



BEFORE THE OIL AND GAS CONSERVATION COMMISSION
OF THE STATE OF COLORADO

CAUSE NO. 26

ADENA FIELD

May 27, 1958

DONALD E. WEIMER
CERTIFIED SHORTHAND REPORTER
DENVER, COLORADO

I N D E X

May 27, 1958, Session

<u>Witnesses</u>	<u>Direct</u>	<u>Cross</u>	<u>Redirect</u>	<u>Recross</u>
J. R. Weyler	10	50		
John McLeland	94			

Exhibits

<u>Pure Oil Company</u>		<u>Petroleum Incorporated</u>	
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BEFORE THE OIL AND GAS CONSERVATION COMMISSION
OF THE STATE OF COLORADO

IN THE MATTER OF THE PROMULGATION
AND ESTABLISHMENT OF FIELD RULES TO
GOVERN OPERATIONS IN THE "J" SAND OF
THE ADENA FIELD, MORGAN COUNTY,
COLORADO.

}
} CAUSE NO. 26
}

PURSUANT TO NOTICE to all parties in interest, the above-entitled matter came duly on for hearing at 243 State Capitol Building, Denver, Colorado, at the hour of 1:00 o'clock p.m., May 27, 1958.

BEFORE:

Commissioner H. C. Bretschneider
Commissioner W. A. Dillon
Commissioner H. H. Houston
Commissioner C. D. Conrado

APPEARANCES:

W. T. Butler, Esq., Tulsa, Oklahoma, and
T. P. Stockmar, Esq., Denver, Colorado, for
Pure Oil Company;
F. L. Kirgis, Esq., Denver, Colorado, and
Raymond C. Johnson, Esq., Denver, Colorado, for
Petroleum Incorporated;
Earl W. Haffke, Esq., Fort Morgan, Colorado, for
royalty owners;
P. M. Westfeldt, Esq., Denver, Colorado, for
Monsanto Chemical Company;
Donald F. McClary, Esq., Fort Morgan, Colorado, for
royalty owners;
Norval Robison, appearing on behalf of mineral
owners in Section 25;

APPEARANCES: Continued

George S. Anderson, Denver, Colorado, for the
U. S. Smelting, Refining, and Mining Co.;

William Smith, Denver, Colorado,
A J. Jersin, Denver, Colorado, Director,
Sam Freeman, Esq., Denver, Colorado, for the
Oil and Gas Conservation Commission.

COMM. BRETSCHNEIDER: Gentlemen, the Commission has reconvened and at this time we will hear Cause No. 26, Adena "J", The Pure Oil Company, as Unit Operator, petition requesting consideration of reallocation of the total field oil and gas allowables established previously for the "J" Sand, including temporary substitute allowables granted to the Delaney No. 1 well and wells on Tract 81-B (other than Delaney No. 1), and temporary allowable granted to Robison No. 2 well.

This is an application or a petition by the Pure Oil Company. I think in view of the fact that this will probably be a rather lengthy hearing we ought to make record to begin with of the parties who are to represent the various interests who are here today.

MR. STOCKMAR: Mr. W. T. Butler and T. P. Stockmar, appearing for the Pure Oil Company as unit operator of the Adena Unit Area.

MR. KIRGIS: Appearing for Petroleum Incorporated, Frederic L. Kirgis and Raymond C. Johnson.

MR. HAFFKE: Appearing for some of the royalty owners, including Delaney and Haffke, Earl W. Haffke.

MR. WESTFELDT: Appearing on behalf of Monsanto Chemical Company, P. M. Westfeldt.

MR. McCLARY: Donald F. McClary, appearing on behalf of royalty interest owners.

MR. ROBISON: Norval Robison, appearing on behalf of the majority of the mineral owners in the south of Section 25, Township 1 North, Range 58.

MR. ANDERSON: George S. Anderson, appearing on behalf of United States Smelting, Refining and Mining Company.

COMM. BRETSCHNEIDER: Are there any others now appearing for anyone interested in the Adena area?

MR. HAFFKE: Mr. Dowell and Mr. Delaney are also present here.

COMM. BRETSCHNEIDER: All right, we will note them as being present. Mr. Jersin, has everyone been legally advised or notified of this hearing?

MR. JERSIN: Yes, sir, they have. Proper notice has been issued.

COMM. BRETSCHNEIDER: Do you have any communications that ought to be read into the record from any of the parties that are interested?

MR. JERSIN: There are no communications, Mr. Bretschneider.

COMM. BRETSCHNEIDER: All right, then I think we are in a position to proceed. Mr. Stockmar, if you would like to

proceed you may do so.

MR. STOCKMAR: Thank you, sir. As you read from the agenda, the matter before us is upon the application of the Pure Oil Company for re-consideration of the three temporary allowables which have been granted as exceptions to the basic Adena Field "J" Sand allocation order. It may not appear from our petition, but to clear the air this is primarily a contest between the Adena Field owners represented by Pure as the operator, and Petroleum Incorporated as the owner of a non-unitized Tract 81-B, which is outside of the boundaries of the unit area.

I am very anxious at the outset to establish the monetary importance of this hearing. There is a tendency in regulation matters to talk about a few barrels a day here and a few barrels there and what not, and particularly after a Rangely scramble, why, the smallest units were a million dollars and so forth, but that is still a sizable amount of money; and that is precisely what we are talking about here today, is a million dollars that we are scrapping over.

Now, the order which our witness will propose should be entered has in it already a very substantial compromise from the position which we believe is fair and equitable. It reduces by compromise the amount in dispute to something approaching \$700,000. In other words, we intend to show that the order we are seeking will, of the million dollars that

might be in dispute, grant to the Delaney tract approximately \$300,000 of those dollars at the outset.

As a further, to me, significant thing, if we are talking loosely about one barrel a day allocation it sounds somewhat like a bagatelle, but in this particular matter one barrel a day difference in the allowable allocation here amounts to approximately \$13,000 over the life of the field. There may be some questions raised by the opponents of our theory here concerning the size of the reservoir, the amount of the oil in place that we have awarded to the Delaney tract, and so forth. We intend to show that our proposal is sufficiently generous to cover a reservoir four times the size that we have calculated it to be..

I would like to distribute to each of you a list of the exhibits which we will present. Most of our exhibits are numbered A, B, C, D, and so forth. You will notice, however, that in the very front of the booklet for your convenient reference I have had prepared and shown there an Exhibit 1, which is a historical summary of what has previously happened with respect to the Adena Field. At least two of the Commissioners present have not been Commission members throughout the entire proceeding, and it's quite an involved pattern of Commission regulations and orders that has gone before; so I would like to briefly review that matter.

Although there were some 26 orders granted ahead of

this particular historical review, I think a proper starting point would be in December of 1955. At that time this Commission approved the Adena "J" Sand unit area, which was then formed without the joinder of the Petroleum Inc. tracts. Now at that time the outstanding tracts were Tract 7, Tract 14, Tract 63, and Tract 62, containing 18 wells.

The next step that may have occurred was that on April 30 of 1956 Petroleum Incorporated completed the Delaney No. 1 well on Tract 81-B, which is the tract in question at this hearing. The Delaney No. 1 well was completed as a producing well. On July 2 of 1956 a very extensive hearing was held in this matter. Actually there were two hearings that day. One of the first things was to eliminate from the confines of the Adena Field the so-called Bruce Tract which lies in this general area and is not shown on this Adena map. The same day, but the order was granted sometime later, the Commission established a total field allowable for the "J" sand of 14,000 barrels per day for oil, 25,173 MCF per day for gas. No change is sought at the present time in that field allowable. In the same order, which is 26-30, the Commission also established the allocation formula under which that 14,000 barrels a day would be divided among the unit and nonunit tracts. Quite courageously, in our opinion, accomplishing what industry has paid lip-service to for many years, the Commission allocated the oil and gas allowable on the basis of

original oil in place.

Following this order later in 1956 Petroleum Incorporated brought suit against the Commission and against the unit operator to have Order 26-30 set aside. Following that, and after a substantial compromise, Petroleum Incorporated agreed to join the unit and to dismiss the lawsuit. Following that compromise agreement, four of the five Petroleum Incorporated tracts were committed to the unit, the four I have shown, 7, 14, 62, and 63, were committed. As to Tract 81-B, they were unable to secure the consent of the land owners and that tract was not committed.

Following that commitment, the same oil-in-place order, 26-30, was revised only to bring into the unit area the four tracts which had been committed, and the same oil-in-place allowable, the same theory was used in calculating an allowable for Tract 81-B. That allowable was contested by Petroleum Incorporated and a subsequent hearing was held in January of 1957, Order 26-33. That order granted a temporary hardship exception to the oil-in-place order, 26-30, by permitting the Delaney No. 1 well to produce 40 barrels a day in lieu of the oil-in-place allowable for a period of one year only; the Commission, of course, reserving the right to look at it again the following February 1st. It also made provision for an additional 40 barrels per day allowable for each other well drilled on the tract thereafter until that well had paid

out its cost of drilling and operation.

Later in 1957 the Commission approved the injection of water into the unit area by the unit operator and at the expense of the unit owners. In March of 1957 Petroleum Incorporated's Delaney No. 2 well was drilled and completed as a producing well. It then became qualified for the temporary 40-barrel payout allowable.

In October of 1957 Lion Oil Company's Robison No. 2 well was drilled and completed as a producing well on Tract 83. Last November the Robison No. 2 well was granted a temporary allowable of 40 barrels per day. Now, on December 21, 1957, Petroleum Incorporated drilled the Delaney No. 3 well on Tract 81-B, and the status of that well is uncertain, although I expect that information will be developed about it.

At the hearing on January 28, 1958, which was near the end of the year when the 40-barrel allowable for Delaney No. 1 would have expired, the Commission met and upon being advised that negotiations were looking up for the joinder of Tract 81-B into the unit, the 40-barrel per day allowable was extended with the finding that it would be called up at this May hearing. Following that meeting, and in February of 1958, the Delaney lease owners were offered participation in the unit on the same basis as all other tracts in the unit are committed. This offer was declined by Petroleum Incorporated and its royalty owners. As of May, 1958, the unit owners have expended

approximately one and three-quarter million dollars for water injection, which, of course, is at no cost to the non-unit tracts.

I am sorry, the Bruce tract is shown on the map. It is the west half of Section 26, which lies just to the west of the Delaney Tract.

To summarize the present situation, gentlemen, the basic order allocating oil in this field is still 26-30. It establishes the field allowable as to which no change is sought. It establishes the basic allocation on an oil-in-place basis. The other orders are temporary exceptions which we have called up for review. Although we framed the petition in its entirety to cover all counts, I am sure the Commission will remember that it had itself committed to call some of these matters, at least, up on its own motion.

There is one point about 26-33 which I would like to call to your attention. It is the temporary order granting other wells on the Delaney tract 40 barrels a day until pay out. A very important feature of that order is the proviso that such an oil allowable is produced without waste. We tend to forget that, but that is still a mandatory part of the order. Another part of 26-33 which has been carried forward is also important, and that is a finding that the action taken in granting 26-33 is not to be construed or interpreted as a departure from any findings contained in its Order No. 26-30; in other words,

affirming the oil-in-place allocation theory.

On top of the other problems that have arisen, all of these present temporary exceptions have made no provision for gas allowables and that kind of thing. There is quite a hodgepodge of these temporary exceptions and they are very difficult to construe as to what should be done with respect to gas allowables. In any event our witness will propose a continuation of the oil-in-place theory in its entirety substantially revised to include additional information gained by the drilling of the Delaney wells, the Robison well, water injection wells, and so forth, to bring up to date the oil-in-place allocation formula.

Without any further statement I would like to have Mr. Jack Weyler sworn as our witness.

J. R. WEYLER

called as a witness on behalf of the Pure Oil Company, being first duly sworn, upon his oath testified as follows:

DIRECT EXAMINATION

BY MR. STOCKMAR:

Q. Jack, to give the Commission immediately an idea of what the order calls for, will you briefly outline the division of oil and gas which we contemplate under the proposed order.

A. As far as the oil and gas in place determination, Mr. Stockmar?

Q. No. In my statement I failed to actually tell the

Commission what it is we are actually proposing. Refer to Exhibit C and simply describe what we are offering in each tract and so forth.

A. In the list of exhibits we have prepared you will find an Exhibit C which is very similar to the Exhibit C which was the attachment to the Order 26-30, which indicates the amount of original oil and gas in place under each producing property in the field, or even those properties which may not be producing but which had recoverable oil and which go into the determination of distribution of any pool oil and gas allowable. In other words, the oil and gas allowable formula of 26-30 splits the oil production and gas production to the properties in proportion to their original reserves.

Q. Will you give the actual figures of our proposal please, Jack?

A. All right. As you will note, as Mr. Stockmar pointed out, the total pool allowable would remain at 14,000 barrels of oil and the total gas allowable would remain at 25,173,000 MCF, I believe is the figure. As for the Adena unit area, the allowable on a daily basis would be 13,928 barrels, and its gas allowable would be 25,082,300 MCF per day. For the Petroleum Incorporated Tract 81-B, it would have as an oil allowable 20 barrels per day and a gas allowable of 24.5 MCF per day. For the Robison Tract, which now has a producing well and has recoverable oil under it, it would share to the extent of an

oil allowable of 52 barrels per day and a gas allowable of 66.2 MCF per day.

MR. STOCKMAR: Thank you, Mr. Weyler. I overlooked, gentlemen, asking that this witness be accepted as qualified. He has been here so many times.

COMM. BRETSCHNEIDER: It's not necessary to qualify him because we know him from long experience.

MR. STOCKMAR: Will the opposing counsel accept Mr. Weyler as an expert witness?

MR. KIRGIS: Yes, indeed, reserving the right to disagree with him we accept his qualifications.

Q. Very briefly, Mr. Weyler, and please do not go into as large ancient history, but for the benefit of the more recent Commissioners will you describe the oil-in-place formula theory.

A. Well, as we testified in previous hearings, the oil-in-place formula for production allocation in Adena is a highly proper method of proration. It in effect and in final analysis allows production from all producible properties in proportion to the original oil and gas in place under these properties, which does one thing of tremendous importance, it prevents migration of oil and gas from one property to another as the reservoir is depleted under normal producing mechanism. In other words, as far as the unit area is concerned, which is outlined in black, it has so many barrels of oil and gas in

place. Other properties have a certain amount of oil in place. If the production allowed each day out of each of those properties is in proportion to the original oil in place, migration will be minimized to the maximum extent.

Now, we, of course, run into the term "recoverable oil". We know we are not going to get 100% of the oil in place out from under each property. We are going to recover some percentage of that oil, so you might ask, "Well, should not that be in proportion to the recoverable oil rather than the original oil in place." Well, in this case, under normal producing mechanism, the original oil and gas in place is a very very close approximation of the recoverable oil under each property, and the percentage of one is a percentage of another.

Q. I want to ask, Mr. Weyler, if you mean the ratios of the two are the same?

A. The ratios of the two are the same if no migration occurs, which is what we are trying to prevent. In brief, that is the advantage and the fairness with which such a formula allows oil production under properties of varying ownership.

Q. Mr. Weyler, you mentioned recoverable oil in place. What is different about actual recoverable oil and recoverable in place? What is it that causes a difference between the two?

A. Well, actual recoverable oil -- maybe I can answer it this way -- we all know that from time to time one property

is able to, by structural position, by some type of state order, for one reason or another, allowed to produce oil in excess of what you might normally think of as equitable through migration of oil from its neighbor's property. Now as we talk about recoverable oil in place, we generally think of recovery of oil under a particular property if no migration did occur, or if the migration did occur was -- how did the statute put it -- compensated for.

Q. Then actual recoverable oil from any particular well may be largely a function of the regulatory rules, in effect, with respect to the field?

