BEFORE THE OIL AND GAS CONSERVATION COMMISSION

OF THE STATE OF COLORADO

30-12

IN THE MATTER OF THE INVESTIGATION)
TO TAKE MEASURES TO PREVENT WASTE)
OF OIL AND GAS IN THE "J" SAND OF) CAUSE NO. 30
THE LITTLE BEAVER FIELD, WASHINGTON)
AND ADAMS COUNTIES, COLORADO)

PURSUANT TO NOTICE TO ALL PARTIES IN INTEREST, the above-entitled matter came duly on for hearing at Room 243 State Capitol Building, Denver, Colorado, at the hour of 11:45 o'clock a.m., September 17, 1957.

BEFORE:

Warwick Downing, Chairman
H. C. Bretschneider, Commissioner
W. A. Dillon, Commissioner
Harvey Houston, Commissioner

APPEARANCES:

Patrick M. Westfeldt, Esq., appearing for Lion Oil Company;
E. L. Maxwell, regional manager for Lion Oil Company;
Wesley G. Gish, appearing for Col-Tex Oil, Inc.;
Robert Munn, appearing for the Tomberlin interests;
William McElwain, appearing for the Triangle J Oil Company;
A. J. Jersin, Director, Colorado Oil & Gas Conservation Commission;
William Smith, [redacted], Colorado Oil & Gas Conservation Commission; and
Samuel Freeman, Esq., Assistant Attorney General State of Colorado.

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KEITH WATSON
Federal Court Reporter
Denver, Colorado

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I N D E X

E X H I B I T S

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PROCEEDINGS

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COMM. BRETSCHNEIDER: The next hearing on the agenda is Cause No. 30, Little Beaver "J," the Commission's own motion to consider field rules, receive reports of operators regarding progress of unitization of "J" sand reservoirs.

It is now a quarter to 12:00. Before we get into this matter seriously, I would like to have somone who represents the major interests to advise us about how long you think it might take to accomplish what you are seeking.

MR. WESTFELDT: My name is Patrick M. Westfeldt, attorney for Monsanto Chemical Company, Lion Oil Division, and I would like to suggest, Mr. Chairman, that there are two phases to this hearing: one is the report of progress in the direction of unitization, and second is consideration of field rules.

It is my opinion that the report with respect to progress on unitization will only take a short time, and that the field rules and evidence in support of that could take a long time. I intend to call one witness, and I expect that his testimony will take an hour with respect to field rules. On the other hand, I think that all of the interested parties that are present here can enter their

appearances and can state to the Commission what has been done with respect to unitization, and that could be done before lunch.

As a matter of fact, if the Commission so desires I am perfectly willing to work through the lunch hour, but I am not sure that everybody would agree with me on that.

COMM. BRETSCHNEIDER: We have a little problem here. The Commissioner here has another date with the governor at 2:00 o'clock, and Mr. Downing---

CHAIRMAN DOWNING: I could be back, I think, at 3:00, but I couldn't be here at 2:00.

COMM. BRETSCHNEIDER: Well, we could do one of two things, we could adjourn until 3:00 o'clock, or we could stay here until 2:00. We can't do it in two hours, though, can we?

MR. WESTFELDT: We may be able to; it is always difficult just to tell how long testimony will take. I tried to give as honest an estimate as I could, and I know that my principal witness will be cross examined, or else some of the other interested parties will want to put on their own evidence.

COMM. BRETSCHNEIDER: Let's have the report, and you can make it as brief as possible.

MR. WESTFELDT: Well now, the way I would like to handle the report, I would like to call Mr. Maxwell to give his statement on the report on progress towards unitization, and then if any of the other interest owners want to say anything, I would like to have them have the opportunity to do so, too.

Mr. Maxwell, would you stand up and say who you are and what your position is and give the Commission the information that you have about unitization?

MR. MAXWELL: Yes, sir.

COMM. BRETSCHNEIDER: This is just a report on the progress towards unitization of the "J" sand area of the Little Beaver Field?

MR. WESTFELDT: That's correct, and it is called for in your notice.

COMM. BRETSCHNEIDER: And if anyone would like to add to these remarks, they may do so, and we will close that phase of this hearing at that time and go to lunch, and probably decide after Mr. Maxwell has finished as to whether we will go to lunch or whether we will meet at 3:00 o'clock or some other time to accomodate some of these people.

MR. MAXWELL: I am E. L. Maxwell, regional

manager for Lion Oil Company, or Monsanto Chemical Company, Lion Oil Division, which if you will allow me, I will refer to it as Lion.

At a hearing held here before the Commission on June 18th, Lion appeared and asked for some time to try to make some progress towards unitization. This field has a long history of unitization effort dating back to June, 1955 when the operators first met and discussed the possibility and the advisability of unitizing.

At that time an operator's committee, an engineering subcommittee and a geological committee was formed, and according to our records the operator's committee met fourteen times between then and March of 1956.

Now, the result of those meetings was that a tentative agreement was reached by the companies attending the meetings as to participation and other factors that would be necessary for unitizing the field, and a unit agreement was written and printed. The unit agreements were circulated for signatures primarily to the owners of working interest, and by October of 1956 just a little less than a year ago, we had been successful, or the operators had been successful in obtaining signatures of working interest owners who would own up to about sixty-five

percent of the proposed unit, and at that time the effort failed because the remaining principal working interest owners, that is, the ones that owned the larger portions, could not accept the proposed participation factors.

These owners were primarily under the Tomberlin-Hogsett lease, and because of this, because not enough ownership could be signed up, the unitization effort was dropped about last October, and nothing more was done on it until the June 18th hearing when Lion asked for some time to try to accomplish some more towards that goal.

I would like to report to you that what has happened since June 18th--and I am happy to say that in my opinion we have made some more progress towards unitization. For one thing, all of the operators in the field cooperated in conducting new well tests and a bottom hole pressure survey, both of which were necessary to evaluate and take a new look at the unitization situation since quite some time had elapsed.

These tests were completed on August 20th, this month. Preceding and after they were completed the meeting was called of the operator's committee which meeting was held on September 5th, and the purpose of the meeting was to discuss unitization and to see if those present were still

interested in unitizing and to see if we could think of something to do that might further us towards that goal; and at that meeting it was decided--because the operators under the Tomberlin-Hogsett lease had been the ones that did not see fit to sign before--that a meeting of the working interest owners under that lease might be in order to analyze the situation again and see if perhaps some of them that had not seen fit to sign before would not be receptive to the idea.

This meeting was held; I think it was last Thursday, and the following day I had a meeting with Mr. Tomberlin and we discussed the same thing, and the result of those two meetings was that perhaps there was some hope that we would be able to actually achieve unitization now; and so we had another meeting yesterday which was of all of the operators, again the operator's committee meeting, and it was quite well attended, and all of the members, all of the operating parties present, we polled them to see if they would be interested in unitizing on the basis as proposed before when the thing died, and everyone present indicated that they would be willing to, and those companies--of course, I appear here only on behalf of Lion Oil Company--but, I just want to

list the companies for you that were there and so indicated, and then if any of them that are present here now--I would like for them to state their own position--but, Lion Oil Company, of course, Col-Tex, Inc., Forest Oil Company, Tomberlin, the Triangle J Oil Company, Al Ward, Jr., and we had a message from the Denver Basin Oil Company that under certain conditions they also would be willing to unitize.

These operators were a unit to be formed; these operators I have just named would own sixty-seven percent of the unit, and of course, there is listed in there Mr. Tomberlin, who previously had not seen fit to sign, and we feel that if we can get these companies signed up that that would pave the way towards unitization, and in fact if we could get these that I have just named signed, and in addition get the others that had signed previously over a year ago--of course, their signatures are void now--but, if they would sign again, we would be able to have signatures representing in excess of eighty-five percent of the working interest owners.

I would like to point out at this point that these figures include some substantial interests under the Tomberlin-Hogsett lease, from whom we have no direct communication. Mr. Tomberlin as the operator of the lease

represented only his own wishes as to unitization, because he doesn't have the authority to speak for the others, and we haven't been in contact with them, so it is a long, long way, I believe, yet from now until unitization might be a fact; and we are not assured, of course, of success in that, but we have received this encouragement of some of the folks that wouldn't join before now stating that they would be interested.

That is the full statement of what we have accomplished since the last hearing on this matter, and I would like to ask that any other owners present that wish to make a statement do so now.

COMM. BRETSCHNEIDER: Thank you very much, Mr. Maxwell. Does anyone else wish to make a statement?

MR. MC ELWAIN: William McElwain of the Triangle J Oil Company. I would like to further verify Mr. Maxwell's statements with regard to unitization and to assure the Commission that Triangle J Oil Company would unitize on the basis that has been agreed upon.

MR. GISH: Wesley Gish, Col-Tex Oil, Inc. Mr. McElwain and I are probably the two veteran members of these many months of procedure working towards unitization, and in view of the spirit of yesterday's two meetings I am

very much encouraged and will make a little stronger statement that Mr. McElwain has as to success.

We feel that we are over the hump and have the details of the revision of the contract as to dates and such, and the re-canvassing of all the working interest owners and royalty interest owners, which will take time; but, I feel very much encouraged that we are over the hump and it will eventually be attained, and Col-Tex, as Mr. Maxwell stated, has always been for unitization and still remains for it.

