A Yes, sir, it is coming, it is presently defined--

Q (Interrupting) As presently defined?

A Yates, Seven Rivers and Queens.

Q You have no oil production from the San Andres or the Grayburg in the South Eunice field?

A No, sir, you do not.

Q You heard the testimony this morning of Continental and Gulf concerning the point at which the structure and particularly the Grayburg hit below the water-oil table between Eunice and South Eunice, did you not?

A Yes, sir, I did.

Q Does that in any way constitute a lateral barrier separating the sources of oil supply in the Eunice Monument area from the South Eunice area and south to the state line?

A No, sir.

Q In your opinion? A It does not.

Q Is it possible that you have communication through that water saturated zone?

A No, sir.

Q You would say your communication occurred above that?

A Yes, sir.

Q What formations in that area between Eunice and South Eunice are above the water table?

A What portions are above it?

Q What formations or portions of formations are above the water table in the area between the Eunice and the South Eunice field?

A Well, shall I pick from the highest point that is above it, structural?

Q Is a portion of the Queens above the water-oil contact in that area, the Queens, South Eunice and Eunice?

A Yes, sir, it is.

Q Are you assuming that your communication of oil which would make this one common source of oil, is through the Queens?

You have got your Grayburg going to water, do you not?

A I made a statement earlier that I thought there was horizontal porosity and permeability developed in this area which crossed boundaries.

Q I understand that. You accept the testimony of Continental and Gulf, that the Grayburg is entirely under water in that area of Eunice and South Eunice?

A In a portion of that area, it is, yes, sir.

Q That would extend from the western limits clear across to the eastern limits?

A Would you designate the area a little more definite? In some areas the San Andres is above the water table.

Q We are moving down into the Eunice field.

A The South Eunic e?

Q The South Eunice from the Eunice field.

A All right.

Q The testimony that is in the record now is to the effect that you have an area extending east-west horizon through which the Grayburg dips. Now, I think there is evidence that a portion of the Queen also dips through that area. If you have any communication across it, you state it is not through the oil saturated portions, it must therefore be through the Queens, is that not correct?

A Well, I stated that the oil migrated in a horizontal plane which crossed formation boundaries.

Q Does it migrate through a water saturated--

A (Interrupting) No, sir, it does not.

Q It must migrate above it?

A That is right.

Q If the only formation above that zone that is productive of oil in the Eumont area is the Queens, it must migrate through the Queens, is that not correct?

A I am having a little difficulty following you. I am not trying to evade your questions. I would like to encourage every one. I just don't understand what you are getting at.

Q Let's say you have door A and door B is locked, if you go through the door, is it door A or B?

A If I didn't have the key, I would go through A.

Q If the communication through the Grayburg in this area is prevented by the water saturation, you would expect your communication through the Queen, would you not?

A Yes, sir.

Q If you had a series of dry holes in that area, dry in the Queens, would it indicate to you a lateral separation from the nath end of this trend from the Eunice Monument area down through the South Eunice?

A Well, where does this Queen, where does that fall in reference to the oil reservoir?

Q Well now, we are talking about the zone generally where the Grayburg goes under water. If in that same zone or area you have a series of wells which are non-productive in the Queens, the only other formation through which you might expect communication, you would have some indication there of a lateral separation, would you not?

A May I ask myself the question, I think you are asking me? May I?

Q All right, phrase the question and I will see.

A Do you mean that in this area that you are referring to near the South Eunice Northern Border of the South Eunice area?

Q Yes.

A That is right.

Q Assuming that this is the Queen and the Grayburg is down here and that it is in the water zone?

A Yes.

Q And that the Queen formation is within this reservoir No. 1 or the oil zone, that is correct. I am talking about the Queen formation that is overlying the Grayburg in that area where the Grayburg first dips below the oil-water table.

A First dips below it?

Q Yes, that is the area we are talking about. I think we have established if there is any lateral communication, it is through the Queens?

A Yes.

Q If the Queen is unproductive in that area, if it in that region had undeveloped porosity or permeability, would that indicate to you a lateral separation in the oil supply in the Eunice Monument, from the oil supply from the South Eunice on?

A It would in that one area, yes, sir. in that small area of the well bore.

Q If it extended across the trend, would it indicate to you that you have common sources of supply?

A If you have a dry hole across there, say one location apart or two locations apart.

Q You would prefer two locations apart?

A I think we have to keep this in mind that in local areas, we have had testimony that in local areas there is tightening up. There are local barriers due to pinch out.

Q So far as the communication of the Queens production in the Eunice Monument area is concerned, you feel that there is communication between that Queens production and the Grayburg production in the Eunice Monument field?

A Yes, sir, I do.

Q As a result of these classifications how many common sources will you come out with when you add them all up here?

A Well, we will have one major oil reservoir which would be No. 1. I believe we had two other distinct and different types of reservoirs, the synclinal reservoir and the reservoir controlled by structure. We have three different types of reservoirs here since a portion of two of these types of reservoirs are not connected laterally or, I believe, I end up with five or six. I ended up with six.

Q Let me ask you this one further question, which suggests the significance of a common sub-sea level below which one substance predominates in production above which separate substance predominates. Does the fact standing alone that you have this similiarity in the area from which you are obtaining oil production throughout this entire 42,000,000 trend from the north end of Eumont down, does that fact standing alone, indicate to you that you have a single common source of supply?

A Yes.

Q Below that line?

A Yes, sir, it does.

Q The fact that Death Valley and the Dead Sea have the same sub-sea data wouldn't mean they were a common source of anything, would it?

A Well, I understand that this is a hearing on gas and not oil, but I would like to continue this argument, if you want to argue about it.

Q I am asking a question as to whether under those circumstances the fact that they are both the same sub-sea level notwithstanding the fact, the further fact that you have got two or three oceans between them, whether that fact standing alone establishes the fact that they are a common source of anything?

A Which two areas are we referring to Death Valley --?

Q We are now referring to Death Valley and the Dead Sea. Those are issues outside the call of the hearing.

A I imagine there would be considerable changes in lithology in that distance.

Q Lithology aside, we are talking about the fact or assuming that they have a common sub-sea datum point. That fact standing alone is not indicative of anything concerning the communication between them?

A The Dead Sea, I can't even get your anology. I refuse to answer the question. May I refuse?

MR. SPURRIER: Certainly.

MR. WOODWARD: I think the question is a perfectly logical question. He is basing his opinion upon the fact that there appears to be a similarity in the sub-sea data point and

this is perhaps a little farfetched but it does illustrate the fact that that common sub-sea datum line has no necessary relationship whatsoever in determining whether you have a common source of supply or not.

Q You do have a further similarity in the analogy here, you have an area in which you have considerable water saturatior and analogy maybe compared with the miles of separation encountered in two different parts of the globe. The fact standing alone that you have the common sub-sea datum line does not indicate so far as we can make out any necessary relationship in the connection between these reservoirs. I think the point is perfectly self evident as it stands. What I would like to find out, is what information taken with that fact you are relying on in classifying these together?

A Experiences of geologists that have worked in the area for a number of years.

Q Do you have any evidence of vertical communication between the Grayburg and the Queen, which would explain the communication might be effected between the Grayburg and the formation south from South Eunice. We have established that it must be through the Queen. Do you have any evidence whatever of vertical communication between the Grayburg in the Eunice Monument area and the Queen in the Eunice Monument area?

A Any difference in what?

Q Do you have any evidence of vertical communication between the Grayburg and the Queens in the Eunice Monument area?

A There might possibly be a little bit of vertical communication.

Q Possibly aside, do you have any evidence of that fact?

A No, sir, I do not, do you?

Q I am not the witness.

A Excuse me, I am sorry.

Q We are trying to find out in addition to this sub-sea data point whether or not there is any other evidence of communication?

A Well, I have gone to considerable extent here working on evidence. I mean I have arrived at certain conclusions that are based on the evidence that I find and that is one of the conclusions that I arrived at. As I pointed out earlier, it is difficult for me to conceive that all of these different formations would have a gas cap and an oil rim and happen to accidentally by coincidence fall on the same horizon. Using that analogy the gas and the oil are distinctly separate as illustrated by the pressures. They are not connected in anyway, fashion or manner. Assuming that they were and that they all fell about the sub-sea datum, I don't know how many factors a person would have to take into account to figure it up. It must be an astronomical number.

Q We are not asking for any astronomical calculation. The only question is as to any tangible evidence as to any vertical evidence of communication between the producing oil in two formations. There is no evidence to that effect in your testimony?

A There has to be in a certain extent to my testimony. Are you speaking of right angles to the formation?

Q We are talking about any vertical communication whether

it is significant or goes straight up and down.

A There is a small amount of vertical communication, yes, sir.

Q That is a conclusion?

A Well, I have to arrive at that conclusion, you restrict me in my answer.

Q On the basis of what evidence?

A Well, if the oil passes, which I have illustrated here, passes from one formation to another irregardless of structure.

Q Isn't that what we are trying to find out whether it does or not?

A I have arrived at that conclusion. I have found out.

Q That statement does represent a conclusion on your part?

A Yes, sir, it does.

Q One other question. Most of your testimony as I take it, is designed to show a vertical coincidence of oil and gas above a certain line. Have you made extensive studies as to the lateral movement of either substance through the reservoir?

A Well, we know that oil and gas both will migrate.

Q Have you made any particular study of how the oil and gas migrate in this particular reservoir? In other words, what you are emphasizing has been on this point above and below the sea level rather than lateral communication?

A No, sir, I have said three or four times that there is a, that this reservoir No. 1, which I have called, is a zone of horizontal porosity and permeability.

Q Which is continuous from the north end of Eumont to

the State line?

A Yes, sir, and further.

MR. WOODWARD: That is all.

MR. CAMPBELL: Let me ask one question.

MR. SPURRIER: We are going to recess until 8 o'clock in the morning. You may ask your question.

By: MR. CAMPBELL:

Q My question is confined to the area now encompassed in the Jalco and Langmat gas pools. From your investigation, your study of this area, do you find any reason, geologically for the horizontal delineation between the Jalco and Langmat gas pools as they now exist?

A No, sir, I do not.

Q Did you make any study of that area with reference to pressures and sulfur content of gas or not?

A Yes, sir, I did.

Q Based upon those studies, do you find any reason, due to pressure differentials or difference in sulfur content of gas for the present horizontal limits between the Jalco and Langmat gas pools?

A The way I interpreted those pressures and sulfur content I see no basis for it, no, sir.

MR. SPURRIER: The meeting is in recess.

(RECESS)

MORNING SESSION, TUESDAY, May 11, 1954 at 8:00 A.M.

MR. SPURRIER: The meeting will come to order.

MR. YOST: I don't believe I offered into evidence the Exhibits 13A to 13H inclusive, 14A to 14G inclusive, and Commission's Exhibit No. 3. If I did not, at this time, we offer those in evidence.

MR. SPURRIER: Is there objections? Without objection, they will be admitted. Is there anyone who cares to cross examine Mr. Montgomery?

MR. MALONE: Mr. Spurrier.

MR. SPURRIER: Mr. Malone.

BY: MR. MALONE:

Q Mr. Montgomery, you referred yesterday to a Gulf well which you thought might be producing gas cap gas from the Grayburg. Can you identify that well for us, please?

A Well, I don't recall the specific statement.

Q I just want the name of the well, if you know, or the location of it.

A Well, it seems to me there was a Gulf well, Gulf H. W. Ellison No. 1.

Q That is a Queen well, is it not?

A Yes, sir, it probably is a Queen well.

Q You don't have in mind the well that you might have been referring to.

A I can't think of it, Mr. Malone. If you want me to look around I will find it.

Q Gulf doesn't know it, if they have gas cap gas producing in the Grayburg and I would like to have the information if there

is one?

A I don't remember making that statement. I assume I did or you wouldn't be asking. I didn't recall saying Grayburg.

Q If you didn't say it, I am happy to hear it.

A I believe I made a remark about a Gulf No. 1 Shipp.

Q That was an exception to - -

A (Interrupting) I thought possibly it was gas cap. I don't recall saying Grayburg formation. But, I also went on to say that due to Gulf's testimony, the pressures they have on the well, it apparently was not gas cap gas.

Q Perhaps, I misunderstood your testimony. You do agree with Gulf as to the importance of preserving the gas cap gas in the Grayburg and San Andres in order to increase the ultimate recovery of oil from that reservoir?

A Yes, sir, I do.

Q As I understood your testimony yesterday, while you first indicated that the interval from the top of the Yates to the top of the Grayburg might be as much as 1200 feet, you would accept the thousand feet that was shown by Gulf's Exhibits as indicating the top of the Grayburg?

A Yes, sir, I would.

Q You did also say that it would be agreeable with you to accept any well producing below the top of the Grayburg from the datum designation which you have recognized as far as the rest of the pool is concerned?

A Yes, sir.

Q With reference to the School of Mines Bulletin to which you referred, was there any respect in which you felt that Mr.

Boss's testimony was inconsistent with the statements that he made in that bulleting?

A No, sir.

Q He did refer to the fact that the communication which had existed in this area was in geologic time rather than in the normal performance of the reservoir, did he not?

A As I recall, yes, sir.

Q Is it your feeling that there is communication throughout this reservoir at the present time or only that such communication has existed in geologic times?

A Well, I feel that communication has existed in geologic times, yes, sir.

Q That would not necessarily mean that communication would be reflected in reservoir performance during the normal course of these pools, the normal life of these pools?

A Oh, no, sir, it is very evident from one location to another when we pass into a different type of lithology the reservoir characteristics are very dissimilar.

Q Does that indicate the lack of communication in your opinion, between certain portions of your oil pool No. 1?

A Possibly, in our life time, in our life time of the well possibly it indicates that it maybe very slow. I don't know, migration, of course, is a very slow process. Something that well records probably are rather slow in indicating.

Q As I understand your recommendation, it would eliminate all of the present delineations of oil pools in this area, would it not, and throw them into a single oil pool with the additional pools which you testified would be required because of the

structure?

A No, I recommend that all of the vertical limits of the present oil pools be redefined, the vertical.

Q The areal limits would remain as they are?

A Yes, sir, that is what I recommended.

Q I misunderstood your testimony. I thought you were going to have one oil pool below your datum point that was going to be the entire length of all the pools shown on your Exhibit, some 43 miles long?

A No, sir. Amerada asked me if I thought it was one reservoir. I said, "yes." In my testimony, I didn't want to get on to such a controversial subject so, I just merely recommended that all the pools be redefined vertically.

Q Vertically?

A Yes.

Q But that the areal delineations remain as they are at the present time?

A The oil pools, yes, sir.

Q If, in fact, that vertical delineation throws them all into a single pool, there wouldn't be much point in keeping the areal delineation, would there?

A I don't care whether there is one, seven or how many.

Q The problem I am trying to reach is this. I am sure you have taken into consideration the fact that the power of the Commission to allocate oil and gas is limited to pools and fields and the statute only gives the Commission as, of course, you are aware, the power to allocate as between wells in a

pool. If the Commission should accept this datum designation and if the result of that designation would be to include more than one pool in the area, there would be no doubt but that their order would be invalid, I assume. That is my legal opinion. It is no doubt the order would be invalid. It is of considerable importance that we, not because the convenience of the thing, throw together pools which as a legal proposition are separate pools. Geologically communication has to exist throughout a reservoir in order for it to be a pool, does it not?

A Yes, sir.

Q So, in order to be sure that we have an entity or a unit that the Commission is authorized to prorate. It has to be where the communication exists as between the various portions of the pool. Well now, how do you reconcile that situation with Gulf's testimony yesterday as to this barrier which apparently exists somewhere at the top of the Grayburg or the base of the Queen. If that prevents communication and if the result of your recommendations would be to throw the Grayburg and Queen into a single oil pool, wouldn't we have a situation in which the Commission's order would have to fall legally?

A Well, I understand that the present vertical limits of the Eunice Monument is the Seven Rivers, Queen, Grayburg and San Andres.

Q With areal limits which you now recommend be retained or that you have no objection to retaining?

A I have no objection to retaining them.

Q You do not feel then that there would be any problem so far as a common source of supply or a pool existing if there is no communication between certain of the oil formations which

are in the pool?

A Well, I don't, of course, I am not a lawyer--

Q (Interrupting) From a geologic point of view, you could testify that it is a pool and a common source of supply?

A Yes, sir, I could.

Q That would be in the face of the pressure differentials that exist in these various pools that are now delineated by the Commission?

A I didn't quite understand your question, Mr. Malone.

Q I think that as long as the areal delineation is continued, that probably isn't of much consequence and I will withdraw the question. I had misunderstood your testimony. You referred to a number of wells that were exceptions to our general proposition with reference to the occurrence of gas above minus 75 and oil below minus 100. Do you happen to know what the total number of those exceptional wells would be?

A I believe the total number of exceptions on the gas well was one gas well, which was the Gulf No. 1 Shipp that was within the presently defined limits of the gas pool. The other exception I pointed out, I believe I stated, they were gas cap gas.

Q Of course, it hasn't been possible for you to study all of the logs of the individual wells in this area in preparation for your testimony, has it?

A Well, I have studied more than twenty percent of the wells in the area, Mr. Malone. Of course, the area has very definite pattern and without being a statistician there are certain things I will have to accept, I had accepted as being

true for the entire area.

Q What type of exception would you recommend that the Commission make in order to take care of such a well as the Shipp which you referred to?

A Well, I, that would be an administrative problem, I believe. I stated that it is not gas cap gas.

Q The thing that concerned me a little bit was that the thing that recommends your program, it seems to me is its simplicity. If it isn't simpler and easier of administration, it probably doesn't add a great deal to a situation that we have followed before as far as oil pools is concerned, does it?

A Would you restate it, Mr. Malone?

Q I am not trying to confuse you.

A No, I know you are not.

Q I merely had felt that the principal thing that recommended your plan was its ease and simplicity of administration. If there are too many exceptions that simplicity of administration, of course, is reduced. That is why I was interested in the individual well exceptions that would have to be made if we adopted.

A I believe I cited one dry gas well that was an exception, as it is presently defined, I believe I stated in the testimony that there are at least 50 or 60 wells possibly more that do not fall within the vertical limits of the presently defined pool. My recommendation will also keep separate all of the dry gas and all of the oil which is very important to the pressure differences between the dry gas reservoir and the oil. My recommendations will cure that problem. An operator will not

be able to open a dry gas section in an oil section in the same well bore.

Q There was some reference in your testimony yesterday as to the extent of the structure, the top of the structure in the Grayburg and San Andres up in the Eumont area. I understood you to refer to its extent, the extent of the gas cap, perhaps, as only 160 acres. Have you actually made any study as to the area of that structure?

A Well, I did after the question was raised yesterday, Mr. Malone, looking at the structure map, I was going on the basis of 1200 feet. My map is contoured on the Yates and going on the basis that the interval from the top of the Yates to the top of the Grayburg was 1200 feet, it probably covered roughly that area or slightly a little more. Using Gulf's 1,000 which I have no objection to wherever the Grayburg is that is the important thing, it would be a larger area considerably, yes, sir.

Q You would accept whatever area was indicated by application of that one thousand foot interval?

A Yes, sir, to the top of the Grayburg whever it might be.

Q Have you ever known of any other Commission or regulatory body which has undertaken to delineate a pool for gas or oil proration on the basis of a datum point as you have recommended?

A No, sir, I haven't.

A It is pretty unique in regulations, isn't it? The information on which your recommendation is based, is not new

information, is it?

It has been available to the Commission and to all of the Geological Committees that have been working with this problem since the discovery or shortly thereafter?

A I am sure that everyone has been aware of this occurrence but I don't know that they have probably interpreted it in the light of keeping the gas and the oil pools separate which has not become a major problem until gas became important economically. That has only been in the last few years.

Q Insofar as the oil pools are concerned the datum could have been used prior to the time of gas allocation?

A Yes, it could have been.

MR. MALONE: That is all, thank you.

MR. SPURRIER: Anyone else? Mr. Hinkle.

MR. HINKLE: Clarence Hinkle representing Humble.

By MR. HINKLE:

Q Mr. Montgomery, as I understand it, the green portions on this well section and plats represent your gas areas and your red shaded portions the oil producing areas, is that right?

A Yes, sir.

Q Take the green area for instance, does that represent the top of the gas horizon and the bottom necessarily?

A No, sir, it does not.

Q What does it represent then?

A Well, often the operator would report the top of a pay and well the interval of the pay which does not indicate that the entire section is productive.

Q It does not represent the top of your gas production

or the bottom, the whole producing zone then necessarily?

A No, sir, it indicates the zone that is open to gas production from which the operator has assumed that it would be produced.

Q Is the same thing true of your oil production, does that only repressnt the zone reported on the logs or does it represent the actual top of the oil, the bottom of the oil producing zone?

A No, it does not, it represents what has been reported.

MR. HINKLE: That is all.

By MR. SMITH:

Q Mr.Montgomeey, as I understand it, from Mr. Hinkle's questioning of you, that there is a possibility that the information from which you worked represents the completion depths of various wells rather than the location of the oil?

A Well quite often Mr. Smith, an operator doesn't drill the entire pay section in a well bore that is true, yes, sir.

Q That is the point I am making?

A Yes, sir.

Q The information on the various charts around here would be reflected from reports of completion depths rather than at the point at which oil is first encountered?

A Well, the operator reports on Commission forms and on United States Government forms, the tops of the pay and the intervals of the pay. I have to assume those are correct?

Q The point I am trying to make is so far as the data on these charts are concerned and your dissovery upon these charts that oil occurred above a certain sub-sea datum point and gas below a sub-sea datum point and in listing the information, did

you accept the figures that appeared on the charts or did you make additional investigation to determine whether the oil was found at a higher or lower point than indicated on various charts?

A Naturally, I relied upon the intelligence of the Committee that prepared the charts. I went further and checked each and every well record that we have on file in our office.

Q When you checked that record, did it say, does it show on the particular report form the top of the pay, the point at which perforations are made and other data from which you could make a determination as to when the top of the pay was encountered?

A Yes, sir, they do.

Q In checking that back on these charts, are the lines which reflect the top of the oil pay, the top of the pay as reported on the forms or is it the point at which the well was completed?

A Well, I assume that if they reported on the forms that is where they are completed.

Q I am asking when you verified the information back on these forms on to these Exhibits here, whether or not the information indicated on the Exhibits reflects from these forms the top of the pay or the point at which the well was completed, If you didn't make that investigation, just say so.

A It comes from the forms, Mr. Smith.

Q I am asking your obswrvation of those forms. I know it comes from the forms. I am asking for your observation of the forms. You say you checked the forms back to the informa-

tion on these charts, you made an investigation of the forms you said?

A Yes.

Q When you made that investigation of those forms, did you take the information that you acquired personally from those forms and verify the location on the various Exhibits around here?

A Yes, sir, I did.

Q Then, we come to the next question. What is the information that you verified from those forms, the top of the pay or the point at which the well was located or completed, just what did you do?

A Well, sometimes, very obviously the forms were wrong. That is true. Then going by the drill stem test and the information that was available from scout tickets in some cases, when they were very obviously reported wrong and those are the things you can pick out, I would have to interpret that, yes, sir.

Q You have got me completely confused.

MR. SPURRIER: Off the record.

(discussion off the record.)

MR. SPURRIER: Now, on the record. Ask him again.