A. Definitely. Definitely.

Q. Mr. Weyler, with respect to the allocation formula which we have talked of, 20 barrels of oil for the Delaney Tract and 52 barrels per day for the Robison Tract, will that be increased if the total field allowable is changed or increased?

A. Yes. In other words, the Delaney property and the Robison property each have a share of the original oil in place; therefore, as the field allowable were increased or decreased by the Commission, so would these two properties have their allowable increased or decreased, as would the unit area. In other words, with any adjustment all three particular properties would go up and down in proportion.

Q. The percentage of the total field production then

would not change?

A. That is correct.

Q. Is there any probability of a change being sought in the field allowable?

A. Yes. I believe in our previous hearing after which the Adena Unit was approved, we stated that we were going to initiate a water injection program, which we have done and which is in full operation, and that the M.E.R. of the Adena Field would be increasing as time went on. We look forward definitely to a substantial increase in the M.E.R. in the field, and therefore at some later date when we are satisfied that the M.E.R. has increased we will be probably, I assume, we will be coming before the Commission and asking for an increase in total pool allowable, which would therefore increase the daily allowable of each of the producing properties in the field.

Q. Mr. Weyler, you touched a moment ago on the effect of differing volumetric withdrawals from these various tracts. Would you touch on that again for the benefit of the Commission please. What happens if withdrawals are not equal?

A. Well, if the withdrawals are not equal, which they have not been lately, migration of oil and gas will occur from one property to another. As in this particular case we are dealing with today, since Petroleum Incorporated has been granted this temporary order by the Commission, Petroleum

Incorporated's Delaney Tract has been produced at a rate which has allowed migration of oil or caused migration of oil or gas from the unit area to the Petroleum Incorporated's properties.

Q. We will touch on the pressure changes again in a moment, but is it your opinion that drainage is preventable or at least reducible by the field rules which we are proposing?

A. Yes, sir. They are not preventable under the field rules that we are recommending today. Drainage will continue to occur in the same direction, that is from the unit properties to the Petroleum Incorporated properties and likewise the Robison property. However, they substantially reduce the migration and loss of oil which the Adena Unit is bound to suffer if the amount of oil continues to be produced off of this particular property.

Q. Mr. Weyler, one of the major factors in determining the amount of oil in place I understand to be the thickness of the pay reservoir. Will you briefly review the isopach or sand thickness maps which have been previously presented to the Commission and also bring along the newest addition.

A. Rather than sand thickness, we have called them oil-in-place isopachs. It's not a sand thickness, it is the amount of oil originally in place in barrels under each property. This particular map, you will note in your list of exhibits it will be called Exhibit A, and this is the most

recent map modified by the latest drilling information that we have, which includes the drilling to date on the Petroleum Incorporated Delaney property, Delaney 1, 2, and 3. Also you will note here is the row of water injection wells which the Adena Unit has drilled for the injection of water, and this map has been revised for the small corrections found through the drilling of these particular wells.

Q. Mr. Weyler, was this map prepared by you or under your direction?

A. This map was prepared under my direction by our geological department.

Q. Does this map show any change from prior maps of the same nature presented to this Commission?

A. Yes, it does. We might, for the Commission's benefit, show the modifications that have been brought about by continued drilling of the Adena Field. Here we will show first the Core Laboratories map prepared in 1954. Now this happens rather to be oil in place, it is sand thickness, but it shows quite the same thing. I was really going to start to show the modifications which we have made in this particular area through additional information by development. This happens to be a sand thickness map which Core Laboratories prepared. They didn't prepare an oil-in-place map, but when they prepared this map, and many of the wells that are now located in this area had not been drilled, the Bruce well, which we have talked

about, which is located right in this particular location in Section 16 had been drilled, and it was at first felt that the Bruce well was a part of the Adena "J" Sand Field and in fact that property was spaced with the rest of the field. Now, as development continued there were dry holes drilled on the Lion Dewey property. There was, of course, this dry hole drilled on the property we are talking about today, the east half of Section 26 operated by Petroleum Incorporated, which definitely proved that the Bruce was not a part of the Adena Field and that the permeability pinch-out has changed from the postulated pinch-out that Core Laboratories showed on this map through their interpretation of the data at hand at that time. Then by the time that this map, which was our original oil-in-place isopach, by the time it was drawn we had additional data. As you can see, we had by that time the knowledge that a dry hole was located here, a dry hole was located here, and we had the data from these wells which showed a thinning of the pay sand in this direction here, a very definite tightening up of the sand. There were now three dry holes around the Bruce well. Every well drilled was adding to our information and getting it more and more exact.

Q. Each map then reflects, to the best of your engineering and geologic talents, the expression of the information then available?

A. Yes, sir, and this map, I might say, was prepared by

representatives of all of the companies that have joined the unit. Primarily, the representatives who did most of the work were Pure Oil Company, Petroleum Incorporated, Lion, Falcon Seaboard, and British-American were the five companies that did most of the work, and this was the outcome here. As you can see, we had at that time just a very little extension of recoverable oil over on to the Delaney tract in question, Tract 81-B.

Q. Will you move on to the next map please.

A. This will show the modification brought about by the drilling of the Delaney No. 1 by Petroleum Incorporated. Petroleum Incorporated drilled the Delaney No. 1 at this location and found a slight modification of the data that we had on the previous maps. We found, oh, approximately 6 or 8 feet, I think it was, of pay sand, and oil in place of over 5,000 barrels per acre, and that adjustment was made on this revision. This is the map that was presented in the hearing of July of 1956.

MR. STOCKMAR: Gentlemen, we do not propose that these old maps be again presented in evidence, some of them have previously been presented. We simply wish to show the changes that have taken place as new information develops.

Q. Mr. Weyler, you may wish to refer again to Exhibit A which we are presenting as the latest revision in this series of maps.

A. Right. Now, Petroleum Incorporated has completed

two more wells, of which the last, or Delaney No. 3, our information indicates a very poor well in the Adena "J" Sand and is right now not being produced. However, that well, when it did drill the "J" Sand, did cut a few feet of what we might construe as being a pay section enough to give it approximately 3,000 barrels per acre, and slightly modify again this line.

Q. Even though that well is not producing, full credit was given for the oil in place in drafting this map?

A. Correct. Now to date this is our best interpretation of the oil in place under not only the unit area, which is pretty well drilled up, but also the Delaney properties. Any further drilling could either reduce or increase that, but that is quite close. In other words, until additional development were to prove otherwise, that would have to be the interpretation of the oil in place under the Petroleum Incorporated properties.

Q. Mr. Weyler, have you taken into account additional information gained in the drilling of water injection wells?

A. Yes, sir. We point out here the water injection wells and the oil and gas in place isopach was modified slightly along this gas-oil contact, which didn't make one difference one way or another, but those adjustments were made.

Q. In support of the proposal which we have, gas also is taken into consideration. Will you present Exhibit B.

A. Exhibit B is the Adena gas cap and it shows the gas

in place under each property and under the entire field, with a small original gas cap down here, which was very minor, and this being the large body of gas cap which is entirely under the unit area.

Q. Again this exhibit was prepared under your supervision and direction?

A. Yes, sir.

Q. And with respect to both Exhibits A and B the information derivable from these maps is the basis of the allocation of oil and gas which you propose in the order we are asking?

A. Yes, sir.

Q. May I ask, Mr. Weyler, if there are any other reasons why these particular new maps were prepared?

A. Yes. They were actually prepared first when we were attempting to work out entry of the two outstanding tracts, Tract 81-B and 83 into the unit, into the Adena Sand Unit. You know this oil in place and gas in place is also a very large factor in our Adena "J" Sand Unit formula for participation in the unit. We were for many weeks attempting to negotiate with the owners of Tract 81-B and Tract 83 for entries of those properties into the Adena Unit, so we had to modify these particular maps so that we could calculate the "J" Sand unit percentage to be ascribed to each of these properties. This map, and the gas-in-place isopach, were prepared by the Pure Oil Company in Tulsa and presented to the Adena "J"

Sand Unit Engineering and Geological Committee in their meeting last fall, and at that time Petroleum Incorporated was represented and the only modification that they suggested at that time to this map was that one of these wells be given one additional foot of credit, which did not show on core analysis but which looked like it might be pay according to the microlog analysis; and that adjustment was made, that one foot of pay was added, and this was the final product.

Q. Then this is a joint effort, in a sense, of all participants in the unit?

A. In that sense that they did look at the map and make that suggestion.

Q. Mr. Weyler, I gather the outside contour line that you have there shows zero original oil in place?

A. Yes, sir.

Q. Will you mark the dry holes and other bits of information, identifying for the record if you will which in your judgment segregate this particular Adena Field from the Bruce well.

A. Here is a dry hole. Here is another. (Indicating)

Q. Would you identify those locations as such?

A. The first I drew is Dewey No. 8 in Section 23. Dewey No. 7 in Section 24. This one here was originally called the Lion Goder No. 1 when Lion Oil Company had the property.

Q. But it is located on the Delaney Tract?

A. Yes, it's located on the Delaney Tract 81-B, and it's in Section 26. Here's another one, the Bruce No. 2 in Section 23, the Edith No. 1 located in Section 26. Those wells do a couple of things: They very clearly define the zero limit of the field along here; they show that the zero line cannot be beyond out in this area.

Q. Mr. Weyler, will you mark the Bruce well with an "X" so it's clearly visible.

A. There is the Bruce well. (Indicating)

Q. And you are satisfied that the zero oil-in-place line is as accurate as can be presently drawn with the present information?

A. That is right. Also you will notice that it has not been given any treatment dissimilar to the treatment given around the rest of the unit. It has extended even further beyond the 5,000 line, which is the first inside line, than throughout most of the rest of the Adena Field.

Q. Now, Mr. Weyler, would you please present to the Commission Exhibit C, which is found in the books. I think the only testimony we might need is that Exhibit C also is prepared under your direction and supervision?

A. Yes, and it has been discussed as far as the amounts of oil and gas allowables.

Q. And it does reflect determinations made from the maps you have presented as Exhibits A and B?

A. Yes.

Q. It's entirely consistent with the theory previously advanced to the Commission and accepted by it under Order 26-30?

A. Yes, sir.

Q. The only changes being the addition of new information as developed?

A. Yes, sir.

MR. STOCKMAR: May we ask the acceptance of Exhibits A, B, and C at this time, gentlemen?

COMM. BRETSCHNEIDER: Yes, sir, you may. We will accept them in evidence.

Q. Mr. Weyler, will you please present and explain Exhibit D.

A. Exhibit D is the pressure survey map. Certain key wells in the field are from time to time measured as to the bottom hole pressure. We shut in all or substantially all of the wells in the field to take this pressure survey. The only reason I say substantially all, there are from time to time wells we don't want to shut in because we are afraid the well will die, which doesn't make much difference whether we shut it in or not because it is too far from a key well to make any difference; but we shut in the remaining wells in the field periodically and take these bottom hole pressure surveys. This particular survey was in December, December 2, 1957. It shows, as all of the maps have shown since production started, the high pressure is in the east or the gas cap area of the field,

and withdrawals from the west side of the field in the oil section have caused a reduction in pressure and therefore migration of both oil and gas in that direction. As you can see here, this is Adena unit property right here, we have taken substantial withdrawals from the wells in this area. They are very good wells and it caused a pressure sink here. We have pinched these back a little and maybe from time to time allowed them to build up over what they had been.

Down here is a small pressure sink, on the Dewey and L. J. Clar properties, but from the entire field you can see it's obvious that the production is being taken from the west flank oil wells and causing a drop in pressure along that side, and, of course, migration of the fluids in that direction

Down here on the Tract 81-B at this time the pressure was approximately 1050 pounds. On the offsetting property the James L. Scanlon, Adena unit property right here, measured 1063-1080. You see we build up as we come to the east. Migration has been and continues to be in this direction.

Q. Toward the area of lower pressure in the vicinity of the Delaney Tract?

A. Yes, sir.

Q. Without covering Exhibit D but beside it, will you present and explain Exhibit E.

A. Exhibit E is a pressure map taken in April, April 1, 1958. We started water injection last year, and by July of

last year had a substantial amount of water each day being injected into these wells. At the present time this area band right down through there is substantially water filled, and that is the reason for that band. I just wanted to bring that out, but this also shows the pressures in the field as of April of 1958, this year. We continue to have a high pressure sink. There continues to be a pressure sink here and withdrawals are substantial. There's a small pressure sink up here again, and production is being taken from the west flank of the field. Pressure down here is the same story. It decreases as we move down into that corner of the properties. Here's a 1146, 1110, 1106, and so on across. The 1044 is on the Lion Robison Tract, showing again migration in that direction.

Just as a matter of interest, the amount of water injected into the reservoir between these two periods has stopped the drop in average pressure in the Adena "J" Sand Reservoir and it has held constant from this date to this date. Actually the measurements indicate 1137 pressure in the field average, 1136 then, but one pound is not necessarily within the accuracy of the instruments; but we have arrested the pressure decline by our water injection process, but that does not, of course, prevent the migration of fluids to the west.

Q. Mr. Weyler, have you prepared a pressure differential map which shows the changes in pressure that has occurred in

this 5-month interval?

A. Yes.

Q. Will you present that as Exhibit F.

A. This map merely shows what we do on each key well is subtract the pressure here from the pressure here and see if there is any difference. Where there is, we note that difference, either plus or minus, on the map and contour the difference in pressure to show where it built up and fell down. Now the major build-up in pressure has been the gas cap and in the oil zone along the front of water with still some pressure reduction occurring in the area of the producing wells. What the over-all average is, we have leveled the pressure out. Now down in the area in question, always you will notice we have had a substantial pressure increase on the James L. Scanlon Lease. This well showed a pressure build up of 44 pounds, here 43, here 35. Now that is due to those properties being shut in. The gas-oil ratio had gotten up to a point on these properties where we could produce the oil from more economical low ratio wells in the Adena Unit, so we shut this property in substantially. There was a little production, but not very much. That allowed migration into the properties to build that pressure up.

Q. In your operation of the unit, Mr. Weyler, what effort is made to take oil from low gas-oil ratio wells?

A. Well, we try to spread the oil production as well as

we can so we don't cause any pressure sinks of too great a magnitude, but we do attempt to take as much as we can, balance that with taking it from the low ratio wells in the field, to prevent the useless waste of energy in the production of the pool allowable.

Q. Does Exhibit F confirm your previous opinion that drainage of oil from the unit tract is occurring?

A. Yes, sir. We know that migration has occurred into this area between the two properties to support the pressure, keep it up. It has had to occur in that manner. In other words, if migration had not occurred in that area, the pressure would not have either risen on the Scanlon properties or in our interpretation remained substantially uniform on the Petroleum Incorporated Delaney property.

Q. What is it that seems to be maintaining the pressure on the Petroleum Incorporated property?

A. The pressure is maintained by the movement of oil and gas from the Adena "J" Sand Unit properties, which is being further, of course, held up as far as pressure goes by the water injection along the gas-oil contact.

Q. Mr. Weyler, were Exhibits D, E, and F prepared by you and under your supervision?

A. Yes. These three -- well, the two pressure maps were prepared by the Adena Unit Engineering staff under my direction. Well, likewise this pressure differential map.

MR. STOCKMAR: We ask the acceptance of Exhibits D, E, and F, if the Commission please.

COMM. BRETSCHNEIDER: We will accept them.

Q. Mr. Weyler, will you present Exhibit G.

MR. STOCKMAR: Gentlemen, Exhibit G is a little bulky and no small copy of it will be found in the books.

A. Exhibit G is a cross section drawn through three wells down in this particular area of the field. This well being the Delaney No. 1 on Petroleum Incorporated's property. This well is the James L. Scanlon No. 5, and James L. Scanlon No. 2 is shown here. This line here is the unit boundary.