COMM. BRETSCHNEIDER: Thank you very much, Mr. Gish. Anyone else?

MR. WESTFELDT: Mr. Munn, do you want to add anything further with respect to the Tomberlin interests?

MR. MUNN: The only thing I can say--my name is Bob Munn; I work with Bob Tomberlin--is that the statement made by Mr. Maxwell is correct as far as I know, and that we would be very happy to work with the working interest holders of the Tomberlin-Hogsett lease to effect unitization.

MR. WESTFELDT: May I add, Mr. Bretschneider, I think perhaps Mr. Maxwell was a little modest about the really serious interest that Lion has in unitization, and I want to emphasize that Lion will continue to do everything

it can to effect unitization.

I know the Commission is aware of Lion's participation in the Little Beaver unit and perhaps its work in the Little Beaver East unit, and the interest that they have demonstrated continues.

COMM. BRETSCHNEIDER: Thank you. If there are no other remarks concerning the report of the commission on progress of the unit plan, we will close that part of the hearing.

Now, it is 12:00 o'clock. What shall we do with the balance of the hearing which relates to new field rules for the area?

MR. WESTFELDT: Mr. Bretschneider, as far as I know, Lion is the operator that is going to present some field rules and evidence in support of them. I don't know that the other operators are going to, although, as I said, there can be controversy over the rules that we will propose. In view of the situation of the commissioners that we will have to leave at a later time, I personally would like to proceed; but, I don't want my wishes to control if there is disagreement about that. I personally would like to go ahead at this time, and I would like to ask if anyone else has any other feeling?

COMM. BRETSCHNEIDER: How many others are to present testimony, and is there much of a conflict between your opinion as to the rules and the opinion of others, do you know?

MR. WESTFELDT: It is my understanding that there is some conflict. I hesitate to say the degree of the conflict.

MR. MCELWAIN: As far as Triangle J's position is concerned, it will not take much time. There will be no testimony on our part; there will be slight cross examination.

MR. GISH: I want to make a very brief statement, but it will just take a few seconds.

COMM. BRETSCHNEIDER: Let's proceed then and see how far we go.

MR. WESTFELDT: First of all, I would like to call Mr. John Rushing as a witness.

COMM. BRETSCHNEIDER: You just have one witness?

MR. WESTFELDT: No, I am going to call Mr. Maxwell as a witness, but he won't take two minutes.

Perhaps to open up the hearing and facilitate it, would you get your exhibits out, Mr. Rushing, and I would like to ask the reporter to take one of the packets

of exhibits for the official record copy of the Commission, and mark the exhibits in the sequence that they appear, and they will be Lion's Exhibits 1 through 7.

(Lion's Exhibits 1 through 7, inclusive, were marked for identification.)

MR. WESTFELDT: For the Commission's information the items that have been presented to you are copies of the exhibits that have been marked, and they are in the same sequence as they will be referred to in the testimony of this witness.

I want to apologize to the other people present for not having complete copies of all of the exhibits to submit to them; I have one extra here that if they want to look at while we are going through the testimony they can do so, and, of course, more copies can be made for them.

JOHN D. RUSHING

having been duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. WESTFELDT:

Q Mr. Rushing, will you please state your name and address?

A My name is John D. Rushing. My address is Houston, Texas.

Q And by whom are you employed, Mr. Rushing?

A Sir, I am employed by the Lion Oil Company, Division of Monsanto Chemical Company.

MR. WESTFELDT: If the Commission please, we will just refer to this as Lion from here on out so that there won't be all of that extra language.

Q In what capacity are you employed by Lion?

A Sir, I am a staff petroleum engineer for the Lion Oil Company.

MR. WESTFELDT: We want this witness to be considered qualified as an expert witness, and I won't insist on going through the details of his qualifications, if the other persons present will accept his qualifications.

COMM. BRETSCHNEIDER: Any objection? (No response.) You are accepted; there is no objection.

Q Mr. Rushing, in the course of your work as a petroleum engineer for Lion have you caused a study to be made of the "J" sand reservoir of the Little Beaver Field?

A Yes, sir; we have on numerous occasions studied this reservoir of the Little Beaver Field.

Q Mr. Rushing, with respect to the exhibits that have been marked and copies presented to the Commission, did you prepare those exhibits or were they prepared under

your supervision?

A Yes, sir, they were.

Q And you are familiar with the information contained in those exhibits?

A Yes, sir, I am.

Q Mr. Rushing, do you have in front of you the first exhibit that is marked Exhibit No. 1?

A Yes, sir, I do.

Q And will you please state what that exhibit is?

A Exhibit No. 1 is simply a field outline or a field map of the Little Beaver "J" sand pool of the Little Beaver Field. The map shows the productive limits of the field which are enclosed by the irregular blue line around the periphery of the field.

The map also shows the producing leases, the wells which are located thereon, and the classification under the existing rules of those wells.

Q What do you mean by the classification under the existing rules?

A Sir, under the existing rule a gas well is a well which produces with an average producing gas-oil ratio in excess of 30,000 cubic feet per barrel. An oil well is a well which produces with an average gas-oil ratio less

than 30,000 cubic feet per barrel.

Those wells which are classified as gas wells on this exhibit are indicated here by a blue circle with small dash lines around the periphery of the circle. Those wells which are currently classified as oil wells are indicated on here by solid blue dots.

Located in the south half of Section 19, Township 1 North, Range 56 West, and in the northeast quarter of Section 30, Township 1 South, Range 56 West, is the Lion Oil Company Flessner lease, on which there are located eight oil wells and one gas well.

In the northwest quarter of Section 30, Township 1 South, Range 56 West is the Tomberlin-Hogsett lease, on which there are located three oil wells.

In the southwest quarter of Section 30, Township 1 South, Range 56 West, is the Col-Tex-Hogsett lease, on which there are located three wells classified as oil wells.

Now, the gas wells are located in the field as follows: in the northeast quarter of Section 30, Township 1 South, Range 56 West, Lion Oil Company has its Flessner No. 11, which is currently classified as a gas well.

In the northwest quarter of Section 31, Township

1 South, Range 56 West is the Triangle J Oil Company Hartmann lease on which there are located wells No. 1 and 1-B, each of which is a gas well.

In the northeast quarter of Section 36, Township 1 South, Range 57 West, is the Forest Oil Company Hough lease, in which there is one well classified as a gas well.

In the southwest quarter of Section 31, the south half, more particularly, of Township 1 South, Range 56 West, is the Denver Basin Oil Company's lease, the Hogsett lease, on which their well No. 4 is a gas well.

In Section 1 down in the south, very southwest portion of the field that you see here, is Col-Tex's Hough lease on which there is located one gas well.

Q Now, that's Section 1 of Township 2 South, Range 57 West, is that correct?

A Right; and immediately east of that lease in Section 6, Township 2 South, Range 56 West, is the Huntsinger-Walker Osborne lease, on which there is located one gas well. That, more particularly, is the northwest of the northwest of that section.

Now, summarizing, this map shows that there are fourteen wells which are considered oil wells, and seven which are considered as gas wells.

Q And all of the gas wells except the one on the Lion Flessner lease are in the southwest corner of the field, is that correct?

A That is correct; they exist in an area of the reservoir of approximately--productive area of the reservoir between 400 and 480 acres, something in that order.

Q Now, Mr. Rushing, do you have in front of you a copy of the exhibit--strike that, please.

At this time I would like to ask that Lion's Exhibit No. 1 be received in evidence.

COMM. BRETSCHNEIDER: Yes, sir.

(Lion Oil Company Exhibit No. 1 was received in evidence.)

Q Mr. Rushing, do you have in front of you a copy of the exhibit marked Exhibit 2?

A Yes, sir, I do.

Q Mr. Rushing, will you please state what that exhibit is and explain it to the Commission?

A Yes, sir; this exhibit is a structural contour map based on the top of the "J" sand. The map shows the gas-oil contact. The structural contours go from a high down in the southeast portion of the field at a subsea of

660, plus 660, to a structural low in the northern portion of the field at approximately 750 subsea.

Q Those figures are minus figures subsea, is that correct?

A No, sir, they are positive.

Q I see, subsea.

A Slightly above sea level. The oil zone in this reservoir which existed at original conditions is colored green on your exhibit and is labelled "oil zone."

This, as I say, is in the northern portion of the field and originally consisted of approximately 733 acres as the productive area. Now, the gas zone located more nearly in the south and south central portion of the field, is colored green and labelled "gas zone," and consisted initially of approximately 1568 acres of productive area.

Now, between the two you see colored in red an area which we call the oil and gas area, which consists largely of the oil and gas contact area. It is colored red here, and it initially, our figures indicate, consisted of approximately 340 acres.

Q What is the total acreage within the productive limits, the sum of those figures that you have just given?

A Within the productive limits, one moment, please, sir. The total productive limit area of the pool is approximately 1962 acres.

Q Before we go on any further, Mr. Rushing, I would like to refer back again to Exhibit 1. I think in giving your testimony about this exhibit you referred to all of the leases on which there were producing oil and gas wells?

