BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
March 13, 1958

IN THE MATTER OF: Case No. 1394

TRANSCRIPT OF PROCEEDINGS

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The hearing called by the Oil Conservation Commission of New Mexico, at the request of Ralph Lowe, et al., to consider the reduction of allowables in the Gladiola Pool in Lea County, New Mexico. Case 1394

BEFORE:

Mr. A. L. Porter, Jr.
Mr. Murray Morgan
Governor Edwin L. Mechem

TRANSCRIPT OF PROCEEDINGS

MR. PORTER: The next case to be considered will be Case 1394.

MR. COOLEY: Case 1394: In the matter of the hearing called by the Oil Conservation Commission of New Mexico, at the request of Ralph Lowe, et al., to consider the reduction of allowables in the Gladiola Pool in Lea County, New Mexico.

(Recess.)

MR. PORTER: The meeting will come to order, please. Just a minute, Mr. Buell. Mr. Errebo wants to make a statement at this time.

MR. ERREBO: If it please the Commission, with regard to Case 1053, the previous case, is Mr. Joiner here from Magnolia?

Mr. Joiner advises me that he has made a telephone call to his office and they advise him that the Sunray agreement has been received, signed.

MR. PORTER: Before we get into the case we have just announced, Case 1394, I would like to make an announcement concerning Bisti, the rehearing on the Bisti case. The Commission feels that we wouldn't have time to complete the docket this afternoon. We will try to complete this Case 1394 and possibly the nomenclature cases and continue the Bisti rehearing until 9:00 o'clock in the morning, and we will reconvene in the Highway Building out on Cerillos Road. The rehearing case will not be taken up this afternoon.

We will take up now Case 1394. Mr. Cooley.

MR. COOLEY: Are there any appearances in this case?

MR. QUINN: John Quinn of Hobbs, representing Ralph Lowe.

MR. COOLEY: Any other appearances?

MR. BUELL: For Pan American Petroleum Corporation, C. L. Kelly, J. W. Brown, Dan Currens, and Guy Buell.

MR. WEBB: Layton Webb, attorney for Sinclair Oil and Gas Company. I would like to enter an appearance.

MR. ERREBO: Burns Errebo with Sunray-Midcontinent. I would like to enter an appearance.

MR. KELLAHIN: Jason Kellahin, Kellahin and Fox, representing Hancock Oil Company.

MR. COOLEY: Any other appearances?

MR. PORTER: Mr. Buell.

MR. BUELL: May I be permitted to make a very short statement for Pan American?

MR. PORTER: Yes, sir.

MR. BUELL: Pan American is the operator of thirteen wells in this pool. I would like to say at the outset that we are opposed to the reduction below the normal unit allowable because in our opinion it is not justified from the standpoint of conservation, and certainly not from the standpoint of correlative rights. We're in this unusual position, if the Commission please, in this pool as in other pools where our interests are substantial, from the standpoint of reservoir studies;we have continuous studies in progress at all times. Certainly this pool, with our substantial interest in it, we try to stay right on top of it. For that reason we are able to say at this time that in our opinion no waste has occurred or will occur producing at the normal unit allowable.

We are in the position, though, of having to ask for a short continuance due to the fact,the unusual nature and the manner in which this hearing was called; due to the short time interval, we haven't had time to prepare formal exhibits or testimony to present, although from the standpoint of studies of the reservoir, we are right on top of it; so we would like to urge that a short continuance be granted of at least two weeks, to enable us to prepare our formal exhibits and our testimony so that we can present our side of this case.

MR. QUINN: John Quinn, representing Ralph Lowe. We have no objection to a continuance as far as I know, except that we would want to put on testimony here in order to support the emergency order which was granted, allowing the lower allowable, and also testimony to support possibly an interim order until the time that the Commission may set for a continuance. We believe that our evidence will show that a permanent order should be issued by the Commission on the lower allowable figure or some similar figure which was set by the emergency order. As I understand Mr. Buell's motion, he has all of his information here at this time, since he was on top of the situation, but he doesn't have his exhibits. If he has his information here, then it seems to me that he should present his information and data which he now has to the Commission, because of the fact that the Exhibits will only serve to clarify the data which he may have.