Q Mr. Montgomery, in making your verification of the locations sub-sea at which point you find oil and no higher from the forms which were submitted by the operators what basis did you use for your verification, the top of the pay as reported on the forms or the point at which the well was completed, perforated?

A Well, where it was perforated.

Q Where it was perforated?

A Yes, sir.

Q In other words, what we have then so far as this data is concerned through here is the fact that the operators were completing at a certain depth rather than the location of the highest point at which you would encounter the oil, isn't that right?

A Well, in some cases, Mr.Smith, the casing shoe is above the top of the pay zone reported.

Q So, that what I am getting at is this. I will ask you as informally as I can. The coincidence to which you attributed the communication throughout, could be the coincidence that one operator offset wanted to complete at the same depth that the other operator completed at?

A That could be.

Q That is just a reasonable conclusion that there was communication?

A I assume that the operator is drilling oil and he certainly is going to drill to the oil horizon.

Q He is going to try to complete where somebody else has completed at the same depth. That means that the information with regard to the sub-sea datum is based entirely at a point at which a mechanical completion occurred rather than upon a point where the oil would be first encountered if that is the basis upon which this evidence is put up here, isn't that correct, Mr. Montgomery? That being the case I will ask you this last question here. That being the case, it is quite

possible that you would encounter oil at a point higher than minus 100 below sea level in many of the locations throughout this entire field and still be in the same reservoir as that below the 100?

A Other than the exceptions that I pointed out, are distinctly separate reservoir, I doubt that there is any oil. I do not know of any oil that occurs above a minus 100 feet.

Q You haven't made any investigation except off the reports filed here and the Exhibits, isn't that right, Mr. Montgomery?

A I believe I have exhausted the supply, essentially exhausted the information.

Q I am talking about the information that you have exhausted?

A Yes, sir.

Q Which is the information of the reports and these particular exhibits which were prepared by the Committee?

A Yes, sir.

Q That is all your investigation consists of?

A Well, electric logs and cross sections and sample logs, I have examined those also.

Q You have stated that based upon the information which you have around here and your investigation of these completion reports which show the completion point at which the well was completed, you have come to the conclusion that there is no oil above that particular point?

A Yes, sir.

Q Isn't it a customary practice to complete your wells

somewhere below the top of the pay?

A Yes, sir, it is.

Q Wouldn't that naturally follow that if you used the point at which the well was completed that you would have some oil pay above the particular points reflected on these exhibits around this room?

A I believe I do have some oil pay and I do believe there is some oil pay above the points reflected in this room, but they do not get above a minus 100 feet. We take in the San Andres formation up in the Eunice Monument area, every week or so, we have wells up there that are replugged back and reperforated but none of them have reached the minus stage yet, and that is the most active reservoir we have in the entire area.

Q We are still talking about completions and not the top of the pay and we also complete the well somewhere in the pay and not right at the top?

A Yes, sir.

Q Now, about the new reservoirs that you are recommending I believe yesterday, you stated that they were extremely efficient and the best pools in the State, is this one of them right here?

A I said they were very good pools. No. 4?

Q This one of them here, No. 4?

A Please, let me see, which one it is. Yes, sir, that is one of the better ones.

Q Let me ask you in your investigation, you have this outlined by quarter sections here and apparently consists of four quarter sections strung out, approximately a mile north

and south. What is the type of energy drive which makes these reservoirs perform so well?

A An active water drive.

Q Where is the water drive coming from, below?

A No, sir, it is coming from the west.

Q You will notice that there is some additional green area over there which is apparently in a known oil field, now which one is that?

A Cooper-Jal Oil Pool.

Q Cooper-Jal?

A Yes.

Q Is the Cooper-Jal Oil Pool effected by the active water drive from the west?

A Portions of it as presently defined, portions of it, yes.

Q It is lying west of your reservoir No. 4. Do you know of any particular reason why it would not be effected only after the western part of the Cooper-Jal pool has been effected?

A Well, it would depend on where it is completed, Mr. Smith, the well. I mean, the water is encroaching along different planes of strata and it does not encroach regularly along those different planes.

Q Do I understand you then to say that the completion depth in this reservoir No. 4 is at a different depth than in the Cooper-Jal?

A That is possible, yes, sir.

Q Do you know whether or not it is?

A Some of those wells are completed at different depths

than some of the other wells in the Cooper-Jal, yes, sir.

Q Are they higher or lower?

A They are higher structurally.

Q As I understand your testimony, then, you have a linticular condition which lies above the Cooper-Jal Pool which permits the entrance of water by means of this linticular intrusion over across the Cooper-Jal and forces the water drive from the west on your number 4 reservoir?

A Well, many of these wells on the west have been watered out, Mr. Smith, and they are no longer productive and many of these wells in the particular reservoir 4 are producing oil out of that reservoir at this time, not in Reservoir 4, do I know of, but in similar type along the reef front here, many of the wells were drilled and produced as dry gas wells for a number of years and then went to oil wells and became top allowables and eventually some of them have been going to water.

Q Of course, that isn't quite responsive to the question, I asked you, but I assume from your statement, I hope I am interpreting it that the linticular condition about the water does not exist and that we do have a water drive coming through the Cooper-Jal Pool and afforded your water drive in the recommended Reservoir No. 4?

A Yes.

Q Is there any reason why the No. 4 should be treated differently than Cooper-Jal?

A Yes, sir, they are very differently and distinctly separate reservoirs.

Q You mean there is an impermeable barrier that lies along

the west flank of Reservoir No. 4?

A No, sir, there is not an impermeable barrier there. It is very permeable in fact.

Q Well, that is the point, why should it be treated in a separate reservoir if there is communication?

A May I point out?

Q Surely.

A In this area right here we have the Continental Shole A-24 No. 2, it was completed in this low reservoir and was later plugged back and completed in this Reservoir No. 6 which I have outlined up here, which is a distinct and separate reservoir. That is not the only one there are several others up there.

Q Then, as I understand your testimony, there is quite a bit of linticularity in the field which maybe found at different elevations depending upon the geological conditions that exists at that location.

A There is very considerable linticularity.

Q That being the case, since you encountered the linticularity at different depths throughout the field, there is a reasonable possibility of finding oil at many locations that you know not about right now elsewhere in the field which would require the exception that you are recommending for Reservoir No. 4?

A Well, they are all explained on geological and engineering basis, Mr. Smith.

Q I understand that.

A May I use the analogy that if the Benton field, even

thought it was discovered should we name it, this is another field. I mean it has been producing for a number of years but has not been designated as a separate field. I have recommended to the Commission that they do that.

Q The point I am trying to make to be as brief as I can, is that because of this linticular condition, isn't it your opinion, that it is a unrealistic attitude to take, an arbitrary line 100 feet sub-sea and say everything above that is gas and everything below is oil? You may encounter the linticular condition at any number of points throughout the entire area which have not been under investigation as yet?

A I chose that point, probably what you say is in part true, Mr. Smith. I chose that point. We want to cure the problems of gas proration. I have not heard any recommendations made to this Commission that will take care of as many problems as this datum will take care of.

Q As I understand your recommendation, it is really a rule of convenience rather than one based upon geological evidence or testimony?

A It is based upon geologic evidence and testimony and I have stated my evidence and my testimony but also there is an absolute matter of convenience involved in the line, yes, sir.

Q Do you see anything more inconsistent between following the present definition of the vertical limits of these pools. I believe that they encompass the top 200 feet of the Queen formation in the gas the lower 100 feet of the Queens in the oil, isn't that the present definition of most of these various pools that we have?

A No, sir, it isn't.

Q What is the definition?

A Well, in the Eunice Monument, the definition is the Seven Rivers, Queen, Grayburg and San Andres.

Q It covers it all?

A Yes, sir.

Q You mean the Grayburg and the San Andres are classified as oil pools, are they in the Eunice Monument area?

A The Seven Rivers, Queen, Grayburg and San Andres is designated as the vertical limits in the Eunice Monument for the vertical limits of the oil pool.

Q All of those formations?

A All of those formations.

Q What is in the Eunice gas?

A Yates, Seven Rivers and Queen, the Seven Rivers and Queen in the gas pool overlapping the Seven Rivers and Queen in the oil pool which does not permit the Commission to prevent an operator from opening up over the oil and gas zone which would be very detrimental to the reservoir. My sub-sea datum with the exception of keeping out the Grayburg would cure that problem there.

Q In other words, you are still of the opinion that so far as the sub-sea datum is concerned, that the Commission can permit separate treatment of the Grayburg and San Andres reservoir if the wells are drilled below a certain known geological marker?

A They can treat them separately.

Q Separately, that is right, from the sub-sea datum?

A For administrative purposes, they can, yes, sir.

MR.SMITH: That is all.

MR. SPURRIER: Anyone else? Mr. Kellahin.

By: MR. KELLAHIN:

Q Mr. Montgomery, after hearing your response to Mr. Malone's questions, perhaps, I am a little dense but I am confused. As I understood your testimony yesterday, you say there is a permeability area through there at the sub-sea datum minus 100 feet, which you have defined as your Reservoir No. 1, is that correct?

A Yes, sir, that is correct.

Q In response to Mr. Malone's questioning, you indicated that you meant during geologic times. Now, my question is do you think that that permeable zone exists from the point of view of the life of the reservoir as an effective permeable zone?

A Well, that is something that, well, I don't know whether we could ever prove or disprove that. I don't believe it could be disproved. I have no conclusive proof other than conclusions that I can draw from my investigation.

Q Well, do you think there is an effective communication throughout the major portion of it? Is it your opinion as of now?

A Well, in some areas this oil reservoir has essentially been depleted and in others, it is still an active reservoir. I believe we can say from that that possibly if there is migration, that the migration is very slow.

Q From the point of view of the life of the reservoir,

then, it would not be considered effective communication, is that correct?

A It would be very slow. I am not sure whether it would be economic or not.

Q You don't want to answer one way or the other, is that the situation?

A Well, I hate to--

Q (Interrupting) In view of your answer, Mr. Montgomery, I would like to refer you to Exhibit 13-F with reference to Continental Line A-28 No. 5 well which falls on the side marked as the Jalco area. You recognize the well, I am referring to?

A Yes, sir, I know the well.

Q According to your chart there you show the gas reservoir overlying the oil reservoir and as I understand your testimony, yesterday, you considered that a separate pool, is that correct?

A Yes.

Q The stratrigraphic traps?

A Of the gas and the oil?

Q The oil.

A The oil, yes, sir, I did.

Q You considered that as separate from your, what you referred to as your Reservoir No. 1?

A Yes, sir, I did.

Q Well, if there were an area of porosity at the sub-sea datum would it not encounter that stratigraphic trap and make it a part of the same reservoir?

A Yes, sir, it probably would.

Q In your opinion, it does not do so then?

A In that, well, it is possible in areas that it would, yes, sir, Mr. Kellahin.

Q I mean in this area.

A Well, I have no evidence in that area. The well offset to the west does fall below that line and apparently is producing from the same reservoir as the Line A-28 No. 5, but that was just a matter of interpretation there.

Q You could extend your reservoir No. 1 over there too, couldn't you, as easily?

A To that one well?

Q Yes.

A Yes, sir, I could.

Q As I understand your testimony yesterday, you were of the opinion there was another reservoir underlying that?

A I said there was a possibility as evidenced on this cross section.

Q In that event, it would indicate that it was following the formation rather than the sub-sea data?

A Reservoir No. 4, yes, sir.

Q Well, I mean reservoir No. 1, if it underlies that Reservoir No. 4?

A Reservoir No. 1 would not follow stratrigraphic horizons necessarily.

Q I don't mean necessarily. If you are correct in your assumption that there is another reservoir underlying No. 4, then it would indicate that it was following the formation, wouldn't it?

A No, sir, I don't see that it would.

Q Well, if it doesn't follow the formation, it has to intersect it, then?

A Yes, sir, it would intersect it possibly.

Q Number 4, then, would not be a separate reservoir, is that correct? If Reservoir No. 1 intersects, then Reservoir No. 4, would not be separated?

A Yes, sir, there would be communication between the two in part.

Q Now, then referring to Exhibit 13 C, I would like you to step over and look at that, if you don't mind, please?

A All right.

Q Referring to the exhibit over here. Referring to Lockhart A-18 # 4 well which is up at this end of the Exhibit, I believe.

A The Number 4?

Q Yes, sir, and the Number 5?

A Yes, sir.

Q Did you make a study of those two wells?

A I made the study as far as the records were concerned, yes, sir.

Q Did you determine from the records a substantial difference in the performance of those two wells?

A Number 4 and Number 5?

Q Yes, sir. They are offsetting wells, are they not?

A Yes, sir, there apparently is not much difference between the two wells.

Q You say there is not much difference?

A As I know right now.

Q Isn't the Lockhart A-16 No. 4 an active dry gas well?

A I would say that it has probably considerable amount of gas in solution.

Q The A-18 # 5 is it not an active water drive well completed in a different formation?

A Yes, sir, the Grayburg formation has very active water drive.

MR. KELLAHIN: I would like to call the Commission's attention to the production records for the month of February, which show the Lockhart A-18 # 4 producing 112 barrels of oil and 8 barrels of water in the Queen and the A-18 # 5 an offsetting well on the same report producing 252 barrels of oil, 64,804 barrels of water producing from the Grayburg.

Q In view of that, can you explain that situation, Mr. Montgomery?

A Yes,sir, the Grayburg formation as we know has a very active water drive. The Grayburg, wait a moment, generally, the Grayburg doesn't have an active water drive. I don't know what happened. Generally the Grayburg doesn't have an active water drive.

Q I didn't mean to confuse you.

A I know. Ordinarily the Grayburg has a very active gas drive.

Q Well, that is all with reference to that, thank you. In reference to your Exhibit 21, yesterday, Mr. Montgomery, Mr. Dailey put on testimony pertaining to that Exhibit and pointed out to instances where water was coming from the middle

of the pay zone in our State J # 7 and State J # 11, I don't remember, do you remember the specific wells? You do remember the testimony where there was oil production below the water?

A I don't recall it offhand, Mr. Kellahin, what area is that located in, the Eunice Monument?

Q It is in the Arrowhead.

A Arrowhead, there was water above the oil?

Q Yes, sir.

A I must have missed it, I am sorry.

Q It was located within your reservoir which you have defined as Reservoir No. 1?

A Well, I assume it is knowing the occurrence of the oil in the Arrowhead Pool.

Q You don't recall that testimony?

A No, sir, I don't, I am sorry.

Q Assuming that is the case, could you offer an explanation of that?

A For the water above the oil?

Q Yes.

A No, sir, I would not attempt to at all.

Q If that occurs, would it not seem to indicate to you that it is a separate reservoir from its own performance characteristerics?

A Well, I would say that it indicates that something is happening there definitely.

Q It is an abnormal condition if you assume it is all one reservoir, it is extremely abnormal?

A Especially in the Arrowhead, yes, sir, it would be.

Q In your study, Mr. Montgomery,have you made any attempt to correlate the oil production and the individual pay sections on the basis of structure rather than sub-sea datum?

A I have noticed the differences. I haven't attempted to correlate it, I have, I am aware there are differences.

Q You have not attempted to do that in connection with the presentation of this case?

A No, sir, I haven't.

Q Gulf pointed out in their testimony a wide pressure differential within the Eunice Monument field, do you consider that significant?

A Yes, sir.

Q In connection with your Exhibit No. 13 C again the Tidewater Marshall No. 1 Well, you have indicated as lying within your reservoir No. 1, pinch out section. That is a dry hole, is it not?

A Tidewater Coleman No. 2?

Q Marshall No. 1?

A Marshall No. 1, oh, here, yes, sir, that was plugged and abandoned.

Q How can you account for a dry hole in Reservoir No. 1, if there is some communication?

A This is one of the cases for purposes of illustration that I did show an oil zone field in there. As I stated at that time that I did in a few exceptions do this but the well did flow one barrel of oil per hour at one time and I thought it was significant that that was there. There probably was a local tightening of porosity and permeability in the area.

Q On your exhibit 13-B, the Gulf Ramsey State No. 1 is a dry hole, is it not?

A In the oil zone?

Q In the oil zone?

A Yes, sir, it was. They had a show of oil as I recall in there.

Q That forms a break in your area of permeability?

A Yes, sir, in that particular area, there is no obstruction.

Q Is that not also true of Exhibit 13 H, Western Gas Wimberly No. 1?

A Yes, sir, it is too tight for production of oil.

Q In connection with your testimony as to Reservoir No. 1, Mr. Montgomery, what, in your opinion, puts the limits on the field? If you are correct in your assumptions there is an area of permeability?

A Puts the limits on it?

Q Yes, sir.

A Porosity and permeability.

Q In other words, outside of the area, delineated in the color section on the map the porosity and permeability pinches out?

A They haven't drilled any wells out there so we have no information.

Q There has been exploration out there, hasn't there?

A Yes, sir, but there has been very few dry holes drilled in the entire area.

MR. KELLAHIN: Thank you.

MR. SPURRIER: Recess.

(RECESS)

MR. SPURRIER: The meeting will come to order, please. Are there any other questions of this witness?

MR. SELINGER: I would like to ask a question or two, if I might.

By: MR. SELINGER:

Q As I understand your testimony, your recommendations do not differ very much from the recommendations of Gulf except that they have used the formations and you have used sea level in your line of demarcation between the oil and the gas, is that right?

A Yes, sir, that is right.

Q In the studies that you have made, have you ascertained whether or not there are any formations that lie astraddle of the sea-level, the same formations?

A That crosses the sea level, yes, sir, all of them do. I don't know about the San Andres but all the rest do.

Q Then, is it possible in those formations that do go across the sea level to have an operator complete a well below your vertical definition into the oil and be classified as an oil well and at the same time complete a well above your vertical limits for a definition for gas and secure gas allowable and an oil allowable?

A Yes, sir, that is correct.

Q That would be permitted under your recommendation, is that correct?

A Yes, sir, it would.

Q Under your recommendation then that any well that is completed below a minus 100 feet sea level would automatically be classified as an oil well?

A Yes, sir, it would.

Q And under your definition a well that is completed above a minus 75 feet below sea level, would automatically be classified as a gas well?

A Unless they completed in one of the reservoirs that I have pointed out.

Q The nine reservoirs that you have picked out here?

A Well, I believe the six.

Q Plus the exceptions that you mentioned, one or two?

A Yes, sir.

Q In your opinion, Mr. Montgomery, is the Yates oil connected to the Seven Rivers oil?

A Depending on what area you are talking about, Mr. Selinger.

Q Well, step to 13 D and let's pin it down to that area.

A Yes, sir, I believe that Yates and Seven Rivers oil are connected in here.

Q Is the Yates Oil connected to the Yates Gas on that Exhibit, in your opinion?

A Well, I have no Yates gas on this Exhibit but according to pressure studies roughly, this reservoir in this general area is four to five hundred pounds and the gas varies from, well, I would say about a thousand pounds roughly, five hundred pounds difference between the gas and oil zone. That would indicate separation at least.

Q Is your Seven Rivers oil connected to your Seven Rivers gas in this area?

A The same applies, Mr. Selinger, the difference in pressures indicates the separation.

Q You would say that was a separation in the Seven Rivers oil and gas?

A Yes, sir.

MR. SELINGER: That is all.

MR. SPURRIER: Mr. Stahl.

By: MR. STAHL:

Q Mr. Montgomery, your examination of these areas, particularly your examination of these various wells, did you have an opportunity to examine the conditions which exist between what is now in the area, what is now delineated as the Jalco and Langmat gas pools?

A Yes, sir, I did.

Q Do you have any recommendations with respect to whether they should be one pool or two?

A I recommend that the boundary be removed, yes, sir.

Q You recommend that it be removed?

A Be one.

MR. STAHL: Thank you.

MR. SPURRIER: Anyone else. The witness may be excused.

(Witness excused.)

MR. SPURRIER: The next company on the list is Amerada. Mr. Woodward.

MR. WOODWARD: If the Commission please, Amerada's witnesses will be Mr. John Veeder and Mr. Robert Christy. I

ask that they be sworn, please.

(WITNESSES SWORN.)

MR. WOODWARD: I would like to ask each of you if you have read the statements that appear in an evidence brief of Amerada containing a summary of its contentions. Have each of you read those statements?

MR. VEEDER: That is right.

MR. CHRISTY: I have.

MR. WOODWARD: Are they true and correct to your knowledge and belief?

MR. VEEDER: Yes, sir.

MR. CHRISTY: Yes, sir.

MR. WOODWARD: At this time, I would like to introduce this summary into the record for the purpose of facilitating an understanding of the evidence in sequence. I would like to introduce it all at this time, although there are statements and contentions which will not appear by oral arguments at this time.

MR. WALKER: Any objections to this testimony being introduced? If not, it will be introduced.

MR. GRENIER: I would like to know what the testimony is. Does it purport to be a summary of what is coming?

MR. WOODWARD: It is a summary of Amerada's contentions and a summary of the testimony that the witnesses will give. They have each read the statement and it is true to the best of their knowledge and belief. It is devised purely to facilitate matters as between their oral testimony and any conflict that would appear in the testimony, and it is understood that

the oral testimony would control. We are not trying to get any evidence into the record of which there would be no oral testimony.

MR. GRENIER: I don't know what the purpose is.

MR. WALKER: It is a brief.

MR. GRENIER: If it is a brief, or if it is evidence it is something else.

MR. WOODWARD: It is an evidence brief which contains statements of fact. We have gone to the trouble of asking that the witnesses be sworn and they testified they read it and the statements are true. We can't submit it as a brief without submitting it in that fashion.

MR. GRENIER: It leaves the rest of us in the dark as to whether there is anything more being presented than we are not aware of, than comes to us and what we can see from Exhibit

MR. WOODWARD: There will be nothing in there concerning which a great deal of oral testimony will not be introduced There are statements in the nature of argument and conclusions, all of it in fact, that portion will be read.

MR. SPURRIER: May we have your name, please?

MR. GRENIER: A. S. Grenier, Southern Union Gas Company Dallas.

MR. WOODWARD: The relevant portions of this brief, at this time, begin on page 2 and continue to Page 4 being a summary. If the Commission please, if we are going to wait for an examination of this thing, I can read it aloud about as fast and let everybody read it.

MR. SPURRIER: No, I think you can go ahead with your

testimony.

MR. WOODWARD: Amerada's first witness will be Mr. John Veeder.

J O H N V E E D E R

the witness, having been first duly sworn, testified as follows:

DIRECT EXAMINATION

By: MR. WOODWARD:

Q Will you state your name and where you live?

A John A. Veeder, Midland, Texas.

Q By whom are you employed and in what capacity?

A District geologist for Amerada Petroleum Corporation.

Q Have you previously testified before this Commission in the capacity as petroleum geologist and expert witness?

A I have.

Q State what experience you have had as a geologist in Southeast New Mexico, particularly Lea County, New Mexico?

A I have had slightly over ten years experience. A big part of that time was spent in Southeast New Mexico.

Q Are you familiar with the subject matter of Case 673?

A I am.

Q Have you made any special studies with respect to geological questions raised in this case?

A I have.

MR. WOODWARD: Are Mr. Veeder's qualifications accepted?

MR. SPURRIER: They are.

Q Mr. Veeder, Amerada's Exhibits 1 through 5 have been placed on the wall. Will you point out those exhibits and tell briefly what each of them is?