A Yes, sir.

Q And did not cover the area in the southeast quarter of Section 30 and in the east half of Section 31. That land is under lease to Lion, is that correct?

A Yes, sir, it is.

Q All right; now, is there anything further you would like to say about this Exhibit No. 2, the structural contour map showing the different areas?

A Yes, sir, this exhibit points out, or rather point up the producing mechanism which exists in this reservoir, and that is that it is predominantly a gas expansion reservoir, the gas energy coming from dissolved gas in the oil zone and free gas in the gas cap. There has been some evidence of water expansion into the oil zone of the reservoir.

Q Where this mechanism exists, Mr. Rushing, in your

opinion does it lend itself to maximum efficient operation under unrestricted competetive conditions?

A No, sir, it very definitely does not.

Q Will you explain that?

A In this reservoir, as I pointed out, you have very low relief. There is approximately forty to fifty feet per mile of dip. With such low relief the expanding gas cap presents a serious problem because excessive rates in the vicinity of the gas zone or in any particular well can cause gas overruning the top of the oil zone. It is a reservoir which you naturally must consider as being rate sensitive. Withdrawals in one zone can and, of course, do affect the performance of the other zone. One cannot be operated independently of the other.

It is the type of reservoir in which you must consider both zones in the operation of the reservoir in order to achieve the maximum ultimate recovery, and at the same time offer some reasonable protection of correlative rights.

Q Mr. Rushing, from your study of this field can you tell the Commission the amount of original oil and gas in place?

A Yes, sir; at original conditions the oil zone

contained an estimated 6,070,000 barrels of original oil in place. The gas content for free gas or gas cap gas, our calculations have indicated that there was approximately 15,979,000 MCF of free gas.

In the oil zone in the form of dissolved or solution gas there was originally an estimated 4,850,000 MCF of gas, macking the total gas content of the reservoir 20,892,000 MCF.

MR. WESTFELDT: If the Commission please, at this time I would like to ask that Lion's Exhibit No. 2 be received in evidence.

COMM. BRETSCHNEIDER: Yes, sir, it will be received.

(Lion Oil Company Exhibit No. 2 was received in evidence.)

Q Mr. Rushing, do your studies of this reservoir indicate total production to date from this field?

A Yes, sir, they do.

Q Would you give us those total production figures?

A As of July 1, 1957 there had been produced from the reservoir a total oil production of 1,625,043 barrels. From the reservoir there had been produced a

total of approximately 3,940,000 MCF of gas.

Q Mr. Rushing, do you have in front of you a copy of the exhibit marked Lion's Exhibit No. 3?

A Yes, sir, I do.

Q Will you please tell us what that exhibit is and explain what it shows?

A Exhibit 3 is an oil production and reservoir pressure performance graph of the history of this reservoir; across the base of the graph you will see time marked off in years by months, beginning in 1953 going through July of 1957.

On the left-hand margin of the graph you will see two scales; the scale on the left is labelled "monthly oil production," with production by months ranging from 10,000 barrels of oil to a maximum of 80,000.

The next scale is labelled "bottom hole pressure," pounds per square inch guage, ranging from 200 to 1400. Now, let's look at the oil production graph---

Q Excuse us a minute, Mr. Rushing.

Mr. Bretschneider, would you want to proceed with the testimony while Judge Downing is out of the room?

COMM. BRETSCHNEIDER: Yes.

MR. WESTFELDT: We still have a quorum of the

Commission present?

COMM. BRETSCHNEIDER: Yes.

Q Will you go ahead, Mr. Rushing, and continue with your testimony with respect to this exhibit?

A The lowermost curve you see on this exhibit is labelled "barrels of oil per month," and is a bar graph showing the monthly oil production by months.

Q From the entire reservoir?

A From the entire reservoir. Now, for example, let's take looking down at the lower portion of the graph, let's take January of 1954, which is the first month in that year which you see marked off there in twelve equal divisions.

Now, going up the graph you will find a bar going across that month over on the left-hand scale, a monthly production of 73,000 barrels. Now, let's take another example down here; for example, in January of '57 you go up the graph until you come to the bar which crosses the month at just slightly in excess of 18,000 barrels during that month.

Now, this graph shows essentially that as the field was discovered the producing oil rate gradually increased until such time as it reached a maximum in the

order of 75,000 barrels, and it has since declined in productivity because of pressure decline and proration until such time as it is producing in the order of 20,000 to 22,000 barrels per month.

Q And that's the current rate of production from the field?

A That's correct.

Q And will you explain the balance of this exhibit, the bottom hole pressure curve?

A That is on the upper portion of the graph you will see a curve which is labelled BHP or bottom hole pressure. On the left-hand portion of the curve you will see that at discovery in May of 1953 the original bottom hole pressure was estimated to be in the order of 1358 pounds per square inch guage.

Now, since the discovery of the field the bottom hole pressure has been determined at the direction of this Commission and by the operators at periodic intervals. These surveys are showing individually; beginning March 1, 1954 we had a reservoir pressure survey which indicated that the average bottom hole pressure in the reservoir was 1318 pounds.

Subsequently in June of 1955 the pressure was

again determined, at which time it was estimated to be 1166 pounds. In August of last year pressure was again determined by shut-in field survey, and the pressure at that time was 1041 pounds.

Q That's August 2, 1956, is that correct?

A That's correct. Now, just last month, the 28th of August 1957 the bottom hole pressure was again determined and it was found to be 930 pounds per square inch guage. So in producing 1,625,000 barrels of oil and 3,940,000 MCF of gas the pressure has declined from an initial of 1358 pounds to its present level in the order of 930 pounds.

MR. WESTFELDT: At this time I would like to ask that the Commission receive in evidence Lion's Exhibit 3.

COMM. BRETSCHNEIDER: Yes, sir, it shall be received.

(Lion Oil Company Exhibit No.3was received in evidence.)

Q Do you have in front of you, Mr. Rushing, a copy of the exhibit marked Lion's Exhibit No. 4?

A Yes, sir, I do.

Q Would you please tell us what that exhibit is and what it shows?

A Exhibit No. 4 is a graphical presentation of the gas-oil ratio on performance which has been associated with the production of the oil and gas volumes that I have mentioned previously. Across the base of this curve you will again see time set out in years by months. On the left-hand margin of the curve you will see gas-oil ratio in cubic feet per barrel.

Beginning in May of 1953 naturally upon discovery the gas-oil ratio was at or near the solution gas content of the oil zone, which was in the order of 800 cubic feet per barrel.

Now, let's take the uppermost curve and follow it across the graph. This is entitled the "field gas-oil ratio," and is determined by dividing the field gas production monthly by the field oil production monthly. You will notice that this curve began to move upward in the fall of 1954, at which time some gas wells began to produce a small volume of gas.

Now, in July of 1955 you will see a vertical line extending, and I believe that line is labelled on your graph as "field rules granted," 300,000 cubic feet per day per gas well. At that time you will notice that as the gas---

Q Excuse me, Mr. Rushing. At this point I think it would be proper for the Commission to take notice of the fact that the file in this cause shows an order entered, I believe, effective August 1, 1955 that permitted the 300,000 cubic feet of gas per day from the gas wells.

A As this gas production was permitted you will notice that the field gas-oil ratio began to immediately climb. Now, let's move down to the lower curve and you will find there portrayed the gas-oil ratio performance of those wells which are considered oil wells in the oil zone of the reservoir.

You will notice that they have increased from again at initial conditions in the order of 1,000 cubic feet per barrel until at the present time the producing gas-oil ratio is in the order of 2,300 to 2,500 cubic feet per barrel from the oil zone.

Now, here in this type of reservoir or in any gas expansion reservoir, gas-oil ratio is a measure of efficiency with which you produce a stock tank barrel of oil. Now, this exhibit shows that by virtue of the spread between these two curves the oil production has occurred from the oil zone at a relatively low ratio; but, by virtue of having gas well production associated with oil

well production we have produced quantities of gas which made the field gas-oil ratio appear as it is on here.

Now, the spread here in my opinion is a measure of the loss of energy, if you will permit that term, which has been brought about by gas well production which has not permitted oil production.

Q And that's gas well production under the existing rules of the Commission, is that correct?

A That is correct.

COMM. BRETSCHNEIDER: You want to make a point of that, don't you?

MR. WESTFELDT: I just like to have the record be as clear as possible, Mr. Bretschneider.

At this time I would like the Commission to admit in evidence Lion's Exhibit No. 4.

COMM. BRETSCHNEIDER: It is admitted.

(Lion Oil Company Exhibit No. 4 was received in evidence.)

Q Mr. Rushing, do you have in front of you the exhibit marked Exhibit 5?

A Yes, sir.

Q And will you please state what that exhibit shows?

A Exhibit 5 is a tabular presentation of the

performance of the reservoir that you have seen exhibited on these two graphs which we have just discussed.

The exhibit is entitled, "The Little Beaver "J" Sand Production Statistics," and reading the columns across from left to right you will see that we have time set out again, years by months.

The next title is entitled, "Producing Wells." Now, that's the field total producing wells which were produced during any one month.

The oil production rate is the next column and it is the monthly production from the pool. The cumulative oil production is the next column. The field gas production follows that, and finally the cumulative field gas production.