Q. Has the Exhibit G been drawn to scale, Mr. Weyler?

A. Yes, sir. It has been drawn completely to scale, both vertical and horizontal are the same scale. It shows how the producible sand pinches out as you move west across these properties, and it shows the proximity of Petroleum Incorporated Delaney No. 1 to the unit boundary. The green part is permeable pay section as determined from core analysis. The yellow is Adena "J" Sand, but it is not pay; it is non-productive tight sand.

Now, actually this does not reflect producing capacity. Actually the pay sand that is in this well and this well is considerably better per foot than is in here, but it actually shows the thickness of pay section as we have determined it. In other words, every foot of pay sand in this well,

this well, and this one above 2.5 millidarcies was considered to be pay section if it had some oil saturation in it.

Q. Those determinations were made consistent with the prior evaluations of producible oil in place?

A. Yes, sir. They were made on exactly the same basis as all of the other determinations were made, both in the formation of the unit, the unit participation, and in the previous work which we submitted to the Commission, which lead to the ordering of Order 26-30. It simply shows the pay thickness and the permeability pinchout here at this location.

Q. Would you again repeat what justification you have for showing a permeability pinchout at the left end of the exhibit, Mr. Weyler.

A. Well, beyond that the sand is too tight to produce, as evidenced by wells in that area. Shown here you have a natural thinning of the pay section as you move west. This entire area out here is non-productible; not because of oil-water contact, as you have in some other parts of the field, but because the sand tightens up and will not give up the fluids of any nature. Also the oil saturation, because of the tightness, are very very low and are even nonexistent throughout the majority of the remainder of that property to the west.

Q. Then I infer from the map that the Delaney No. 1 well is not drawing from as large a body of producible oil sand as the unit wells shown on the exhibit?

A. That is certainly right. This is a quite small reservoir here, and sustained high rates of production, demand that migration exists support the pressure we know is on this property. It's a continuous support, these high rates of production.

Q. Mr. Weyler, will you please present Exhibit H to supplement this exhibit.

A. Exhibit H is just to add on a little as far as quality of the area we are talking about. We are attempting here to show simply the quality of the sand found in these three wells which we showed on the previous cross section. This bar graph indicates the millidarcy feet of sand cored by these three particular wells -- the millidarcy feet, I should say, of pay sand cored by these three wells. Petroleum Incorporated Delaney had 110 millidarcy feet is all that was found in that pay section. The Scanlon 5 is over 1600, and No. 2 Scanlon is over 4300. This does not particularly show migration or anything like that, but it does show the quality of the sand in this part of the field. I think Petroleum Incorporated had to frac this well. I shouldn't say had to, but did, with 10,000 pounds of sand and 10,000 gallons of oil before they were able to make a good well out of it.

COMM. BRETSCHNEIDER: Where are the Scanlon wells with relation to the Delaney well?

Q. Would you draw a line, Jack.

A. Yes. They are lying directly east, Mr. Bretschneider, Here is the Delaney well, here is the Scanlon 5, and here is the Scanlon 2. They are these three wells.

Q. Those are the same three wells shown on Exhibit G just previously?

A. Yes, sir. Both cross sections show the same thing. Again this is the unit boundary and Delaney lease boundary, common boundary.

Q. Mr. Weyler, this Exhibit H shows the original productive capacity of the wells before any treatment by Petroleum Incorporated?

A. Yes, that is right.

Q. Do you have any figures with respect to what the well would actually produce before that treatment?

A. We have some data, yes. Our indication is prior to treatment that the Delaney No. 1 well was swabbing a barrel and a half of total fluid per hour. Prior to treatment was then fractured with 10,000 pounds of sand and 10,000 gallons of lease crude. Another interesting point, this particular well, as far as the pay section, I think we gave that well as far as pay section about eight feet, but I notice it is perforated over about a 2 to 3 foot interval, 5802 to 5804.

Q. What was the effect of the sand fracing which was done, Mr. Weyler?

A. The effect of the sand fracing was to actually

provide a larger radius of drainage, you may look at it, or productive capacity by the breaking down of the sand section, physically increasing this particular value, you might say, of the well by fracture process, which, of course, is common today, thereupon allowing this well to drain a larger area than it normally would at much higher rates of daily production than it would. I think it is obvious, at least it is to us, the proximity of this well with relation to the Adena "J" Sand Unit where all that oil is coming from.

Q. In your opinion, did the sand fracing of the No. 1 Delaney well give it access to the unit oil?

A. Yes, it did.

Q. The fractures extended across the lease line?

A. No, I certainly have no idea where the fractures actually extended. I simply know they did have a successful fracture treatment, increasing the producing capacity to an extent that they were able to produce at these larger rates of production.

Q. Mr. Weyler, were Exhibits G and H also prepared under your supervision?

A. Yes, they were.

Q. Will you present Exhibit I and explain it please.

A. Exhibit I is a graph showing the per cent recovery, which is shown on the vertical scale, versus time, which is shown on this horizontal lower scale of both the Adena Unit

properties and the Petroleum Incorporated properties. In other words, this is a per cent recovery versus time. The Adena Field was discovered back in November of 1953 and production was just getting under way in the first part of 1954. Under the entire properties which are now in the Adena Unit, the percentage recovery to date is approximately 15.5% of the original oil in place. Now even though the Petroleum Incorporated Delaney properties were initially produced as late as May of 1956, their rates of production have allowed a to date percentage of approximately 22% of their original oil in place. In other words, they have produced, even though they came in at a much later date, over 6% more of their oil than as the Adena "J" Sand Unit.

Q. Mr. Weyler, there seems to be three distinct production periods covering the Delaney properties. Would you identify each of them and explain what they seem to mean?

A. Yes. The initial production here, the slope of this you can see is steeper than it is directly following. That is when the Delaney No. 1 was producing under an order allowing it a maximum of 125 barrels per day. It would have caught the unit in just a few months as far as producing the same percentage of reserves. However, after the July, 1956, hearing the proration was changed and the allowable was allocated on the basis of original oil and gas in place, and the slope of this production reduced and it somewhat paralleled

the Adena "J" Sand Unit slope. However, as you can notice, it is a slightly lesser slope than was the Adena "J" Sand Unit because at that time we did not have the information that there was as much oil in place on that property as we do know today, and therefore did not give it a share which properly reflected the reserves of that lease.

Q. Mr. Weyler, if during that period the allowable had been 20 barrels per day for the tract instead of 9, what would have been the slope of the recovery curve?

A. The slope would have been the same as the slope on the Adena "J" Sand Unit, substantially the same slope as the unit properties are now showing. Here's another break which is when the new order came out allowing Petroleum Incorporated 40 barrels per day on their properties, and since these high rates of oil production have been allowed on the Delaney property have allowed them to date to have produced already 22% of their oil production, and increased the slope substantially. Just to bring that on up to the 50% mark, in other words if that continues, why, by about March of 1960 the Petroleum Incorporated properties would have produced over 50% of their original oil in place, which is pretty fair, which could not be done without migration.

Q. Mr. Weyler, we are attempting to prove drainage from the unit tracts to the non-unit tracts. Does this exhibit support your testimony from the prior exhibits?

A. Yes, it does, in this way: Since these two properties are in the same common source of supply, if one property produces a disproportionate share of the daily oil, this disproportionate production will cause reduction of pressure on this property and allow migration, will cause migration of oil and gas onto the property which is overproducing.

Q. Can you see from this exhibit any effect of the Commission's field rules?

A. Yes, I can. It's a very good chart which very clearly shows the effect of the Commission's orders upon the production of various properties. Here is when they were on the 125 barrels per day, and only on one well, and then nine barrels per day, and then on these later orders. It clearly points out that the Commission orders have a tremendous effect often upon the ultimate and definitely upon the equitable production from any particular property.

Q. Mr. Weyler, although the chart isn't broad enough, can you project this for the full life of the field if the present orders are perpetuated?

A. Yes, sir. It could be continued on to that extent. In other words, we believe that the Adena "J" Sand Unit properties will, under this water flood operation, recover approximately 50% of the oil originally in place, which would take it out on another 12 years or more, and would be way out here, and we would be up to this 50% line. Well, if this continued

to that same date, Petroleum Incorporated properties would recover well over 100% of their original oil in place, which is, of course, impossible without tremendous amounts of migration occurring.

Q. Mr. Weyler, have you made any material balance calculations to further aid your testimony with respect to the drainage?

A. Yes, we have. Our material balance calculations indicate the following to be true, and on the assumption now that the Petroleum Incorporated properties, after they were drilled in May of 1956, some orders say were ^drevised which prevented no migration one way or the other. From that date, May 1956, they could have expected to recover approximately 32,000 barrels of stock tank oil by solution gas drive. They had no migration and they had no gas cap, and you can't get an effect from this gas cap unless migration does occur, and by solution gas drive, and on their properties they could have expected approximately 32,000 barrels of production down to a depletion pressure of approximately 200 pounds.

Q. Am I following you that the assumption you are making is the same as sealing off the Petroleum Inc., properties from the rest of the reservoir?

A. That is right.

Q. And depleting it as a separate unit?

A. Correct. However, when Petroleum Incorporated

developed their property in 1956 they found a pressure of approximately 1185 pounds existing on that property. It's a common source of supply with the Adena Unit. What happened? Obviously the depletion of unit properties prior to their initial drilling had drained the Petroleum Incorporated properties. By material balance calculation that amount is approximately 14,000 barrels of stock tank oil.

Q. Let me make sure I am following you here, that prior to the drilling of the Delaney No. 1 well the unit properties, in a sense, drained away from the Petroleum Inc., property 14 some thousand barrels of oil?

A. Yes. That is a very common occurrence, one party developing prior to another and for a period of time until the second party develops, migration does occur.

Q. Even if we set aside the rule of capture that no doubt applied in those days and treat that oil as having belonged to the Delaney tract, what then is the equitable amount of oil that should be recoverable by the Delaney tract?

A. Well, by that token then we will say that that 32,000 barrels they would have recovered by their own solution gas mechanism, plus the 14,000 that drained off their property, we will give that back to them, then their equitable production would have been approximately 46,000 barrels of oil.

Q. What has been the actual production to date from the Petroleum Incorporated tract?

A. The actual production to date has been approximately 43,856 barrels. Petroleum Incorporated people can correct me if I am wrong, but that is our information as of 5-1-56 that their approximate production, which means that they have produced to date, within approximately 2200 barrels of all of the oil that they should have recovered had they developed initially when the unit did, allowing then no initial migration off and allowing them their full recovery of 46,000 some barrels of oil.

Q. By that figure you are speaking of their equitable share of the recoverable oil in place under the Delaney tract?

A. Yes. Just as a matter of interest as far as the recovery factor for that property, that would have been a recovery factor of approximately 23.1%, which is under the primary recovery of the entire Adena Field, which also had a gas cap to help increase the recovery. Now, assuming that Petroleum Incorporated by reason of the fact that they are in a reservoir with a gas cap should be allowed at least the average recovery and enough migration across on their property to give them the average recovery experienced by the rest of the producing properties, which I think you will recall that original primary recovery was expected to be 29.9%, this would have given them a recovery of 59,555 barrels from the entire property, and that would have included about 13,000 barrels of migration because of the gas cap.

Q. Do I understand the difference between the 59,000 that would have been recovered by the tract and the 46,000 that you just mentioned is due to permitting them to have the benefits of gas cap expansion?

A. Yes, sir.

Q. That was a hypothesis, I understand, carrying the production from the Petroleum Incorporated tracts to completion.

A. Yes, sir.

Q. Have you made any calculations which will show the amount of drainage which the unit tracts have already suffered to this time?

A. Yes.

Q. Will you please run through those?

A. The production to date is an important figure. From the producing properties, Petroleum Incorporated is approximately 43,856 barrels. They should be pretty well depleted if migration had not occurred, but it has occurred. Their pressure right now, instead of being down in the low hundreds, is over 1,000 pounds. Our material balance calculations indicate that to date not only has the 14,227, we have it calculated stock tank barrels, be returned back across the line, but an additional 22,579. That is carrying it out pretty fair, say 22,500 barrels of oil has migrated back on to the Petroleum Incorporated properties to bring about this support of pressure that we know exists on the properties.

That totals, since their development, 36,800 stock tank barrels of oil migration from the unit properties to Petroleum Incorporated.

Now that has happened in the past. You can say we are not going to correct all of those inequities that has existed. What would be the case now if we did devise some order, which I don't think we can do, which would seal off and allow no further migration on to the Petroleum Incorporated properties? Starting another material balance calculation right from now, and the conditions of the property as we know them today, solution gas drive mechanism with no migration either one way or the other, would give them an additional 24,675 barrels -- this is hypothetical -- for a total of 68,531. Then this would be their ultimate recovery from today on if no further migration existed. That figure is 34.4% of their original oil in place according to our oil-in-place maps. That is pretty fair production.

Q. As I understand the assumption that you made in deriving at that, an order by this Commission would be required which would absolutely preclude any further migration on the Petroleum Incorporated tract?

A. Yes.

Q. And you seem to indicate that that was not possible?

A. I guess it would be possible because an order could be made to shut them in, but you might say practical or is

something that we are not even recommending that we go to this extent to prevent or preclude all migration, for this reason: We are matching withdrawals from the field with water injection today. In fact we are overinjecting. We are going to build up the pressure in the Adena "J" Sand Reservoir, and that includes Petroleum Incorporated properties in the aggregate. They are going to realize all the benefits from this water injection program and pressure maintenance project. All they have to do is produce one barrel and they get some more migration, so we know that we cannot devise an order that is going to preclude migration as long as they are allowed to produce something, which they definitely of course should be allowed a couple of oil wells in a producing formation.

Q. Mr. Weyler, let's set aside those figures for just a moment. Will you give the Commission your thinking as to what the condition of the Delaney tract will be at the time that your water injection program has been completed and terminated?

A. Well, since we are going to support the reservoir pressure and keep it up, that is for an estimated nine years until we have moved the water bank substantially across the reservoir leaving a band down through the reservoir of oil, there is going to be about nine more years of continued water injection where we will match withdrawals. Up to that time Petroleum Incorporated will be producing some amount of oil. At that date, nine years from now, the condition of those

properties are going to be substantially what they are today; they are still going to have 80 to 90 per cent of their property oil saturated and they are still going to have their pressure over the remaining primary recovery after nine years of production.

Q. In other words, every time they take a barrel out, another barrel comes in to take its place, is that right?

A. That would be true.

Q. Will that oil existing at the end of the 9-year period still be recoverable to some extent?

A. Oh, yes. We expect them to recover after we all start what we generally term the "blow-down period", when we terminate the water injection and we deplete that last strip of oil and their property has yet to be affected by any encroachment of water, they will still have this 80 to 90 per cent of their original oil in place, it will still be on their properties, and they will enjoy an additional 20,000 barrels of recovery, at least, from that date on to depletion. They will be one of the few remaining producible segments of the Adena "J" Sand Field.

Q. Thank you, Mr. Weyler. If you can, now convert these figures that you have been talking about into dollars of value so that the Commission may see what the financial condition with respect to the Delaney tract would be, and compare these equitable take features with the proposal that we have to make.

A. All right. Now our recommendation -- I presume that would be the proper one to start with -- that Petroleum Incorporated should be allowed no more than 20 barrels per day, allow them to produce from now until depletion of the entire reservoir a grand total of 129,500 barrels of oil, with a gross income of approximately \$392,000, with a recovery factor of approximately 65% of all the oil they had in place. Of course that came about by migration, those sizable amounts. Now of that amount, of that 129,500 barrels, 93,400 approximately is unit oil. Now this we are recommending the Commission write an order to allow. Of that money, \$287,700 worth of gross income will be unit income, should have been unit income, if no migration had existed. We are willing for that to be allowed.

Q. Will you add to that figure, Mr. Weyler, the value of the production to date, the 43,856 barrels to date.

A. That 43,800 barrels to date had a gross income of approximately \$128,000, a few dollars either way, but that is pretty close.