A Well, Exhibit 1 is a subsurface contour map of the Eunice Monument and South Eunice fields. This map is contoured on the top of the Yates restored to sea level contour, interval is 50 feet. Exhibit No. 2 is an AA prime which is this long traverse extending north south from the northern limits of the Monument field down to the Souther, approximately the southern limits of the Eunice Monument Field. A prime A double prime is also a north south cross section and I would like to point out that this well does tie into this well. These traverse or cross sections are established on sea level and for convenience, we broke these two down rather than have it too long. We have two other traverses BB prime which is a west east traverse across the crest of the Monument structure. CC' Prime the final traverse is also a west east cross section across the southern part of the Eunice Monument Field. We have pointed out as shown on this contour map the relative relationship of these traverses. We have one AA prime goes down to this point and a short one, the second one is in this position. The third one is across this way and the fourth is in this position here.

Q Mr. Veeder, do these Exhibits indicate or represent some of the results of your study of the area covered by Case 673?

A That is right.

Q Were they prepared by you or under your direction and supervision?

A That is right.

MR. WOODWARD: We ask that Amerada Exhibits 1 through

5 be accepted?

MR. WALKER: Any objections to these Exhibits? If not, they will be admitted.

Q Considering now, Exhibits 2 and 3, which you state are north-south traverse from point A to point A double prime extending through the Eunice Monument and South Eunice Field, what geologic formations are shown by these two Exhibits?

A These two exhibits are our breakdown of the Whitehorse Formation. At this point is the base of the salt and the top of the Tansil and the top of the Whitehorse. Below the Tansil is a sand section which has been called from the early time, earlier exploration, the Yates, and it has been used extensivel by more geologists for shallow correlation. This sand averages 100 feet in thickness. Below this sand is a dolomite section and this would be the top of the Seven Rivers by definition. The carbonate section is broken in places by minor developments of sand, but it could be considered for all purposes a carbonate section. Below the Seven Rivers is a development of sand which persists all over the area and that is called the top of the Queens. I believe most geologists recognize this particular sand as the top of the Queens. On Gulf's cross section yesterday, they used sample logs, I believe their determination very close to ours. We have used electrical logs because I believe that we are going to have to use electrical logs more and more in our studies. Below the upper Queen sand, I would like to call that, there is another carbonate section, which is present throughout the area. Below this carbonate section is a well developed sand which we have called Penrose-sand or

possibly what is called the prominent sand. This sand can definitely be picked by Schlumbergers throughout the area.

Q That takes you through the Whitehorse formation then, does it not, Mr. Veeder?

A That is right.

Q You have by means of electric logs, picked the tops of these formations from each of the wells shown and correlated them across the cross section?

A I have one exception to that, of course, and this is the sample log and electrical log was not available.

Q The majority of the wells, the source of your information for the majority of the wells was electric logs which gave you results very close to those obtained by Gulf using sample logs, is that correct?

A That is right.

Q I believe you have stated in the study of these formations you were able to find a clearly identifiable geologic feature, namely the prominent sand which you pointed out. Is that the sand colored in yellow?

A That is the sand colored in yellow on all four traverses.

Q You have decided lithologic change both at the top and the base of the sand?

A That is right.

Q Approximately, how far above the top of this prominent sand or Penrose, do you pick the tops of the Tansil, Yates, Seven Rivers and Queens?

A Approximately, the Tansil would be 1040 feet, the Yates

would be 880, the Seven Rivers would be 750, the top of the Queens 135.

Q Are these formations of approximate uniform thickness throughout the area as shown by Exhibits 2 and 3?

A That is right.

Q Would you then expect your elevation above the top of the Penrose to be uniform or approximately the same throughout the area?

A That is correct.

Q Now, Exhibits 2 and 3 are set up on sea level in the line from A to A prime represents sea level, is that correct?

A That is right.

Q What is the elevation of the top of the Yates above sea level in the Phillips 1 - Monument well?

A The elevation?

Q Will you point that well out?

A The Phillips 1 well is the first marked well on any of the traverses and that plus datum would be plus 1,003.

Q In the Amerada No. 3 - State "A" well?

A Plus datum in that particular well is a plus 1189.

Q That is for the Yates?

A That is right.

Q In the Empire or Cities Service No. 1 Closson, what is the elevation of the Yates above the top of the Penrose?

A That plus datum is a plus 328.

Q Looking over the whole area, what range and elevation above sea level do you note for the top of the Yates in this entire area?

A These particular wells you have a range of 861 feet. There are higher wells and there are lower wells, and actually there is a range approaching 1,000 feet.

Q One thousand feet variation above the top of the Penrose or your prominent sand?

A No, I beg your pardon.

Q Above sea level?

A That is the range of elevation.

Q Above sea level?

A Yes.

Q You have then, fairly uniform elevation for the Whitehorse above the top of the Penrose, but widely different elevations above sea level?

A That is right.

Q What do these variations above, what do you attribute these variations above sea level to?

A The variations above sea level, of course, would be due to the structure which is shown on the map here.

Q What is that structure?

A The structure could be considered anticline.

Q The east west axis of this anticline is in the area of the Amerada 3 State "A" well, is that correct? Referring now to Exhibit no. 2, you might point it out there on the contour?

A Three "A" well is in this position.

Q Will you point that same well out on Exhibit No. 2, No. 2 is the north south traverse?

A Well, I will point it out on this one.

Q The axis of this anticline then, the anticline dips

generally to the south, there is a long slope to the south, is that correct?

A That is right.

Q Do any of these formations, now going from the axis of the anticline to the south, dip below the water-oil contact?

A This prominent section below the base of the prominent sand does dip below the water-oil contact, in this particular position.

Q Were you present, yesterday, when Gulf presented their testimony?

A That is right.

Q Were you present yesterday when Continental presented their testimony on delineation?

A That is right.

Q To what extent, if any, does the point you are picking here as the point in which the formations particularly the base of the Penrose, dip below the water table conform to the areas that were testified to yesterday?

A I would say they roughly conform possibly our point might be roughly, slightly further south.

Q You were also present yesterday when Gulf's witness, Mr. Boss testified as to the lithologic barrier below the base of the Penrose?

A That is right.

Q Have you, in your study, been able to observe such a condition?

A In our studies, both by samples and electrical log interpretation there is in our mind, a definite barrier below

this prominent sand. Actually, I have one well here, the Amerada No. 2, State "W". This well was perforated from 3550 to 3600. That well was treated with 500 gallons of acid and the well was swabbed dry. This is the zone I am talking about.

Q Above that zone, what is the predominant production?

A Above the base of the Penrose, the predominant production is gas.

Q Below the base of the Penrose?

A It is oil.

Q Is there any oil production above the base of the Penrose in the Eunice Monument Field?

A There is a small amount of production on the very south west flank of the Eunice Monument Field.

Q From what formation is that production coming?

A That production is coming from Seven Rivers and Queens.

Q Considering the point at which the Grayburg dips below the water table, does that indicate to you the lateral production limits of the Grayburg in the Eunice Monument area?

A That is right.

Q Does this impervious zone below the base of the Penrose indicate the vertical limits for that pool, that is the Grayburg?

A That is right.

Q In the Eunice Monument field?

A Grayburg.

Q In your opinion, what are the possibilities of communication vertically between the Grayburg oil field in the Eunice Monument area and the production above the base of the

Penrose to which you have just testified?

A Well, Mr. Boss testified about bentonitic shales. I will go along with that. I have examined several, many wells in this area and I can vouch for that bentonitic shale being present. I definitely think that is a barrier. I also, think by electrical logs also that you can also indicate there is a barrier without using the bentonitic shales or you can use them additionally. Besides that we do have this perforated section which we actually have acidized and can't get anything out of it.

Q It is your opinion that whatever oil production is present above the base of the Penrose, there is no communication vertically below the base of the Penrose?

A That is right.

Q Returning to your testimony with respect to the elevation of the Whitehorse formations above sea level which of these two reference points, the top of the Penrose, or sea level, represents a more valid geologic delineation of the vertical limits of this common source, in your opinion?

A In my opinion, the geological delineation should be established from the Penrose.

Q That is from a geologic feature?

A That is right.

Q If delineation were based on a geologic feature, would you have any objection to identifying and locating that geologic feature by reference to the number of feet it was above or below sea level or for administrative purposes?

A I would not object.

Q Your marker is a geologic marker?

A That is right.

Q You stated that most of the production above the base of the Penrose was gas. What are the area limits of the gas production from the Yates in the Eumont gas pool?

A If gas production in the Eunice Monument Field is confined essentially to the crest of the structure out of the Yates formation.

Q Does that production extend southward below the midpoint of Township 20?

A We have not found production south of that, within this area.

Q What limits is the Yates gas production to the crest of the--

A (Interrupting) I would say the presence, the situation of your Yates sand being located on the top of the structure.

Q Do you have any lithologic change preceeding from the center of the crest of the structure to your periphery?

A Your sand is present, possibly there would be some lack of permeability in the Yates and when you get off the crest of the structure.

Q From what area is the gas production in the Seven Rivers coming in the Eumont?

A The gas production from the Seven Rivers is confined essentially to that of the Yates. There are sporatic little areas which can be found which apparently have no communication. There is a small amount of gas production on the very north end of the field but the major part of your Seven Rivers,

upper Seven Rivers production conforms to that of the Yates.

Q What are the areal limits of your gas production in the Queens Field, indicate those?

A The gas production on the Queen is found throughout this whole area, where it is found on structure.

Q Generally, throughout the Eumont gas pool?

A That is right.

Q So, that you have Yates and Seven Rivers production from the crest of the structure and widely distributed production of Queens throughout the entire area, is that your picture above the base of the Penrose?

A That is right.

Q If you had drainage or communication of gas from the north to the south end of this structure, or from the north end boundary of the Eumont Pool, down to the State line, to which formation or formations would you expect such communication of gas above the base of the Penrose?

A That formation would have to be the Penrose sand or the prominent sand.

Q That is the only possible continuous reservoir you have?

A That is right.

Q Moving south from Amerada 3 State "A", again on this north-south axis, are there any indications of separations, that is lateral separations above the base of the Penrose? Which would effectively retard lateral communication of gas to these sands?

A We have in this position six dry holes. Three of these

dry holes did penetrate the carbonate section below the base of the prominent sand, it did encounter water in this carbonate section, there was no fluid, gas, oil or water found above the Penrose sand in those formations above were barren. There were three other wells drilled in the Seven Rivers and Queens, they were plugged and there was no record of any gas-oil, or water being found in any of those wells. Besides that we do have an indication, subsurface indication of a saddle between Eunice Monument and South Eunice.

Q Mr. Veeder, do you have the same structural conditions existing to the north and south of that saddle?

A No, sir, north of the saddle the Eunice Monument Field this field is the only field in this whole general area which produces, does produce oil of the San Andres. To us this field should not be correlated with that to the south. Its relationship would be closer to Hobbs, where your oil production is coming from. The reason you have oil production in the San Andres is because of the high relief of your structure. You definitely have a deep structure below the Monument similar to Hobbs, south we have no knowledge of any deep structure.

Q Mr. Veeder, you were, there pointing to three possible zones of separation and impervious zones below the base of the Penrose. The water-oil contact of the Grayburg formation to the south and this area of the saddle and the dry holes between Eunice and South Eunice?

A That is right.

Q You, therefore, are pointing to the possible existence of at least three separate common sources of supply. A common

source of supply of oil below the base of the Penrose and north of the water contact. It would be a common source above the base of the Penrose extending south to the saddle, and source of your production south of the saddle?

A That is right.

Q Looking for a moment south of the saddle, do you know of any valid geologic reason for retaining the present line between Jalco and Langmat?

A I know of no definite reason.

Q Mr. Veeder, are you indicating by your testimony in any way, that additional separation may not exist within any or all of these three possible common sources of supply?

A Additional separation definitely may exist at this time. I don't think we have enough proof to definitely say that that separation would cover the whole field. It possibly might, but I definitely would not want to say so.

Q There could be additional separation both in the Eumont the Eumont area, the Eunice Monument area and the fields to the south of this saddle you are pointing out?

A That is right.

Q You are simply pointing out three zones of separation which you think the Commission should recognize in pool delineation in this area?

A That is correct.

MR. WOODWARD: We have no further questions on direct examination.

MR. SPURRIER: Does anyone have cross examination of Mr. Veeder?

CROSS EXAMINATION

By: MR. MACEY:

Q If you were going to draw the line on a map, Exhibit 1, separating the so-called Eumont Gas Pool with the one or two gas pools to the south, which are presently the Jalco and the Langmat, where would you draw, exactly where would you draw that line?

A Well, I would bring that line, using these dry holes which show that we definitely have an impervious barrier. I would bring that line through here and carry it on through here. (Indicating) There is a dry hole here in this position. That would pretty much conform with the saddle.

MR. WOODWARD: That line has been drawn on this contour over here which is actually the same as the other and would be testified to in greater detail by Mr. Christie. But we will have some additional engineering evidence there on which we are basing that line alone with the geological testimony.

Q Mr. Veeder, you said that the wells which are indicated on that map by red arrows were barren in the productive zones of the presently defined Eumont Pool? Were they actually tested or was--

A (Interrupting) I can give you the detail if you want it, do you want it?

Q I would like to see it. If you say--

A (Interrupting) They were tested by drill stem tests, production test.

Q If you say they were that is good enough.

A I have the detailed information on all six wells, if

you want it. I actually, do have production tests and drill stem tests on practically all wells.

Q I don't want you to read it to me.

A It is here if you want to read it.

MR. WOODWARD: We will tabulate it down and give it to the Commission for your perusal.

Q I have one other matter. I have one other question. Is it your contention that the Eumont Pool should be defined as being the Yates, Seven Rivers and the Queen formation down to the base of the Penrose, is that your testimony?

A That is right.

Q Your W. E. A. well which is on the west side in 21, 35 Section 1, I believe it is.

A That is right, it is entirely out of the Eumont Field.

Q It is just a location out of the Eumont Field, isn't it?

A No, I believe there is definitely more separation. This is a recent completion, W. E. D. your W. E. F. is situated, I believe, in this position so actually that would be half a mile. It is not an offset.

Q Let me ask you what pool is the W. E. A. in, what pool should it go in?

A I definitely think-- the W. E. A. you are talking about?

Q That is right.

A The W. E. A. is definitely, well, it is in this position here, its production, it is one of those wells where the production is coming out of the Seven Rivers. There is no production in the W. E. A. out of the Penrose. There is no

oil production out of this carbonate section below it. It is in that group of wells which I pointed out which we do have as the exceptions.

Q Is that well a dual or is it just a single drill completion?

A There are three W. E. A. wells.

Q The well on the exhibit?

A No. 2 was perforated in the lower Seven Rivers and it had oil production. It was perforated in the middle Seven Rivers and we had gas production.

Q What I am trying to get at, is it a common reservoir or is it a separate reservoir? I am thinking of it as an administrative angle, Mr. Veeder, because if you define the Eumont Pool to include that Seven Rivers oil, obviously the gas and oil would be a common source of supply as Mr. Malone pointed out today. It is very important, what the common source of supply is. You can't prorate a well one way and then prorate it another way?

A That is right. I can say definitely that the source of oil in the Seven Rivers is definitely different than the source of oil in your dolomite below the Penrose sand. You are dealing with two different sources.

MR. WOODWARD: I might clarify that question just a bit, if I understand your question correctly, is it possible that there is an additional separate common source of oil above the base of the Penrose here, which is not part of the Eumont Gas Pool? Is that a possibility?

A That is a possibility.

MR. WOODWARD: Do you have the necessary information to testify at this time as to whether that is a probability?

A I definitely don't have the information to prove it.

Q You definitely don't think the well should go into the Eunice Monument Oil Pool?

A That is right, it is from a different source.

MR. MACEY: Thank you.

MR. SPURRIER: Anyone else have a question of Mr. Veeder? If not, the witness may be excused.

(Witness excused)

MR. WOODWARD: Amerada's next witness is Mr. R. S. Christie.

R. S. CHRISTIE

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

DIRECT EXAMINATION

By: MR. WOODWARD:

Q State your name, please?

A R. S. Christie.

Q Your address?

A I live at Tulsa, Oklahoma.

Q By whom are you employed and in what capacity?

A Amerada Petroleum Corporation, petroleum engineer.

Q Have you previously testified before this Commission in the capacity of a petroleum engineer and as an expert witness?

A Yes, I have.

Q What experience have you had as petroleum engineer in Lea County, New Mexico?

A I have worked in this area approximately 25 years.

Q Have you made any special studies with respect to the subject matter of Case 673?

A Yes, I have.

MR. WOODWARD: Are the witness's qualifications accepted?

MR. SPURRIER: They are.

Q Mr. Christie, Amerada's Exhibits 6 through 9, have been placed on the wall. Will you tell me what those exhibits are?

A Exhibit No. 6 is the same map as Exhibit No. 1 that Mr. Veeder testified to, with the exception that we have placed the south end of the Eunice Monument Field, the bottom hole pressures in the oil wells, and the bottom hole pressure of the gas wells starting at the top of the Township 21, South, and going to the State line. It also shows cross sections of the bottom hole pressure traverse.

Q What does the graph on the lower left hand corner of Exhibit 6 show?

A The red and green lines, that run approximately vertical, are the average bottom hole pressures of the various tiers of sections in Township 21 South and the portions of 22 South.

Q That is actually plotted against the tiers of Sections that appear opposite that line?

A That is right.

Q What do Exhibits 7, 8, and 9 show?

A Exhibits 7, 8, and 9 are simply a break down of this

particular area across the saddle which shows the pressures north and south of the saddle.

Q Turning your attention to Exhibit 2 for a moment, will you show the productive zones from which the oil pressures, I believe you stated were shown in black on Exhibit No. 6? Show on that north south traverse where those pressures were taken.

A Those pressures were taken in the carbonated section below the prominent sand or the Penrose sand and with the pressures reported in the October, 1953 survey.

Q Will you point out the zones in which the gas pressures shown in red on Exhibit 6 were taken?

A The gas pressures were taken from wells above, from the Queen and above.

Q Turning your attention to Exhibit 6 over here and moving south along the north, south axis of the structure that is shown there, what variations do you note in the pressures shown in red, which are the gas pressures taken above the base of the Penrose?

A I am sure this line is a little hard to say at a very great distance, so, I will just read the average gas pressure for these tiers of sections. The gas pressure, average gas pressure was 1128 pounds. The average oil pressure is 438 pounds. Moving to the next tier of sections the average gas pressure is 1113 pounds, the average oil pressure 465 pounds. Moving south to the next tier of sections the average gas pressure was 1121 pounds, the average oil pressure was 579 pounds, which indicates very little change in the first top three tiers of sections. Moving farther south to the next

line of sections, the average gas pressure was 998 pounds, the average oil was 773 pounds. Then, we get into the area of the saddle where the pressures are primarily or almost entirely above or north of the saddle. The pressure of the gas wells was 989 pounds, the pressure of the oil wells 676 pounds. Crossing the saddle then into the next tier of sections, we have a rather sharp drop in the gas pressure which averaged 842 pounds. The oil pressure averaged 615 pounds. From there on south both the gas and oil pressures almost coincide, having approximately 650 to 700 pounds.

Q Mr. Christie, in that area that you describe the sharp drop, I note there is a red line running generally north and south above and below it and a diagonal line connecting those two. Will you explain that line?

A You are speaking of this? (Indicating.)

Q That is correct.

A The line as shown in red from the bottom of Section 5 running south to about the middle of Section 29, then crossing the saddle continuing on south, is the same line that is shown on Exhibit No. 7, with the gas pressure shown correspondingly.

Q That diagonal line is then perpendicular to the contours of the saddle, is that correct?

A Essentially so, yes.

Q Will you compare the variations in the bottom hole pressures for the oil zones shown by the green line on Exhibit 6 and the bottom hole pressures for the gas zone with the red line, would you compare the curve for those two pressures?

A Well, I believe, that is essentially the same infor-

mation as I pointed out over to the left.

Q Is there a wide variation in those pressures?

A There is a very wide variation from this point down to the saddle and after you pass over the saddle, then there is very little change, very little variation.

Q Do you have the same kind of curve for the two, aside from the differential between them, do you have the same kind of curve down to the saddle for your oil production, for your oil pressures and your gas pressures? Do either one or the other tend to be more uniform so far as the curve you have drawn?

A I don't know that I understand your question.

Q Do you have fairly uniform gas pressures shown by that red line down to the saddle?

A Yes, they are reasonably uniform down to the saddle and then they drop sharply after you pass the saddle.

Q What is the situation with respect to the oil pressure, are they as uniform as the gas?

A Well, they are more uniform. There is not near as much change in the oil pressure as in the gas pressure.

Q Then you have in addition to this differential in pressure, you have a different pressure curve?

A Yes, sir, I think it shows definitely there is a separation between the oil zone and the gas zone, and also that there is a break, an impermeable barrier here at this saddle.

Q Directing your attention particularly to the testimony, which I believe you heard, concerning the possibility

of impervious zone below the base of the Penrose, would the differential in pressures between the gas production above the base of the Penrose and the bottom hole pressures for the oil production below that tend to confirm or contradict that geologic evidence?

A My opinion, it would tend to confirm it.

Q Would the differential and the different pressure curve indicate to you whether there is any communication across that impervious barrier?

A My opinion there would be very little if any communication across the saddle.

Q Would you point out specifically the possibility of communication of oil production from the Grayburg formation to the oil producing area above the base of the Penrose? What is the relationship of the pressures of the Grayburg in that area and the oil production obtained above the base of the Penrose in the Eunice Monument area?

A Well, as I pointed out, if I understand your question correctly, the gas pressures are considerably higher than the oil pressures in the same area.

Q Now, is there any difference in the oil pressures as to the oil production above the base of the Penrose and the oil production below the base of the Penrose?

A Where you have oil production above the base of the Penrose that corresponds more nearly to the gas pressures than the pressures in the area below the base of the prominent sand or the Grayburg.

Q Would that indicate to you whether or not there is any

communication between the oil production below the base of the Grayburg and above?

A It would indicate to me there was no communication.

Q Mr. Christie, I believe you have testified concerning this saddle, looking now only at the red line as it passes across the saddle, or the red line as they pass across the saddle, do you note any variation in gas pressure going generally from the South Eunice Field?

A In addition to the curve shown on the left here on Exhibit No. 6, I have picked out two areas, directly across the saddle at various positions and have shown those on Exhibits No. 8 and 9. Exhibit No. 8 is shown as the bottom hole pressure traverse BB which is over on the eastern side of the saddle. Pointing to Exhibit No. 8, we have north of the saddle a pressure of approximately, nearly 1100 pounds and still north of the saddle, a slightly less than 1000 pounds, and then after crossing the saddle it drops down to a little above, about 650 pounds, a little less. The same thing is true in Exhibit No. 9. We have practically no change in the pressures until you get to the saddle. After crossing the saddle it drops appreciably. I would like to point out on these Exhibits we have designated in black, the actual call of the formations as reported to the Commission. They do not check with our geological interpretation and interpretation is shown in red. We find there is quite a difference in the way the companies call those different formations which I think most of us realize.

Q Mr. Christie, have you made a study of a few of these

productions of gas in the field north and south of this saddle?

A I have had that prepared. I didn't make it myself.

Q Mr. Christie, will you state what conclusions you have reached or what information you have gathered concerning the cumulative production of gas, that is the cumulative withdrawals of gas from the fields north of that saddle and south of it?