Now, you will notice that on this exhibit there are no figures for the years 1953 and a portion of 1954 down to October 1. During that time gas production was not recorded nor reported in such a manner that we could make an accurate presentation by months, so it became necessary from an engineering standpoint to establish the amount of production that had occurred in order to have a point of beginning, so using pressure performance and the volumes of the reservoir, the oil and gas zones, and engineering

calculations, we determined that in order for the pressure to exist which existed at that time there had to have been produced from the pool an estimated 1,540,000 MCF of gas. Now, that in our opinion is the best estimate that we could make of the gas production at that time.

Now, going to the next page you will see as of July 1 that the field has produced a total of 1,625,000 barrels of oil, and over on the right our estimated cumulative field gas production is 3,940,960 MCF.

MR. WESTFELDT: If the Commission please, I would like to ask that Lion's Exhibit No. 5 now be admitted into evidence.

COMM. BRETSCHNEIDER: Yes, that is satisfactory.

(Lion Oil Company Exhibit No. 5 was received in evidence.)

Q Mr. Rushing, do you have a copy of Lion's Exhibit No. 6?

A Yes, sir.

Q Will you please state what that is and explain it to the Commission?

A Exhibit No. 6 is entitled, "The Little Beaver "J" Sand Oil Lease Recovery Status," as of July 1, 1957. Beginning over at the left you will see columns going from

left to right.

Column No. 1 indicates the operator in the lease, No. 2 the number of wells, No. 3 the acre feet of net productive oil sand which is beneath that lease, No. 4 the original oil in place in barrels per acre foot.

The next column is the original oil in place beneath that lease. The column after that is the oil produced to July 1, 1957. The next column is the percent of the original oil in place under oil leases.

Now, that's under those leases which have producing oil wells only.

Q Perhaps you can refer back to Exhibit No. 1 and point out the three leases that you are talking about.

A Yes, sir, I will. The Lion-Flessner lease is the first lease that you see portrayed here, and it's in the south half of Section 19 and in the northeast quarter of Section 30, Township 1 South, Range 56 West.

The next lease there is the Col-Tex-Hogsett lease which is in the southwest quarter of Section 30, Township 1 South, Range 56 West; and the third lease is the Tomberlin-Hogsett lease, which is located in the northwest quarter of Section 30, Township 1 South, Range 56 West.

Now, back to the columns again; the third column

from the right is labeled, "Percent Recovery of Lease Original Oil in Place." The numbers set out there indicates as of July 1, 1957 the percent recovered of the oil in place initially under that lease.

The next column is the percent of the cumulative oil produced by each of these leases, and the next column is the percent of the fourth quarter allowable.

Q With respect to the column, the second one from the right, percent of cumulative oil production, when you are talking about cumulative oil production is that from the field or the oil in place under these three leases?

A Sir, that is the cumulative oil production from these three leases.

Q From the original oil in place under these three leases?

A The original oil in place, yes, sir.

Q All right.

A Now, let's take the Lion-Flessner lease. You will see that it has eight wells. It has 2893 acre feet of oil sand, net productive oil sand beneath the lease. The original oil in place is estimated to be approximately 2,690,000 barrels.

The lease has produced to date 727,000 barrels,

which is forty-eight percent of the original oil in place under that lease. The recovery--I beg your pardon; that column labeled "Percent of Original Oil in Place under Oil Leases," that is forty-eight percent.

Q That is the figure?

A There is forty-eight percent under that lease of the total oil in place beneath the three leases.

Q Is that figure reached by a fraction of which the numerator is 2,690,000 with a demoninator of 5,620,000, is that correct?

A That is correct.

Q And so that the oil in place under the Lion-Flessner lease with respect to the oil in place under these three oil leases was forty-eight percent?

A That's correct.

Q All right; will you proceed?

A Now, the percent recovery of the lease original oil in place is twenty-seven percent as of July 1, 1957. Now, that figure is obtained by dividing 727,000 barrels by 2,690,000 barrels.

Q And what that means is that Lion has recovered twenty-seven percent of the original oil in place under its lease, is that correct?

A That is correct. Now, the next column shows that of the cumulative oil production from these three leases Lion has produced approximately forty-five percent, and finally Lion's percent of the fourth quarter allowable is 46.3 percent.

Q Is the fourth quarter allowable the allowable estimated in the fourth quarter of this year under the existing rules?

A That is correct, using the most recent test obtained in the third quarter.

Now, let's take the Col-Tex-Hogsett lease, which I point out again is located in the southwest quarter of Section 30, Township 1 South, Range 56 West. That lease has three wells on it which are oil wells. Beneath that lease are 1511 net acre feet of oil sand.

The lease contained originally 1,405,000 barrels of original oil in place. It has produced only 216,500 barrels. It has twenty-five percent of the original oil in place under oil leases.

It has recovered only 15.3 percent of the lease original oil in place, and thus far it has produced only 13.4 percent of the cumulative oil production from the oil producing leases, and under the existing rules in the

fourth quarter it would receive only 9.3 percent of the fourth quarter allowable.

Now, finally the Tomberlin-Hogsett lease, which is located in the northwest quarter of Section 30, Township 1 South, Range 56 West, has three wells on it which are classified as oil wells.

The lease there are 1642 acre feet of oil sand, and it contained originally 1,525,000 barrels of original oil. It has produced to date 668,000 barrels, and that is twenty-seven percent of the original oil in place--I beg your pardon.

Q How was that?

A I beg your pardon, I am crossed up again. Of the total oil in place beneath the three producing oil leases, 1,525,000 beneath the Tomberlin lease is twenty-seven percent.

Now, to date the lease has recovered of the lease original oil in place 43.8 percent. Of the cumulative production from the three oil producing leases it has recovered 41.4 percent.

Now, under the existing rules it will receive during the fourth quarter an allowable which is 44.4 percent of the allowable granted to the three oil producing

leases.

Q This is notwithstanding the fact that that lease only had twenty-seven percent of the original oil in place under these three leases, is that correct?

A That's correct.

Q Now, what conclusions do you draw, Mr. Rushing, from the information shown on this exhibit?

A Sir, the conclusion to be drawn from this exhibit is that the field rules now in effect permit some of the operators to obtain a disproportionate share of the oil production from the oil leases.

You can see by this graph that Tomberlin-Hogsett lease with only twenty-seven percent of the oil in place beneath the three oil producing leases is allowed to produce forty to fifty percent of the pools daily oil production, and history indicates that this has been the case since the fourth quarter of 1955.

To date this table shows that this lease has recovered 41.4 percent of the cumulative oil production which has been produced from those leases.

Q In view of this situation, Mr. Rushing, in your opinion do the present field rules of the Commission adequately protect the correlative rights of the owners of

these three leases?

A No, sir, it does not. I do not believe that it offers adequate protection of correlative rights for both the owners of mineral and working interests.

Q Is there anything further that you would like to say about this exhibit, Mr. Rushing?

A No, sir.

MR. WESTFELDT: I would like to ask that this exhibit also be admitted in evidence.

COMM. BRETSCHNEIDER: All right.

MR. WESTFELDT: It's Exhibit No. 6.

COMM. BRETSCHNEIDER: It is admitted.

(Lion Oil Company Exhibit No. 6 was received in Evidence.)

Q (By Mr. Westfeldt) Now, it is correct, isn't it, Mr. Rushing, that Lion has made many studies of this reservoir?

A Yes, sir, we have made numerous studies.

Q And you are continuing to make studies and observe it?

A Yes, sir; you must of necessity continually observe and study this type of a reservoir.

Q Now, based on these studies do you have an

estimate as to what the ultimate recovery from this reservoir will be under existing field rules?

A Yes, sir.

Q Will you please give that information to the Commission?

A Our engineering studies have indicated that if the present rules continue in force and effect that the operators will recover from the reservoir approximately thirty-five percent of the original oil in place, or an ultimate from beginning of about 2.1 million barrels of oil.

Now, that's 2.1 million out of a total of 6,075,000 original barrels in place.

Q If these present rules remain in effect in your opinion will correlative rights of the different lease owners be protected?

A No, sir; I believe that disproportionate rates of production could continue and actually get worse. If you will again refer to the exhibit, I believe it is No. 6, which is the oil lease recovery status, looking at Col-Tex-Hogsett lease, you will see that while they have twenty-five percent of the original oil in place beneath their lease, they have been allowed to produce only 15.3 percent

of the lease original oil in place.

They have obtained thus far only 13.4 percent of the cumulative oil production from the three leases, and these rules grant them only 9.3 percent of the fourth quarter allowable.

Q Referring back, Mr. Rushing, to Lion's Exhibit No. 2 which showed the gas-oil contact under the present rules, is it likely that the gas-oil contact as shown on the Col-Tex lease will move in a northerly direction under the present rules?

A Yes, sir; it very likely will continue to move in a northerly direction displacing oil in advance of its movement.

Q Which will in effect make the Col-Tex oil recovery even smaller, is that right?

A That's correct; it will render that oil which is swept in advance of the encroaching gas irrecoverable to the Col-Tex lease.

Q In view of this situation, Mr. Rushing, is it your opinion that waste will result under the existing field rules?