Q. And the grand total, gross values that this property should achieve under our proposal, will be what?

A. That does total \$392,000. That includes the \$128,000. The \$392,000 gross income includes the \$128,000 of income to date.

Q. Does it include the oil that will be available during

the blow-down period?

A. It includes approximately \$61,600 worth of gross income derived from that blow-down production of 20,000 barrels

Q. Now, sir, will you compare that with the income that would be achieved from this point forward if the 40-barrel per day allowable now permitted as an exception was continued perpetually?

A. Per well for the two wells?

Q. Per well, yes, sir. Sixty barrel per day differential.

A. Sixty barrel per day differential. If each well were allowed to produce an amount of oil equal to 40 barrels per day from now until the life of the field, we would have these conditions: We would have again, to date, the same amount, 43,800 barrels production worth \$128,000 gross income. For the next nine years of production during the water injection period these wells would be allowed \$607,000 worth of gross income -- wait, I am sorry -- this amount I am reading now \$607,000 of income is the overage income only, \$607,000 worth of extra income from 197,100 additional barrels, which is the difference between 20 barrels a day for the next nine years and 80 barrels a day for the next nine years. Then again you would add to that the 20,000 barrels of recovery to be expected during blow-down work, another \$61,000; so their gross income during the entire life of the property under that scheme would be approximately \$796,600. Actually it's even more than that,

because there is another 20,000 barrels a day allowed, what we are recommending, for a total of \$999,100, or very close to 1 million dollars of gross income would be allowed these properties under that scheme. I am sorry I read the wrong figure to you the first time. That, by the way, would be a phenomenal recovery factor of 163.9% of all the oil they had under their properties to start with, which is remarkable.

Q. Let's not call it remarkable, Mr. Weyler. What does it prove to you with respect to drainage of unit oil?

A. It simply, of course, proves that very very great majority of all of their oil production is brought about through migration of oil and gas from their neighboring property, the Adena "J" Sand Unit.

Q. May we state again, to summarize, the gross amount of cash throw-off at the present price of oil that the Delaney tract will receive under our proposal?

A. Yes.

Q. Just state the total amount of cash throw-off that may be expected.

A. Under the proposal that we recommend, the Delaney properties will be allowed to produce a proper share of the "J" sand allowable which amounts to 14,000 barrels, which is 20 barrels per day, that their ultimate gross income from these properties would be \$392,000.

Q. Thank you, Mr. Weyler. If I haven't asked you, were

these last Exhibits G, H, and I prepared under your supervision and direction?

A. Yes, they were.

MR. STOCKMAR: We would like to present and ask their acceptance in evidence please.

COMM. BRETSCHNEIDER: We will accept them in evidence.

Q. Mr. Weyler, will you give us some figures on the costs to date of the secondary recovery operations that have been carried on?

A. Yes. To date our investment, not operating costs, but simply the investments which the unit has placed into this secondary recovery operation, is approximately one and three-quarter million dollars, of which Petroleum Incorporated as well as Pure and all others have contributed according to their share of the Adena "J" Sand Unit.

Q. But as owners of the Delaney tract, no participation in this expenditure has existed?

A. That is correct.

Q. What contemplated further expenditures do you foresee?

A. Well, we can foresee the amount of water which is going to cost the unit a million dollars just for the water that is to be injected; investments easily totaling another half to three-quarters, maybe a million dollars; operating costs, of course, added onto the unit by reason of this pressure maintenance program have very sizable figures. In

other words, this pressure maintenance project is going to cost the unit well over 2 million and maybe 3 million more dollars. Of course the profits are substantial also, but any tract or property which is not contributing to this amount and which reaps the benefit is given what we term a "free ride",

Q. Thank you, Mr. Weyler. I would like to revert for a moment to Commission Order 26-33, which is the order that provides for a 40-barrel per day production from the Delaney No. 2 well until paid out. It goes on to say, "Provided that such an oil allowable is produced without waste." May we have your opinion as to whether the Delaney No. 2 well can produce 40 barrels a day without waste?

A. The Delaney No. 2 well?

Q. Yes, sir.

A. For the first basis, no, because of the migration that that establishes. If the unit is producing something less than 14,000 barrels of oil, and any well, any well on that property produces 40 barrels, migration is going to occur, which is, as I understand it, under the statutes termed waste. Also our latest information is that this Petroleum Incorporated Delaney No. 2 well, which is the southernmost of the three Delaney wells, is producing at a gas-oil ratio of 1767, which is higher than that amount of oil that could be produced say on the unit properties, and therefore might constitute waste, although that is not substantially over the present Adena gas-

oil ratio. I would say that the Petroleum Incorporated No. 1 is presently producing, at least by test, witness test, a gas-oil ratio of 2643, that is the first well, which is substantially over the ratio of the Adena "J" Sand Unit production.

Q. Has there been a noticeable increase in gas-oil ratios in the Delaney production in the last few months?

A. Yes. We have here, I believe, most of the tests that were run and the ratios have gone up on the Delaney properties, at least by test, in the last six months or so. Take the previous test to these most recent were last year, in 1957, these that we have, and showed moderately lower ratios. Now they happen to have increased sizably.

Q. As a last question, Mr. Weyler, may we have your opinion as to whether you think the order we are proposing is fair and equitable and will tend to prevent waste and reasonably avoidable migration of oil?

A. Well, it will certainly reduce the amount of migrating oil, which if you can reduce waste it would be reducing waste in that manner. As far as equitable production from that property and from the unit properties both, it would establish a much more equitable sharing of the daily oil production.

MR. STOCKMAR: I think that concludes my examination of Mr. Weyler, if the Commission or staff have questions of him.

COMM. BRETSCHNEIDER: Any cross examination by any

of the other parties interested?

MR. KIRGIS: Yes, there will be, Mr. Commissioner, but I would like to have about a 10-minute recess before undertaking that, if I may.

COMM. BRETSCHNEIDER: Any questions you want to ask now or do you want a recess?

MR. JERSIN: I would rather wait until after the cross examination.

COMM. BRETSCHNEIDER: We will take a 10-minute recess.
(Whereupon a short recess was taken.)

COMM. BRETSCHNEIDER: Gentlemen, we are ready to resume the hearing. Mr. Kirgis, did you wish to cross examine the witness now?

MR. KIRGIS: Yes, sir, if I may.

COMM. BRETSCHNEIDER: You don't have any more witnesses?

MR. STOCKMAR: No, sir.

COMM. BRETSCHNEIDER: You may proceed then.

CROSS EXAMINATION

BY MR. KIRGIS:

Q. Mr. Weyler, if I understood you correctly in connection with particularly Exhibit F, which is a pressure differential map, you stated that there was a substantial increase in pressures on the Scanlon lease, is that right?

A. That is right.



Q. I believe you also said that was due to the fact that it had been shut in during a period of time prior to the later pressure survey, is that right?

A. Substantially shut in. We did produce some during that interim but not a great amount. I don't have the barrel-age. Would you like to know how much they produced off that property during that period? We have those figures.

Q. Is it a material amount or not?

A. No, it is not a material amount.

Q. Do you have any explanation as to why the gas-oil ratios on the Scanlon had become high?

A. That entire end of the field, the area of the field is tight. In fact the sand begins to get tight from here approximately south, which is the lower third of the Adena Field. It gets very tight as you go southwest in this direction. In fact that is what terminates the productive limits of the field. It gets so tight you can't produce anything; therefore, any rates of production down here will produce, after a period of time, somewhat higher gas-oil ratios than it would up here were it not as tight, because to get a certain rate of production with the pressure drop so high through the sand you have to reach out, you might think of a longer way to get some energy. It takes more energy to get the production that we are talking about and therefore you create a lower pressure around the well, breaking up more gas and solution,

etc., increasing the gas-oil ratio of those producing wells.

Now, the Scanlon wells, although they have a higher native amount of permeability feet or producing capacity than did the Delaney, had been produced during the period of primary production prior to unitization and during unitization and the cumulative amount created higher ratios in that area. That is experienced throughout the reservoir, but primarily the high ratio wells were in this area plus along the gas-oil contact, so therefore we produced those wells in limited amounts down there and eventually shut them in. As much as 5,000 to 1 gas-oil ratios existed down there in the field, and those wells are now shut in. That was a long answer but maybe I answered your question.

Q. Let me see if I can restate it shortly and you tell me whether I am right or wrong. You say that the reason for the high GOR's is because of the basic porosity in that part of the field?

A. More permeability condition than porosity.

Q. I mean permeability, I beg your pardon.

A. Yes, that is correct, that is very true. Well, there are a lot of contributing factors. It's very hard to key one factor.

Q. Might the prior production from the Scanlon wells -- let's take as an example Scanlon No. 5, which I believe is the direct offset to the Delaney -- might prior production from

that well have any effect on GOR's in that area?

A. Yes. Let's put it this way: Not only did the production from say Scanlon 5 have a bearing on the ratio of itself and other wells to other wells in the area, they all had a bearing on their own ratio plus the Scanlon ratio, because when you produce from an entire section of a field the production of one well actually influences the future characteristics of another; so the production characteristics of all of the wells down there are a function of the production rates of volume, etc., of the production of all of the wells in the area.

Q. Then I take it the method of production of these wells -- and I am taking the Scanlon No. 5 for an example but you can add others if you wish -- may have an effect upon the GOR's, is that right?

A. The Scanlon No. 5 definitely has an effect upon the GOR if it produced any oil, which it did. It has an effect on its GOR and an effect on the other GOR's in that area. Fluid and gas came out of that well.

Q. Now, is there anything peculiar because of the permeability condition which you have described which bears any direct relationship to the rate of production of those wells when you are thinking in terms of the effect on GOR's?

A. You mean the native rock permeability, what it might? I don't follow your question exactly.

Q. For an engineer I am sure that was an obtuse question. You have mentioned two particular factors which may have an effect on the GOR's: One is a permeability factor; another is the rate of production from any given well or group of wells.

A. That is right.

Q. Now, is there a relationship between those two things which should be kept in mind operationally for the purpose of controlling GOR's?

A. Those two factors are always considered if you are attempting to control gas-oil ratios and so are many other things, such as what is your sand thickness, how big is your reservoir, if you have a gas cap how big is the gas cap, and you have water-oil contact. Those two factors, permeability and rate of production, are two of the multitude of factors that you might consider when you are attempting to produce proper gas-oil ratios or keep them as low as possible in the reservoir; two of the many factors.

Q. Was there anything within your knowledge in the actual operation of wells and the rate of production from wells in this area which contributed to those high GOR's?

A. Well, I think we went over that pretty much, but to go back a little bit, before unitization everybody was producing under a certain set of field rules which allowed so much oil production and gas production from each well, and each property owner was trying to protect himself by producing

under the limits of the Commission's orders. Now the Commission orders couldn't take into account too much about permeability. They just said every well is the same and they ought to get the same oil and the same gas. So in certain type of thin areas the ratios increased more than it did in others because the voidage was greater out of those leases than they were out of another. The pressure was different in one lease with respect to another. Down in this area that was the case. The voidage per well was about the same but the production per unit volume was different, and the pressure dropped more than it did in other areas and the gas broke out of solution and it was produced, but certainly it was all within the scope or under the existing orders at that time.

Q. Let me move on now to another subject with relation basically I think to your Exhibit G, which is a cross section of three wells. It isn't up there but I don't know that it need be for the purpose of this. Well, perhaps it should be put up. Now, as that is on the board, its location is such that you can still point out the cross section, can't you, on that exhibit?

A. This is the bottom hole pressure map underneath. Yes, this is the December survey, but those are still the same circled wells here, here, and here, the three wells shown.

Q. Yes. Now is there another well actually which would be in line with that further to the west?

A. Yes, the Scanlon 3.

Q. To the west?

A. To the west of this, out here.

Q. That is east, I believe.

A. East, yes.

Q. I am talking west.

A. Yes, there is a dry hole out here in Section 26.

I think that is the Lion Edith.

Q. Is there a producing well in that west half of Section 26 where that dry hole is?

A. The Bruce is a producing oil well in the west half of 26 north of this Edith well, which is in line with these.

Q. North of your line here then?

A. That is right.

Q. Now looking at Exhibit G, there are on that, which is identified as well logs, is that correct?

A. Yes, these are electric logs.

Q. Now, if you stated I missed it what use you made of those or why they are there.

A. The electric logs?

Q. Yes.

A. I didn't discuss it, which maybe I should have done. The electric logs are simply there as aids to see the pay section as it was determined from core analysis to show how it looked on the electric log also. Of course the electric log

is another tool we have and you can see the pay section as drawn is also reflected by the electric log, and the quality of the sand definitely deteriorates in a westerly direction. It deteriorates badly, and by the time you get to this well you have this very thin pay section.

Q. Now, did I understand correctly that the basic material or data that you used for Exhibit G was core analysis material?

A. Yes, sir, that is correct.

Q. Will you state how much core was taken in each of these three wells that are depicted?

A. Well, these are not our properties. This is core analysis data published by Core Laboratories, Incorporated, which compiled a lot of cores that were taken. On Page 58 of that publication they show the Lion Oil Company Scanlon No. 2 -- I will have to count it here -- from 5756 to 5800 or a total of 44 feet of core for this well, Scanlon No. 2, 44 feet. The lower part of that core is shown here zero zero perm., no oil saturation.

Q. That was at the bottom of the 44 feet, is that right?

A. Yes, and we have here a net pay of 24 feet.

Q. And how is the net pay computed?

A. The net pay was computed in the same manner we computed net pay of all of the wells in the field when we were determining the oil in place, if we use the oil in place maps.

We called a foot of pay by core analysis, we called it a foot of pay if it had permeability in excess of 2-1/2 millidarcies and if it had some oil saturation and if it was over, which is in the record used in the previous order, above the oil-water contact point, etc., or below the gas-oil contact. All of this work was done by the committee, the geological and engineering committee, up to a certain date. Of course this well was drilled at a later date, but the same ground rules were used on all of the wells.

Q. Was connate water one of the factors in there? I think the former testimony indicated that.

A. That is correct. Only that was to gauge the amount of oil in a foot of pay with regard to the amount of oil in another foot of pay. That was a factor that the connate water or water saturation was brought in after we determined a foot of pay with another foot of pay we gave it a certain oil saturation according to connate water curves or transitional curves or whatever you might want to call them that were constructed by Core Laboratories after core analysis testing data, etc. That has all been discussed before.

Q. Yes, it has, I am sure. Now also how many feet of core were on the other two wells? Would it be permissible for you to write the total feet on the board there?

A. Total of 44 feet. Here's a copy of core analysis. I don't know, they might have cored more and not analyzed them

or something like that. Now this one was. I guess the "J" sand started at 5793, so that to 5816 would be about 23 feet. On this one of Scanlon 5 that appears to be the proper amount. Again we had zero zero permeability, zero permeabilities and no oil saturation on the bottom, and it definitely does not look as good as this one. The net pay section out of that 23 feet is 15 feet.

Now the Delaney No. 1 I guess is next. This is information which we could stand corrected on. However we do have this core analysis data from Petroleum Incorporated. Delaney No. 1, which shows they cored it from 5799 to 5818, which is 19 feet, so there is 19 feet of sand section approximately here and it's even worse as far as permeability and saturation.

Q. Now, you have used the phrase "worse" both as to the second one there whatever it is, Scanlon 5, is that it?

A. Yes.

Q. You said that was worse than two and now the Delaney is even worse. How are you using this phrase "worse"? What do you mean?

A. By looking at the permeabilities and seeing obviously that the total permeability feet of the well that is one is the best, this one is next, and this one can be the worst on that basis.

Q. You mean by that there are fewer feet of sand with

2.5 or better feet of permeability, is that right?