A The cumulative production as reported as official figures is 94,903,757 MCF which is the total gas reported from the gas-cap and the Bradenhead wells, or rather the gas zones and the Bradenhead production. That is the cumulative production from the Eumont field. The Jalco pool totals are 338,552,950 MCF. The reported production in the Langmat Pool is 248,378,451 MCF, those figures include both the Bradenhead gas and the dry gas.

Q The total of those figures indicate that you have had a greater withdrawal of gas south of the saddle than north of it?

A Substantially greater.

Q Despite this substantially greater cumulative withdrawals to the south, you show on Exhibit 6, and on your Exhibits 7, 8, and 9 a relatively sharp increase at that saddle and an immediate leveling off, is that correct?

A To the north, yes, sir.

Q No withstanding disproportionate withdrawals from the south?

A Yes, sir.

Q Does that indicate to you that there is a communica-

tion or drainage of gas to the south across that saddle?

A It indicates to me there is very little if any, communication across the saddle.

Q If there were such communications, would you expect a gradual increase in your pressure curve for gas north of the saddle?

A Yes, I might add for the records, these cumulative figures I gave are to March 1, 1954.

MR. WOODWARD: We would like to ask that tabulation be introduced as Amerada Exhibit No. 10?

MR. SPURRIER: Is there objections? Without objection it will be admitted.

A I might point out that the Exhibit also includes gas productions in other gas fields. We were only primarily concerned with the Jalco-Langmat Field in this field.

Q Incidentally, from what formation or formations are your gas pressures taken?

A They are taken from the Queens, Seven Rivers.

Q This is in the Eumont Pool?

A In the Eumont Pool, yes.

Q You have produced relatively little gas in the Seven Rivers in Eumont?

A Very little, yes.

Q Turning your attention to the dry holes that Mr. Veeder testified about, to what formations were those wells drilled?

A According to Mr. Veeder's testimony, three of them were drilled down into the carbonate section and the other

three were drilled to the Queens or the Seven Rivers.

Q Mr. Christie, assuming that there is geological evidence that the productive limits of the Yates gas cap north of the saddle did not extend south of the center of Township 20, and that the areal limits of the gas production from the Seven Rivers is approximately the same, limited to the crest of the structure. Assume further that the Queen is the only continuous reservoir north of this saddle and that six dry holes have been drilled to the Queens or below that, you have a different type of structure above and below that saddle or north and south of the saddle, and that withdrawals of gas south of the saddle have been many times greater than withdrawals north of the saddle. Nevertheless existing in an abrupt increase in pressure immediately north of the saddle. Assuming all these things what is your opinion, as to the probable extent of drainage or communication of gas, if any, across this saddle?

A My opinion would be very little, if any.

Q Mr. Christie, where would you draw the line delineating the southern limits of the Eumont Gas Pool?

A On Exhibit 6, I would draw a red line which I believe would be a reasonable division between the two areas. The red line beginning on the west extends eastward to the south boundary of Section 30 Township 21 South, 36 East. It is bounded on the east by the north east quarter of Section 31, in Township 21 South, Range 36 East, and continues on east and south taking in, including the south west quarter of Section 32 and then continues on east to approximately the area of the

saddle.

Q You are suggesting now, on the basis of your pressure study a possibility of a separation above the base of the Penrose on the gas formation?

A That is a lateral separation in the Whitehorse formation, that is correct.

Q Your pressure studies tend to confirm the vertical delineation of the Grayburg Oil Pool in the Eunice Monument area?

A Yes, sir.

Q Turning your attention for one moment south of the saddle, do you know of any engineering reasons for continuing the line between the Jalco and Langmat at this time?

A No, I do not.

MR. WOODWARD: Those are all the questions that we have

MR. SPURRIER: We will take a short recess.

(RECESS)

MR. WOODWARD: That finishes our direct examination and we would like to call him later to present Amerada's recommendation with respect to this matter.

MR. SPURRIER: Is there any cross examination of Mr. Christie? Mr. Macey.

CROSS EXAMINATION

By: MR. MACEY:

Q Mr. Christie, first of all in connection with your reservoir pressure information, I don't know what Exhibit numbers those are. I can't see the figures from here.

A This is Exhibit 8.

Q What is the other, nine?

A Exhibit 9 .

Q Those pressures , are they reservoir pressures or are they shut-in tubing or casing pressures?

A They are reservoir pressures.

Q They are actually sub-surface pressures?

A Yes.

Q I would like to ask you, as a reservoir engineer, whether or not your Well W. E. A. No. 2, whether you consider that that gas zone which is productive in the well and the oil zone which is also productive in the well are common reservoirs?

A In my opinion, they are not common at that location. There is a separation between the gas and the oil which doesn't seem to have any permeability as I understand, but that doesn't mean that somewhere in the reservoir there is a connection.

Q Do you have any subsurface pressures on the oil zone in there at all?

A Yes, the sub-surface pressure on our W. E. A. lease are approximately 1,000 pounds. Originally, that is when we originally drilled them, that I believe was about the highest pressure we had, around a thousand pounds.

Q What about the Houston Well to the east, do you have a reservoir pressure on that well?

A We had a pressure shown here as 502 pounds on No. 1, Houston No. 1.

MR. MACEY: I believe that is all.

MR. SPURRIER: Anyone else have a question of Mr. Christie?

By: MR. GRENIER:

Q Mr. Christie, I wonder if you would continue giving us the average pressures in the gas reservoir. He says from a certain point on they came out about the same. I don't think you quite completed that for the last three or four tiers of sections, would you give those once more to us?

A I believe I gave 989 and 676 as the oil, the next tier was 842 for the gas and 651, I believe I didn't give that to you.

Q That is the bottom tiering going south, is that right?

A Yes, sir, and continuing in Township 22 South, the next row, tier of sections, the average gas pressure was 624 and the oil pressure was 655. The next section below we had an oil pressure of 620, no gas pressure shown, although we do have one gas pressure that was reported as 921 pounds in the Yates which I chose to eliminate in this study because it looked to me like it was out of line with all the other pressures in the general area. Continuing south in the next tier the average gas pressure was 641 pounds, the oil pressure 750 pounds, the last tier of sections gas pressure was 327 and we have just one oil pressure which for some reason has a pressure of 1186 pounds.

MR. GRENIER: Thank you.

A It could well be over in the next, in another province, really, it is located, isolated by itself. There could be some reason for it, that I didn't check into.

MR. SPURRIER: Anyone else. If not Mr. Christie may be excused.

(Witness excused.)

MR. SPURRIER: The next company on the list is Skelly.

MR. SELINGER: If the Commission please, so much of the factual data, geological data has already been presented to the Commission, although we have a geologist and two engineers available, we think there is sufficient information on file that we believe it is highly unnecessary to make it cumulative. The statements of Gulf and the conclusions of the Gulf Oil Corporation are our conclusions after a study of the area. Namely, that the present vertical and areal limits of the field, as now defined by the existing orders of the Commission, be continued except that the Jalco and Langmat fields be combined, and secondly, that the Tansil be included as a part of the gas pays in the various classified gas pools.

MR. SPURRIER: El Paso is the next company.

MR.HOWELL: We have some brief testimony in connection with the Rhodes area that we would like to put on in this pool delineation.

H. F. S T E E N,

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

DIRECT EXAMINATION

By: MR. HOWELL:

Q Will you state your name for the record, please?

A H. F. Steen.

Q What is your position with El Paso Natural Gas Company.

A I am the general superintendent.

Q Are you familiar with the area in Lea County, located in Township 26 South, Range 37 East, that is known as the Rhodes storage unit area?

A Yes, sir, I am.

Q Will you refer to what I believe is the Commission's Exhibit 3 and show the general outlines of that area?

A It is in purple.

Q How long has El Paso Natural Gas Company been operating that as a storage area?

A Since about 1945.

Q What, in general, is the manner in which it is operated?

A In general the manner in which this area is operated is that when we have flus production of gas or have spray flare gas that we do not have a sale for, it is pumped into this area. We have facilities and compression available for an input of some 70 to 80,000,000 cubic feet of gas per day. We have likewise facilities whereby we can take to shave peaks and give us quick withdrawals of gas of some 70,000,000 feet of gas per day.

Q Have the companies studies indicated that that area is reasonable separated from surrounding areas?

A Reasonably so, that is true. A study was made and the area was unitized with the State and with the Federal Government back in 1945, I believe, it was started. I believe the order was issued probably in 1948. We find that we have or it is our opinion, now, I am not an expert witness on this communication and vertical and horizontal limits and things of that nature. The statement is what our experience has been. We find there is a very good closure on the north, also on the east. We realize there is some leakage on the south but the

operators running the oil wells down here don't seem to mind that it is leaking a little in this area. We also feel that there is something of a form on this side over here. (Indicating) Part of the area is probably benefiting from the gas we are pumping into the Rhodes storage area.

Q For the purpose of the storage area, is it reasonable efficient and effective?

A Yes, sir, we have found it so.

Q Of course, in operating the storage area the wells that are committed to that unit should not appear on the proration schedule or be subjected to proration?

A That is true.

Q And the company is asking in this connection that any wells committed to the Rhodes unit be committed from the delineation of any gas pool in that area?

A That is true as they are right now.

Q In order to save time, we have, I think you have the file, Mr. Macey, on Case No. 140 resulting in Order No. 772 of the Commission and we would just like to offer this as Exhibit 1, El Paso Natural Gas Company's Exhibit 1 and not clutter up the record with new details.

MR. SPURRIER: Is there objections? Without objection it will be admitted.

A I might add that there might be communication, we have been hearing about communication here, if there is communication to the north, it is more or less on an "ox-cart type" communication. It isn't a "jet plane type" communication, because we pulled this thing down to about 300 pounds in 1944.

The pressures on these surrounding area varied on up to a thousand pounds. We have since then raised the pressure to, at times, 900 to 1000 pounds and again pulled it back down to 300 or 400 pounds. We think that if there is communication it is very slight in these areas. We realize we do have a small amount of leakage down in the southerly direction.

MR. HOWELL: That is all.

MR. SPURRIER: Anyone have a question of Mr. Steen? If not the witness maybe excused.

(Witness excused.)

MR. SPURRIER: Permian Basin, Mr. Stahl.

MR. STAHL: We are ready to go forward at this time, if the other people have finished with the pool delineation, but all of our remarks and testimony got mechanics of proration rather than pool delineation.

MR. SPURRIER: Very well, is there anyone else? I have Texas Pacific Coal and Oil Company, Southern Union and Stanolind yet on my list. Is there any more testimony on delineation?

MR. CAMPBELL: Did you think that Texas Pacific was next after Permian?

MR. SPURRIER: Yes, sir.

MR. CAMPBELL: As the Commission knows, our principle concern about delineation from the beginning has been the horizontal boundary between Jalco and Langmat. There is in this record, by virtue of Continental's presentation yesterday, some evidence that that should be retained. There is also, at least that was their recommendation, there is also a

considerable amount of evidence in this record that it should, that line should be eliminated. I believe all the witnesses have made that suggestion. We are in this position that we want to cross examine Mr. Dailey, on that point and probably will be required to offer some additional evidence to that already offered in Case 582, which is now a part of this record, in order to have before the Commission all of the evidence we have, which we believe justifies the elimination of that line and the elimination of the differentials and allowables in this area. Consequently, we would like to have the opportunity to cross examine Mr. Dailey on that point and then if necessary after that cross examination, offer some evidence on delineation only with regard to that point. We have no quarrels in connection with vertical limits at all.

MR. SPURRIER: Mr. Dailey, would you agree to undergo cross examination on that particular point?

MR. DAILEY: We agreed, yesterday.

MR. SPURRIER: At this time?

MR. DAILEY: Yes.

MR. SPURRIER: Mr. Campbell, your witness.

MR. DIPPEL: May I ask the Commission a question before we go into this cross examination? Is Mr. Dailey being submitted for cross examination generally at this time or only with respect to the one line. I understood that he would be available for cross examination after everybody got through with pool delineation?

MR. SPURRIER: Everybody is apparently through with pool delineation except Texas Pacific.

MR. CAMPBELL: I don't know if Stanolind or somebody else has something direct, we will wait.

MR. SMITH: For Stanolind Oil and Gas Company. We do not intend to put any additional testimony into the record. We feel that the factual data offered by Gulf and Amerada is the position that our witnesses would support and our testimony would be merely cumulative of testimony that is already in the record and would burden it. I would like to state for the record that for pool delineation purposes we are in the position that Skelly stated, that we recommend the elimination of the Langmat Jalco line and preserve the pool delineation otherwise as they now stand.

MR. DIPPEL: Then, he is to be cross examined generally, not only about this particular line, but everything else at this time?

MR. ADAIR: Mr. Dippel, purely in the interest of trying to speed it and shorten the hearing, I think I see possibly an out. If it will shorten the hearing, I will put it this way, the Texas Pacific's main objection to Mr. Dailey's testimony is the line, the testimony with respect to maintaining the line between Jalco and Langmat, let me ask you this, does Continental have any objections to removing that line?

MR. DIPPEL: I don't know whether it is proper for me to do it at this point.

MR. ADAIR: Let me rephrase, if I may, before you answer that. I realize that is a difficult question. In light of the testimony that has been heard since Mr. Dailey testified, that is Gulf's engineer and geologist, Amerada's engi-

neer and geologist and in light of the Phillips' testimony at a prior time on this same hearing and in light of the Texas Pacific testimony in Case 582, which is in this record, I will ask you if there is any objection on the part of Continental to removing the line between Jalco and Langmat? If your answer is that there is any, and the Commission is satisfied, why I think we can eliminate about two hours of time here. That is what I was trying to do.

MR. DIPPEL: If it is all right with the Commission, I will try to answer your question. It may not be the answer you want. I definitely feel that I should say and that I can say that none of the people connected with Continental, whether they are here at this hearing or whether they are in our headquarters department want to unnecessarily burden the record of this case with a lot of testimony that isn't going to accomplish anything. We want to speed it, this thing and we realize that time is short. If it is the consensus of all of the other operators that the line should be eliminated, I think that the recommendation of all of these operators will weigh very heavy in the balance when the Commission gets ready to consider that line. I will state very candidly that we discussed this among ourselves at considerable length last night. Our engineers tell me that they are not convinced that the line should be removed even on the basis of the testimony that has been offered on that matter in this case, but we definitely will not object if the Commission sees fit to eliminate that line. We are not insisting on the line. We have previously stated and at the risk of being boresome to some, I

want to reiterate that Continental feels that it has an obligation to the Commission, perhaps a little greater than the obligation of any of the other operators. I do not mean to imply that anybody doesn't feel his obligation or want to discharge it, but we put on the testimony in Case 245, and the Commission acted on it. They put the line where it now is on the basis of that testimony. Our engineers feel honestly that the testimony doesn't convince them, it doesn't belong there but we definitely will have no objection to the Commission's removing it. If that will eliminate the necessity of spending time cross examining Mr. Dailey on that point, I would like for the record to show that we have absolutely no objection to removing of the line but we will not recommend its removal. If that is satisfactory to you?

MR. ADAIR: I wonder if it would be in order to ask if any other operators have any objections to removing the line? I am not trying to poll a vote on it. I am trying to shorten the hearing.

MR. SPURRIER: Does Southern Union--

MR. GRENIER: (Interrupting) We have no objection to the removal of the line.

MR. SPURRIER: I have no one else on the list. I assume that -- is there anyone who objects to the removal of the line excepting Continental, or who doesn't recommend it? We will recess until one o'clock.

(RECESS)

A F T E R N O O N S E S S I O N
1:00 P. M., May 11, 1954

MR. SPURRIRR: The meeting will come to order. I think we left off where the question was whether the Commission would say or wouldn't say whether there shall be a line between the common boundary between Jalco and Langmat, shall remain or be thrown. The Commission does not feel that it is proper for us to do that at this time, either for or against. The Governor and Commissioner Walker both will be here later and we will take that up at that time. Mr. Macey has requested permission to cross examine Mr. Dailey at this time, not on this boundary, but on a slightly different proposition involving Jalco and Cooper-Jal. If there is no objection to that procedure we will go ahead.

MR. MACEY: Mr. Spurrier, don't you think Texas Pacific Coal and Oil Company were the ones that requested this determination, or whatever you want to call it?

MR. CAMPBELL: Well, Commissioner Spurrier, I feel that in the interest of trying to speed up this thing, if there is any way possible to do it, that if it is agreeable with Continental and with you, that we might defer the cross examination of Mr. Dailey. We all know the phase on which we are going to cross examine him, until later in the afternoon when the other Commissioners get here. If there is any possibility of resolving this thing at this time to do away with the hour or two that it will take to put on additional evidence, we will do it. If the Commission is unable to make that decision now, we feel it is up

to us to put on all the evidence we have, and to cross examine Mr. Dailey to bring out what his views are. So, we would like to request that our cross examination of Mr. Dailey be deferred until later in the afternoon, and that we proceed with the other matters that the Commission wants to hear in this case.

MR. SPURRIER: Very well. Is there objection to Mr. Campbell's motion?

MR. DIPPEL: We have no objection to the procedure except that we hardly feel that it is fair to Mr. Dailey to cross examine awhile about a matter and then go to something else and let somebody else cross examine him about a similar matter. We would like to have his cross examination over with at one time, if we can. We are here for all purposes, and if it suits the Commission better to take it up peace meal, we will do it that way, but in the interest of orderly procedure, I think all the cross examination of this witness ought to be disposed of at one sitting. Texas-Pacific asked to cross examine him and he is here if they want him.

MR. MACEY: I want to cross examine him. I don't think we ought to have the repetition two or three times.

MR. YOST: Off the record.

(Discussion off the record.)

MR. SPURRIER: In the face of these comments, I think the Commission will defer until Governor Mechem makes his appearance, at least, and in the meantime we can go on with the other type of testimony. I presume we can start down the list again. Southern

Union said they had no testimony.

MR. GRENIER: Not on the delineation aspect, no, sir. We do on the matters of proration.

MR. SPURRIER: We will start again. Mr. Woodward has asked that we ask if there is anyone who desires to cross examine Mr. Veeder any further. Apparently no one does, so I presume it is all right to excuse Mr. Veeder. Now, we can start.

Does Gulf have anything further?

MR. MALONE: We have no further testimony. We will put in some rules which can be prepared and handed to the Commission.

MR. SPURRIER: The Commission wants to give all of you whatever time you feel is necessary to make these rule amendments. However, the thought occurred to me, and I haven't discussed it with the Commissioners, that rule modification may or may not be testimony. We have always asked, and we are going to definitely ask in this case, for proposed orders, whether you want to consider those changes in proposals as testimony and introduce them at this time, or whether you would be willing to submit them as proposed orders is something that you may decide.

MR. MALONE: So far as Gulf is concerned, we will be glad to conform to that procedure if the Commission would like to follow it.

MR. SPURRIER: I think it would save time.

MR. MALONE: In any event, it doesn't make any, we don't need to make the testimony for the rules because a statement can be made.

MR. DIPPEL: Continental will be glad to follow that procedure.

MR. SPURRIER: Amerada?

MR. WOODWARD: We have no more testimony as such, however, we had planned an explanation of some recommendations. We were not at all jockeying for position in that matter, we were simply interested in seeing the testimony, particularly with respect to waste and various species of waste that might be shown before any undertaking, any recommendations based on that factual condition. It would be our recommendation to go ahead and get into the record everything that could be construed as testimony at this time, and if you run short you can always submit these recommendations in the form of briefs.

MR. SPURRIER: Skelly?

MR. SELINGER: We don't have any testimony to present on the rules.

MR. SPURRIER: Permian?

MR. STAHL: We have some rather brief direct testimony which we would like to put in. We also, as you recall, asked to have the privilege of calling two witnesses of someone else, one of which we would probably like to recall immediately following the direct testimony, the other one I don't know yet, it would depend on what happens later on this afternoon.

MR. YOST: That leads to another point. During the hearing last month I believe you asked all those present to designate

the individuals who testified in Case 582, whom they might like to cross examine. At that time, I believe Mr. Stahl was the only one that expressed the wish to cross examine those individuals. I believe we were off the record at that time, last month, that does not appear in the transcript. It should show on the record, I believe that you made such a request.

MR. SPURRIER: Who are those people, Mr. Stahl?

MR. STAHL: It was Mr. Adair and Mr. Grimm. We are prepared to go forward at this time, or did you want to finish running down the list.

MR. SPURRIER: No, go ahead.

MR. STAHL: We would like to have our witness sworn. I am the witness.

(Witness sworn.)

G. E. S T A H L,

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

MR. STAHL: Without benefit of counsel, I want to make a statement under oath which is going to be directed primarily to the question of the minimum take provisions that are in Permian's gas purchase contract. The purpose of this testimony is to show that the establishment of a minimum allowable as proposed by Texas Pacific becomes virtually impossible. This will deal only with our gas purchase contracts.

For the record, I am employed by Permian Basin Pipeline Company, in the Gas Supply Department. My duties primarily con-

sist of negotiating gas purchase contracts and operating contracts which the company engages in. If my qualifications are acceptable with that preface I will proceed, otherwise I will go through the usual list of qualifications, Mr. Commissioner.

MR. SPURRIER: They are acceptable.

MR. STAHL: Thank you. As you all know, one of the primary questions of dispute in this hearing, in the application of the Texas Pacific for rehearing has been with respect to setting up minimum takes under the gas purchase contracts and setting up, having a Commission set up minimum allowables. We feel that it is desirable to explain for the record Permian's minimum take or pay for volumes. The way those are arrived at and how they differ from what we understand the minimum take or pay provisions of El Paso's contracts are,as those have been discussed in this record. There has been apparently some little misunderstanding about Permian's minimum take or pay provision. I am sure if you will review the record with that thought in mind, you will see from some of the cross examination which has been directed toward some of our witnesses in the past that there has been some misunderstanding.

First of all, our minimum take or pay for volumes are not stated per well. It is my understanding that the contracts which El Paso has in force in Southeast Lea County, as well as the contracts which they are currently offering, do have a stated minimum take or pay for volume. From the record it is not clear whether that is 500,000 cubic feet a day or 550,000 cubic feet per day.

But the point is that there is a stated volume.

Permian's, on the other hand, is not. It is based upon the economically recoverable reserves underlying the tract of land involved. Each contract that Permian has stands on its own feet, and the minimum take or pay for volume is for the entire contract rather than for each well involved. Therefore, after determining economic recoverable reserves are under a particular contract, there is then applied against that reserve figure an assumed exhaustion rate.

In other words, what daily or yearly production would exhaust that gas underlying the tracts involved over what is approximately a 20 year period. Then, the minimum take or pay for volume is determined by applying a set percentage against that annualar exhaustion figure. This means that in different wells in the same gas pool we will have different minimum takes. In those cases where a contract covers only one well, for example, if the reserves underlying Joe Doe's well, and that well is the only well under the particular contract with Joe Doe, if those reserves are twice what the reserves of a single well contract with, let us say, Mr. Roe, then the minimum figure that we, in our contracts, will take or pay for, would be twice Mr. Doe's, Mr. Doe's would be twice Mr. Roe's.

Therefore, if you set up, or if the Commission attempts to set up a minimum allowable based on the minimum take or pay for provision, you can have two wells side by side, one contracted to El Paso where the minimum might be 500,000 cubic feet per day,

one connected to Permian where the minimum could be conceivably a million cubic feet per day. Therefore, it is our feeling that from a practical matter and not attempting to make a legal argument as to whether the Commission has the authority to set the minimum allowables or not, that it is from a practical matter impossible to administer such a program as suggested by Mr. Adair.