A Very definitely, yes, sir. The production of gas energy which is permitted under these rules will be

30.12

dissipated before it can do the necessary work of producing oil.

When you produce gas without producing oil in association with it, then you have wasted energy. The present rules permit at this time the withdrawl from the pool of about 16.5 barrels of reservoir space per barrel of stock tank oil. That is, in my opinion, a considerable waste of energy. I would like to point out that if we fail to make use of the recovery potential of the gas energy which is in this reservoir we are very definitely causing waste, because this recovery potential, once it is wasted cannot be regained outside of pressure maintenance.

Q In effect you have a pressure maintenance system now, don't you?

A Yes, sir, built in within this pool, we will say, this huge gas cap which in effect constitutes a large source of pressure maintenance material.

Now, it is impossible to achieve such energy without--if it is wasted it is impossible to regain it without expensive pressure maintenance expense by instituting pressure maintenance facilities.

Q Now, Mr. Rushing, does Lion have any gas wells

in the field?

A Yes, sir; we have one gas well located in the northwest northwest of the northeast of Section 30, Township 1 South. That well is labeled on your exhibit Flessner No. 11.

We actually have two high gas-oil ratio wells which have been checked-in except for intermitent testing occasionally to maintain efficient operation of the reservoir and preserve the reservoir in its highest state of efficiency upon being unitized.

In so doing Lion has suffered a loss of income and has actually sacrificed a portion of its competitive position. Now, we feel that the maximum efficiency, the most benefit for all, can be obtained through unitization, and if unitization is not accomplished then our efforts to maintain reservoir efficiency by keeping these wells shut-in will have been in vain, our losses will have been rendered irrecoverable, and therefore waste will have occurred.

Q And south of these high gas-oil ratios of Lion that you have mentioned there is more Lion acreage in the gas area, is that correct?

A That is correct.

Q And that acreage does not have producing gas wells located upon it, is that right?

A That is correct; as I said before, we have chosen to let the gas act to dissipate the oil.

Q And Lion and the other oil operators have gotten whatever benefit results from this pressure maintenance, is that correct?

A That is correct.

Q But not of developing the gas area? Based on your studies, Mr. Rushing, can you tell the Commission what benefits would be obtained from unitized operations?

A Yes, sir; our calculations indicate that with unitized operation we can expect to bring about an estimated ultimate recovery of fifty-two percent of the original oil in place, or an ultimate recovery of 3,160,000 barrels of stock tank oil.

Now, this is an increase of 1,050,000 barrels over and above that offered by continued operation under the existing rules.

Q That fifty-two percent figure that you mentioned is compared with your estimate of thirty-five percent under existing field rules, is that right?

A That's correct. Now, further unitization we feel

will allow the fullest measure of protection for correlative rights, and by virtue of selective production and unitized control of the reservoir it will reduce waste to a minimum.

Now, if you will remember I mentioned while ago that the current rules permit a withdrawl of sixteen barrels of reservoir space per barrel of stock tank oil.

Now, with unitization making efficient use of the energy that is available we can produce a stock tank barrel of oil and its associated gas and create in the reservoir only eight barrels of equivalent space.

Q Would you explain what you mean by "reservoir space"?

A Yes, sir; in the production of a stock tank barrel of oil in a gas expansion reservoir you have gas which is associated with that production. Now, that gas, as I said before, is in two forms: dissolved and free gas.

Now, the number that I have shown here, either eight or sixteen, is the barrels of space occupied in the reservoir by one stock tank barrel of oil and its associated gas production.

Q But that will be reduced substantially if unitized?

A From an estimated sixteen under the current rules to eight under unitization. This represents, of course, the maximum efficiency that we think we could obtain.

Q Mr. Rushing, Mr. Freeman has asked me to inquire of you if you can give us any estimate at this time based on your information as to what quantity of oil has already been lost. Do you have any estimate of that? Have you made any calculations on it?

A No, sir, I haven't made any calculations which indicate that which has already been lost.

Q But, you can say to the extent that gas has been produced from the gas cap that reservoir energy has been dissipated, is that right?

A Very definitely. I wouldn't hesitate to say that had we been able to unitize the reservoir close to initiate conditions that we would have a number which would be significantly better than fifty-two percent as forecast for the entire operation.

Q Would you go ahead, Mr. Rushing, and tell us any further advantages that you think would result from unitization?

A Yes, sir. Another advantage of unitization that

we think will come about, we believe it very strongly, is that with a unitized operation we will be able to permit--be able to produce daily about 1,050 barrels of oil as compared to between 650 and 700 at the present time.

This 1,050 is from the entire oil pool and it will be brought about by producing only the oil wells and allowing the gas cap gas to expand through the oil zone displacing oil along with it.

Further, we feel that unitized operation is the only method by which we might be able to apply a more efficient recovery process. As most of you probably know or are aware of at the time, that the industry is giving very active consideration, research and actual field testing of several new processes which could yield recoveries that would approach ninety percent of the original oil in place. I am speaking with reference to those drives which are called missile drives or solvent drives.

Now, in this reservoir we have a condition which we think will lend itself to that typeof an operation. The reservoir has a huge gas cap, which, of course, could furnish a gas supply to carry forth the solvent into the oil zone, and at the same time it is an energy level which will

act to displace that production from the reservoir.

Now, those things are under active consideration. There are several large-scale field tests under way right now, and here again we feel that in order to do this we must maintain the reservoir at a state of efficiency and in such a condition that these processes could possibly be most efficiently applied.

Q That is, prior to unitization you want the field rules to permit the most efficient recovery, is that correct?

A That is correct.

Q Well, in the absence of unitization and prior to unitization will you tell the Commission what you propose?

A Yes, sir. In the absence of unitization we feel that the reservoir must be operated at its maximum efficiency to yield a recovery which we feel is closest to that offered by unitization, or else waste and inadequate protection of correlative rights, we feel, will occur.

Further, if the reservoir is to be unitized at some later date than the rules in which we operate the reservoir between now and then, we must preserve the reservoir and not bring about damage and must preserve the reservoir in a high state of efficiency such as that the

possibility of damage or waste to the reservoir is removed or minimized.

Q Do you mean you want to use the gas energy as efficiently as possible, is that correct?

A Yes, sir, from an engineering standpoint we would like to shut-in the gas wells.

Q But you are not proposing that here?

A No, sir; we realize that we can't do that. We have made some provision for the owners of gas wells.

Q Because of their lease ownerships and correlative rights?

A That's right, because of the fact that they have wells and lease ownership.

Q Well, specifically can you tell the Commission what you propose in the way of field rules?

A Yes, sir. Specifically we propose that a maximum efficient rate of production from the pool of 700 barrels per day---

Q Is that oil, 700 barrels per day?

A That's 700 barrels of oil per day--at this time be allocated among the owners of oil wells giving equal weight to the productive acre feet of oil sand beneath the lease, and the percent of wells on the lease which are

classified as oil wells.

Now, here we would leave the classification of the wells as it is under the existing rule.

Q And you have already described that?

A Yes, sir; that is, 30,000 cubic feet per barrel above which it would be a gas well, below which it would be an oil well, and we would maintain the existing oil well gas limit of 125,000 cubic feet per day per well.

MR. WESTFELDT: The Commission might take notice that that's what its present order provides, 125,000 cubic feet of gas, as per 125 barrels of oil.

Q And what do you propose with respect to the gas wells?

A We propose that the field gas wells be permitted to produce daily an amount of gas which is equivalent to the reservoir withdrawals created by the oil and gas production from those wells which are classified as oil wells.

Q Mr. Rushing, have you prepared some proposed field rules?

A Yes, sir.

Q Do you have in front of you the document marked Exhibit 7?

A Yes, sir.

Q Is that your proposed field rules?

A That is correct.

MR. WESTFELDT: If the Commission please, I don't think the proposed field rules are normally considered factual evidence as the other exhibits that we have identified; but, I would like the record to show that the document that is marked Exhibit 7 and which has been identified by Mr. Rushing are the field rules proposed by Lion, and I would like at this time to ask Mr. Rushing to go down these field rules one by one and summarize them and explain them to the Commission.

A Our Rule No. 1 is entitled, "Well Classification," and this sets out the classifying gas-oil ratio that we have discussed previously of 30,000 standard cubic feet per barrel of oil.

Rule No. 2 here is the permitted daily gas volume for oil wells, and it says essentially that each well that is classified as an oil well in accordance with Rule No. 1 shall be permitted to produce daily a volume of gas not to exceed 125,000 standard cubic feet.

Q And that's regardless of the volume of oil produced, is that correct?

A That is correct.

Q That's a gas limit?

A Yes.

Q And Rule 1 and Rule 2 are already embodied in the existing rules, is that right?

A That is correct.

Q All right; will you go on to Rule 3?

A Now, in our Rule 3 we make provisions for the Commission at its own request or on request of the operators to conduct a hearing in order to hear evidence concerning and to determine the maximum efficient daily oil and gas production rates.

The rule also provides that the operators will furnish to the Commission such data and information that they might need to determine those rates.