A. Where?

Q. You say these are better or worse.

A. Right. There is more permeability feet, millidarcy feet, here than here, and there is more millidarcy feet here than here, as shown by the bar graph that we had up in one of the exhibits.

Q. How is a millidarcy foot used as you have calculated it, Mr. Weyler?

A. Calculated? Well, it is a result of core analysis published by Core Laboratories. A millidarcy itself is -- we are getting into something--

Q. I am not trying to embarrass you, I am only trying to find out.

A. Well, a millidarcy is a thousandth of a darcy. They are both measures of permeability. It's the permeability of a sand to permit the flow.

Q. That I understand. Now how do you determine a millidarcy foot or a number of millidarcy feet?

A. Well, here is the way we did it here. We took the feet of pay section. We took the total -- I believe this is the way the computation was made -- we took the total feet of pay and multiplied it times the total millidarcies of the total pay section.

Q. In other words, I am just trying to understand this,

if this core analysis showed let us say 10 millidarcies for a one foot interval, that is 10 millidarcy feet then, is that correct?

A. That is right.

Q. And if for the next interval of one foot it showed 19 millidarcies then you have a total of 19 millidarcy feet, is that right?

A. Yes.

Q. And by the same token if anything was short of 2.5 millidarcies you would assign no millidarcy feet to it whatsoever, is that correct?

A. That is correct.

Q. In other words, if there were 10 feet that showed 2 millidarcies you wouldn't get 20 millidarcy feet out of that?

A. That is right. According to all the data we had anything less than 2.5 millidarcies will not contribute one bit of fluid.

Q. What is the data which is the basis of your statement that less than 2.5 millidarcies will not contribute any fluid?

A. We have to go back to some Core Laboratories, if you will permit me to introduce them. If you will permit me to read, I think we can do it better than me trying to remember it exactly.

Q. As long as you identify from what you are reading.

A. I certainly will. You know Core Laboratories did a

tremendous amount of work with regard to this field. I would like to read from the publication which was an attachment to a letter September 23, 1954, to Mr. W. M. Peck, reference Adena Plant Operators, and signed Mr. W. L. Horner.

Q. This is from Core Laboratories?

A. Yes, W. L. Horner of Core Laboratories, Core Laboratories stationery. He said, and I will have to read and keep going until we have had enough I think: "The thickness of net permeable productive sand was determined for each well within the productive area. It was found after thoroughly studying these data and after discussions with the operators and engineering committee members that for the purpose of this study net permeability sand should be defined as that sand having permeability to air by core analysis in excess of 2.5 millidarcies. This limit was adopted for the reasons as discussed below, and a subsequent check showed that net pay thickness determined from core analyses using this limit agreed closely with microlog interpretations of net pay. Therefore, within the total sand thickness, net permeability sand was determined from complete core analysis where available, using a cut-off of 2.5 millidarcies. Where core analysis was not complete, microlog or electric log measurements were used to determine net thickness. For some wells having complete core analysis, a cumulative effect of small shale breaks, indicated by the microlog core description to be present, was

not reflected by the core analysis data. In such cases the microlog pick of net pay was used."

Q. I am sorry, I don't want to just burden the record. Is there anything beyond that that is pertinent to this inquiry of why the 2.5 was used as a cut-off?

A. Also attempting to flood 2.5 millidarcies or less sand in the laboratory they couldn't do it, couldn't get fluids through it.

Q. That isn't what is said there, is it?

A. No, I said also. You said is there anything else. That was another reason.

Q. Do you know of your own knowledge that they actually did test the 2.5 and were unable to get fluids through it?

A. I understand--

Q. From what way, from whom?

A. From Core Laboratories that that was done.

Q. Just somebody in Core Laboratories?

A. Now that was a recollection of about two years ago. You asked for additional reasons. I am trying to remember what happened in 1954. The micrologs picks and the electric logs picks substantially agreed. This was one of the very first agreements that was unanimously made in a joint hearing in the geological committee, of which the Petroleum Incorporated representative was chairman. It was agreed upon at that time between Petroleum Incorporated, Lion, Pure, and everybody else

without one dissenting opinion. It has never been questioned to date.

Q. That was an agreement for the purpose of negotiating for a unit, wasn't it?

A. It was agreed among the geologists that that was a fact. It was used in determining values at a later date. That was not what the engineers and geologists did, they said anything less than 2.5 will not produce.

Q. That was done for purposes of negotiating a unit?

A. I guess that was one of the initial steps.

Q. Now you mentioned that some of these things were verified by electric logs. I am not sure which type of electric logs you mentioned.

A. Speaking of microlog.

Q. Does a microlog show you what has more or less 2.5 millidarcies of permeability?

A. Well, your microlog in the same section of the core, and by observation of just thousands of feet of core, it was obvious that they were picking up the very same thing. In other words, on the microlog we were getting a core analysis for say eight feet. Every bit of core was less than 2.5. Also as the geologist would say it would not pay on microlog analysis, so--

Q. Does a microlog actually show what is pay and what is not pay?

A. In certain cases it may, yes.

Q. It may?

A. Of course there is a great amount of dispute some times on actual interpretation of one man's interpretation of microlog analysis and another. However, in this case to this date there has never been any dispute with regard to the cut-off point of lower limits of production. The pay section, what is known pay by microlog core analysis, that was done by a committee, not me or Pure Oil Company, it was done by everybody and we all agreed upon it!

Q. That was a basis for negotiation on the unit, was it not?

COMM. BRETSCHNEIDER: Pardon me for just a moment. Are you trying to discredit the determination made by the committee as to where the cut-off point should be?

MR. KIRGIS: Yes.

COMM. BRETSCHNEIDER: Why don't you leave that for your engineer to produce evidence that another basis is the reason for one instead of going over all this detail which has already been decided on by a committee and already determined to be a factor in the unit.

MR. KIRGIS: We intend to do that, Mr. Commissioner, but my purpose in this cross examination on this point is to bring out from Mr. Weyler that there is nothing -- and I believe this is true, he may not agree with me -- there is

nothing sacrosanct about this thing, and the mere fact that the committee for purposes of getting some agreed factors for negotiation of a unit does not determine an ultimate engineering truth.

COMM. BRETSCHNEIDER: It may not be, but still it's a fact on which the unit was set up.

MR. KIRGIS: That is correct.

COMM. BRETSCHNEIDER: And if you expect to upset that I think you should produce testimony to show it was not a fair basis for whatever you have in mind and not take up so much time with this witness in going into the mechanics of determining the 2-1/2 millidarcy cut-off point.

MR. KIRGIS: Well, Mr. Commissioner, we intend to do that fully and we have exhibits and testimony prepared for that, but I think as a background for that I am entitled to cross examine this witness as to exactly what he did and what conclusions and what limitations he has applied in the testimony which he has given here.

COMM. BRETSCHNEIDER: He didn't do that. Core Laboratories did that and everybody knows the basis. You know the basis, your engineers know the basis.

MR. KIRGIS: He is the witness who is now from these facts drawing conclusions regarding migration of oil and things of that type.

COMM. BRETSCHNEIDER: That is right, but all I am

trying to do is to cut down on this lengthy cross examination.

MR. KIRGIS: I will try to make it as brief as I can. I think the point will be clear when our own affirmative evidence is presented.

A. In the final analysis, if you will pardon me, Mr. Kirgis, so often we will find that there is absolutely no oil in that rock anyway, as evidenced by the Petroleum Incorporated Delaney No. 1 core. The lower six feet that were cored had zero zero oil saturation, and all the others had pretty sorry oil saturation anyway, so it wouldn't produce any oil regardless.

Q. You mean that is what you stated as zero zero?

A. Yes. If there is none there it can't produce.

Q. I am not arguing that point.

A. But we still don't think it would give up anything. Here's another thing, Mr. Kirgis, about that: I think you will find that in normal production practice permeability is also regarded in relationship to the other permeability around it, and in normal time, in any producing time, if there is higher permeability associated with the lower permeability the lower permeability, even if it could give up something, wouldn't have time enough to do it. Of course it's a little difficult to start putting some time limits on this thing but for practical purposes we thought the committee made a pretty practical cut-off point. I will guarantee if you hadn't had

those eight feet in there that wouldn't be a producing well.

Q. Moving on to another subject now to clarify something that I apparently missed that was said shortly after your discussion of this, and I think it was actually in relationship to your Exhibit H, which is a bar graph that you actually referred to but we don't need to bother with that, but you said as to the Delaney No. 1 before treatment of the well that it made about 1-1/2 barrels per hour swabbing. Did I understand that correctly?

A. That was a report that we had, yes.

Q. Then I understood you were about to go on to say what it did after sand fracing, but I didn't get the figure if you gave it.

A. Well, all we have is immediately after, and I presume this was during the time. I think it was 15 barrels of oil per hour swabbing. I am not sure of that date, but of course when you fracture a well you pressure up the darn thing with pretty heavy pressure and it's going to kick back its load oil plus some additional production at some pretty fair rates. The only thing we can say about the satisfactory final effect of a well fracture job is that it kind of levels off.

Q. Now, you also said, I think, that the sand fracing gave this Delaney No. 1 access to the unit oil. Now how do you know that?

A. It allowed it to produce at high enough rates, which

if allowed to continue to produce at those high rates could do nothing but drain the unit if the unit was not producing its proper share for the total pool production.

Q. Now, do you know how far -- does anybody know -- how far let's call it the fissures which may have resulted from the sand fracing which might extend from the well bore?

A. I have absolutely no idea how far they went. Regardless, they increased what we normally term drainage rate by breaking down the formation and allow any fluid that would come to come at higher rates without as much pressure drop across any particular foot of sand.

Q. But you said any fluid that would drop, so it doesn't necessarily increase the area which may be drained, does it?

A. No, it doesn't.

Q. You are not suggesting that these fissures may go clear over on to the unit and be a pipeline?

A. No, sir, absolutely not, absolutely not. It doesn't increase the area that that well will drain, because even prior to fracture treatment if given enough time the Delaney No. 1 well could produce all of the oil out of the Adena Field, and after fracture the more it would do it in a shorter time.

Q. Did I understand you to say the Delaney No. 1 could produce everything in the field?

A. Yes, it could, all of the recoverable oil in the field.

Q. That one well could?

A. If given enough time.

Q. This has been a most uneconomic development then, hasn't it?

A. I didn't say anything about economics. I said time and total amount of production. In other words, it could deplete all of the reservoir pressure if given enough time. It certainly would not be economical, don't confuse the two. We were just talking about being possible.

Q. You mean from an engineering standpoint this one well could produce all the oil in the Adena Field, is that correct?

A. Yes.

Q. If it were the only well there?

A. I would say so, as long as it's in the same common source of supply and the rest are shut in.

Q. No other wells there?

A. Yes.

Q. Do you know how many pounds of sand entered the formation as a result of the sand fracing?

A. Ten thousand pounds.

Q. Do you know how much went into the formation and how much didn't?

A. No, I don't. I guess nobody does.

Q. Were any of the unit wells sand fraced?

A. Yes.

Q. Any in the neighborhood of the Delaney tract?

A. I am not sure. Some were actually fractured in the lower part of the sand attempting to increase the radius of drainage in the lower part of the sand, and some were sand fraced because they were too tight.

Q. Do you know whether Scanlon No. 5 or No. 2 was?

A. I don't believe they were.

MR. STOCKMAR: Gentlemen, I want to allow Mr. Kirgis as full a latitude on cross examination as you are willing to permit him, but I advise Mr. Weyler that he need not relearn all of the ancient history that we have been over here for the last two and one-half years, and if some point is to be made on things that he has not specifically covered on direct examination I would prefer that the Petroleum Inc., witnesses do so.

MR. KIRGIS: Mr. Stockmar, on direct examination, quite a point was made of sand fracing of the Delaney No. 1, and I am entitled to determine whether there was sand fracing of the unit wells in the area.

COMM. BRETSCHNEIDER: But can't you get to the point more directly without discussing all these technical things about which all these boys already know the answer?

MR. KIRGIS: I asked a simple question as to whether or not these other wells were sand fraced.

COMM. BRETSCHNEIDER: He said he didn't know.

MR. STOCKMAR: I am perfectly willing if we can take enough time for the information to be obtained and presented.

Q. Your answer is you don't know now?

A. I think my answer would more properly be I don't think they were. They were Lion wells when we got them, but I don't think they were since they got into the unit. I don't think they were ever fractured, but I can't say for sure.

Q. Now moving on to your Exhibit I, that is a graph showing Per Cent Recovery Versus Time.

A. Yes.

Q. One curve for the Delaney and one curve for the unit, am I right?

A. That is right.

Q. Now, are those curves, and therefore the information that is depicted by this Exhibit I, based entirely on your estimates of oil in place originally?

A. Estimates presuppose kind of guessing. They are calculated oil in place as determined by all of the various things we have discussed that have led to the construction of the oil and gas in place isopach and volume determined under each property from those maps. Yes, these percentages reflect percentages of those figures.

Q. In other words, just to take an example which may be ridiculous, I don't know, assuming that there were four times as much oil in place under the Delaney tract as you originally

computed, then I take it that that curve representing the percentage recovery against time on Delaney would be much flatter, isn't that right?

A. Your first assumption is correct, it is ridiculous.

Q. I asked you to answer the question, not to quarrel with the hypothesis.

A. However, it is true. The percentage shown here for the Petroleum Incorporated properties is a percentage of the original oil in place as shown on the oil isopachs, and with any other amount that percentage would thereupon be different.

Q. Then the answer to my question is a simple yes, is that right?

A. That is right. The mathematics preclude any other answer.

Q. Now you made reference to a material balance calculation, or I believe in fact two material balance calculations, but did not give us the method of that calculation nor the facts which constituted it. Did you make such a material balance calculation for the entire field?

A. That work has been done. I did not make it, but it was made under my direction by reservoir engineering personnel. This was Turner's method when we were referring to the calculations of solution gas drive mechanism. We can go into detail if you want.

Q. I am not too concerned about that. I do want to

ask a few things about it. Your testimony was not based, I take it, on a material balance calculation for the field as a whole, is that right?

A. That is correct, it wasn't necessary.

Q. I would like to ask you this: Could you explain to us at least the first step in the material balance calculation which you did make and to which you testified?

A. The first step? Well, it just depends on where you want to start. Now let's take the first one I made. The first step was the knowledge that when this property was drilled it encountered bottom hole pressure of approximately 1185 pounds, gas-oil ratio of approximately 720, in that neighborhood, one way or another doesn't make much difference, the fact that it had, by computation, 271 plus thousand reservoir barrels of oil in place and about 199,000 stock tank barrels.

Q. That is all I want. Then if I understand you correctly from your answer here, again your calculation of oil in place was a basic concept in the performance of your material balance calculation?

A. Yes, volumetric computation.

Q. Now as a general matter, and as an expert engineer, you consider a material balance calculation to be a reliable thing when it's related to any one lease in a field or any one small area in a field?

A. It can if you do what we did.

Q. Explain that to me.

A. I was going to. If you recall we made this assumption: Well, can we not assume properly this, that if there are 271,000 barrels of oil originally in place under this property, and that no migration occurs one way or another, and that the pressure conditions and gas and liquid saturation conditions exist, that from that point on according to Turner's material balance formula certain things will happen. Now those are the assumptions we made, and you are able to do that because you have in effect said this is a reservoir, migration will not occur, and this then should occur on the property by the material balance calculation; and that is absolutely proper. Now, I think what you are referring to is if migration occurs between two properties continually from time to time that you are not able, therefore, to say that you can make a material balance on one of these properties and consider no migration and have the end effect equal the new effect due to migration. No, that is not right, but we shouldn't confuse it. We made these presumptions to see if they produced without migration, then that can be considered properly.

Q. But migration is inevitable no matter how well a field is managed, is it not?

A. It sure is. You can't say there is no migration. We are not trying to say that. We are simply trying to cut it down to a minimum, but still our assumptions are proper.