That covers the evidence which we wish to submit upon the question of minimum allowables. Before getting off the stand, however, before completing the direct testimony, in Case 673, on Page 67, Mr. Adair asked Mr. Ainsworth if Permian's gas purchase contracts or its dedication commitments prohibited, in any way, field change agreements between Permian and other pipeline companies in the area. This is to advise for the record that, in our opinion, they do not. That concludes our direct examination. If there is no cross examination I will get off the stand.

MR. SPURRIER: Does anyone have cross examination of Mr. Stahl? Mr. Adair?

MR. ADAIR: I have no questions.

MR. SPURRIER: If not, the witness may be excused.

(Witness excused.)

MR. STAHL: I would like, at this time, to call Mr. Adair.

E U G E N E A D A I R ,

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

DIRECT EXAMINATION

By MR. STAHL:

Q Mr. Adair, in view of the letter introduced into evidence

by El Paso yesterday, signed by Mr. Kersey, and the testimony of Permian Basin Pipeline Company witness, which you have just heard, has your company changed its position on the minimum allowable question?

A Not as a result of your testimony, but as a result of the letter which was read yesterday from El Paso Natural Gas Company. Our company had determined that it would not, at this time, press its request for a minimum allowable. For the sake of the record, however, I would like to state that we came here prepared to put on evidence requesting a minimum allowable, based not upon contract provisions, but based upon having a reasonable relation to waste and the prevention of waste. For example, our figures show that the minimum allowable which we have suggested of 90,000 MCF per month gives the operators of a gas well only one half the break that an operator of an oil well gets to the same depth. Our figures show that an oil well or a gas well, drilled to the depth of the gas wells drilled in the vicinity here that we are talking about, costs approximately $45,000.00 to drill and complete and equip them. That operator of such a well, if it be an oil well gets 40 barrels of oil a day under current proration of oil. Apparently he can count on getting approcimately that much oil, because time after time the Commission's records will show that the purchasers of oil have requested and recommended a cut in oil allowable. Such an oil well costing $45,000.00 and with a top allowable will pay out in approximately 18 months. A similar oil well drilled to 11,000 feet due to the deep well adaption formula

also pays out in approximately 18 months. A gas well with a 90,000 MCF per six months proration period requires 37 months to pay out.

We think that the operator of a gas well should have half as much of a break as the operator of an oil well. The risk in drilling and completing are the same. We also think that there are many other reasons having some direct relationship to prevention of waste to encouraging the greatest ultimate recovery of gas and hydrocarbons from the reservoir. We think that a minimum allowable would tend to encourage ratable take between pools as delineated by the Commission, or as may be hereafter delineated by the Commission. But, as I stated earlier, we had determined after hearing Mr. Kersey's letter in which effect to us meant this, that they had contracted to take those minimum allowables and they would consider that they were nominated to take and would nominate to take what they had contracted to take. That is, I think, to be expected from Mr. Kersey and from the El Paso Natural Gas Company, with whom we have had pleasant relationships and for whom we have a very high regard. It shows good faith. It shows no disposition or tendency whatsoever to take any advantage of a condition over which the producer has no control. Unfortunately, however, not all of your contracts are with El Paso Natural Gas. We have contracts with other purchasers. We have none with Permian that I know of. Although I believe we offered you a couple of wells and were not even privileged with a reply. We had determined not to press the matter, if the Commission please, at this hearing. We

feel that if the situation develops as it apparently may develop in the future where demand for dry gas in Southern New Mexico, due to residue, takes in Texas or other matters, falls too late to be economical, we feel that not only Texas Pacific, but other operators will be in here requesting minimum allowables at that time.

For the purpose of the record, and mainly and solely because of, and relying upon the letter from El Paso Natural Gas Company, which has been introduced here in evidence, we are deferring that request and withdraw that request for minimum allowable at this hearing.

MR. STAHL: In view of that statement, that is all the questions I have for Mr. Adair. The fact that he is withdrawing the request at this time is sufficient.

MR. SPURRIER: Anyone else have a question of Mr. Adair?

MR. MACEY: I missed the first part of your testimony about the 90,000 MCF.

A 90,000 MCF per proration period. I think that is slightly less than an average of 500,000. It was our position that the procedure of the Commission, its bookkeeping, its problems incident to administration of gas proration would be greatly simplified if every standard proration unit, that is of whatever the Commission agrees upon, such as 160 acre units were assigned at the beginning of each proration unit, an allowable of 90,000 MCF against which the gas purchaser and the operator would draw until such time as it ran out, and then only would it be necessary

for the gas companies to come in and nominate additional allowables. We also think that that has a substantial basis in the statutes which say that, as we read them, that the proration period shall be fixed for a period of not less than six months. We are perfectly willing to go forward the way they are doing now in handling the monthly allowables. But we feel that some unnecessary work and some odd results from the way they are handling them in the present, we feel that if the Commission would credit to each unit at the beginning of the proration period, a minimum allowable of 90,000 not based on contracts, because that doesn't tie into our contracts based upon having a reasonable relation to waste and based upon having a pay out, and assuring some continuity of income, that that might be a simpler way of handling the entire situation.

Before I get off the stand, if the Commission please, I would like to make it clear, I think we tried to once and possibl it was misunderstood that Texas Pacific Coal and Oil Company has never intended to leave the impression and does not now attack gas proration as such. We were and are not entirely satisfied with some of pool delineations.

MR. SPURRIER: Anyone else have a question of Mr. Adair? If not, you may be excused.

(Witness excused.)

MR. SPURRIER: It seems to me that we have nothing to come before the Commission now except some direct testimony on waste and also -- Mr. Stahl, do you have another witness?

MR. STAHL: I would like to recall Mr. Grimm.

MR. SPURRIER: Excuse me, I am sorry, I will go on with my statement. I would like for both Commissioner Walker and the Governor to hear this testimony on waste and, therefore, when Mr. Stahl is through with Mr. Grimm, if any of you desire to put those rule amendments in, that is perfectly all right with me. I will be here. In the absence of that indication we will recess until we can gather in our other two Commissioners.

MR. FOSTER: Can you take the statements?

MR. SPURRIER: It will be all right with me.

MR. STAHL: I would like to recall Mr. Grimm, please.

MR. SPURRIER: You are also reminded that you have been sworn in this case?

MR. GRIMM: Yes, sir.

R. D. G R I M M,

recalled as a witness, having been previously duly sworn, testified as follows:

CROSS EXAMINATION (CONT'D)

By MR. STAHL:

Q Mr. Grimm, in reviewing your testimony with respect to your suggested method of prorating gas in Southeast Lea County, I believe you testified that you would set up the proration so that you deducted or would deduct casinghead gas from the total market demand before arriving at a calculation of the dry gas well allowables. Am I misstating in this instance your recommendation?

A Yes, that is essentially correct. I believe I stated I

would deduct the amount of casinghead gas that was produced with the oil under a gas-oil ratio limitation from the gas allowable assigned to that acreage unit.

Q What I don't recall, what was the gas-oil ratio that you proposed?

A I didn't definitely tie it down, I said between six and ten thousand cubic feet per barrel should be in that order.

Q If it was ten thousand cubic feet per barrel, what would the production be, casinghead gas production be from 160 acres?

A 3,600,000.

Q Do you know what the gas allowable has been running out in Southeast Lea County per 160 acre unit, roughly?

A I think it is somewhere around half a million, roughly.

Q Around half a million?

A I am not sure, in the last month I haven't checked, but I think that is approximately right.

Q That would mean then, under your theory, that all the dry gas wells would be shut-in where there were four wells, would it not?

A Not necessarily, if they were making that amount of gas they would be, yes.

Q Yes, I was assuming that, then the operator who has completed a dry gas well would get no return on that particular well, would he?

A If the other conditions were true, that is correct.

Q And --

A (Interrupting) At the present time.

Q Then, market demand would have no effect on setting the allowables, would it? A Yes, sir, it would.

Q Wouldn't the oil allowable set the gas allowable in those particular tracts?

A The oil allowable and its attendant casinghead gas production would certainly limit the gas allowable on those particular tracts, that is true.

Q In some cases it would limit it to zero, wouldn't it?

A That is correct.

Q What is the basis for your recommendation, Mr. Grimm? Why do you recommend that?

A Well, I so testified here, I believe this is all one common source of supply and I do not see why an operator should be allowed to take gas from an oil well and gas from a gas well and in effect have a reservoir voidage more than the acreage contiguous to his own tracts.

Q Would you apply that same reasoning if it were conclusively demonstrated that these were essentially gas pools?

A If they were, that is true.

Q I don't understand. If they are -- let's assume for a moment that they are essentially gas pools, would you still apply the same reasoning?

A By the same reasoning, I don't quite understand what you

mean.

Q Would you make the same recommendation?

A As to the limiting gaspool ratio?

Q Yes. A Yes, sir.

Q You would still cut out then those gas wells from producing any gas? A Yes, sir.

Q Would you follow that same theory near the depletion of the oil reservoir, Mr. Grimm, when you are getting down to pretty much marginal proposition?

A At such a time, I might recommend to change the limiting gas-oil ratio, but, yes, sir, I would still follow the same theory.

Q All the way down? A Yes, sir.

Q Aren't you wasting reservoir energy, Mr. Grimm, in that casinghead gas, its reservoir energy is disipated through the separator when the pressure is reduced?

A It is my belief that I am using reservoir energy for a different purpose, wasting it by exhausting it through a separator. You might call it waste, it depends on the separator pressure.

Q Isn't the standard separator pressure out in Southern New Mexico 40 pounds or less? A Probably.

Q You take gas coming our of the reservoir as high as 1200 pounds and bleed it down to 40 pounds, isn't that waste, Mr. Grimm?

A I don't really know of any place that that is occurring. If such were done, it would be waste of reservoir energy.

Q Do you think from a standpoint of economics of pipeline operations, with which I know you are very familiar, that your recommendation is economically sound?

A I think I will have to pass, thank you, anyway.

MR. STAHL: Well, I think that answers the question. That is all.

MR. SPURRIER: Anyone else have a question of Mr. Grimm? If not, the witness may be excused.

(Witness excused.)

MR. SPURRIER: Now, Mr. Continental, do you have some rule recommendations you would like to put into the record? You have your choice, if you want to su mit them in a proposed order form perhaps you have a statement you would like to make?

MR. DIPPEL: About what?

MR. SPURRIER: As Mr. Foster suggested, he had a statement to make for the record, I suppose it is one of those short closing statements.

MR. DIPPEL: As to the kind of a statement, I would like to ask the privilege to make such a statement later after we find out what they do with our witness here.

MR. SPURRIER: Mr. Howell, do you have some direct testimony?

MR. HOWELL: You passed us on the list with reference to some testimony. We do have some testimony with regard to the effect of the various proposed gas-oil ratios related to the marketing facilities in the Langmat and the Jalco areas and have

made some studies as to what would be the effect of the imposition of some of those ratios. If it was your intention to shut off all testimony, other than the testimony with reference to waste, I think we would like to put it on, but it would probably ome in more logically after the testimony as to waste, because if my understanding is correct, there is some flaring that might be taken care of and the way to take care of it might be shown by the testimony which we have.

MR. SPURRIER: You would rather put that testimony --

MR. HOWELL: (Interrupting) We are willing to put it on either before or after to suit the convenience of the Commission. It comes more logically afterward because then we would know about what particular flare gas is being talked about.

MR. SPURRIER: I would rather it would be logical and I would also rather have the Commission here. You don't have a Commission at the moment. Mr. Howell, I can assure you that you weren't passed intentionally. I actually missed you on the list. Mr. Malone?

MR. MALONE: If it please the Commission, Gulf has some suggested amendments to the existing field rules or pool rules which are in general minor and mechanical. I believe that we will, without putting on testimony in support of them, hand them to the Commission for the Commission's consideration, and we will be glad to give them to the operators to the extent that they are available.

Briefly they would provide for gas allowable to be allocated

at the present on the basis of one hundred percent acreage; that a non-standard unit shall contain not more than 640 acres. The overall length and width of which would not exceed 5,280 feet depth except in instances where the unit comprises four quarter sections of an irregular section. Such a matter would be considered 640. In other words, that any acreage not exceeding 5,280 feet can be attributed to a well. That exceptions for such non-standard units can be granted automatically by the Commission on evidence that notice has been given to offset and no objection has been received by the Commission within 20 days after the date of the receipt of the application by the Commission. The only other change is to define a gas well as follows: "A gas well shall mean a well which produces gas not associated with crude petroleum oil in the reservoir or be a well which produces more than 100,000 cubic feet of gas to each barrel of crude petroleum oil from the same producing horizon." The rules would also provide that where you had a non-standard unit a standard allowable would be assigned pending approval of the non-standard unit. We will be glad to incorporate these in any proposed order that is submitted.

MR. SPURRIER: Let's take a short recess.

(Recess.)

MR. SPURRIER: The meeting will come to order. The next victim is the Oil Conservation Commission staff. I believe you want to call Mr. Stanley?

MR. YOST: That is correct.

S. J. S T A N L E Y,

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

DIRECT EXAMINATION

By MR. YOST:

Q Will you state your name?

A S. J. Stanley, Engineer for the New Mexico Oil Conservation Commission.

Q Mr. Stanley, do you have a statement that you wish to make for the record, before you begin on your testimony?

A I have. If it please the Commission, it is my desire to first of all clarify my position with respect to gas-oil ratio. I am absolutely neutral in this controversy. My testimony will undoubtedly hurt a few operators which is to be expected in any controversial matter. I do feel that it will benefit the majority of the producers. I believe that over a long period of time more gas and oil will be recovered from certain pools in question. I believe that the State of New Mexico will benefit by my recommendations, the operators will benefit and especially those operators that believe in conservation, the prevention of waste and the insurance of ratable take.

Last, but not least, I firmly believe that in the final analysis the gas purchaser will realize a greater ultimate recovery of gas to be purchased and processed in the future. My primary and fundamental study has been based on the Langlie-Mattix

and Cooper-Jal Oil Pools which underlie two gas pools, namely the Jalco and Langmat. By virtue of past completion practices the gas produced from gas and oil reservoirs effect the gas pool. I feel that the Blinebry andTubb, Justis, Byars, Queen and even the Eumont are unique in that the producing horizons are fairly well defined and do not present an associated casinghead gas problem at this time. Therefore, I feel that the Langmat and Jalco are the problem of our gas proration system, and these problems should be resolved.

I firmly believe that in order to prevent waste and protect correlative rights, certain rules should be enacted pertaining to the oil pools underlying the Jalco and Langmat Gas Pools and essentially I recommend that this Commission adopt a no flare order; a gas-oil ratio limitation in those oil pools that have an unlimited ratio at the present time, namely, the Langlie-Mattix, Cooper-Jal, South Eunice, Penrose-Skelly, Falby-Yates, Leonard, South Leonard, Rhodes and Hardy; that this Commission will proceed with caution in combining the horizontal limits of certain pools, namely, the Eumont, Arrow, with the Jalco and Langmat; that this Commission should have more time and experience in gas proration before naming one common source of supply for the four main pools.

Q Mr. Stanley, did you prepare Exhibits 1 and 2 which are on the wall?

A Yes, sir, I prepared all these Exhibits with the excep-

tion --

Q (Interrupting) Would you please explain Exhibit 1 and 2?

A I prepared all these exhibits with the exception of No. 3. I borrowed this exhibit from our geologist, Mr. Montgomery.

Q Please explain Exhibits 1 and 2?

A Exhibits 1 and 2 are directly connected with each other. If you will notice in Exhibit 1, these are two oil wells located in the Langlie-Mattix Oil Pool. These are two gas wells located in the Jalco Gas Pool. I would like to show from Exhibit 2 that whenever you refer to the Langlie-Mattix Oil Pool, you also refer to the Jalco Gas Pool, also you refer to the Langmat Gas Pool, for the following reasons: That the Jalco Gas Pool which extends from Township 21 South as outlined here in this red line and extends nearly to the State line, in fact, it does extend to the State line and at the same position of the Langmat-Jalco and under lying these new pools are the Langlie-Mattix Oil Pool which is colored in yellow and the Cooper-Jal which I colored in Green.

The vertical limits of the Langlie-Mattix are the Yates, Seven Rivers and Queen. The vertical limits of the Cooper-Jal Oil Pool are the Yates and Seven Rivers, with the exception of the last 100 feet. However, the vertival limits, excuse me, I wish to make a correction, the Cooper-Jal Oil Pool includes the Yates and Seven Rivers.

Now, the Jalco Gas Pool includes the Yates, and the Seven Rivers with the exception of the last 100 feet. This is also true of the Langmat Gas Pool. So, in reality they incorporate

each other, they overlap each other and whenever tou produce from anyone of the two oil pools, you may be producing from one of the gas pools, as I will show in this particular exhibit.

Now, returning to this Exhibit, on Exhibit No. 1, we have Well No. 6, Well No. 5, Well No. 2, and Well No. 1, which are shown on Exhibit 2. Here is 6, 5, 2 and 1. Now, each of, the two oil wells are each located on 40 acres as shown here and each gas well has a contributed acreage of 160 acres.

Now, both wells appear, both oil wells appear on the oil proration schedule at the present time, both gas wells appear on the present proration schedule with an attributed acreage of 160 acres apiece. They are both producing oil and both producing gas. I, personally, inspected No. 5 and No. 6. The first inspection that I made was on February 25, 1954, at 12:00 Noon, Mountain Standard Time.

No. 5 well was flowing on a 39/64 inch choke with a flowing tube pressure of 365 pounds. No. 6 well was flowing at a 1 inch choke with a flowing tubing pressure of 280 oounds. Both of the oil wells were connected to a meter to a casinghead gas well line and both wells were being metered on that particular day that I made the inspection. I calculated that there was 263,000 cubic feet of gas per day. In the meantime considerable gas was being flared and at a later date, I can estimate the amount of gas that was actually being flared by actual measurements, because on March 31, at 12:45 P. M. Mountain Standard Time, No. 5 well was flowing c on a 27/64 inch choke at 500 pounds pressure and No. 6 well was

flowing on a 38/64 inch choke with 420 pounds pressure. So, that, actually there was less gas being produced on March 31st inspection than there was on February 25th, due to the fact that the wells were slightly pinched in during the later inspection.

Now, on March 31st, I have asked El Paso Natural Gas to turn the wells into their metering system. They turn them in for a period of 15 minutes because prior to that time the plug valve on the meter run was in a 60 degree closed position. I had observed that during the 15 minute period of time that the wells were stable, they were flowing in a stable manner and I calculated that prior to opening the wells completely into the casinghead gas line the wells were producing that particular day, were selling this much gas, 440,000 cubic feet, but they were flaring 3,905,000 cubic feet of gas.

Now then, referring back to Exhibit No. 1, I would like to prove that this gas even by virtue of the definition of casinghead gas as provided in the rules and regulations of the Oil Conservation Commission, that this gas that was actually being flared was casinghead gas plus dry gas. When we refer back to Exhibit No. 1 well, note that the casing in No. 6 and No. 5 wells is set in the Tansil formation above the Yates. This No. 2 well which is the gas well producing from the Yates, the pipe was set through, and it was perforated adjacent to the Yates gas dry section, and the No. 1 well also had the casing seat in a Tansil formation above the Yates. However, in the process of drilling

No. 5, the operator had drill stemmed tested in this interval from 2,880 to 2,900 and our geologist had correlated that point to be somewhere in the vicinity of the Yates, Seven Rivers contact or perhaps up in the Seven Rivers, which would classify this well at this particular point as being in the Jalco Gas Pool. However, the operator had chosen to deepen his well, deepen it to the Queen formation which is all producing and produces this entire section.

Therefore, I feel that most of that gas that is actually being produced from that well is dry gas and that it is being flared. Now, since dry gas or any gas will flow through a formation much easier than a fluid, if this situation is permitted to exist, I think that eventually this Yates formation or the Upper Seven Rivers, wherever the dry gas reserves are, it will eventually pull down to a pressure equal or lower than the Queen formation. When that happens the oil that is contained in the Queen formation will flow up into the dry gas section and I believe that that will result in underground waste. I do think in this particular point that you can classify this flare as showing surface waste and underground waste in the future. I believe I have some other cases, in fact, I have quite a few,that I had inspected but for the sake of the record and brevity, I would like to mention one or two more here.

I might proceed and compare, first of all just how you would compare the production of these two wells. Now, I am going to

assume that the average dry gas allowable over the year will be a million cubic feet per day. I don't think it will be that high, but with this operator flaring four million cubic feet of gas on two wells located on 80 acres and whenever you consider that you have a million cubic feet of gas allowable from each of the gas wells, he is in reality producing four times as much dry gas as his offset operator when you compare this on the 160 acre basis. He is actually producing eight times as much gas when you compare it to the present allowable of, let's assume it to be half a million a day. This operator is actually flaring and producing 16 times as much gas.

Now, on this particular well, Mr. Spurrier, himself, had directed me to look for these flares along with Mr. Macey and I had worked in the Jal area and they are rather difficult to find sometimes, because occasionally they are not fired by the pumper. However, I do know that all the pumpers arise early in the morning about ten o'clock, and if you go to the pool hall at eleven you will find where all these flares are.

At this particular flare that I will proceed with next, at this particular time, unfortunately, Continental Oil Company had their Bell Lake Unit Fire Well No. 1 and quite a few people were coming to Jal from surrounding areas to really see a good oil well fire. It was a good one. This particular flare you could see it from Jal very easily, and occasionally some of the town's practical jokers would direct these strangers to this particular

flare that I am going to talk about. I don't know whether you can see this Exhibit or not. These wells that are named here shows you the Conoco Sholes A-23, this is not the well, but neither is it any well appearing on this particular Exhibit.

However, I chose this Exhibit because this well is located not very far away. I have also referred to it by a question that I asked Mr. Homer Dailey when he had testified for Continental Oil Company yesterday that when you are on the back side of the reef, you have a peculiar condition in the fact that it dips upward and to the east as you come up to the apex of the structure. Furthermore, this producing formation in this particular area has a producing characteristic in that it has a very good water drive from the west.

This particular well was located in this area and our Commission records show that the top of the Yates is 2,910 feet. The oil and gas pay is from 3,045 to 3,079 feet, the oil string is set at 3,019 feet with a total depth of 3,079 feet plugged back. Our geological interpretation is that the well is producing from the Yates formation and this is confirmed by the operator as evidenced by his forms. It is also interesting to know that this well file shows that in 1950 on May 22, the operator had filed a 24 hour shut-in pressure of 906 pounds. On December 5, 1950, the operator reported a shut-in pressure of 963.3 pounds dead weight gauge. In other words, at that time, it appeared to me that the well was classified as a gas well. Our records indi-

cate that the plug back operation in a 5,000 gallon treatment of acid were conducted during the initial completion of the well. The well produced one barrel per day, natural, increasing to 110 barrels per day following the 5,000 gallon acid treatment. The operator on Form C-105 shows an interval from 2,865 wiich is behind the pipe. The casing was set at 3019, and below the casing shoe and in the open hole the operator shows a gas zone from 3045 to 3050 and from 3072 to 3077. In other words, what the operator actually shows is that he has a gas zone along with the oil zone.