Now, our Rule 4 on page 2 sets out that the maximum efficient rate of oil production from the "J" sand pool of the Little Beaver field shall not exceed during any one month a daily average of 700 stock tank barrels, unless and until otherwise ordered by the Commission.

Q And that's for the entire reservoir?

A That is from the entire reservoir. Now, Rule 5 sets out the fact that the Commission shall determine the

maximum permissible gas production from gas wells by permitting those wells classified as gas wells to produce daily an amount of gas equivalent to the reservoir withdrawals created by those wells classified as oil wells.

Now, in our Rule 6 we set out the allocation formula. Now, the rule says that the maximum efficient daily oil rate for the "J" sand pool of the Little Beaver field shall be allocated on a lease basis as to producing leases with wells thereon classified as oil wells by application of the formula hereinafter set forth.

Q At this point, Mr. Rushing, you are referring here to an allocation of that 700 barrels of oil MER among the three oil producing leases, is that correct?

A That is correct.

Q And you are not recommending an allocation on a per well basis?

A No, sir.

Q All right; will you go ahead with your formula and explain the allocation?

A Now, the daily rate which is to be allocated to the lease is determined by multiplying the field maximum efficient rate of oil production by a factor which is

determined by multiplying fifty percent times the fraction that lease has of the pool--of the productive acre feet found beneath the oil producing leases, plus fifty percent of the factor obtained by dividing the lease oil wells by the total of the pool oil wells.

Q So that those fractions within the brackets on your proposed field rules in the first instance show the net productive acre feet of oil sand beneath a lease that has oil wells on it over the net productive feet of oil sand beneath all of the oil leases?

A That's correct.

Q And the second fraction is the number of wells on the lease, number of oil wells on the lease, over the total number of oil wells in the pool?

A That's right, sir.

Q That gives equal weight to acre feet of oil sand and wells, is that correct?

A Right. Now, each of those factors is defined there. Now, further in the rule we say that no lease shall be permitted to produce daily in excess of the amount allocated by use of the above formula, and at the same time we say that in no case shall an oil well be permitted to produce daily an amount of gas in excess of 125 MCF per well.

Although the formula allocates as to leases there is still an item in the rules for well control, and the rule considers well efficiency by virtue of limiting the gas from an oil well to 125 MCF.

Q Now, will you proceed with your discussion of the gas allowable?

A In determining the allowable to be produced from those wells classified as gas wells, the pool gas well gas allowable is to be determined by a formula which considers the oil and its solution gas plus the free gas produced in association with that oil, the sum of which are converted to equivalent barrels of reservoir space.

Then you take that, the barrels of reservoir space occupied by the fluids produced and convert that to equivalent MCF of gas.

Now, the factors that enter that are set out there, the formation fluid characteristics which are to apply, are available in the fluid analyses which have been presented.

Q I won't bother you with any more detail on that. If Mr. Jersin wants to ask you any questions about it, I will leave that up to him.

MR. JERSIN: You go right ahead.

THE WITNESS: Now, on the next page you will see that we have set out there the description of the leases which are classified as oil producing leases, or which have on them wells classified as oil producing wells, and the acre feet of net productive oil sand beneath each of those leases.

The Lion Flessner lease is set out there as 2893; Tomberlin-Hogsett has 1642, and the Col-Tex-Hogsett has 1511 for a total net acre feet of oil sand beneath the oil producing leases of 6,046.

Q Now, those are the figures that were shown on the Exhibit 6 which has already been admitted in evidence?

A That's correct.

Q Will you proceed?

A Now, in Rule 7 the allocation formula for distributing that pool gas rate is set out. Here you take the pool gas allowable, gas well gas allowable, and divide that simply by the number of wells in the pool which are classified as gas wells.

Q Well, will you explain Rules 8 and 9 now?

A Now, in Rule 8 we make provisions for the operators to furnish to the Commission the gas-oil ratio

on test on each producing well semi-annually, and we have set out here that the testing period shall be in the second and fourth quarters of each year beginning with the months of January and July. The details of this are similar to rules which are already existing as far as testing procedures.

Now, Rule 9, we make a provision for that which is necessary in the formula concerning reservoir pressure. Now, I mentioned that you have to use fluid characteristics which are a function of reservoir pressure. Here we have set out that reservoir pressure shall be obtained semi-annually during the first fifteen days of January and July of each year. We make provisions for selecting key wells to be selected by the operators and approved by the Commission. And that, sir, are the essentials.

Q Mr. Rushing, I note that on the last page of this Exhibit 7 it is suggested that the rules become effective October 1, 1957; is that your proposal also?

A Yes, sir.

Q Mr. Rushing, after going through these rules I would like you to state to the Commission what in your opinion are the advantages that these rules offer over the existing rules?

A Well, advantage number one, they provide for the protection, we think, of correlative rights by virtue of allocating the production of oil more nearly in proportion to the ownership of the oil zone.

Advantage number two would be that they minimize waste by making more efficient use of the expanding and the gas cap gas.

Under this proposed rule we would produce--if you remember I mentioned that under the current rules at the present time we produce sixteen barrels of reservoir space per barrel of stock tank oil. Under unitization we could obtain production with approximately eight barrels of space created.

Under these rules we can obtain a barrel of production with only twelve barrels of reservoir space created. Now, by making the oil and gas zone withdrawals equal the possibilities of the oil zone expanding into the gas cap are minimized, and this condition could be conducive to extreme waste, both surface and underground, and further---

Q It gives the gas well owners also production of equivalent reservoir space?

A Yes, sir.

Q To the oil zone producers?

A Yes, sir. Now, the rules allow for the production ultimately of approximately forty-two percent of the original oil in place.

Q And that is compared with thirty-five percent under existing field rules?

A That's correct, or an ultimate recovery of 2,550,000 barrels. Under these proposed rules then there would remain for the operators to recover 925,000 barrels of oil.

Q Mr. Rushing, will you state to the Commission the reason that you have chosen 700 barrels of oil a day as a pool MER?

A Yes, sir; the rate of 700 barrels of oil per day was chosen as the pool MER for several reasons: number one is that within the body of the oil zone itself we are currently producing approximately 700 barrels with no apparent extensive damage to the body of the oil zone itself.

Now, the second reason was that it is at the rate at which under competitive conditions we can favorably market the oil production, and third it is the rate at which the gas plant will be efficiently loaded.

The 700 is also the rate at which we feel is a

maximum at which the reservoir could be operated outside of unitization, which would minimize waste, protect correlative rights, and achieve, we think, the closest possible ultimate recovery to that obtainable by unitization.

At the same time we feel that operation of the reservoir beginning with an MER at this time of 700 will tend to preserve the reservoir and the possibilities for achieving the maximum ultimate recovery.

Any MER, we think, in excess of 700 barrels would not accomplish the protection of correlative rights, nor would it permit the prevention of waste, because it would allocate some of the owners again a disproportionate share of the pool oil production.

Q And that 700 MER that you propose is also subject to the provisions providing a gas limit on oil wells, is that right?

A That's correct.

Q Mr. Rushing, have you made a calculation of what you believe the allocated production would be initially under these rules?

A Yes, sir.

Q Would you tell the Commission what those are?

A The application of the proposed allocation formula would yield for the--if you applied them at the present time--they would yield for the fourth quarter for the Lion Oil Company Flessner lease 302 barrels of oil per day.

Q And how many oil wells are there on that lease?

A There are eight oil wells, sir.

Q And you have already testified as to the net acre feet of oil sand?

A Yes, sir; there are 2893 acre feet of oil sand beneath that lease. Now, the allocation factor on the Lion Flessner lease will be applied, but the individual well gas limit when applied would reduce the amount allocated to 302 barrels, because we have some wells which must have the gas limit applied to them.

Now, looking at Col-Tex-Hogsett with 1511 oil zone acre feet, three producing wells, they would be allocated 23.2 percent of the pool MER, but like the Lion Flessner lease the gas limit would be applied and they could only produce sixty-one barrels of oil per day with their gas limit of 375 MCF per day for the lease.

Tomberlin's Hogsett lease with 1642 acre feet would be allocated 24.3 percent of the pool MER, and

because of the fact that the gas limit would not apply he could produce the full allocation of 170 barrels with an associated gas production in the order of 155 MCF.

Q There is one other thing I would like to ask you about, Mr. Rushing: have you made any calculation of the developed net acre feet of gas sand under the gas wells?

A Yes, sir; if you will give me a moment I will get that data (looking through documents). I don't have it in exhibit form, but I have a calculation here in front of me.

The gas leases which consist in the southwest portion of the field of the Col-Tex-Hough lease, the Huntsinger-Walker-Osborne lease, the Denver Basin-Hogsett lease, Forest-Hough lease, and Triangle J-Hartmann lease, comprise a total of 7040 gas zone acre feet, which is approximately one-third of the pool gas zone acre feet.

Q What is the ratio of the gas zone acre feet to the oil zone acre feet?

A The ratio of the developed gas zone acre feet attributable to gas wells to the oil zone acre feet is the ratio of 7040 to 6046, which is 1.1.

Q Is there anything further that you would like to add to your testimony, Mr. Rushing?

A Not at this time, sir.

MR. WESTFELDT: I have no further questions of this witness.

COMM. BRETSCHNEIDER: Art, do you have any questions?