Q. And just to be sure that I am clear on it, one of the basic assumptions is the oil-in-place calculation?

A. That is very correct.

MR. KIRGIS: No further cross examination, Mr. Commissioner.

BY MR. HAFFKE:

Q. Mr. Weyler, as I understand this migration, it's more or less a 2-way street, is that correct?

A. It can be, yes, sir.

Q. In other words, your oil migrates over toward the gas cap, and now that you are putting water in you are forcing it to go back through the same street?

A. That isn't the only reason it's going back, but if there is any pressure differential between two properties it would.

Q. But you are creating an additional pressure, and the oil migrates back and forth.

A. It's migrating anyway. We are going to give it an extra boost.

Q. Before you testified it was migrating the other way.

A. Before the property was drilled it is my opinion that some oil migrated from this property, yes.

Q. Now you said something about a dry hole, and I admit my ignorance, but I assume in your connotation or explanation of a dry hole it is one that will not give up oil, is that correct?

A. Well, no. I would say it was one that the particular operator did not want to continue to produce because it was not economical to produce.

Q. Let me ask you a hypothetical question on one of these exhibits you had up there. I am not certain as to the exact identification of it, but I think it was Exhibit E, in which there was an area in the middle which showed where your water pressure or water wells were.

A. Oh, yes.

Q. And in that area as I understand you testified that that was now saturated with water, is that correct?

A. Well, to a very large extent. It is not depleted, there is still some additional oil there and some trapped gas and connate water. Probably if you drilled a well right down there you would have a water well, I will put it that way.

Q. And you would call that a dry hole? I mean that is in the connotation that you used as dry hole?

A. For a period of time, yes. It would depend on how close that was to the oil and how fast you would produce that well whether you could suck the oil back through and make a well.

Q. Now then in understanding all of your testimony here it seems to me that you absolutely predicated all of your computations on one assumption, that your isopach map, reflecting oil in place, is absolutely correct, was that true?

A. Well, let me--

Q. You can answer yes or no.

A. Yes, that is correct.

Q. Now basing that assumption -- let's take a hypothetical question -- if that is not true and using that Exhibit I, for example, and there were in fact five million barrels of oil in place, then your computations are all in an entire reverse order, aren't they?

A. Five million where?

Q. Just a hypothetical question.

A. On that property?

Q. No, I said hypothetical question. Assuming that your computation as to the absolute oil in place line there is wrong, and assume that in fact there was five million barrels of oil in place, is that clear?

A. I don't know where this five million comes from.

COMM. DILLON: Is that proper cross examination?

COMM. BRETSCHNEIDER: You are building up a hypothetical question that doesn't discover anything.

MR. STOCKMAR: Gentlemen, I am perfectly willing myself to allow it if Mr. Haffke will make it a little clearer that it's an entirely hypothetical situation we are talking about. In other words, eliminate from your mind what you believe to be the facts and go along with the question.

A. I am still not sure where you mean this five million

might exist.

COMM. DILLON: He is just assuming that.

Q. Assume there is five million barrels. Is that the current isopach map right there that you are using?

A. Yes, sir.

Q. And as I remember your testimony you have computed something like--

A. No, that is not, that is a pressure map, excuse me.

Q. Exhibit A.

A. Here it is.

Q. All right, your testimony was based on the fact that from Exhibit A, your isopach map there, you have computed so many hundred thousand barrels of oil in place, and from there you proceed with these other exhibits, proceed with all your ratios, and I think you have answered that is correct, that that is your basic premise. Just for personal clarification, if we hypothesize as a hypothetical question, say instead of that figure, supposing it should be say five million.

A. All right.

Q. Then all of your exhibits are just in reverse order, aren't they?

A. Not in reverse order, no.

Q. I mean the result would be that if there is any more barrels of oil in place in that particular area, and there are enough more barrels of oil in place, your formula here would

inure to a greater benefit to that unit, I mean that area and to detract from the unit. If we take Exhibit I, that curve would level out and might even go down this way on the Delaney production.

A. I see what you mean, yes.

Q. Now, as I understand it you are now proposing to the Commission here that this is absolute computation on barrels of oil in place?

A. It is our best information to date. It may be too much. In other words, we--

Q. Now, Mr. Weyler, let me just ask for clarification here, I think you are in this realm, it is or it isn't or you don't know.

COMM. DILLON: Does that help to determine the issue here?

MR. HAFFKE: Yes, it does very much, Mr. Dillon.

COMM. BRETSCHNEIDER: Core Laboratories made the basis, and you ought to know whether it's correct. The only way to find out whether it's correct or not is drill more wells around there.

MR. HAFFKE: I agree with you entirely.

COMM. BRETSCHNEIDER: But it's correct as far as anybody knows now.

MR. HAFFKE: No, it's not.

COMM. BRETSCHNEIDER: The basis from which we have

to determine this problem is on what we know now, and if you draw up a hypothetical question we can't take any notice of a hypothetical question. You can say anything, you can build up anything.

MR. HAPFKE: Exactly.

COMM. BRETSCHNEIDER: We don't look at a hypothetical question and I think you are wasting our time by going into a problem like that.

Q. Mr. Weyler, would you refer back to the isopach map of 1955. Do you have it there?

A. Yes, we do. You mean the first one that the committee made before the drilling of any wells on the property?

Q. None on the Delaney property at all.

A. All right.

Q. Now, what was your computation at that time?

A. The computation at that time, the exact figure I don't have. I think it's probably somewhere. It was the best data we had then without drilling.

Q. And at that time it was presented to the Commission for the unit, wasn't it?

A. Yes, that is correct.

MR. STOCKMAR: Not that one.

Q. Which one was the one that was presented?

A. This was used by the unit to make a unitization formula.

Q. If I remember correctly there were just a few thousand barrels of oil allowed at that time?

A. That is right.

Q. And what was that date?

A. That was May, 1955.

Q. Where is the one that next followed that that you had in your exhibits? Now when was that?

A. That was presented to the Commission in the hearing in July, 1956, after the completion of Delaney No. 1.

Q. Is that the exhibit that was presented to this Commission and upon which their order was drawn which resulted in a 9-barrel a day allowable?

A. That is correct.

Q. At that time, Mr. Weyler, am I to assume it to be correct that had it not been for the foresight of this Commission, Pure Oil would have accepted that and never raised any objection and drained the 26 notwithstanding what has developed because the Commission had allowed further development?

A. That is absolutely correct. That was our data to that date. That was our information to that date.

Q. Now, to this date we have had three changes of that line, have we not, sir?

A. No, we have one change in it since the drilling of two more wells.

Q. But before that the first one formed the unit and

then the second and third?

A. Let me say this, Mr. Haffke, you said you presumed this was the only data that we would use. We might have found pressure data or some other particular data which would have shown--

Q. You are not proposing that you would have investigated on your own on behalf of the unit to give the benefit to 26, are you?

A. We sure have been investigating any information we could because we don't know that it might have been eight or six or two barrels as shown by later drilling. There was nothing to indicate that you might not go up here and drill a dry hole with no oil at all and reduce it, as later development along the gas-oil contact showed that in the drilling of a particular location we reduced the oil in place. Every time you drill a hole you don't add to this map. It could be heavy.

Q. It could be light too.

A. It could be either way.

Q. And the only way you are going to know is by further development?

A. That would improve your knowledge, that is correct.

Q. And if we should have a much greater reservoir down there than you presently suspect, you will never find it unless you encourage development enough, will you?

A. I cannot speak for the operator of that property. I don't think I would drill there.

Q. There is another question that bothers me, and maybe you can help me illustrate it on the blackboard. It's a pure hypothetical question. On the graphs, and I have seen some of them, I assume there is a formation that forms a pretty general trend up one way, is that correct?

A. A general trend up one way.

Q. Just for illustration, some place along here there is a trap, is that correct?

A. Correct.

Q. All right, is it pretty uniform that the gas also migrates up to the top of that trap?

A. Yes, until you drill it, and the wells start changing the static conditions that were brought about through migration of hydrocarbons and geologic time. You generally find the gas at the high point.

Q. Now then, there is another area in here some place which I think you usually refer to as oil-water contact, don't you?

A. Yes, oil-water contact.

Q. This area in here is oil generally?

A. Not all of it.

Q. I am talking about originally, before we tap it.

A. It is both oil and water and gas in solution and in varying degrees.

Q. Yes, but that is where you probably get the oil production.

A. Yes, although you can drill above the established oil-water contact and get nothing but water very often.

Q. You can do that?

A. Yes, nothing but water, even though there is some oil saturation there.

Q. Now then what is usually down here?

A. Water.

Q. Water?

A. Sometimes there is some oil saturation that might have or probably occurred during the migration of the hydrocarbons.

Q. Now then when you talk about original oil in place, I presume that in your computation you are assuming something like this before anybody has tapped it at all, is that right?

A. Yes.

Q. That is what you are trying to compute back?

A. If you knew the trap was there and it had oil and gas capped and water contact, that would be the figure you might guess is there. A geologist guesses it is there before they drill.

Q. Let me ask a question there. What if half of this oil was taken up in this area, what happens?

A. Half?

Q. Yes, nothing down this way.

COMM. DILLON: I think we are getting away from the issues. I don't think that will help the Commission determine this matter.

MR. HAFFKE: Commissioner Dillon, I think when we have the direct evidence it will clarify it.

COMM. DILLON: We can't determine it on assumptions. We must stay with the facts.

COMM. BRETSCHNEIDER: He has already gone over the facts.

MR. HAFFKE: May I ask one more question?

COMM. BRETSCHNEIDER: Yes, but please don't get into a long discussion about something we don't care about.

Q. All right, this is the question, and I call the Commission's attention to it, if the oil is pulled out of this and the water migrates this way and at a later date a well is drilled here, you probably get a dry hole with water, won't you?

A. Mr. Haffke, that depends on very many things. Actually if the production up here has migrated and the water is up through that area completely, you could get a dry hole, I will admit that. I don't see how in the world that has anything to do with that property down there.

COMM. DILLON: I would like to admonish the witness to just answer the questions and not argue the matter with counsel.

THE WITNESS: Yes, sir.

MR. HAFFKE: I believe that is all.

MR. ROBISON: I would like to ask Mr. Weyler a few questions.

BY MR. ROBISON:

Q. Mr. Weyler, I think you neglected to mention what the effective pay was given to the Robison No. 2. Could you clarify that for me?

A. The pay thickness in total feet?

MR. STOCKMAR: What is the information that you are after?

MR. ROBISON: The effective pay. He gave all the other wells but he didn't mention the effective pay that was given to the Robison No. 2 to give it a 52 basis on your theory, 52 barrels of oil per day.

A. Eleven feet, Mr. Robison.

Q. Now on this map, I think you mentioned that the Scanlon No. 5 was given 15 feet of effective pay.

A. That is correct.

Q. On your contour lines you have on the Scanlon No. 5 12,436.6?

A. Yes, sir.

Q. On the Robison No. 2 you have 5,537?

A. Yes, sir.

Q. There is four feet difference in effective pay

according to your figures.

A. That is correct.

Q. What is the big difference between those two wells in the amount of your contours?

A. Well, there is a difference of porosity, which is probably not very significant. Probably the largest difference in original oil in place is the permeability. Now the permeability of the Robison average is less, considerably, than the Scanlon No. 5; therefore, the water saturation on that property is higher as evidenced by permeability found by core analysis. If the water saturation is considerably higher, the oil saturation is considerably lower, and that is what I was talking about when I said we try to find the true oil saturation as evidenced by core analysis of each well. We used the curves constructed by Core Laboratories, Incorporated, which you take the permeability of each foot is so high above the oil-water contact, and so you can pick a water saturation and therefore an oil saturation.

Q. Now on this contour of 12,434.6, how do you know that it goes here instead of down here?

A. Well--

Q. You have no wells to indicate that except the furthest most wells which are 40 acres between.

A. This was all done the same way. In other words, it was mechanically contoured to start with. In other words, the

10,000 line should be so close to the 12 and so close to the 5 according to how much difference there is between the 5500 and the 12, so it would be closer to the 12 than it would the 55.

MR. STOCKMAR: May I caution you again just to specifically answer the questions and don't go into any more detail than required.

Q. Most of these lines are even, but this is quite a gap right here.

A. Yes. You will notice things like that throughout the map. Look at that little high right there, that is even more of an odd condition than that. There is a gap there as evidenced by the core analysis.

MR. ROBISON: I think that is all I have.

COMM. BRETSCHNEIDER: Does anyone else wish to cross examine the witness? Do you want to ask him any questions?

BY MR. JERSIN:

Q. Mr. Weyler, just one question. You presented several exhibits with isopach maps where committees agreed on the interpretation. Would you mind going through those exhibits and state where a Petroleum Incorporated representative approved or had no objection to the interpretation or was a member of the committee that approved it?

A. He is not here today. This is the first one constructed by the joint geological and engineering committee of

which Mr. Cowdrey of Petroleum Incorporated was chairman. The committee finally unanimously approved this map as being that map representative of the original oil and gas in place under each property, and submitted it to the Adena Unit Operators for purposes of computing unitization factors. This is the product, and after months and months of work we agreed upon this map.

Q. There are some properties in the unit which originally were operated by Petroleum Incorporated?

A. Yes.

Q. Referring to those properties, what was the cut-off point on the permeability?

A. The cut-off point on the permeability on these other four properties of Petroleum Incorporated was the same, 2-1/2 millidarcies or less. The cut-off point was the 2-1/2 millidarcies.

Q. Is that true for every lease that is now a part of the unit?

A. That is true of every lease now a part of the Adena Unit, yes, sir.

Q. Was that cut-off point agreed to by the representative of Petroleum Incorporated at these committee meetings?

A. Yes, sir. That was one of the very first agreed upon factors that would be used in the construction of these maps.

*Fred Kirgis - Comm. Not held to
Unit Negotiations!!*

MR. JERSIN: I believe that is all, Mr. Bretschneider

MR. STOCKMAR: No redirect.

COMM. BRETSCHNEIDER: If there is no redirect, the witness is excused. Mr. Kirgis, would you like to present your case now?

MR. KIRGIS: We are ready to proceed. I would like to make a very brief opening statement and then start with our presentation.

COMM. BRETSCHNEIDER: All right, sir, you may proceed.

MR. KIRGIS: I would like to make this point first. It has been made, but I am not sure it has been made clearly: It is our position, and in this we believe very sincerely, that what may have been agreed upon, whether Petroleum Incorporated participated or not, but what may have been agreed upon for purposes of negotiating a unit is a different thing from that which binds this Commission. Now the Commission may come to similar conclusions, but this field is, as we see it, let us call it a 3-lease field. There is a Robison tract, which is a lease. We happen to have no concern with that. There is the Delaney tract, which is a lease. Then for operational purposes there is a unit, which is just as though it was another and a separate lease.

Now that unit is, of course, made up of a group of leases, as we all know. Those people, and that includes Petroleum, Inc., as to the properties that are within the unit

agreed upon certain things for the purpose of negotiating. You and I may negotiate a contract and neither of us agree really with what we have done, but we have arrived at a conclusion which is acceptable to us both for the purpose of that contract.

Now the mere fact, as we see it, that the operators within the unit have agreed upon a certain limitation, whether it's 2-1/2 millidarcies or some other thing to be applied in their negotiations to reach an agreement among themselves, does not ipso facto mean that that is a standard which must be accepted. Maybe it will be accepted, but it need not be accepted by this Commission whose function it is to find out what the actual fact is, and the actual fact may vary from that which has been agreed. Just as in your contract and mine, we may arrive at a conclusion that is not quite satisfactory to either of us, but knowing that we have different views we are willing to accept it. Now the acceptance of any such thing has not been controlling upon this Commission, whose function it is to find out for itself what the true facts are.