Now, on this particular day of March 3, I made the inspection at 10:00 P. M., Mountain Standard Time. The well was flowing, the gas was being flared and burned at the well site. I observed the tubing pressure to be 330 pounds on a full one inch open choke The well was tied into a high pressure gas line by a high pressure separator. However, with the well flowing on 330 pound flowing pressure, I observed that the high pressure gas line had a static pressure of 560 pounds and in oil file terminology, could not buck the line pressure. Therefore, to produce his oil, he was actually venting considerable amounts of gas. I did not measure the gas, but whenever I compared this particular flare with the other, I would say that it was in the neighborhood of four or five million cubic feet per day.

I have another exhibit over here (indicating), I might point out that it is not the intention of the Commission to discriminate on pointing out certain wells. This well was not being flared.

We have the name covered up. This particular well has an oil string set at 2,808 feet and a total depth of 3,260 producing from the Yates and Seven Rivers. It was completed in March of 1949 with an initial gas potential of 58,500 cubic feet per day. It was produced as a dry gas well to August of 1951 and was completed in September of 1951, by deepening the total depth of 3,670. The well produced 55 barrels of oil for a 24 hour period and was given an oil allowable by virtue of deepening to the Queen pay. In the meantime, on September 22nd of 1951, the well potential was produced by a gas purchaser for 23,300 MCF per day. During January of this year the dry gas sales were 40,651 MCF. February of 1951, the producer sold 13,600 MCF. It is presently carried on the oil proration schedule for 17 barrels per day. You may wonder what I am leading up to, but I believe that the only way that we can insure ratable take is to inaugurate a gas-oil ratio limitation in these particular fields.

Q Do you have some bottom hole pressures?

A Yes, I would like to introduce into the record all the pressures of the Falby-Yates case heard abour four or five months ago. I would also like, at this particular time, to read some pressures that we have recorded and show the differential of pressures that we have. From north to south, actually in the Eumont field, the pressures of dry gas wells vary from 1,000 to 1,100 pounds. The pressure is pretty uniform until you reach approximately this particular area here.

Q What area is that?

A The Falby-Yates area, in other words, they gradiate down

to lower pressures and the shut-in pressures are 600 pounds tn that particular area.

Now, I would like to go ahead and for the sake of the record show that there was quite a bit of differential pressure between the Yates and Seven Rivers formation on one hand and the Queen formation on the other. This was brought up in the Falby-Yates. I would like to, for the sake of the record, they are the John M. Kelly's Jack No. 3 to 5, I would like to show the differential pressure that exists in these two wells, these two particular wells. One well was completed in the Falby-Yates Pool for the pressure of 625 pounds. The other well which was deepened to the Queen zone and had a pressure of 240 pounds in the lower Queen oil formation or a differential of 385 pounds. I found some other pressures of the same nature, two wells drilled on the 40 in the Jal area in Township 25 South with about the same differential. I think our study of bottom hole pressures taken throughout this area shows that there is a differential in the general area, the general classification, you might call it, of three to five hundred pounds differential between the Yates, Seven Rivers on the one hand and the Queen on the other. Now, I don't mean to say that we have two separate reservoirs but maybe that the pressure differential is due to the fact of the excessive oil withdrawals from the Queen formation and no one has proven to me, and it is hard for me to visualize, and I worked on this particular problem, whether or not we have one common source of supply. I

don't know. I finally came to the conclusion after studying the problem that the only way that you can tell whether you had a Yates, Seven Rivers and Queen with a common source of supply is to shut the entire field down for a period of, it may take ten days, a hundred days, or a thousand days, and allow equilibrium, allow the pressures to build up and reach the equilibrium and then selectively open up certain wells to see if we have interference and see the bottom hole pressure draw downs.

It is evident to me that that is economically impossible and by virtue of the fact of past conpletion practices where operators have drilled their wells in good faith, have completed them under theexisting rules and regulations at that particular -- I don't feel we should upset the applecart at the present time and deprive them of the rights that they had at that time and should have today.

Q Mr. Stanley, are there several occurrences which you have shown by Exhibits 1 and 2?

A Yes, sir, there are. I didn't have them all drawn up, but we have quite a few of these cases. Now, I would like to continue with Exhibit No. 4, 5, 6, 7, 8 and 9.

Q You prepared these exhibits also?

A Yes, sir, the girls in our office did the coloring, however, Exhibit No. 4 is casinghead gas sales for 1953 in the Langlie-Mattix Oil Pool. It is 25,251,867 MCF. These figures were obtained from the Commission files.

Now, on the vertical scale or the scale that is in percent range from zero percent to 50 percent, these bars represent gas-oil ratio intervals. These bars represent, say, that all the wells producing from the zero to 6,000 interval, gas-oil ratio interval produce 10.08 percent of this total amount of gas or have produced it in 1953.

From the 6,000 to 10,000 interval, it is 5.9 percent. From the 10,000 to 15,000 interval produced 6.6 percent. From the 15,000 to 25,000 interval produced 18.3 precent. From the 25,000 to 50,000 interval, 20.49 percent. From the 50,000 to 100,000 interval, 17.8 percent and those wells producing in excess of 100,000 to 20.81 percent.

Now then, I have compared Exhibit No. 4 and would like to compare it with Exhibit No. 5. Now, Exhibit No. 5, instead of using the total amount of casinghead gas that was produced in the Langlie-Mattix Oil Pool, I have prepared this Exhibit on the basis of 497 oil wells in 1953, those wells having a ratio of zero to 6,000, 29.37 percent; 6,000 to 10,000, 9.1 percent; 10,000 to 15,000, 12.27 percent; 15,000 to 25,000, 19.32 percent; 25,000 to 50,000, 12.27 percent; 50,000 to 100,000, 11.27 percent and only 6.44 percent for those wells producing in excess of 100,000.

In other words, it is plain to me that in the Langlie-Mattix only 6.66 percent of the number of wells produce in excess of 20 percent of the total casinghead gas. Now, instead of reading these figures into the record, to save time I would just like to go

ahead and state that I have studied the Cooper-Jal on the same basis, and have found that those wells in excess of 100,000 to one amount to 18.87 percent of the gas. When you figure it again on the oil well basis only seven wells produced 18.87 percent of the total amount of gas that was produced in the Cooper-Jal field or percentagewise, it is only 4.49 percent. Now then, I have combined the two pools. I believe that the two pools should be combined anyway. Based on the Langlie-Mattix and Cooper-Jal 25,000,000, plus the other 7,000,000 gas, approximately, this reflects the same manner then you throw them together. That over the ratio of 100,000 to one, those wells produce approximately 20.38 percent of the gas. On percentagewise basis, on the well basis of 653 oil wells, only 5.97 percent of the wells produce 20.38 percent of the gas in both the Cooper-Jal and the Langlie-Mattix Oil Pools. Unless you want help to read all these figures into the records, I would like to present the figures that appear thereon.

MR. YOST: The figures are on the Exhibit and they will be part of the record.

Q Please explain Exhibit 10.

A This particular Exhibit here (indicating), what I have tried to do in this exhibit again, I have broken down by colors to show you that the yellow color, as you gradiate from yellow to dark blue, you increase the gas-oil ratio. In other words, with yellow you start with zero to 2,000. Pink is 2,000 to 6,000; red is 6,000 to 10,000; blue is 10,000 to 50,000 and dark blue or

purple is 50,000 or over. What I am trying to show in this particular exhibit is that there is no rhyme or reason, or no sequence or no regularity of gas-oil ratio distribution throughout the two pools. That it actually depends in the manner in which the wells were completed, perhaps ten years ago or 15 or 20 years ago.

Q Please explain Exhibit 11.

A Exhibit 11 has numerous curves on it based from 1938 through 1953. First of all the blue curve is the number of wells in the field. We can see that from 1938 to the present time we have had a considerable increase in the number of wells in the particular field. This red exhibit --

Q (Interrupting) Red line?

A I mean red line, excuse me, represents the total gas plant take from 1938 to 1953, based on the figures available to us at the Commission office. This represents the dry gas plus casing head gas. The green line is the total gas that was reported by the operators, submitted on forms and presented to the Commission. We know that that is an impossible situation. First of all that green line should at all times appear above the red line for the simple reason that that green line should represent the total gas plant take, plus the gas that was being flared, yet only one time during 1948 did it exceed the red line, but ordinarily fell under the red line, the green line falling under the red line at all times from 1941 to the present time.

The orange line represents the casinghead gas sales. There is a slight increase and this curve, it is important that it is increasing, the casinghead gas, because actually the oil is decreas-

ing and the dark line represents the dry gas production which shows that it is increasing rapidly and especially during the past two years.

Now, this Exhibit which is Exhibit No. 12, the black line is the oil production from 1938 to 1953. It shows a great amount of oil that was produced in 1939, a gradual decrease or perhaps you might call it a rapid decrease to 1945, rather stable from 1945 to 1949, a little increase from 1949 to 1951, and then it assumes its downward trend. We attribute this increase in production due to the discoveries that were made in the Yates formation interval or at the dry gas interval. The number of wells is the blue line. It is the same line in effect that appeared on the other Exhibit. The orange line is the gas production which also shows you that we can't expect increasing gas production in the future.

What I would like to bring out about this Exhibit is as follows: In these two oil pools or in this particular area of the Jalco, the Langmat, the Langlie-Mattix, and Cooper-Jal, based on oil being worth $2.60 a barrel in that particular area, based on dry gas worth 9.5 cents per 1,000 and casinghead gas 3.5 cents per thousand, during 1953, from my calculations, the total value of the gas was $7,884,735.00. The oil was $7,079,167.00. In other words, in 1953, the value of gas was worth some $800,000.00 more than the value of the oil and I think that this would be exaggerated in the future.

Q Does this same situation that you have shown in Exhibit 4 to 9, in your opinion, exist in other pools?

A Yes, sir, it does, probably not to such an extent that they do in the Cooper-Jal and Langlie-Mattix.

Q Based on your testimony and the information from Exhibits that you have prepared, do you have any recommendation to make?

A Yes, sir, I do have.

Q Will you give those recommendations?

A Due to the absence of controlled production of casinghead gas, as presently defined, and due to the manner by which the wells have been completed in the past, first, casinghead gas is partly dry gas production.

Secondly, since the vertical limits of Langlie-Mattix, and Cooper-Jal Pools coincide with the vertical limits of the Langmat and Jalco, the withdrawals of gas and fluid from each and every pool have a direct bearing on each other, that there is non-ratable take of gas between the oil pools a ompared to the prorated gas of the dry gas pools. For the protection of correlative rights, the insurance of a greater ultimate recovery of oil, and the prevention of rapid decline in pressures in certain areas to insure the recovery of gas at higher pressure and to utilize the full extent of the present reservoir energy, I feel that the no flare order and a gas-oil ratio limitation are long overdue and are essentially needed for a successful program of gas proration. From my calculations, the average gas-oil ratio from the Langlie-Mattix Oil Pool is 17,600 to 1, and the Cooper-Jal, the average gas-oil ratio is 7,400 to 1. That as a recommended GOR/gas-oil ratio for a trial period during our first step in gas proration, I

recommended the limit be 10,000 to 1.

Q What do you think ~~by~~ about A.O. the wells having a gas-oil ratio of over 100,000 to 1?

A Well, I think that we should give them some consideration and use the statutory definition that Texas has of defining a gas well of being 100,000 to 1. Anything in excess of that should be defined as a gas well. However, I thought perhaps others would present testimony along that line, but that is my general feeling.

MR. YOST: That is all the questions we have.

MR. SPURRIER: Anyone else have a question?

CROSS EXAMINATION

By MR. OWEN:

Q On this GOR, do you want it to apply to all the fields, th... this recommendation of gas-oil ratio?

A For both dry gas pools?

Q No, for the Cooper-Jal and Langlie Mattix?

A Yes, there are others that were mentioned.

MR. CAMPBELL: Just one question, I believe that you may have stated your testimony on this point, but I wasn't certain of it.

By MR. CAMPBELL:

Q Based upon your study in the Jalco and Langmat areas, is it your opinion that the horizontal division between the Jalco and Langmat Gas Pools should be eliminated?

A Yes, sir, based on my study, I think they should be eliminated. However, at this time, I did not want to go ahead and in-

corporate those two pools with the Eumont.

MR. SPURRIER: Anyone else?

MR. YOST: I would like to offer in evidence Exhibits, Commission's Exhibits 1 and 2, and Exhibits 4 to 12, all inclusive.

MR. SPURRIER: Is there objection? Without objection they will be admitted. Mr. Howell?

By MR. HOWELL:

Q Mr. Stanley, if that definition, the statutory definition in Texas of a gas well having a gas-oil ratio in excess of 100,000 to 1 be adopted, would the mere adoption of that definition prevent any waste in the field?

A I don't know whether it would or not, Mr. Howell?

Q In other words, the no-flare order clearly would?

A Yes, sir.

Q And limiting gas-oil ratio would?

A Yes, sir.

Q But the mere change in the definition of some wells that are now defined as oil wells, to wells defined as gas wells, would not have any effect upon conservation as you can see at the present?

A Yes, sir, that is correct. I know that you are concerned with this particular problem, Mr. Howell, that we have some high gas-oil ratio wells that enter a casinghead gas line, is that not true?

Q That is correct.

A If they were classified as gas wells it would be assumed

that they would expect to get the price of a dry gas well, is that right?

Q It might effect a great many contractual relationships.

A Well, I don't know, but I think it is a moral obligation of the operators not to take advantage of that definition, if it should ever pass.

MR. SPURRIER: Mr. Stahl?

By MR. STAHL:

Q You stated that you wanted to utilize the definition as presently in effect in Texas, as I understood your testimony. You mean both parts of the Texas definition or only the 100,000 to 1?

A Only the 100,000 to 1. I am not familiar with the other part.

MR. SPURRIER: Anyone else have a question?

By MR. MACEY:

Q Exactly what do you accomplish by defining a gas well as having a limit of 100,000 and over?

A Simply for administrative purposes.

Q If you had a well producing more than 100,000 at a ratio of 100,000 to 1, you would put that well in the gas pool?

A Yes, sir.

Q Irregardless of where it was producing from?

A Not necessarily. I believe that we may end up with a problem of having defined some gascap wells and I don't know how I would handle that problem, where we are producing gascap. If it would appear in the Queen formation that we are having 100,000

to 1, I believe I would prorate it as a gas well or prorate it under a gas-oil ratio limitation. I have never hurdled that problem.

MR. SPURRIER: Anyone else? Mr. Woodward?

By MR. WOODWARD:

Q Mr. Stanley, have you been able to determine approximately how many oil wells are at the present time completed in, what you would call a predominant gas pool, that is using your definition of 100,000 to 1, for the moment, and on the basis of that definition, have you been able to determine approximately how many oil wells are at the present time completed in that common source of supply that you would call the gas zone?

A I can tell you ow many wells have a gas-oil ratio in excess of 100,000 to 1, on these Exhibits I would assume that would --

Q (Interrupting) That is --

A (Interrupting) In the Langlie-Mattix Oil Pool, we have 32 wells at the present time. They have a ratio in excess of 100,000 to 1. In the Cooper-Jal Pool we have seven wells in that category.

Q These are pools, defined primarily as oil pools?

A Oil pools, yes, sir.

Q You have a relatively small number of gas wells in those pools?

A Yes, sir.

Q What is the situation with respect to the gas pools?

A Well, now, in the gas pools, and I would like to make a point here, we have a number of wells that are producing actually from what we call a dry gas reservoir, actually producing oil. A typical example is the Falby-Yates, and we have other synclinal areas that were brought out in this particular testimony, especially, the Winter area, which falls in the neighborhood of Jal, New Mexico. Several of those pools that we have that may be effected also by this gas-oil ratio limitation. The reason that I recommended a rather, it seems, a high gas-oil ratio limitation is for this reason: I would like to, at all times, see that these oil wells are produced in such a manner that they will void more space than the surrounding dry gas wells volumetrically. I believe that is in the interest of conservation. I believe that if we withdraw volumetrically the greater volume in the Falby-Yates Pool, you are actually surrounded by gascap, and the flow will be a natural repressuring project. If the reverse were true the oil would flow into the dry gas zone and that would certainly create waste. Therefore, I feel that these gas-oil ratio limitations that I had made is not a steadfast rule. They could change with changing conditions.

Q Now, Mr. Stanley, in your experience do a great many of the pools that have been classified as either oil or gas pools, either in New Mexico or other states, are a great many of those pools productive of both oil and gas?

A Yes, sir.

Q Have the Commissions of this State and other states, to

your knowledge, classified them simply as an oil or gas pool, depending upon the predominant production from that pool?

A Yes, sir, they have.

Q Have they often found it necessary to call any one of these things an oil and gas pool?

A Well, they may have, but I am not familiar with an actual example.

Q You are acquainted with the fact that they have taken some common sources that are productive of oil and gas, or called it either an oil or gas pool?

A Yes, sir.

Q One other series of questions. As I understand, you have pointed out the possible sources of gas production by well. I believe you have testified that you are getting some gas production from oil wells completed in oil pools?

A Yes, sir.

Q You are getting some gas production from oil wells that are completed in gas pools?

A Yes, sir.

Q And, of course, you are getting some gas production from gas pools as such?

A Yes, sir.

Q There is one other possibility of the gas well in the oil pool?

A Yes, sir.

Q And I believe you have a statewide rule concerning volu-

metric displacement?

A Yes, sir.

Q Concerning that problem, are there any other combinations as to gas production by well that that list does not include?

A No. I would like to bring out a point along John's questioning. The reason that I would like to have two pools is that I would like, like I originally stated, I would like to protect the operators who have dually completed, who have twin wells, who have done these things in good faith under the then existing Rules and Regulations of this Commission and I don't think that this Commission or any other regulatory body should deprive them of the rights of those operations that have been conducted in the past in that manner.

Q And then view the problem of the oil well and gas well as one of working out some sort of practical solution?

A Yes, sir.

Q Whereby you eliminate to the greatest extent the waste of both oil and gas?

A Yes, sir.

Q And permit the greatest of recovery of oil and gas?

A Yes.

Q Recognizing the expenditures of money and assessing, to some extent, some reasonable and limited amount of gas available for the production of that oil, is that correct?

A Yes, sir.

MR. SPURRIER: Anyone else?

MR. COUCH: Terrill Couch of the Ohio.

By MR. COUCH:

Q Mr. Stanley, I don't believe I got quite clear whether your recommendation of the 10,000 to 1,000 to 1 gas-oil ratio would apply to all of the 12 oil pools that have been mentioned in connection with this hearing or not, that would increase the gas-oil ratio in some of them and put one on where in some cases there is none?

A I only referred to those that did not have a gas-oil ratio.

Q The others you recommend leaving as is?

A Yes, sir, I might elaborate a little further. I made the study in the Langlie-Mattix and Cooper-Jal Pools. I definitely believe that a gas-oil ratio of 10,000 to 1 should exist in the two pools. There may be something that I overlooked in the named pools, where the 10,000 to 1 would not be practical and would not be workable. If that is the case, I think it should be called to the Commission's attention and some other arrangement made as far as the gas-oil limitation is concerned.

MR. SPURRIER: Anyone else? If not the witness may be excused.

(Witness excused.)

MR. SPURRIER: We will take a short recess.

(Recess.)

MR. SPURRIER: Mr. Stanley has been excused, but I understand some one wants to ask him a question for the record. Is

that true?

MR. MACEY: Yes, sir.

S. J. S T A N L E Y.

recalled as a witness, having been previously duly sworn, testified further as follows:

CROSS EXAMINATION (CONT'D.)

By MR. MACEY:

I asked you the question when you were on the stand a few minutes ago about the purpose of defining gas well at the 100,000 to 1 limit. You answered, if I remember correctly, that it was for administrative purposes, more or less?

A Yes, sir.

Q I think you should explain to the Commission exactly what you mean by that answer.

A Whenever, I said, for administrative purposes, any gas well as so defined would naturally be subjected to certain rules, and I would like to read into the record Rule 404, Natural Gas Utilization. "After the completion of the natural gas well, no gas from such well shall, first, be permitted to escape to the air; secondly, used expensively in engines and pump and then vented; thirdly, used to gas lift oil wells unless oil gas produced is processed in a gasoline plant or beneficially used thereafter, without waste or; fourth, used for the manufature of carbon black."

MR. MACEY: That is all.

MR. HOWELL: May I ask one question following that? Ben Howell representing El Paso Natural Gas Company.

By MR. HOWELL:

Q Could not the same result be obtained by amending Rule 404 to make it applicable to any gas produced from a gas well or any well having a gas-oil ratio in excess of 100,000 to 1?

A I see no objection to that.

Q Would not that achieve every result of prevention of waste without changing the status of any existing wells?

A Possibly, it could be.

MR. HOWELL: That is all.

MR. SPURRIER: Anyone else? If not the witness may be excused.

MR. CAMPBELL: May I ask one more question?

By MR. CAMPBELL:

Q Mr. Stanley, how would you define a well that happens to be open in both the gas zone and the oil zone?

A Well, sir, at this present time, we are defining that as an oil well, being open in the lowermost zone and the gas-oil ratio limitations would actually take care of such a situation.

Q You are defining all those as oil wells at this time?

A At the present time.

Q Don't you think that administratively it might be wise to take care of those wells by defining them on the basis of a gas-oil limit such as 100,000 to 1, so that anyone who has wells in that condition would have to make his decision as to what to do with them, but in either event he would be subject either to gas prorationing or the gas-oil ratio limitation?

A That is correct.

MR. CAMPBELL: That is all.

MR. STANLEY: I think Judge Foster had a question for an order that he could not find. I would like to answer that question, if you want it answered, Judge.

MR. FOSTER: I wanted to call the Commission's attention to the fact that in these oil pools that Mr. Stanley has testified about here this afternoon, there is a Commission Order that is in effect, which declares tham to be essentially gas pools and which abolished the gas-oil ratios in those pools. I want to call it to the Commission's attention because I think you will want to deal with it in the overall problem.

MR. SPURRIER: Anyone else have a question? If not, for the third and last time, the witness may be excused.

(Witness excused.)

MR. SPURRIER: Mr. Woodward, are you ready to put on your testimony?

MR. WOODWARD: Yes, sir. If the Commission please, I would like to make a preliminary statement with respect to Amerada's interest and position in this matter and make a brief reference to the species of waste that are now in the record and then ask Mr. Christie some questions with respect to his recommendations on the types of Rules and Regulations that he feels are desirable.

"Amerada Petroleum Corporation is interested in Case 673 as a producer of gas and oil from the Eumont, Jalco and Langmat gas

pools and from the Monument, Eunice, Falby-Yates, and Langlie-Mattix oil pools in Lea County, New Mexico, as presently delineated by the Commission.

It is Amerada's contention that the production of natural gas from the gas wells and from the gas pools included within the call of this hearing is in excess of the reasonable market demand for the types of gas produced from such wells and pools, that such production is defined as waste by Section 2(e), Chapter 168, Laws of New Mexico 1949, and that gas proration orders are necessary to prevent such waste. It is also contended that the unrestrained dissipation of reservoir gas energy from oil wells and oil pools constitutes waste as defined by Section 2(a) of said Chapter and that a limiting gas/oil ratio should be placed on production from oil wells and oil pools for the prevention of such waste. It is further contended that the flaring or blowing into the air of natural gas without beneficial use constitutes waste as defined by Section 2(b) of said Chapter and that a "no-flare" order is necessary to prevent such waste.