BY MR. JERSIN:

Q Mr. Rushing, on your Exhibit No. 1---

A That is the field plat?

Q ---yes, with your definition of the field limits?

A Yes.

Q Will you discuss the line of productive limits that you drew on that exhibit as to the limiting permeability or water encounter, or what it might have been?

A Sir, I am going to say "geology" which has been prepared here and the field productive limits were determined by a group of geologists and engineers, and there have been studies made by each company's geologist, of course, so as to the minute details of determining that outline, I couldn't give you too much data except that in the northwest portion of the field there is a water-oil contact which exists, and if you will wait just a minute I will give you the approximate level of that.

The water-oil contact, the data I have here

indicates it was found at 753 feet above sea level.

Q This group of engineers or geologists that you mention, were all of the operators in the Little Beaver field represented by some type of technical man?

A I believe they were, sir. It was a joint geological and engineering committee which met on several occasions to prepare data for engineering studies of the reservoir.

Q In other words, his study was done in the first go round on unitization back in 1956 that was discussed by Mr. Maxwell in the other portion of this hearing?

A Sir, I can't testify as to the exact date of origin of the field limits which exist here.

MR. JERSIN: Well, is that correct, this field limit line was established in 1956?

MR. MAXWELL: Is that correct? Mr. Gish was in on that.

MR. GISH: Art, if I may be permitted to make a statement: in the various meetings it is a fair statement that all working interest owners and all operators were represented with the possible exception of the Huntsinger forty acre lease.

COMM. BRETSCHNEIDER: So then generally you say

this line was acceptable, the outline was acceptable?

MR. GISH: I would correct it in one little place, but it is minor.

MR. MUNN: Sir, may I ask if Mr. Tomberlin's Hogsett lease was represented at the time that the field limits were determined? I would like to explain that I have only been with Mr. Tomberlin since May, and I am not in the least way familiar with the details of engineering which has occurred in the attempt to unitize the field; but, it is obvious that on the map that is presented at this hearing that there may be some question as to control of a gas cap.

I, therefore, would like to know for sure that Mr. Tomberlin's group was represented at the time that these field boundaries were established, and if they accepted and approved the boundaries.

MR. WESTFELDT: Maybe Mr. Gish can answer that.

MR. GISH: I would say that they weren't represented in all meetings, but they had very comprehensive knowledge of what was going on, and at the meetings they were in they saw the maps and knew what was finally accepted.

MR. MUNN: Who was present, sir, from

Mr. Tomberlin's group?

MR. GISH: Mr. Mayfield was present considerably.

MR. MUNN: I say in Mr. Tomberlin's behalf, sir?

MR. GISH: I don't know just what you would call "his group" but the working interest in the Tomberlin lease, there were representatives off and on of the Ward's and of the Fraser's and of the Mayfield interest, and Mr. Tomberlin was present occasionally.

MR. MAXWELL: I can add a little bit to that, Wesley, if I may. I have the minutes of a meeting here, and here is a meeting on July 14, 1955 at which Mr. Tomberlin himself was present, and the minutes say that Bruce Roll, who was Lion's representative, I guess, at that meeting, reported that the geological committee's revision of the maps as far as the interpretation of the location of the isopach lines is concerned in the undeveloped area in question, mainly along the south half of Section 30, was a result of a compromise between Dr. Long's oil isopach map and the committee's first map, and that's the end of the quote in the minutes.

That's the only reference I find. These are the operator committee meeting minutes made, but that was the map that all the work was based on, and it is my

impression that that is this map or these outlines are determined from the map.

BY MR. JERSIN:

Q On your Exhibit 2, Mr. Rushing, the colors that you have indicating the oil, the oil and gas, and the gas zones, that represents initial conditions in the reservoir?

A Yes, sir, that is our interpretation of the initial condition.

Q Do you have an interpretation of what these lines may be now as to your oil and gas contact lines?

A No, sir, I do not, because essentially that would have to be constructed from gas-oil ratio performance, and somewhere in there you would have to draw the line as to what is essentially gas and what is essentially oil. No, in answer to your question, I do not have a schematic.

Q You don't have an interpretation of what the movement of the gas cap might have been since the original?

A No, sir, not in the form of an exhibit.

Q Mr. Rushing, could you get your calculation in shape to submit a copy to the Commission?

A Yes.

MR. JERSIN: We will appreciate that.

MR. WESTFELDT: The calculations of what, Mr. Jersin?

MR. JERSIN: His calculations for the estimates he has given today, the acre feet, and so on.

THE WITNESS: We will attach to that a copy of the fluid analysis which is needed, too.

MR. JERSIN: All right, fine, thank you.

BY MR. WESTFELDT:

Q Mr. Rushing, in giving your calculations I believe that you gave some calculations on allocation of oil production?

A Yes, sir.

Q Did you give your calculations of what the gas well allowable would be initially under the formula proposed in your rules?

A No, sir, I didn't.

Q What do your calculations show?

A Application of the formula which is presented in the proposed rules at the present time yield for the pool gas wells a daily allowable, in summation, of 1,050,000 standard cubic feet per day.

Now, if you will recall the formula allocated that to the producing gas wells on the basis of wells. Now, if you will look at that map you will see one reason why we came to the conclusion of allocating on that basis.

Take, for instance, the Col-Tex-Hough lease, the Huntsinger-Walker-Osborne lease, and see that those wells have very little productive area, and my formula which considered productive acre feet would of necessity penalize those wells very severely; so we had to do something that was reasonable, and we feel that the allocation on the basis of wells here presents a reasonable allowable to those wells. Since they have drilled the well they received daily then 150 MCF per day per well.

MR. JERSIN: And that's the explanation of why you used fifty percent on wells for your formula on the oil also, I imagine?

THE WITNESS: Yes, sir.

MR. JERSIN: Mr. Bretschneider, I believe with the witness submitting his calculations we will be able to examine all of the assumptions made; I have no more questions.

BY COMM. HOUSTON:

Q Do you have the available information about the secondary recovery, or is it in effect now? Do you propose to use secondary recovery in it?

A No, sir; like we said, we have a gas zone here which has a tremendous energy source in it. It is within

its ability--under unitization it is within its ability in pressure maintenance unit, because that gas cap contained originally about fifteen or sixteen billion cubic feet of gas which can be used to expand through the oil zone and effectively sweep it.

Now, if you would term these more efficient processes that we would consider and that are being considered by the industry, if you would term those secondary recovery---

Q Do you propose to leave these gas wells capped in for maintenance pressure?

A Yes, sir, and take from the reservoir initially approximately 1,050 barrels of oil per day, and about three million cubic feet of gas.

Q What about the lease owners and royalty owners that are involved in these gas wells, what do they think of that?

A Sir, what I am talking about would be under unitization, and they would be a partner to unitization.

Q Of these gas wells?

A Yes, sir; the gas zone is considered in the unitization participation formula.

Q On your wells there that you have producing, you

are pumping them, I presume, or are they flowing?

A Sir, I can't testify to the exact number of pumping wells, but I believe that there are about four pumping wells.

Q That's the Lion's wells?

A No, sir, I believe Mr. Tomberlin now has a well pumping and we have three with units set on them. The balance of the wells then, or ten wells, would be flowing wells, of the oil zone wells.

Q Well then, why wouldn't instead of taking this acre feet, so many acre feet of sand, why couldn't you just take the percentage of the wells as they are now producing and allocate for the field? You say you recommend 700 barrels a day.

Why couldn't you just take the wells that are now producing and break them down on percentages and bring it to 700 barrels a day?

A Well, sir, we looked at numerous formulae. The ones that we finalized on here represents what we think will best prevent waste and protect correlative rights of the owners of oil and gas leases.

Q Is all this Hogsett and Tomberlin, all of them, are they agreeable to the unitization?

A Well, sir, I believe Mr. Maxwell testified earlier that---

Q That some of them were, but not all of them?

A I don't know what the people who were not present at those meetings--I don't know what their attitude is.

Q I understand--I might be wrong--that this Hogsett and Tomberlin wells are the largest in the field. Naturally I would presume that they would be represented as far as unitization is concerned.

COMM. BRETSCHNEIDER: We are not considering unitization at this meeting.

COMM. HOUSTON: I am right now.

MR. MUNN: Sir, I would like to state that we became acquainted with this proposal, at least I did, on September the 5th, and at that time we were shown a comparison between unitization, the proposed field rules, and the present means by which the field is being operated.

As stated before I am not too conversant with all of the facts and the engineering data that pertains to it, and I am very apologetic to this group that I am not.

The only thing that impressed me on this thing was that Mr. Tomberlin's wells or the Hogsett lease is capable

of producing roughly fifty percent of the oil which is being produced under the present field rules, and the gas-oil ratios apparently have not gotten out of hand, and apparently that is the reason by which these wells are allowed to produce fifty percent of the oil which is being produced from the field.

The proposal by Lion will cut the income from this lease by fifty percent, and on that basis we certainly think that it is unfair.