Now that is the premise of our position, and we propose to show to this Commission, and by the way in doing this we are going to accept most of these same factors. We are, for one part of our presentation, going to accept for instance the 2.5 millidarcy limitation and show to this Commission that in our judgment -- and this is based upon

Kingis-Pet doc. accepts 2.5 md !!

engineering analysis and the engineers will be before you for examination -- that the oil in place here is something quite different from that which has heretofore been assumed to be the fact. We believe we have competent evidence for that and we will present it.

Now our position is this: That the actual oil in place is different from that which has heretofore been assumed. Our position, secondly, beyond that is that some of these limitations apply, which we are accepting for our first computation such as the 2.5 millidarcies and so on, are very conservative. There may even be more oil in place than actually can be recovered. Beyond that we also are going to bring out what we believe to be drainage pattern, and much has been made of that factor by the unit operator.

We think the drainage situation is something different, and in that connection we will point out that the drainage computation which has been given here are again based on the computation of oil in place rather than an actual analysis of drainage as such, and we will have evidence on that point. Beyond that we will have very briefly reference to the fact that in any field, not just Adena, but any field some special consideration has to be given to edge wells if any field is to be developed so that the ultimate limits of recovery can be determined, and therefore the greatest ultimate recovery can be had for the benefit not only of the owners of

that field but of the State of Colorado; that there has to be some special treatment of an edge well which will permit that well to be drilled and permit it to be operated at a reasonable profit, not a large profit; and it certainly is our position that what we seek is not in any way taking unit oil.

Now, with that brief statement I would like to call our first witness, if I may, Mr. John McLeland. If it will not be too confusing, we have large copies of exhibits that will be put up as we go along and we have smaller copies in a binder, and while I am interrogating Mr. McLeland about his background we will distribute the smaller copies.

JOHN McLELAND

called as a witness on behalf of Petroleum Incorporated, being first duly sworn, upon his oath testified as follows:

DIRECT EXAMINATION

BY MR. KIRGIS:

Q. Mr. McLeland, will you state your name.

A. John McLeland.

Q. And your age, Mr. McLeland?

A. Thirty-one.

Q. What is your occupation or profession?

A. Petroleum Engineer.

Q. What is your present employment?

A. With Petroleum Incorporated.

Q. For how long have you been associated with Petroleum Incorporated?

A. I joined Petroleum Incorporated in September of 1956.

COMM. BRETSCHNEIDER: If there are no objections from anyone, we will accept him as an expert witness.

MR. STOCKMAR: I am not acquainted with Mr. McLeland. I don't know why he is being called.

MR. KIRGIS: I would propose to do this, if I may go through his functions to show what experience he has had for the type of thing which he is doing here, I think that is what you want, isn't it?

MR. STOCKMAR: I want to know whether he is a geologist or engineer.

MR. KIRGIS: He said he is a petroleum engineer.

MR. STOCKMAR: I am sorry, I missed it. Then we accept his qualifications.

Q. From what school did you graduate and with what degree?

A. From the University of Tulsa in July, 1951, with a B.S. in petroleum engineering.

Q. Coming back to your present functions with Petroleum Inc., what are your functions?

A. My chief duties are in the establishment of oil and gas reserves, the evaluation of properties, the preparation of subsurface reports, and attendance in unitization and also engineering committee work.

Q. Have you had any special training and experience in

the interpretation of electric logs and core data?

A. In the fall of 1951 I took a course under Dr. Hamilton at the University of Tulsa in night school. Subsequent to that time, during my experience with the Texas Company, I attended three different logging schools that they presented, and since that time I have attended the Schlumberger Service Schools at Great Bend, Kansas, and beyond that I have interpreted logs for Petroleum Incorporated since that time.

Q. Now, let us put up Exhibit No. 1. Mr. McLeland, by whom was this prepared?

A. This exhibit was prepared by me.

Q. Will you state what the base map is as distinguished from the contour lines and coloring that appear?

A. In so far as I know, the base map would be the original map used by the geological and engineering committees in the formation of the Adena Field.

Q. What is portrayed by the base map, generally speaking

A. These lines that are drawn around the periphery of the pool on the east side of the field.

Q. You are going now out to the heavy line?

A. The heavy line, the east side of the field. This line is generally coincident with the zero gas-in-place line as interpreted by the engineering committee. On the west side of the field, this line generally conforms with the zero oil-in-place line which was established by the Adena Field

Engineering and Geological Committee. It also is a rough estimate of the oil-water contact in the "J" sand. In the south end of the field these dashed lines are my interpretation and revision in so far as they affect the oil-in-place calculations in that area.

Q. Now, does this map also show the producing wells in this field?

A. It does. The producing oil wells are shown by a closed circle. Those are the oil wells that were completed in the field. The zero or the open circles that have four lines perpendicular to them are abandoned holes. The circles which show that are open, which show rays like on a sun, were the gas wells that were completed in the gas cap area of the Adena Field.

Q. Now, did I understand you correctly that the hatched dark lines in the southwest corner are your interpretation that you will substantiate later, is that correct?

A. That is correct.

COMM. BRETSCHNEIDER: You mean the broken line?

THE WITNESS: These broken lines around here, yes.

COMM. BRETSCHNEIDER: The broken line on your map is different than it is on the maps in these folders.

THE WITNESS: It's very close to what you have there.

COMM. BRETSCHNEIDER: Your broken line starts there about where the figure 23 is. Here it starts almost down in

Section 26.

THE WITNESS: This line here is actually the demarcation of the engineering committee and what, I think, is Pure's interpretation of the area at the present time, so I would assume that this is the correct revision point.

COMM. BRETSCHNEIDER: Why is this different?

THE WITNESS: The only thing that I can say there is that I prepared the large map, and that subsequent to that a draftsman drafted those on, so there may be some slight change.

COMM. BRETSCHNEIDER: This line on this side is also different. I just want to call attention to that fact.

THE WITNESS: That would be the only explanation that I would have.

Q. In other words, the large map, which is the exhibit itself, is the one which is accurate to your knowledge?

A. To my knowledge that is correct.

Q. What is the pink area shown in the lower left-hand corner?

A. The pink area is the Delaney lease which is operated by Petroleum Incorporated. It lies in the east half of Section 26, constituting 320 acres.

Q. Will you point out specifically and identify the wells on that pink area.

A. The northeastern-most well is the Petroleum Incorporated Delaney No. 3, which was completed in December of 1957.

Going south of that one 40-acre location, you find Petroleum Incorporated Delaney No. 1, which was completed in May of 1956. On south of that you will find the Delaney No. 2, which was completed in March, I believe, of 1957.

Q. Now, there are certain lines also in that southwest area marked A-A Prime and B-B Prime. Will you state generally what they are?

A. These lines refer to cross sections which were prepared and will be presented at a later date. Cross Section A Prime A extends from within the field similar to what Pure presented, with the exception that we extended it to include the Lion Oil Company Edith No. 1, which is located in the northwest quarter of Section 26.

Q. Is this then basically an orientation map, is that its purpose?

A. That is true.

Q. Now looking at the fact that this does show existing wells, are there 40-acre tracts within the unit which are in fact undrilled?

A. Yes, there are. You will note here in the base map, which I think is in the small exhibits, that there is an undrilled location within the unit area and within the zero oil in place line, which is located in the southeast quarter of Section 29. There is another undrilled location in the southwest quarter of Section 29. There is an off-pattern well

drilled in the southwest quarter of Section 32. In Section 1 on this side of the field there are apparently two 40-acre locations which have not been drilled, if you interpret the zero oil-in-place line as being correct; and I think you will find generally that in the southwestern area down in the immediate area of the Delaney lease there is one undrilled location, particularly on the James L. Scanlon lease, which is located on Tract 82, which would be in the northeast quarter of Section 25.

Q. Do you know whether or not oil production has in fact been assigned to those undrilled tracts or any of them?

A. It is my understanding that the entirety of the allowable in the Adena Field or Adena Unit is assigned to all acreage with respect to oil in place underlying that, whether they were drilled and proven productive or not.

Q. Do you have anything further you wish to add regarding this Exhibit No. 1?

A. I believe that is all.

MR. KIRGIS: Now, just by reason of mechanics and getting these things together and getting additional ones put in, we will have some numbers or some designations as 1-A and 1-B, which I hope the Commission will pardon. The next one in the booklet is Exhibit 1-A.

Q. Mr. McLeland, who prepared Exhibit 1-A?

A. I did.



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Q. What generally does it purport to show?

A. It shows the procedure in which I arrived at an oil-in-place calculation underlying the Delaney No. 1, which is operated by Petroleum Incorporated. On the left-hand side of this exhibit core analysis data has been presented. On the right-hand side of the exhibit are the oil-in-place calculations for this particular well.

Q. Generally are you familiar with the methods used by the engineering committee of the unit in making these computations of the oil in place?

A. I am.

Q. In the preparation of this exhibit have you or have you not undertaken to follow those same methods?

A. Yes. I have followed the same limits using those which were supposedly -- I guess they were accepted by the engineering and geological committees of the Adena Unit -- those limits being 2-1/2 millidarcies and a measurable oil saturation.

Q. Now what is the source of the data shown in the various columns on Exhibit 1-A?

A. To the left on this exhibit for the Delaney No. 1, Column 1 is a measured depth from ground level. This also is in reference to the core analysis interval and depth below ground level which was conducted and which was considered as pay. The second column is a subsea depth related to sea level.

The third column is the permeability which was measured by laboratory analysis. The fourth column is porosity which was also measured by laboratory analysis. The fifth column is the residual oil saturation which is determined by retort analysis during the laboratory inspection in preparation of the analysis of the core.

Q. What is the significance of oil saturation as so determined from core analysis?

A. Core analysis, when you take a core from the ground you first must suffer a reduction in pressure. That reduction in pressure causes a loss of fluid which was originally in the core. This loss of fluid might be water and it also might be oil. Therefore, I speak of the oil saturation which is measured in the laboratory as a residual oil saturation.

Q. Proceed, I am sorry to have interrupted you.

A. Under the oil-in-place calculations, applying similar methods which were used by the Adena engineering committee, the sixth column shows the height above the water table which was chosen for this well as minus 1147 feet. The seventh column shows water saturation which results from the relationship which the engineering committee used, which is Exhibit 2 I believe, that Pure has presented at the previous hearing. The eighth column is the oil saturation, which is simply an arithmetical calculation resulting from the water saturation and determination by that previous exhibit. The ninth or tenth

column is the oil-in-place calculations per oil in foot.

Q. This is the ninth column, isn't it?

A. The ninth column is the oil-in-place calculation per foot, which uses the previous factors to arrive at the hydrocarbon value within each foot. The tenth column is the cumulative oil in place assignable to that well, which would be for this particular well, at a depth of 5808, some 5 thousand and 2.9 barrels per acre.

Q. Now, were there cores taken below surface depth 5808?

A. Yes. We cored this well some five feet and had it analyzed below the depth which is shown here, which would be 5813. In those five feet no oil saturation existed, and two feet showed zero permeability and three feet showed permeabilities less than 2-1/2. They were not considered in this calculation.

Q. Now what is your purpose, Mr. McLeland, in the preparation of this exhibit?

A. The purpose in showing this exhibit is to enable your comparison of our method of calculation with the engineering committee, and also to show that some variation can exist between our calculations and those shown by Pure's calculations. I believe there is a slight difference here, but it's insignificant in this particular well.

Q. Now will you turn to Exhibit 1-B.

A. Yes, sir.

Q. Who prepared this exhibit, Mr. McLeland?

A. I did.

Q. Generally speaking, what is it?

A. This is a similar computation to Exhibit 1-A, with the exception of additional estimation of oil in place below the core depth of that well.

Q. Does this Exhibit 1-B relate to a different well, and if so what well?

A. It relates to Petroleum Incorporated's Delaney No. 2. This well is located in the southeast northeast southeast of Section 26.

Q. What is the source of data, leaving out for the moment the item in the fourth column bearing designation "L", what is the source of the data other than that?

A. The source data were the other information which lies above that point from the depth of 5844 to a depth of 5852 is from core analysis data which was obtained from the Core Laboratories.

Q. Now, will you explain the significance of this designation "L" which appears in the fourth column opposite some of the values shown there?

A. This column at that point represents a means of comparison between log calculated porosity for the interval below this depth and core porosity; in other words, to determine what porosity would be relative to core analysis. We have

analyzed the log for some five feet through the interval that was cored. We have related this by graph to obtain a relationship between log calculated porosity at a depth below coring point in order to arrive at this porosity calculation.

Q. Now let me see if I understand, these items that are designated "L" under the heading porosity, those are calculated rather than taken directly from core analysis, is that right?

A. They are calculated. However, they are not the calculated log porosities; they have been related to core porosities through the interval that was cored.

Q. Now let us move to Exhibit 1-C. Does that in any way serve as explanation for what you have done in arriving at the values designated "L" on Exhibit 1-B?

A. Yes. This Exhibit 1-C is a graph presentation of our method used to arrive at the correction factor necessary to relate log calculated porosity to the core porosity. The calculations were made at intervals of 5847 through 5850. Those five points were plotted and a mean average line was drawn through there in order to enable the relationship of log calculated porosity below coring depth as was stated previously.

Q. Did you prepare this Exhibit 1-C?

A. I did.

Q. Now in doing this, and following the method which you have described, have you followed an accepted engineering method?

A. Yes.

Q. Now does Exhibit 1-D bear any relationship to the explanation of the work done by you to arrive at the "L" values on Exhibit 1-B?

A. Yes, it does.

Q. Did you prepare this Exhibit 1-D?

A. I did.

Q. Will you state from what you prepared it and what its significance may be?

A. Exhibit 1-D was prepared from core analysis data of 18 wells in the immediate area. They constituted roughly the Bruce No. 1, the Delaney No. 1, the Delaney No. 2, the Delaney No. 3, the Dewey 3 -- I may take some time to locate that one.

Q. Are they listed at the top of the exhibit?

A. They are listed at the top of the exhibit, and it's roughly from this point on down. It included some wells on the Scritsmeir lease, I believe it also included -- no, it did not include any wells in south Adena, it was generally all of the wells south of the line I would say from Section 13 and 18 on down which was considered and stated previously as a tight area.

Q. Now, what calculations are portrayed by this or what result is portrayed by this, speaking of Exhibit 1-D?

A. With respect to 1-D, no direct calculations were made. It has merely necessitated the plotting of porosity

versus permeability for the core data of all of these 18 wells. After plotting all of these points for these core analysis, I then constructed a mean average line through the center. With this mean average line you may then relate porosity to permeability. As you know, it is necessary to have a permeability value in order to go through the calculations of oil in place which were used in the previous calculations by the Adena engineering committee, so this map was generally constructed for that purpose.

Q. You said map, I believe you meant graph, did you not?

A. That is right.

Q. Is this a generally accepted engineering method of determining such relationship?

A. Yes, it is, and I believe a graph similar to this is also present in the Core Lab study, although it is an average of all core analysis throughout the entirety of the Adena Field. This graph represents an average of core analysis data with respect to this area which is considered tight.

Q. Now, do the data then which you have plotted on Exhibit 1-C and 1-D form a basis for your calculations of porosity values on Exhibit 1-B below the coring depth?

A. They do. It is not marked on your Exhibit 1-B, but they should have been marked at 5853. The permeability should have an "E" after it. In other words, those are not measured permeability values, they were obtained by means of construction

of these graphs.

Q. Then as to both the third and fourth column, permeability and porosity on Exhibit 1-B, you have constructed values, constructed by means of the data shown on Exhibits 1-C and 1-D, is that correct?

A. That is correct.

Q. And you have used that by reason of the absence of core data at the depths below 5853 or 5852 in the Delaney No. 2, is that correct?

A. That is correct. And you will also note that at a depth of 5852, which was the base of the cores for this particular well, that a permeability value measured in the laboratory was 23 millidarcies and a porosity of 10.2%. In other words, there is nothing to indicate that pay does not exist below that depth, and for that reason these calculations were made for the rest of the section.