For substantial evidence of waste in the record of Case 673, and Case 582 as incorporated therein, reference is made to the testimony of:

1. Stanley J. Stanley, the January hearing in Case 582 at page 126 et seq., with respect to the relationship between the allowable for residue gas in Texas and the market for dry gas in the Jal area of New Mecico indicating, at least seasonally, the capacity of wells in the Jalco area to produce in excess of Market demand.

2. Stanley J. Stanley, the January hearing in Case 582 at page 136 et seq., with respect to the possibility of underground waste of oil in the Cooper-Jal area resulting from excessive production of gas cap gas.

3. R. D. Grimm, the February hearing in Case 582 at page 13 et seq., with respect to the underground waste of gas resulting from disproportionate withdrawals from different portions of the same gas reservoir.

4. R. D. Grimm, the February hearing in Case 582 at page 29 from Phillips' Exhibit 4 showing the volume of natural gas vented from New Mexico gasoline plants which process casinghead and gas well gas in 1953.

5. R. D. Grimm, the February hearing in Case 582 at page 29 to the effect that productive capacity in the area covered by Case 673 is 7-10 times greater than the capacity of present gas transportation facilities.

6. R. D. Grimm, the February hearing in Case 582 at page 38 in connection with the surface waste of gas by venting and flaring it in the field.

7. G. E. Trimble, the March hearing in Case 673 at page 57 in connection with the venting of gas from a gas transmission facility in the Langmat Pool.

For substantial evidence of prejudice to correlative rights in the record of Case 673, and Case 382 as incorporated therein, reference is made to the testimony of:

1. Stanley J. Stanley, the January hearing in Case 582 at

page 138, et seq., with respect to disproportionate withdrawals of gas from adjacent leases in the Langmat Pool.

2. R. D. Grimm, the February hearing in Case 582 at page 16 et seq., with respect to the adjustment in disproportionate withdrawals in the Jalco, Arrow, Langmat, and Eumont Pools during 1953 that would result from gas prorationing.

3. R. D. Grimm, the February hearing in Case 582 at page 20 et seq., with respect to disproportionate withdrawals in the Jalco Pool.

4. R. D. Grimm, the February hearing in Case 582 at page 22 et seq., with respect to the number of wells that have secured pipe line connections as the result of gas prorationing.

5. G. E. Trimble, the March hearing in Case 673 at page 54 et seq., with respect to disproportionate withdrawals and drainage from and to adjacent leases in the Langmat Pool.

R. S. CHRISTIE

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

DIRECT EXAMINATION

By MR. WOODWARD:

Q Mr. Christie, you have been present at each of these hearings that is at the January, February and March hearing in Case 582 and in Case 673, is that correct?

A I have been present but I haven't attended the full hearing on all cases.

Q You have heard a substantial part of the testimony on these cases?

A Yes, sir.

Q You have heard Mr. Stanley's testimony today concerning waste in this area?

A Yes, sir.

Q Mr. Christie, for the prevention of waste and the protection of correlative rights in pools coming within the call of Case 673, what is your recommendation with respect to the production of gas from gas wells completed in gas pools?

A We would recommend, Amerada recommends that the present rules remain in effect with some minor modifications. The principal modification being suggested by Gulf of the 660 acre unit with a standard 160 acre unit as being the base and the provision be made for securing unorthodox units more easily.

Q Mr. Christie, what would be your recommendation with

respect to the production of gas from oil wells completed in oil pools?

A We would recommend in those fields that do not have a limiting gas-oil ratio that a limiting gas-oil ratio be placed on those wells. We would suggest to start off that this limit be 6,000 cubic feet until such time as testimony or evidence would indicate it might be something different than that.

Q Mr. Christie, are you suggesting that limitation should be placed on the production of gas from oil wells in oil pools as a result of this hearing or as a result of special study concerning individual pools?

A I personally think it might be as a result of study.

Q That is after notice and hearing of the special study?

A Yes.

Q What is your recommendation concerning the production of gas from a gas well completed in an oil pool?

A That provision is already taken care of in the present State-wide rules which is State-Wide Rule 506B-2, which briefly is, "A volumetric displacement rule allowing you not to produce more gas than approximately the volumetric displacement of oil and gas."

Q Mr. Christie, what would be your recommendation with respect to the production of gas from oil wells completed in gas pools?

A It is my opinion that the rules should be promulgated to take care of this class of well and as a sample, I have

one that I would like to read into the record. "The unit allowable for gas shall be increased 2,000 cubic feet per barrel of oil produced from oil wells located on the unit and completed in the gas pool for which such unit is established, and such oil well shall be permitted to produce the entire unit allowable for gas, provided their production of oil does not exceed the top unit oil allowable for such a well as determined by Rule 505."

Q That rule contemplates a situation where the same operator has both oil and gas well and he is merely given an option of producing the increased unit gas allowable so long as he does not exceed the oil allowable, is that correct?

A That is correct.

Q What is the justification, Mr. Christie, for permitting an additional allowable of gas for a gas unit that has both oil and gas wells located on it, and completed in the same common source?

A Well, an operator should be entitled to produce his oil so that it wouldn't move off his lease or move up structure into gas zone and he is entitled to produce that amount of oil or gas that is in the oil in solution. This 2,000 that we recommend which is more or less arbitrary, could be anything from the actual solution ratio at the present time to any other arbitrary figure.

Q Are you suggesting that such a Rule be adopted as a result of this hearing in this Case or as a result of special study and hearing at some future date?

A I think it should be something the Commission should consider and set for hearing at a future date after study and so forth.

Q Considering then that the provlem of the gas well and the oil pool is taken care of by the Statewide Rule and you are recommending that the production of gas from oil well in oil pools and the production of gas from oil wells in gas pools be taken care of at a subsequent hearing that leaves this then for the scope of any order issued as a result of this case to the production of gas from gas wells in gas pools, is that correct?

A Yes, sir.

Q What recommendations do you have concerning the no-flare order applicable to the production of dry gas casinghead gas and gas cap gas, residue gas?

A We favor a no flare order.

Q As a practical matter, do you think that gas proration would work without it?

A No, I do not, not satisfactorily.

Q Do you have any recommendations concerning the definition of a gas well?

A We must have a definition, I think the one that has been proposed by Mr. Stanley is all right. That is 100,000 cubic feet per barrel of oil, over 100,000 cubic feet per barrel of oil.

Q Do you have any further recommendations, Mr. Christi in this matter?

A No, I don't.

MR. WOODWARD: That concludes Amerada's presentation here. We might say in parting that we feel that all of the operators that have testified before this Commission

over the last four or five months have indicated the common recognition of the fact that gas prorationing is necessary, it is for the prevention of waste and protection of correlative rights and if a difference of opinion exists, I would suspect that it exists as to the ways and means and not as to the ultimate object to be accomplished. We have purposely left or urged the Commission to leave out some very important areas of gas production, namely, the production of gas from oil wells and oil pools, and the production of gas from oil wells in gas pools, until that matter can be given additional study and some investigation made pf the appropriate amount of gas to allocate to oil wells to prevent the underground waste of oil or the premature abandonment of such oil wells. We have, also, pointed out that at the present time, the Statewide Rules do take care of the situation of the gas well in an oil pool. We believe that such a suggestion will eliminate a great deal of subsequent debate and confusion at this hearing if the scope of those orders are limited to that extent at this time, but we would like to get in the record that we are urging the Commission's study of these on the two important areas.

MR. SPURRIER: Anyone have a question of Mr. Christie?

MR. SELINGER: May I ask Mr. Christie a few questions?

By MR. SELINGER:

Q I want to direct your attention to your recommendation, as to only that part of your recommendation in which you recommend as a temporary measure the adoption of a 6,000

foot gas-oil ratio limitation in those oil pools. I didn't understand whether you were making that recommendation as to the Langlie-Mattix and Cooper-Jal only or whether you were applying it to all those fields that have no limiting gas-oil ratio?

A I was recommending it for all fields that do not have a limiting ratio.

Q Does Amerada have any production in the Penrose-Skelly field?

A Yes, we do.

Q Are your wells connection as to its casinghead gas?

A As far as I know, they are.

Q Aren't all the wells in the Penrose-Skelly connected to gasoline plants?

A I believe that is true.

Q In which you differ from Mr. Stanley's recommendations of a 10,000 cubic foot limitation. Have you undertaken to determine whether or not that would have an adverse effect in reducing the gas-oil ratio limitation from 10,000 to 6,000, whether or not that would have any adverse effect on the gasoline plants?

A I haven't make an analysis of that, no, sir.

Q If that lowering of the recommendation of Mr. Stanley, from 10,000 to 6,000 would have an adverse effect on the gasoline plants, would you be agreeable to having the limitation remain at 10,000 as made by Mr. Stanley?

A Yes, I would.

MR. WOODWARD: I would like to say, I think that

line of questioning illustrates the desirability of deferring that very subject for subsequent study. There are so many ramifications to the thing, I don't think within the time alloted, we can get them all in. We are specifically urging that that subject of gas produced from oil wells in oil pools be deferred for further study.

MR. SPURRIER: Anyone else have a question.

MR. GRENIER: A. S. Grenier of Southern Union.

By MR. GRENIER:

Q Mr. Christie, the questions I would like to ask you, relate primarily to the situation involving gas wells in gas fields and more particularly your first recommendation. As I understand it, do you recommend that the present allocation formula based one hundred percent on acreage be retained?

A Yes, sir.

Q Why, is it your opinion that that be so or rather, perhaps you could get at it this way. How can you reconcile that with the rather material variations in pressure between the northern portion of this area that we have under discussion and the southern?

A I reconcile it the same as we do oil. We prorate oil on the acreage basis and we have all those conditions in the oil fields. I think it would work just as well as gas.

Q Can you compress the oil in a small area the same way as you do gas?

A No, you can't.

Q Are the two problems then physically identical in your thinking as between oil and gas?

A Well, they are similar in one respect that you have to prorate them. That is one factor and I think that is all we need.

Q Assuming that a formula based in part, at least, on deliverability could be worked out which wasn't too elaborate and complicated, would you have any objection to that on principle giving recognition to a deliverability component?

A I would have to see the formula first.

Q It doesn't strike you as shocking, just as a general proposition that a deliverability should be given some consideration in a matter of this kind?

A I think it is proper to look into it.

MR. GRENIER: Thank you.

MR. SPURRIER: Anyone else? Mr. Stahl.

MR. STAHL: I would like to make this observation before Mr. Christie gets off the stand with respect to deliverability, at least, as far as Permian Basin Pipeline is concerned. We have refrained, during this hearing about going back into the question of deliverability, Primarily, because, as you all know, there is an Industry Committee which is currently working on some of those problems. There are tests that are currently being run, deliverability tests. It is our feeling and belief, possibly, it was a erroneous feeling, that it was the general consensus of opinion that we would wait until the work of this Industry Committee was flanked up, before we got back into the question of deliverability. I appreciate that Mr. Christie has made a recommendation. I think he has made it and will admit he has

made it without putting in any evidence to support it. If we might defer the question of deliverability until such time as the industry committee has had an opportunity to get farther along with their work, I am quite sure that we can resolve the question of deliverability at this time in that way. For that reason, I would like to request that Mr. Woodward withdraw that particular recommendation at this time, for that reason and no other reason?

MR. WOODWARD: If the Commission please, I believe Mr. Christie urged the adoption of a rule with respect to gas wells in gas pools, substantially in the form of the present order.

Mr. Christie, let me ask you this question, with respect to the present orders which you are urging a continuation of, substantially in there present forms do those orders in your opinion, contemplate further study of the allocation factor?

A I understand all orders are subject to renewal.

Q Is there any statement in the statement of facts in that order which would indicate that the matter is being given thorough study, do you recall?

A No, I don't recall that.

MR. WOODWARD: We will introduce one of the orders, if necessary, or make reference to it. It is part of the Commission records which clearly indicate that this matter is being given further study. In fact, what Mr. Stahl had recommended is that they go along on an acreage basis now, pending a further study of the allocation formula. Not that

we are committed in any way to the present formula but that we adopt a rule substantially as we have now.

MR. STAHL: That is satisfactory to me as long as it is understood that deliverability has been postponed and as long as Mr. Christie's recommendation includes that postponement.

MR. WOODWARD: We make reference to Order No. 4-370-A.

MR. SPURRIER: Anyone else have a question of Mr. Christie? If not he may be excused.

(Witness excused).

MR. SPURRIER: To be very frank at this moment, I am lost about who comes first.

MR. CAMPBELL: We have nothing further except a statement. I want to make a remark with reference to the matter that arose before lunch in connection with Mr. Dailey's testimony. The statement made by the attorney for Continental relative to their position on the line between Jalco and Langmat.

In view of the fact that at this hearing and at previous hearings in connection with this matter, all of the witnesses who have testified have testified that there should be in their opinion, there was no reason for any line between the Jalco and Langmat gas pools, these, including the witnesses, geological and engineering witnesses for Gulf, Amerada, the Commission, Phillips, Texas Pacific Coal and Oil Company, statements made on behalf of Skelly and Stanolind, in view of the fact that Continental has indicated that they will have no objection to the removal of that line, we have

decided not to add to this already voluminous record or to the time that is being spent here belaboring that particular question.

We are willing to forego the cross examination and the introduction of additional evidence which we have available in the light of these developments. We do not, however, in the event, someone else decides to cross examine Mr. Dailey, we wouldn't want to close the door to asking him some questions, if that particular phase of his testimony arises in connection with other cross examination. Other than that, I do have a statement that I want to make at the proper time as to the position of Texas Pacific Coal and Oil Company as a result of these additional hearings. I assume that you are taking those in order when you make the recommendations and I have no testimoney to offer in connection with it.

MR. SPURRIER: We would be glad to have your statement, if you have it ready.

MR. CAMPBELL: Well, I have it ready.

MR. KELLY: I would like to ask a question on a point of order. On the statement that Mr.Campbell is going to present and other people, time might run out on your five o'clock dead line, does the Commission intend to keep the case open for other operators to file written statements after that time, if they don't have the chance to present an oral one?

MR. SPURRIER: If it isn't sworn, it isn't testimony. I am sure that you can submit your statement at any time.

MR. KELLY: Supposing the written statement is filed under oath, that is sworn to before a notary?

MR. SPURRIER: We can't close the case then. We will have to continue the case. It is not testimony because no one can cross examine, Mr. Kelly.

MR.KELLY: I am not asking about testimony statements. You will keep the case open for statements to be filed?

MR. SPURRIER: That can always be done. We will take the case under advisement and give you ten days to get those statements.

MR. KELLY: The case will be open after ten days for ten days for the filing of written statements by any operator that so desires?

MR. SPURRIER: It will.

MR. CAMPBELL: I am not jockeying for position but I understand Mr. Howell has some testimony he wants to offer. I feel that perhaps the testimony should be received before the statements start.

MR. SPURRIER: I realized that Mr. Howell was there. You were on your feet.

MR. CAMPBELL: I don't know what Mr. Howell is going to do. I would rather go back and sit down.

MR. HOWELL: We would like to have Mr. Baulch and Mr. Steen sworn as witnesses.

(WITNESSES SWORN)

J. W. Baulch, Jr.

the witness, having been first duly sworn, testified as follows:

DIRECT EXAMINATION

By: MR. HOWELL:

Q Please state your name for the record?

A J. W. Baulch.

Q What position do you occupy with El Paso Natural Gas Company?

A I am the supervisor of the gas dispatching and the gas production departments in the Permian Division.

Q Where are your headquarters?

A At Jal, New Mexico.

Q Are you familiar with the gathering facilities which the company has in the Jalco and Langmat Gas Pools?

A Yes, I am.

Q Now, what facilities do you have that take casinghead gas from those two pools?

A Well, at the present time, we have three plants that we are processing casinghead gas through. Namely, what we call our Jal, No. 2 plant, Jal No. 3 plant and the Jal No. 4 plant. We have a network or a gathering system that we interconnected between the three plants with the exception of No. 4.

Q Now, is there any other pipeline connections, substantial pipeline connections taking casinghead gas out of those areas?

A Not that I know of.

Q As to the low pressure casinghead gas, do you have the figures of the daily volumes which were processed through your plant in the last six months?

A Well, I have it over a four month period from December.

Q Well, over the four month period?

A It begins in December, 1953 and continues through March, 1954. During that four months period we averaged gathering 118,401,000 cubic feet per day.

Q Is that themaximum capacity of the plants that handle that gas?

A Roughly, our capacity is around 120,000,000 to 123,000 000.

Q Now, are there wells with which that system and that plant is connected which are unable to deliver gas into the lines and the operators are flaring some in the field?

A That is right.

Q Is that gas in excess of the plant capacity you have for processing it?

A Yes, it is.

Q Have you made studies based upon the reports of the gas and oil produced from wells connected with that system as these reports are filed with the Commission?

A Yes, sir, I have.

Q Have you estimated the average daily volume that will be available in the event, a limiting gas-oil ratio of 10,000 to 1, be placed in that area?

A Yes, I have.

Q What is your estimate as to the volumes that will be produced from the wells to which your system is connected?

A Well, with the 10,000 to 1 gas-oil ratio limitation as best I can tell, we would be able to gather approximately the 99,761 cubic feet per day.

Q That is 99 MCF, is it not?

A Yes, sir.

Q 99,000,000 cubic feet?

A That is correct.

Q Is that within the capacity of your plants to process?

A Yes, it is. Now, that would reduce the volume of gas that we have averaged gathering for the past four months by 18,640,000 cubic feet.

Q Would that furnish an available market then for gas which is now being flared?

A That is right.

Q Now, if that ratio were 6,000 to 1, have you made computations as to the volumes that would be gathered and processed through that system?

A Yes, I have. The amount of gas available would be reduced to 85,558,000 cubic feet per day.

Q That would leave idle plant capacity for some 35,000,000 cubic feet a day?

A A little under that, to be exact 32,843,000 cubic feet.

Q Is there a limit on the treating capacity for the dry gas that can be handled by El Paso Natural Gas Company's system?

A Yes, there is.

Q Just briefly in 1952, what was the daily volume of dry gas that could be processed through El Paso Natural Gas Company's facilities in Lea County?

A Well, approximately 300,000,000 cubic feet of gas.

Q Has that been increased?

A Yes, it has.

Q What is it now?

A At the present time, our normal facilities, that is facilities, that we would normally use for processing high pressure dry gas is about 400,000,000 cubic feet per day. As a replacement of casinghead gas, we can utilize up to an additional 140,000,000 which makes our total capacity for dry gas about 540,000,000 cubic feet per day.

Q In order to get that, you would have otherwise have to dispose of 140,000,000 casinghead gas to get to that?

A That is right.

MR. HOWELL: I think that is all.

A I might add one thing, these volumes that I have been quoting are on a 13.45 pound pressure base.

MR. W LKER: Anyone have a question of the witness? If not, the witness maybe excused.

(Witness excused.)

H. F. S T E E N

the witness, having been first duly sworn, testified as follo

DIRECT EXAMINATION

By: MR. HOWELL:

Q Will you state your name for the record?

A H. F. Steen.

Q You are the same H. F. Steen, who testified previously in this hearing for El Paso Natural Gas Company?

A That is correct.

Q Now, Mr. Steen, will you tell the Commission briefly what the facilities are in Lea County for marketing both dry

gas and residue gas, that is the character of facilities that are required for each?

A Well, briefly, the facilities required for marketing dry gas in Lea County, all of the gas is not, not all of it is sour, but it is all handled as sour gas because the sweet and sour is enterconnected so far as the gathering system is concerned, consequently, pipeline systems are required. Purification compression dehydration plants are required. On the low pressure gas you have the same thing, if you gather the casinghead gas you have a gathering system. If you buy this residue gas from the tailgate of someone else's gasoline or residue gas plant, you have a pipeline there, then you have compression facilities, you have dehydration and purification facilities.

Q Just roughly, what is the total cost of the marketing facilities that are installed in Lea County--

A (Interrupting) Mr. Howell, I do not have it for Lea County. I have it roughly for the Permian Basin and it is averaged over a period of some eight or ten years. There is roughly 116,000 horse power installed which costs, at the time installed some $15,000,000.00. The average price of that or th price today would be some 25 percent higher than that. There is some 15 and a half million dollars worth of gasoline extraction facilities. There is some $13,000,000.00 of purification and dehydration, not to speak of pipelines. A rough estimate of the pipelines would be $10,000,000 to $20,000,000. I couldn't say just what that is. I speak only of our facilities. On top of that other operators, particularly, those who

have gasoline plants in the area have facilities that I would imagine would be comparable to the figures that I have given or, they could be more or less, I am not sure about that. When I say other operators, I mean such as Phillips, Gulf, Skelly, Warren, Stanolind and I am not purposely leaving anyone out. There are numerous others that have gasoline facilities, all sell the gas as residue or other operators, particularly us, take it as sour gas. We compress it to a higher pressure, purify it and dehydrate it and put it into our main line. In some cases such as the Gulf Eunice Plant at Eunice, the Warren Saunders Plant, the Denton plant, all in Lea County, we buy the gas from the operators as pipeline gas. He has done all of these things that I have spoken of. He has gathered the gas, purified it, dehydrated it and compressed it and sells it to us to meet the rigid requirements of the pipeline specification gas.

Q Have you considered the question as to whether or not, without the necessity of constructing additional facilities, your present facilities can handle the casinghead gas that might be produced in the Langmat and Jalco field, if a no flare order and a limiting gas-oil ratio be imposed?

A I have studied the figures that Mr. Baulch gave earlier concerning that. I concur with them. I think it is correct. I would like to add at this time that we had purchased some six or seven months ago two 2500 horse power, it happened they were Clark engines, they are at this time stored in Clark's Factory at Holland, New York. The purpose of this purchase was to install these two engines at our No. 4 plant.

Incidental to that, there would have been a number of pipelines to be installed to take this flare gas which we feel it is our duty to do in the Jalco-Langmat area as we have tried to build commensurate with the gas venting there. Our records indicated that there was some 13 to 16,000,000 cubic feet of gas build up and up of that volume that was flaring. Consequently, we bought these engines and intended to install them in the No. 4 plant. The engineering work is complete. The engines are stored in New York. However as the case opened again before the Commission and has been continuing now for some period of time, we did not feel that we should go ahead with that installation until we were sure what the outcome of this case might be. From where I sit right now, I am certainly happy that we did not spedn that million and a half dollar that would have been required to install the two engines and the pipeline to gather the gas that is now venting.

Q As a practical operator, Mr. Steen, would you state to the Commission, if you can see any conservation measure that would be achieved or waste prevented by defining as a gas well, any well that produced in excess of 100,000 to 1 cubic feet?