MR. WESTFELDT: If the Commission please, with respect to the statement that Mr. Munn has made, I would like to point out to the Commission that in attempting to establish an oil MER and in an attempt to establish a system where the gas energy can be used as efficiently as possible, absent unitization, we have also tried to consider the correlative rights of the parties, and I know that the Commission realizes the definition of correlative rights is in the Act, and in doing that we have worked out this formula that considers the net acre feet of pay under each leaf, which I think should be considered, and the number of wells that the operators have drilled and spent their money on, and these items are pointed out particularly in Exhibit 6 that has been submitted, which on its face shows

that the Tomber-Hogsett lease has twenty-seven percent of the original oil in place under the three oil leases.

Notwithstanding that percentage, its production to date has been in the nature of forty to forty-five percent of both cumulative and current production, so that I think that that lease has had substantial benefit when correlative rights are taken into consideration, and that the proposal indicated by Mr. Rushing will more nearly bring oil production into line with actual interests of oil and gas in place, and at the same time trying to achieve greatest ultimate recovery, most efficient use of the gas, and things of that nature.

MR. GISH: Exhibit 6 very vividly shows the abuse of correlative rights that existed on Col-Tex-Hogsett lease. The proposed field rules by Lion only in a meager way correct that abuse, because it would raise the daily allowable current of forty-six barrels a day to sixty-one barrels a day.

That sixty-one barrels a day is brought about as pointed out by the gas production limitation on the oil wells of 125,000 cubic feet per day. This may be superfluous, but Col-Tex wants to request that the minutes and proceedings in the June 16th hearing be made a record, a

part of this hearing, and specifically request--and we feel that the evidence submitted at that time substantiates it--that the gas limitation on each oil well be 250,000 cubic feet per well, and even though we have a gas well we are not too concerned as to how much reduced that gas well production is so as to preserve the natural reservoir energy so that we can partially correct and benefit by oil production on the Col-Tex-Hogsett lease, because we have suffered great abuse for a long time because of the existing gas production limitation.

CROSS EXAMINATION

BY MR. McELWAIN:

Q I would like to ask Mr. Rushing what is the total number of acre feet in each oil zone and gas zone?

A In the oil zone there are 6,604 net acre feet of productive oil sand. In that portion of the reservoir which is called the gas zone there are 20,561 acre feet.

Q Would that indicate then that the gas zone is approximately three times the size of the oil zone?

A You are correct, sir, 3.07.

Q Then you recommend rules that if they void the same amount of reservoir space in the oil zone as in the gas zone will there be gas migration under the oil zone?

A Well, sir, now let's discuss that a little bit. I pointed out while ago that under the developed gas leases there was---

Q I am talking about the whole gas zone, not just the developed---

A Well, sir, now I am getting to that. There are 7040 gas zone acre feet.

Q Just a minute; does that include any of Lion's acreage?

A No, sir, it does not. I am talking about a particular area of the reservoir, the southwest portion in which there are five leases with producting gas wells on them.

Now, that portion of the field in which there are wells, that is, producing gas wells, contains one-third of the pool gas zone acre feet.

Q Is there a producing well on any of Lion's acreage, producing gas well that would be affected by these rules?

A Yes, sir, there is the Lion Flessner No. 11.

Q Is that included in the acre foot total you gave a moment ago?

A No, sir, it is not, because we have chosen in the

past to take our gas production from our approximately fifty percent ownership of the gas zone acre feet through the oil zone.

MR. WESTFELDT: The Lion Flessner gas well is shut-in, is that correct?

THE WITNESS: That is correct, except for periodic testing as required it is shut-in.

Q Do the rules provide that that well will be shut-in?

A No, sir, we exercised the option in the interest of reservoir efficiency.

Q Through these rules that well will receive a gas allowable, is that right?

A Of 150 MCF per day per well.

Q Now, I---

A Wait a minute, I am not through here. I want to follow through. Now, in the southwest portion of the reservoir there are 7040 acre feet. Now, the ratio of that zone down there where those gas wells are to the oil zone is 1.1 to 1.

Q Is that the way you propose that the gas allowable will be divided?

A 1.1 to 1?

Q Well, to just these wells in the southwest corner that you are talking about.

A Sir, with a producing well you can produce it or keep it shut-in. Now, we have elected on our Flessner lease to keep our wells shut-in and let the gas go through the oil zone to produce oil.

Q That's true, Mr. Rushing, but you have testified that there were some 7000 acre feet of productive gas sand in which there were producing wells, correct?

A In the southwest portion of the reservoir.

Q I the southwest portion, and you have indicated that's a 1.1 to 1 ratio?

A Compared to the oil zone.

Q Right, but yet---

A That is comparing two areas where withdrawals are taking place, gas withdrawals and oil withdrawals.

Q But yet those wells in that southwest corner of the field will not receive all of the gas allowable, is that correct?

A Well, sir, they receive that which is allocated to them in accordance with the formula.

Q But, there will be some allocated to other leases also?

A To the Lion Flessner No. 11, yes, sir.

Q What is the total number of acre feet including the Lion's Flessner lease?

A Well, including the Lion Flessner lease and the east half portion of the reservoir the number is, like I told you initially, 20,561 acre feet. Are you proposing that gas be produced from the gas zone in the ratio of three to one as compared to the---

Q Yes, I am proposing that gas be produced from the total gas zone in the ratio of three to one, because that's the actual reservoir space that is occupied.

A Well now, let's consider this: let's say that we do take gas out in the proportion of three to one. That would deplete the gas cap and the recovery from the reservoir would essentially be obtained by solution gas drive, which is recognized as one of the lowest forms of recovery that can be obtained.

Q That may be true, Mr. Rushing, but an owner of a straight gas well down here receives no advantage from that, is that correct? You are using his energy to produce oil?

A Sir, we are not going to use all of his energy to produce oil. We merely are deferring some income until

the oil zone is depleted.

Q You mean that gas is going to stay here?

A No, I don't maintain that it will specifically stay in one place; what I am saying is that we think that that gas production should be utilized to produce oil.

Now, the only way that we can make the maximum use of that is under unitization. Short of that then we must make the next most efficient use of it.

Q Then under these proposed rules there will be gas sweeping the oil zone, is that correct?

A That's correct, and a large portion of that will come from the Lion fifty percent ownership of the acre feet of the gas zone.

Q I recognize that Lion has some undeveloped acreage in which they are entitled to a gas allowable, but in any event there will be migration of gas into the oil zone?

A That, sir, is the mechanism of gas expansion drive.

Q Do you think that protects correlative rights?

COMM. BRETSCHNEIDER: It would under a unit plan, wouldn't it?

MR. McELWAIN: It would under a unit plan, yes, but we are talking about a rule---

COMM. BRETSCHNEIDER: You have to have rules

between now and the unit, as I understand it, and if these rules are going to be rules I imagine they are as close to the unit rules with the unit plan as you can get at this time, so it seems to me we have to make a step someplace to get forward.

I am not objecting to all of this discussion, but if we are going to have discussions on all of these fine points we are not going to get through with this hearing. I would like to see you get to the end of this argument.

All this Commission wants to consider is evidence and testimony and not discussion between engineers and operators as to points that are not really technical.

MR. WESTFELDT: May I then just ask or point out to the Commission that Exhibit No. 1 which has been admitted in evidence shows this large area in the gas zone that is undeveloped and owned by Lion that will obviously migrate toward the gas productive area, and they are draining or must be draining the Lion gas area.

MR. McELWAIN: Does Lion own the royalty and mineral interest there?

MR. WESTFELDT: I have no idea--and that the Lion gas well has been shut-in and a large Lion gas area is undeveloped, and there was only one other question that I

wanted to ask this witness.

REDIRECT EXAMINATION

BY MR. WESTFELDT:

Q And that was what his opinion would be of raising the gas limit on the oil wells?

A Sir, I have testified previously that gas-oil ratio is a measure of efficiency with which you produce oil, and ideally we would like to produce a barrel of oil with little or no gas. That would be as near maximum efficiency as you could get.

Now, anything less than that is a compromise, and we feel that 125 is an appropriate limit which will bring about the maximum ultimate recovery outside of unitization.

MR. WESTFELDT: I have no further questions.

COMM. BRETSCHNEIDER: Does anyone else wish to discuss the matter with the witness? Art, are you through? Sam, do you have anything to say?

MR. JERSIN: I have nothing more.

COMM. BRETSCHNEIDER: Does anyone have anything else to say? Are you through?

MR. WESTFELDT: I am through.

COMM. BRETSCHNEIDER: The witness is excused.

(Witness excused.)

COMM. BRETSCHNEIDER: The hearing is closed.

MR. WESTFELDT: I was going to call another witness, but I won't because I think it has been covered.

COMM. BRETSCHNEIDER: Does any other company wish to present any testimony or any witnesses? (No response.) Under those circumstances the hearing is adjourned.

(Whereupon, at 2:00 o'clock p.m., September 17, 1957 the hearing in the above-entitled matter was closed.)

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REPORTER'S CERTIFICATE

I, Keith B. Watson, Certified Shorthand Reporter, do hereby certify that the foregoing transcript, consisting of pages 1 through 83, constitute a true, correct, and complete transcript of my stenotype notes taken in the foregoing matter.

Keith B. Watson
Certified Shorthand Reporter

616 Kittredge Building

Denver 2, Colorado

AM 6-0013

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