Q. Was the well Delaney No. 2 in fact drilled through the entire series of depth shown on Exhibit 1-B?

A. It was.

Q. Now, will you turn, Mr. McLeland, to Exhibit 1-E. Did you prepare that or did you not?

A. I prepared this exhibit.

Q. And what does it purport to show?

A. It is a similar computation or calculation for the Delaney No. 3, which is located in the southeast northeast

northeast of Section 26 located at this point on the map.

Q. Was all the data here available from core analysis?

A. All of the data that was used in arriving at an oil in place for this particular well was available from core analysis. In addition there were three feet cored below this point which showed no permeability. We therefore did not use any calculation from logs for that interval.

Q. Now as to Exhibit 1-F, did you prepare that or did you not?

A. Yes, I prepared this exhibit.

Q. And what does it purport to show?

A. In much the same manner this is a calculation or computation of the oil in place which underlies the Doll No. 2, which is located in the northeast northwest southeast of Section 35. That well was abandoned on completion.

Q. Will you turn now to Exhibit 1-G. Who prepared that?

A. I prepared this exhibit.

Q. And what does it purport to show?

A. The same method of calculation was used for determination of the oil in place underlying the Edith No. 1, which is the western-most extension of our cross section A Prime A. It is located in the southeast southeast northwest of Section 26.

Q. Will you turn now to Exhibit 1-H and state who prepared that?

A. I prepared this exhibit, which was for the Robison

No. 1, and a similar type computation was made for this abandoned hole located in the south half of Section 25.

Q. I call attention to the sixth column here. Is there any change required in the statement of height above water table?

A. I don't believe so. I think those corrections that we had in there were made and made in all exhibits.

Q. Except mine.

A. Except yours. We had the numbers inverted, which was a typographical error. I think all of them now should relate to the correct depth or height above the water table.

Q. I see that I omitted one question that I meant to ask in connection with Exhibit 1-B, which was the calculation and the tabulation relating to the Delaney No. 2. That is the well where you made calculations of permeability and porosity in the method which you described. Are the conclusions which you arrived at regarding the extension let us say of figures regarding permeability and porosity below the depth of the actual cores substantiated by any geologic data?

A. Yes, they are.

Q. Will you explain that please.

A. I have here a geological description of the section which was cored for this well, and also the section which was not cored below that point, and if I might, I might read from this.

Q. All right, briefly just on that point.

description

X

A. The basis for this well was considered at a measured depth from 5844. The sand description at that point stated thusly by the geologist: "Sand with thin carbonaceous shale laminations and mottled carbonaceous shaley in part; sand, gray, fine grain, sub-angular to sub-round, slightly micaceous and glauconitic, fine carbonaceous fragments, heavy clay cement to slightly quartzitic, very tight, trace spotted fluorescence."

From 5845, which I think it was related to the top of the log, this would be through the top of the pay section in this well. The geologic description is as follows, and this occurred in the cored interval from 5845 to include 5853: "Sand with scattered thin carbonaceous shale laminations; sand, gray buff, fine grain, sub-angular to sub-round, slightly micaceous and glauconitic, abundant fine carbonaceous fragments and black mineral grains, few plant and fossil fragments, few thin streaks and trace spotted clay cement, mostly hard, slightly quartzitic, low to fair porosity and permeability, good very light stain and fluorescence, light odor, slight vertical fractures from 5849 to 5853."

Below that point, which is the interval which was not cored for this well, the geologist described the sand as follows: "Sand, thin carbonaceous shale laminations; sand, gray-buff-white, fine grain, sub-angular to sub-round, slightly micaceous and glauconitic, fine carbonaceous fragments and

black mineral grains, trace clay cement, mostly hard, slightly quartzitic, low to fair porosity and permeability, some very light stain and spotted fluorescence." That is in the interval for our calculations.

Q. Now, is there any significant difference between the geologic report on the cored interval and the uncored interval as you have just read them into the record?

A. I do not see any significant difference. I think that in both instances they describe the sand -- in one instance it said gray, and the other it said white.

Q. Otherwise the descriptions are the same?

A. That is right.

Q. Now, how does that substantiate the work you have done on 1-B in assigning porosity and permeability factors below the coring depth?

A. We feel this offers substantiation for calculation of porosity and permeability and the existence of oil saturation below the cored depth.

Q. Now, if you will, Mr. McLeland, turn to Exhibit 2, which is a cross section that will have to be folded out in the books that you have been provided. Who prepared this exhibit, Mr. McLeland?

A. I prepared the tracing of the electric logs and some of the lettering was done by my assistants under my supervision.

Q. Generally, what is this exhibit?

A. The general significance of this cross section, we believe, is to show the continuity of structure of the continuousness of the "J" sand as it proceeds from the Scanlon No. 2, which is within the Adena Unit, proceeding westward to include the Edith No. 1, which is located in the southeast southeast of the northwest.

Q. Will you refer to Exhibit No. 1 which is on the board and point out to the Commission where this cross section is located?

A. This is the location on which is letter A Prime A. It is also shown on this small scale plat on Exhibit 2.

Q. What is the source of the data which is portrayed on this Exhibit 2?

A. Primarily the source data is from electric logs. However, correlation was made with coring information and also data that was taken on completion of the wells.

Q. Now, are the electric logs actually shown on this Exhibit 2?

A. They are.

Q. There is, of course, a yellow area that is very clear across this cross section. Will you indicate what is designated by that yellow area?

A. The yellow area defines the interval lying between the top of the "J" sand and the base of the "J" sand, and furthermore this blue area defined over here is an arbitrary

selection of the existence of water at a subsea datum of minus 1147 feet.

Q. You say it is arbitrary. What do you mean by that?

A. If you will note this log shown here for the Edith No. 1 does not indicate exactly that there is water bearing sand at that point. It is highly resistive. It may well be due to tightness of the sand, but it certainly does not indicate the presence of water at that point.

Q. Then why did you put it there?

A. Primarily because 1147 was the mean average datum used throughout the Adena Field in the preparation and consideration of recoverable oil in place.

Q. Now, in your statement a moment ago regarding the significance of the yellow area, I believe you said it was from the top of the "J" sand to the bottom of the "J" sand. Is that entirely correct as to the bottom particularly?

A. There may be additional benches of the "J" sand. I am not a geologist. I have taken some geology in school, but there may be an additional bench of the sand. I believe this might be considered "J" too, I am not certain of that, but at least it was not considered productive in the main part of the field.

Q. Has that been the basis of the productive portion of the "J" sand in the Adena Field?

A. That is correct.

Q. Now, do you have any particular comments to make regarding the location and pitch of that yellow area?

A. This primarily is the cross section extension from within the Adena Unit to include this point as shown by cross section A Prime A. It does show a very flattening of the structure as you proceed from a point of Scanlon No. 5 to include this other point. In other words, the structure apparently is flattening out.

Q. How did you arrive at both the thickness of that segment to the "J" sand there and the pitch as you show them on the exhibit?

A. There is a base datum for the tracing of all of the logs that was used at a subsea elevation of minus 750. Using a base datum it moves the logs up and down, so we got the pitch that you speak of. This does not say that the entirety of the section is pay. It says that the pay for this particular well would come within that interval. The top and base is marked primarily by the S.P. The instances you can pick tops on the basis of the "J" sand was the basis of the microlog.

Q. Have those tops and bottoms been made from the microlog, is that correct?

A. This top and bottom primarily was picked from the S.P. However, it does correlate with the micrologs.

Q. Do you have anything you wish to add regarding this Exhibit 2?

A. Maybe we should point out what these curves are. You will notice a difference here on Delaney No. 1. There was not a microlog taken on Delaney No. 1. It was a neutron, and that was the only change between the other logs that were conducted on the wells. The others show to the left for each individual log an S.P., two resistivity curves being 16-inch curves, and the lateral curve, it's 19 feet in spacing, and the third curve is the 64 inch. The fifth curve is the microlog, which was on the well.

Q. Do you have anything further?

A. I believe that is all.

Q. Now, will you put up Exhibit No. 3 please. Mr. McLeland, who prepared what has been marked here as Exhibit No. 3?

A. I did.

Q. Generally speaking, what does it show?

A. It is the cross section which was marked on Exhibit No. 1 as being B Prime B, which is a southern to southwest cross section drawn through the Petroleum Incorporated Delaney wells, and extended to include the Lion Oil Company Doll No. 2.

Q. That lies to the south, is that correct?

A. That is correct.

Q. What is the source of the data from which Exhibit 3 was prepared?

A. The source data was from the electric logs for these wells, also comparison and utilization of the core analysis

data available for those wells, as well as completion information.

Q. Now, is the significance of the yellow area the same as it was on Exhibit No. 2?

A. The yellow area, as defined here, still is an interval of the "J" sand which lies between the top and the base of the "J" sand for each of the wells shown on this cross section.

Q. Are those things shown regarding the electrical surveys there the same as they were on Exhibit No. 2?

A. They are, and also the same subsea datum was used in order to obtain the pitch of the logs with respect to one another. You will note on this cross section that there is apparently a rise or a change in structure with respect to the common datum from the Delaney No. 2 to the Doll No. 2. This will be further explained by our future exhibits.

Q. Do you have anything that you wish to add regarding this Exhibit No. 3?

A. I believe that is all.

Q. Now move to Exhibit No. 4, which again is a map or plat. Mr. McLeland, referring now to what has been marked Exhibit No. 4, who prepared this exhibit?

A. This exhibit was prepared under my supervision.

Q. By assistants in your office?

A. That is correct.

Q. Now what is the base map?

A. The base map of this exhibit in so far as the location of the wells was the same base map which was used on Exhibit No. 1. It generally conforms with the previous interpretations of structure.

Q. Now we are getting a little ahead of ourselves. What is purported to be shown by this map?

A. This map shows the structural position on a common datum on each of the well locations in the Adena Field.

Q. Is this the top, bottom, or some other part of the "J" sand as shown?

A. This is the structural top of the "J" sand in the Adena Field.

Q. Now, at the location of the wells shown on this map, there are figures. What do those figures indicate?

A. Those figures which underlie each well location so marked are the subsea elevations of the top of the "J" sand of each well.

Q. And what then is the significance of the figures which appear in the various contour lines?

A. Those are the subsea contour lines which were drawn utilizing the data which underlies each well. They are contour intervals of equal elevation of the "J" sand.

Q. Is that also the top of the "J" sand?

A. That is correct.

Q. Now what is the source of the data from which these tops were taken?

A. These tops were primarily taken from a valuation of each electric log which we had available for the Adena Field. In order to arrive at the subsea elevations we utilized the Adena engineering committee's expected changes in so far as the K.B. elevations. We went through that report to obtain the elevations, which we realized there were errors on the original determination of K.B. elevations.

Q. What is the pink area in the southwest corner?

A. The pink area in the southwest corner is the area of interest to us, at least, the Petroleum Incorporated Delaney lease which is located in the east half of Section 26.

Q. Now, on the official copy of this exhibit, which is on the board, there is a blue area toward the left-hand side. Will you explain what that portrays?

A. This blue area, which is shown on this map, is the elevation that the "J" sand is full of water. Beyond this point no oil production is possible. This red line which denotes the eastern-most limit of the blue line is a line which was drawn using and utilizing the data which the engineering committee used in establishing the oil-water contacts through these various points.

Q. Now is that portrayed on the smaller editions of this exhibit which are in the binders?

A. The red line and dotted line is shown on all of the exhibits that we have prepared.

Q. In other words, the red line toward the left of the exhibits as they appear in the folders is the oil-water contact line, is that right?

A. Yes. It is the oil-water contact line which would be represented on the structural top of the "J" sand.

Q. Now, does this map, Exhibit No. 4, differ in any important degree from earlier exhibits that have been introduced in this hearing showing tops of the "J" sand or the oil-water contact?

A. The only place that I can see there is a change would be in the southwest area where we did utilize the engineering calculations for determination of the oil-water contact opposite this Bruce. In addition, the structural top is carried further. However, I don't believe they presented a structural top map of the "J" sand. It shows the continuity of this sand-bar type deposition trailing south from northeast to southwest extended into south Adena.

Q. Does that indicate to you that there is one continuous structure in the area portrayed on that exhibit?

A. Yes, I believe that it does. It is a definite indication of the continuity of structure, the axial trend being northeast southwest.

Q. Is this type of map customarily used in the oil

industry in determining the prospective area of an oil field?

A. Yes. It is the first map generally constructed by geologists and also by reservoir engineers when they study an area to determine if additional exploration is desirable. It is one of the useful tools that they have to arrive at the prospectiveness of sand.

Q. Do you have any observations based on this exhibit as to the location of the Delaney tract in relationship to the edge of the field, the structural limits?

A. Yes. You will note that according to the limits which were imposed upon productivity within the Adena Field, being the oil-water contact, the Delaney lease is some distance removed from that point.

Q. Do you have anything you wish to add regarding this Exhibit No. 4?

A. You will note that in certain areas there is a nosing trend throughout the entirety of this exhibit. In the northern-most area there appears to be a nose, a flattening of the structure, through we will say Section 6 and around Section 31. Also in this area you will find a flattening of the structure as you proceed down-structure and into the water. This same condition is prevalent throughout the area of the Delaney lease.

Q. Have you anything further that you wish to add on that exhibit?

A. I believe that is all.

Q. Then will you put up Exhibit No. 5.

COMM. BRETSCHNEIDER: Mr. Kirgis, pardon me for interrupting, how long do you want to continue this evening?

MR. KIRGIS: At the Commission's pleasure.

COMM. BRETSCHNEIDER: Well, it's almost 5:30 and you have 12 exhibits here to go through.

MR. KIRGIS: That is right.

COMM. BRETSCHNEIDER: And you won't get through these before six or 6:30.

MR. KIRGIS: That is correct.

COMM. BRETSCHNEIDER: Perhaps we better stop, look, and listen to consider whether we want to meet tonight or meet in the morning. If you want to meet in the morning, it's all right. If you want to meet tonight you will have to canvass the group to find out.

MR. KIRGIS: To help you with what planning you may wish, I would say that Mr. McLeland is about half through his direct testimony. I, of course, cannot estimate what the cross examination may be. Then we have Mr. Kaveler at the conclusion of Mr. McLeland, and Mr. Kaveler's testimony would run an hour and a quarter to an hour and a half, and whatever time may be needed for cross examination, of course.

COMM. BRETSCHNEIDER: Is there any more witnesses outside of Mr. Kaveler that you are going to have?

MR. KIRGIS: Those are the only ones for Petroleum Incorporated. Mr. Shively might be called, but I at this time do not anticipate the need of doing that. I don't know whether the royalty owners intend to call witnesses or not.

MR. WESTFELDT: We may have a witness on behalf of Monsanto. I don't think our testimony would take more than a half an hour.

MR. KIRGIS: One suggestion has been made here that we might start at nine in the morning.

COMM. BRETSCHNEIDER: I think perhaps it might suit more people to adjourn now and start at nine in the morning. Is this a good place to stop, Mr. Kirgis?

MR. KIRGIS: Yes, it is.

COMM. BRETSCHNEIDER: If it's a good place to stop, I think maybe we better do that and we will resume at nine o'clock tomorrow morning.

(Whereupon the hearing in Cause No. 26 recessed at 5:30 p.m., May 27, 1958, to reconvene at nine o'clock a.m., May 28, 1958.)

C E R T I F I C A T E

I, Donald E. Weimer, Certified Shorthand Reporter, hereby certify that I personally recorded in shorthand the proceedings in the foregoing matter in the first instance and that I later transcribed the same and that the foregoing record is true and correct to the best of my knowledge and belief.

Done at Denver, Colorado, the 2nd day of
June, 1958.

Donald E. Weimer

Certified Shorthand Reporter
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