A I can not see where it would be a conservation measure particularly, Mr. Howell. I believe all the operators feel that we are worried about that because of the price of the gas. That is not the case primarily. I think if the gas-oil ratio which I certainly hope goes into effect, I might add here, I think it will be the greatest step toward conservation if the no flare order and the gas-oil ratio go into effect and

are enforced that has ever happened in the history of the New Mexico Oil Commission. If the Commission puts the orders in effect and enforces them so far as conservation of natural resources are concerned, we are highly in favor of it. We would hate for it to be so placed that we would lose the operation o a great part of the operation of any of these plants, however, we are not worried about that. That is beside the point. Back to your question about the 100,000 to 1 oil-gas ratio. It is my feeling that not only on the 100,000 to 1 ratio well but other high gas-oil ratio wells, say 50 or 60 or 30,000 to 1, it is my feeling that some experience will have to be obtained in producing those wells. I do not know that the geologists or the gas engineers presently concur in this and I do not speak as an expert, merely from some degree of experience. When they cut this field back, if it is done, I think it will raise the pressure over the various gas pools and oil pools, particularly--I don't mean gas pools, I mean oil pools throughout this area, by so doing, particularly, when a well is completed in three formations, say that the Yates, Seven Rivers, and Queen formations is opened, the Queens being the oil production formation, maybe the Seven Rivers, the Yates, also being open into the well bore, when that well is cut back, I am inclined to believe that in some instances the gas pressure from the Yates, which is generally higher than the other formations, would cause an increase in pressure in the other formations and possibly restrict or cut off the flow of the oil now coming into the oil bore which will leave essentially a gas well into the pressures equalized in an oil pool.

I don't think that will be universal. I think it will happen in certain instances. In those instances I think the operators are going to come to the gas purchaser in the area and want him to take that gas from that oil well, perhaps, as gas cap or high pressure gas. In most instances those wells will not buck a high pressure line. They will go into a line anywhere from 150 pounds up to maybe 300 pounds. Well, that is going to cause a great deal of trouble with the gas operator so far as having equipment available and not only trouble but an awful lot of expense so far as having equipment available to take that medium pressure so-called gas. I think that it will require some study because I am not sure that I am right about this and some of the other fellows may have much better ideas than I have. The only reason that I hate to see 500,000 to 1 ratio wells classified as gas wells over night, that have been classified as oil wells is that I don't know that the facilities would be available to take the gas. On top of that if they are available or that is if the gas will buck the high pressure line and you can buy the gas as high pressure gas, of course, at that time, the gas company will have the latitude of making its minimum requirements and using that gas as a flexible well to meet his peaks and ups and downs. That is no problem. I am not particularly upset about it. I would hate to see it done all at once. I would rather see it done on a trial basis.

MR. HOWELL: That is all.

MR. SPURRIER: Anyone have a question of Mr. Steen?

By: MR. MACEY:

Q Mr. Steen, if the Commission were to put into effect no flare order in south east New Mexico the gas would, of course, in all probability, be marketed into your plant, I believe in the Jalco-Langmat area. How long will it take you to provide the facilities to pick up that gas?

A Mr. Macey, it would be hard for me to tell you exactly. Some of the wells already are connected and the other is a matter of pipelines generally speaking, short pipelines, so I would say in a matter of 30 days at the most and I think two weeks time. We could be able to be taking all of that gas that is now being flared should the 10,000 to 1 ratio be put in effect. If you were to put it in effect today or tomorrow A.M., I think half or two-thirds of it could be turned into the plant day after tomorrow. That is my understanding of time.

Q Is there any casinghead gas economically for you to pick up?

A I would have to check the records on that. The majority of it, we could pick up economically and we would be very happy to do so, provided that we could get a contract. When you say any, that would be uneconomical, what range are you speaking of, Mr. Macey?

Q I am referring to a relatively very low volume oil well which had a low volume of casinghead gas produced that might be so low that it wouldn't pay you to run a line out to pick it up.

A That is almost unheard of in the Langmat Pool, but nevertheless if it is near our system, we would try to pick it

up. However, if it is of a mile or maybe a half a mile and it is a very low volume, well, we would look it over before we ran a pipeline out there. We have run some long pipelines to get a small amount of gas. We don't like to see it flare and if they pass a no flare order here, you know these operators, they concur with you on these things sometimes. Then, there is a combination of effort there, it might even be a dual ownership of a pipeline or something like that should happen around here.

Q What,actually, I was thinking about, was if you were faced with a no flare order in the Cooper-Jal Pool and he realized that he couldn't get any exception whatsoever to that no flare order, he might hesitate in drilling a well, possibly because he would be faced with a shut-in, if he can't market his gas, his well is going to be shut in as I understand the proposal. I believe that eventually, it maybe perfectly possible that we haven't found the extreme limits of the Cooper-Jal Pool. I don't think we have found the limits of the Monument, I don't know definitely whether the same thing is true of Cooper-Jal. I am thinking down the road of possibly a loophole in the order to give some one exception to the no flare rule, if it is proved unfeasible, uneconomical altogether.

A I think your statement makes a great deal of sense because, just because a man has a well that is displaced out from the limits of the gathering system, I don't know that he should be penalized to the full extent that he could not produce his well. You might give him a certain time limit or

see what the field is going to do in the way of development. If any of these companies that have gasoline plants, I believe they will concur, that if any of us see, in our area, a field developing and our geologist and engineers are reasonably sure after two or three wells are drilled that there is going to be something of a field in the area, they have no hesitation in running a line to the field although it is unprofitable at the outset.

MR. MACEY: I believe that is all.

MR. SPURRIER: Anyone else? If not, the witness may be excused.

(Witness excused.)

MR. HOWELL: That is all our testimony.

MR. CAMPBELL: I want to state very briefly the position of Texas Pacific Coal and Oil Company in connection with this gas proration matter. I feel that it is incumbent on us to explain it rather fully, though I will do it briefly. In view of the fact that the original rehearing in the Jalco Pool was at the request of Texas Pacific Coal and Oil Company, I believe that the results of these new hearings have at least furnished to the Commission and to operators who have had occasion to go into their own situations, some information that was not available to them at the time that the original order was entered. I think the testimony presented by Mr. Stanley this afternoon, if taken alone would have been well worth the time that the Commission and industry has spent in connection with these hearings.

At the time that we raised the objections to the Jalco

Gas Pool Order, it was based primarily upon four things. First, our concern about contracts entered into in good faith. Second, the delineation of the pools. Third, the establishment of proration units, and fourth, which is really a part of delineation of pools, the treatment of oil wells in these areas that have now in the last few years, because of the price of gas, primarily become important as gas areas.

The testimony and evidence offered here during these new hearings have presented to us some possibilities, at least, of not a solution because none of us probably are going to be fully satisfied, but certainly a partial solution to some of our concern.

First, with reference to the contracts that were explained here by Mr. Adair, by virtue of the letter offered in evidence here by El Paso Natural Gas Company that they would pay for gas which they failed to nominate provided they were given the opportunity to make up their shortages in accordance with their contracts has caused us to withdraw from the time being any request to the Commission for a minimum allowable. That takes care of that problem at least for the time being. In the event there is in the future a situation where the dry gas market becomes so low in New Mexico that dry gas wells are not being given the opportunity to produce on an economic basis, of course, all of us are going to be concerned about it. With reference to delineation of pools we have asked all along that the line between the Jalco and Langmat pool be removed. All of the testimony that has been offered hereby engineers and geologists, with the possible exception of

Continental's question on the matter, has been that there is no reason for that line. We believe that the evidence shows that it should be removed. With reference to the vertical limits of the pool, of course, we are concerned essentially with the Jalco-Langmat area. We are willing to go along with either the present definition of 100 feet above the base of the Seven Rivers or the recommendations of the Commission's geologist with reference to sea level datum, but in either event, we feel that the simplest method of determining where you stand, and that is one of the problems that most people are concerned about, is deciding whether your wells are oil wells or gas wells and how they are going to be treated.

We suggest that all wells that are completed solely above the vertical limits, whatever they maybe, shall be gas wells in a gas pool. That all wells completed solely below that point shall be oil wells in the oil pool, and that wells which are completed both above and below that line be defined as oil or gas wells by some method of definition adopted by the Commission which we suggest to be 100,000 to 1, and those wells that are completed, both above or below then will either be prorated as gas wells or controlled by limiting gas-oil ratio.

We do want to clarify one point with reference to vertical limits. As I understood the Gulf testimony, they are recommending that the present defined limits of the Cooper-Jal Oil Pool and the rest of the oil pools remain as they are, and that the definition of the gas pools remain as they are except the elimination of the line between Jalco and Langmat.

As I understand it there is presently considerable overlap between the oil pools and the gas pools lying above them. In order to avoid the confusion that naturally results from that situation we recommend the redefinition of the oil pools so that they will constitute laterally the same area but actually on a vertical basis, they will be only that area below whatever vertical limit the Commission sets so that it will not be an overlap between oil pools and gas pools.

Now, with reference to the units, the proration units, we have not had an opportunity to study carefully the recommendations that have been made, but we do concur generally in the proposition that we should be allowed to obtain unit allowables up to 640 acres without the necessity of hearings on each and every one of them provided offset operators are given an ample opportunity to raise any objections that they may have. We think that it will not only help the operators but will help the Commission in its administration of gas proration. I have already covered the question of how to treat oil wells and gas wells. There maybe exceptions in certain areas, I am sure there are, as the Commission geologist has indicated. There has been one recognized in the Falby-Yates area and there will be others.

We believe that a general definition such as we have suggested would take care of the general problem and then those exceptions whether in areas or units can be brought up on special hearings. We favor the adoption of the gas-oil ratio limitation in the oil pools as the Commission ultimately finds them. We believe that in the area of the Jalco-Langmat

areal distance there in the Cooper-Jal Pool and in the other pool in that area, that a 10,000 to 1 ratio would be a fair one on which to start at this time. We are also in favor of a no flare order because we do not believe that you can properly enforce any limiting gas-oil ratio or any gas proration system unitl you accompany it with a no-flare order.

As I say, we do not know what the results of these hearings will be, but we believe that they have brought out evidence and testimony by which many of the problems that have arisen can be resolved and, at least, we can know where we stand in connection with gas prorationing if a proper order is entered.

MR. SPURRIER: Mr. Smith, with Stanolind.

MR. SMITH: Our position in this matter, as I understand the presentation to be, is substantially that which has already been taken by Gulf and supported substantially by Amerada and by Texas and Pacific. We think that the present limits of the field as presently set out in the existing orders should be maintained with the exception that we did recommend a short time ago that the line between the Jalco and the Langmat pool be eliminated. We have no objection to that whatsoever. We believe that the present vertical limits in the field should be maintained as they are in existing orders both for the oil and the gas fields for the reason that we may create more problems than we may solve by adopting some other system without further and more detailed study in each of these areas. We have been operating under the present delineation without any great trouble so far as I understand the

situation to be.

If the Commission should decide to adopt the sub-sea datum basis a system as recommended by the Commission's geologist I certainly want the Commission to keep in mind the geologist's testimony that the Grayburg, San Andres could be considered an exception and that wells completed below the non-geological marker in the Grayburg and San Andres would be considered as oil wells and gas cap wells and not be subject to the same proration rules as would be the case for the other gas fields located throughout the area. I do think that, perhaps, the Commission geologist made a detailed study. I would like to commend him on his energy and his perserverance in this particular matter but I do think that an arbitrary line of the nature that he recommends would cause localized disturbances and would require a great number of exceptions on the partof the Commission and could eventually lead to more administrative trouble than the apparant simplicity of his plan would indicate at first examination.

We are in support of the proposition, passing on to other matters, with respect to the definition of a gas well, the adoption of the 100,000 to 1 definition as indicated by Mr. Stanley, and by other people who have made recommendations here. We are also in support of the adoption of a reasonable gas-oil limiting ratio in all oil fields where there is no limit set at present. In that connection, it appears from the testimony of El Paso Natural Gas Company and the recommendations of other witnesses that at least as a starting point, we could take 10,000 to 1. I agree with Mr. Woodward

of Amerada that perhaps the figure might be at present a little unrealistic but it certainly is a great deal better than affinity. I would be inclined to take a higher figure at the outset than a lower and that would be our recommendation that it be commenced at 10,000 to 1, to see how it works.

With respect to the no-flare gas portion of Mr. Stanley's recommendations, we are in favor of that too. We think that it is highly essential to gas prorationing where you have such a complex geological situation as you do have in this area that you do have a no-flare gas order. However, I would like to direct the Commission's attention to certain practices that are presented by a no-flare gas order. One of them would be, of course, in the event of new completions that if the well has been completed and while you are testing, it is necessary to flare gas to know what you have, I think a reasonable period of time after the well has been reported to have been completed should be in order. What is a reasonable period of time, I am not in a position to recommend now, but I would say that as a rule of thumb that you should be subject to the no-flare gas order within 30 days after the completion of the well or failing which you should come to the Commission to request an exception to explain your hardship situation.

One other matter, with respect to minimum allowables has been withdrawn by Texas Pacific and I think requires no further comment by any operators here. I would like to commend the Commission on their extreme patience in this matter. We have had a very complex matter. I think from the testimony

that has come out and the statements that most of the operators are in substantial agreement about what should be done. I believe if the Commission can take what we have now and set out a set of orders which will be acceptable perhaps we won't all like but it will be acceptable to all of the operators.

MR. FOSTER: It may seem to some of us that we have spent a lot of time here in these hearings. Of course, a lot of time has been spent, but looking out of the back of the wagon, again, I think that we have come along ways, in a mighty short time. It is certainly encouraging to see the Commission assembling a very efficient staff and that they are actually working. These Exhibits here that the Commission staff has prepared, I think are due some complimentary remarks. They certainly evidence a great deal of interest in these questions and a lot of hard work and they certainly have been most helpful I know to the Commission and I know they have been to me.

Now, as to some of the features of this proposed order. I think it is in this record without dispute that a gas well in the areas that we are talking about will efficiently and economically drain 640 acres. If there has been any testimony contradicting that, I haven't heard it or I have failed to hear it. I would like to suggest to the Commission that the standard proration unit here be established as 640 acres as the drainage area for gas wells in these fields. It seems to me that that would simplify the matter. Other units smaller than that could be fractional units.

Of course, the testimony is just as conclusive on the

question of the limiting gas-oil ratio. I haven't heard anyone that actually opposed that. Of course, I think it goes without saying that the Commission would give it most serious consideration and in all probability will adopt those ratios. Now, I don't care whether you adopt them any where within those limits that we have mentioned here, 6, to 10,000. It does occur to me, however, that it would be better to start maybe low and come up if necessary than to start high and then try to come down, because that is always most difficult.

The most highly controversial issue, I suppose in this whole series of hearings has been the question of the vertical limits of these pools. I want to state Phillip's position as clearly as I can, regarding that. Our testimony is to the effect that these reservoirs are all one common source of supply. We still think that is true, but we are not going to be dissappointed or upset or put out or make any attack upon an order that doesn't give us all the things that we ask for. If the Commission wants to delineate them in some other manner, why we will go along with that for the time being. I think we have to say that in good faith because certainly we had no intention of making any attack upon the order as it was originally written when we participated in those hearings. We took part in the Committee Meetings that delineated those pools and we knew our position at that time but I don't think any one operator can just be obstinate and insist that his position be adopted on any particular point. For that reason, we were perfectly willing to accept the rules as they were originally written.

We thought they were workable then. We think they are workable now. I think you could make some changes at least to put all of these four pools that we have been discussing here, combine them as one pool and extend the vertical limits down to the base of the Queen, at least. I think you could do that and not do violence to the evidence in this case at all.

Now, as to the changes in the rules. There is one matter that I am particularly interested in. I think you should clearly and definitely define a gas proration unit, whatever area you may want to make. I think in that definition you should limit exceptions to that rule to those cases where it is necessary to prevent waste in order to prevent the confiscation of property. If the Commission will permit me the privilege of drafting that sort of a rule and sending it in for your consideration, I will be glad to do so.

MR. SPURRIER: The Commission will not only permit you, Judge, we want any and all proposed orders that we can get.

MR. FOSTER: I think too, that the Commission should give some consideration to the statutory powers that it has of compulsory unitization here for the purpose of preventing the drilling of unnecessary wells. Now, I don't mean that you ought to go just hog wild about it. I don't mean that at all, but I do mean that you do have within your power the provision in the statute and in your present rules that would permit you under certain circumstances to require the unitization of some of these tracks. I think that is a good rule and I think it would be a good practice. I think it would be a step forward

and in the right direction.

Of course, no one that advocates conservation and prevention of waste can seriously say that it is not necessary to have a no-flare order in connection with the program which you are undertaking. That shouldn't be just a hard and fast matter. I realize the hardships in some instances may occur and the Commission can always temporarily, within its judgment and wisdom, take care of those matters, but I do think that the no-flare order is essential if you want to make this thing work and I think that you do.

Mr. Chairman, other members of the Commission, I want to thank you for the time that you have afforded my company during these long tedious hearings and our witnesses and whatever order you write, ain't going to suit us in all respects, I know, but I don't believe you are going to come up with something that we can't live under and that wouldn't be acceptable.

MR. SMITH: May it please the Commission, Judge Foster reminded me of a matter that I didn't mention. We also concur in the suggestion that gas units be increased to 640 acres, that is in line with Gulf recommendations which I stated that we had substantially adopted.

MR. SPURRIER: At the risk of hurting someone else, I am going to request that from now on, if a company has a statement, the Commission is not interested in reiteration of what somebody else has already said. If you don't have a change to make in the recommendations that have already been made, we suggest that you withhold and we will assume that

you are in agreement. Southern Union.

MR. GRENIER: Limited slightly by that last suggestion I think I would like to limit my remarks simply to this, that I hope that the Commission will keep an open mind on this subject of the allocation formula. That was the matter which was of principle interest to us when we came here and that was the only matter that we had planned to introduce any direct testimony on and so long as the ideas expressed by Mr. Stahl and apparently concurred in by the Commission that this thing is to carry on and perhaps be subject to further examination in the light of what the Industry Committee finds, I am sure that, as Judge Foster said, any order can be lived under.

MR. SPURRIER: We are not taking a poll here and we don't want to limit you, but as you can see the time is getting short. El Paso, Mr.Howell.

MR. HOWELL: I think El Paso has no further statement to make. We have stated the points that seem material to us. We would like to be heard when the proper time comes on the question of deliverability as a factor.

MR. SPURRIER: Very well done, Permian.

MR. STAHL: I have only one point I want to add and I want to make it for the record. That is that Permian, as you all know, put in its proposed rule changes under oath, Mr. Ainsworth did that I believe at the last hearing. Mr. Ainsworth has been available for any questions and I think it was made clear at the time that he put in those recommended

rule changes under oath that he would be available. There has been no attack of any nature or kind on those proposed revisions as they were put in under oath. It is my personal assumption and the Company's assumption that those recommendations, as far as the ones put in by Mr. Ainsworth, are supported by all operators here.

MR. SPURRIER: Mr. Selinger.

MR. SELINGER: We concur in the recommendations of previous witnesses with respect to the rules. We have already expressed our opinion as to the vertical delineations. We want to specifically point out that we urge the Commission to not have a gas-oil ratio limitation of less than 10,000 to 1, particularly in the Penrose-Skelly area. From benefit of the previous experience, this is one operator that is not in favor of deliverability in the allocation formula. We concur in the one hundred percent acreage factor.

MR. SPURRIER: Amerada.

MR. WOODWARD: We have said our say.

MR. SPURRIER: Gulf.

MR. MALONE: Gulf's case is before the Commission except on the point of no-flare order and gas-oil ratio and we approve of both of those.

MR. SPURRIER: Continental?

MR. DIPPEL: Maybe I am plubm out of order, Mr. Chairman, but I want to ask a question, if I may. I take it that Mr. Dailey is no longer subject to call for cross examination?

MR. SPURRIER: Well, there were two people interested as I remember. Texas Pacific and Bill Macey. They have both

indicated--

MR. DIPPEL: Permian indicated they wanted him available. I have forgotten who else, if anybody.

MR. SPURRIER: Anyone else want to cross examine Mr. Dailey? Time has run out.

MR. DIPPEL: Continental has prepared some proposed changes in the rules. I have here, approximately 30 copies in mimeographed form which I would like to leave here on the table with permission of the Commission, so that they would be available to representatives of any operators that would be interested in having a copy of them. I should like to leave several copies with the Commission and their personnel. I merely want to call attention to the fact that we provide substantially the same rules that Gulf proposed with the addition of a no-flare gas rule and then we set up a definition of a gas well and then we provide that wells that are not classified as gas wells under the rule will be classified as oil wells. Then we have a rule that gives these kind of oil wells an oil allowable equal to the normal unit allowable under Rule 505, subject to the gas-oil ratio limitations. I don't want to abuse my privilege but I think that in view of what has gone on here before today I should make a few remarks about Continental's position in this amtter, because unfortunately we have been placed in a somewhat unique position that we are not at all too uncomfortable in. But I do think it requires of us some few additional comments over and above what perhaps we normally would make.

I heard some comment incidentally during the day that

there were a number of people amazed when they learned that the Commission in writing its orders in Case 245 had had so much material available for consideration before it wrote those orders. The main purpose of our appearing in the record today has been to put into the record the exhibits that were considered by the Commission but for some reason through inadvertence were never introduced into evidence. We have them all introduced into evidence today. Other exhibits have been introduced and certainly there can be no question but what the necessary ingredient for the Commission to exercise its jurisdiction are now in the lap of the Commission.

Certainly there has been a showing that this gas proration is necessary to prevent waste and to protect correlative rights and do all the other things that are designed to be accomplished by gas proration. Continental Oil Company would like to urge the Commission to move as rapidly as it can, consistent with the proper care that it certainly will want to exercise but we feel that the Commission could reasonably proceed in this matter and it would expedite everything, including its own administration of gas proration if it came up with orders that were substantially the same as the ones they adopted in Case 245.

I want to say only this one thing further with respect to the line between Jalco and Langmat. We have not receeded from our position because of any desire to be obstinate, it is the honest conviction of our engineering staff that they can not join in the recommendation with the other operators that that line be removed and we ant the record to

clearly show that we are not recommending it now.

But I want to reiterate what I said before noon, that we have no objection to its removal if the Commission feels that it should be removed, I believe that is all I need to say excepting thank you for being patient with me this long in this closing statement.

MR. SPURRIER: Mr. Hinkle.

MR. HINKLE: In view of the Commission's ruling about duplicating statements, I think we will avail ours of your earlier proposition that we may file a written statement so that it will keep the record straight as to the position of the Humble. We will probably have some recommendations to make to the Commission.

MR. SPURRIER: Ohio.

MR. COUCH: In keeping with this recommendation and with your request, we adopt what Humble has just said on his statement.

MR. SPURRIER: Anyone else?

MR. OWENS: That also applies to Shell.

MR. WHITE: The Texas Company wishes to go on record as concurring with and joining in the recommendations made by Gulf at yesterday's hearing. We also favor the proposed rules that were submitted to the Commission by them today.

MR. SPURRIER: Anyone else?

MR. VICKER: Mr. Vicker with Atlantic, wishes to file a written statement.

MR. SPURRIER: Anyone else? In the interest of time, now, again, we will give you ten days which would be May 22,

we will make it May 24th, since that falls on Monday. If we do not have the statements in by that time, we will consider that it is not necessary to wait for them before we promulgate an order. Does anyone else have a comment in this case?

MR. WALKER: There have been a lot of complimentary things said the last few minutes on behalf of the Commission or for the Commission, I think that it is only fitting that I say in behalf of the Commission that we want to thank you sincerely for the patience and the help that you have given us and we do appreciate it very much.

MR. SPURRIER: Anyone else? If not, the record is closed.

STATE OF NEW MEXICO)
: ss.
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, Court Reporter, do hereby certify that the foregoing and attached transcript of proceedings in Case 673 taken on May 10th & 11th, 1954 before the New Mexico Oil Conservation Commission 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 10th day of June, 1954.

Ada Dearnley
Notary Public, Court Reporter

My Commission expires;
June 19, 1955