MR. BUELL: May it please the Commission, apparently I left the wrong impression on Mr. Quinn. I didn't mean to. From the standpoint of needing time for a complete reservoir study, that isn't necessary, but to correlate our data, to arrange it in a presentable form to the Commission so that it will justly reflect our position as the facts warrant, that is what we are asking for. Due to the short time interval between the notice of the hearing and today, in all fairness I believe we are entitled to it.

MR. QUINN: I would like to ask Mr. Buell if he intends to introduce data at that time which he may obtain subsequent to

this date, or do you want to correlate the data you now have and make exhibits to present to the Commission?

MR. BUELL: Mr. Quinn, it will always be Pan American's position, I hope, to present to the Commission the very latest and most current data available. I hope that answers your question.

MR. QUINN: We have no objection to that.

MR. PORTER: The Commission will withhold the decision on the motion made by Mr. Buell until after Mr. Quinn for Lowe has presented their testimony, and any other interested parties have had a chance to cross examine the witness. Mr. Quinn, will you proceed?

MR. QUINN; Since you have delayed ruling on the motion, at this time, I would like the record to show then that I will not agree to continuance prior to the time that we put on our evidence.

MR. COOLEY: I don't understand.

MR. QUINN: I believe I made the statement that I would agree to the continuance when it was made, but since we are going forward with the evidence and present evidence at this time, we intend to present evidence to the Commission of necessity for a permanent order, I'll state then that I will not agree that the continuance should be made at that time. Now Mr. Buell will renew his motion, I presume?

MR. BUELL: Yes.

MR. QUINN: I have a short statement before I put any evidence on, and that is that the applicant intends to show that

the emergency order which was entered into by the Commission on the 28th of February should be made permanent, and generally we intend to show that the number of wells producing water in the Gladiola Pool has been increasing over a period of the last six months; and on February 21st the Ralph Lowe Lawton State No. 2 Well, which is located in the northwest southwest quarter of 32, Township 11 South, 38 East, N.M.P.M., commenced producing 100 percent water. Prior to that date the well was capable of producing a top allowable since its completion date, which was on September 19, 1956.

We also intend to show that there is a possibility that the water production from certain wells in the Gladiola Pool is premature, and that this premature water production was caused by the higher allowable of these wells at excessive rates.

Also, as set out in paragraph 5 of the emergency order, that the production of the wells in the Gladiola Pool at the rate authorized for the month of March, 1958, and subsequently be authorized at a higher rate may result in underground waste.

During the period of purchaser prorationing which was had in June, July, August, September, and October of 1957, the production from the wells in the northernmost portion of the pool, which was formerly the North Gladiola-Devonian Pool and which was combined with the South Pool and made the Gladiola Pool, was reduced to an approximate average of 190 barrels of oil, and that during this period the pressure performance of certain of these wells

indicated that production at a lower rate would result in additional ultimate recovery of oil from these wells.

In proving these points which we have stated, we intend to introduce the testimony of only one witness, Mr. Landua, petroleum engineer, and we have six exhibits which will be introduced in the course of the testimony.

Mr. Landua, will you be sworn and take the witness chair?

(Witness sworn.)

HARVIN L. LANDUA

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

DIRECT EXAMINATION

By MR. QUINN:

Q Will you state your name?

A Harvin L. Landua.

Q Where do you live?

A Midland, Texas.

Q Are you a petroleum engineer?

A Yes, sir.

Q What are your schools?

A Graduated from Texas A. and M. in 1938, was employed by the Humble Oil Company for approximately twelve and a half years, the last three years of which was in their reservoir engineering section down in Houston; and since that time have been with Mr. Ralph Lowe in Midland and with the Chemical Corn Exchange Bank in

New York in their Petroleum Division.

Q What is your knowledge, Mr. Landua, of the Gladiola Field?

A I started following Gladiola itself in about 1952 through Oil Conservation Commission records, and started following North Gladiola when it was discovered by Mr. Lowe in '56.

Q Have you made a study of that particular area?

A Yes, we have.

Q Are you familiar with Mr. Ralph Lowe's holdings in the field?

A Yes, sir.

MR. QUINN: Are Mr. Landua's qualifications acceptable?

MR. PORTER: Yes, sir.

MR. QUINN: I would like to mark these as exhibits.

(Lowe's Exhibits 1 through 11 marked for identification.)

Q Mr. Landua, I would like to hand you what has been marked as Plaintiff's Exhibit No. 1 a nd ask you to identify that.

A Exhibit 1 is a plat showing the various oil fields in the southeastern portion of Lea County of New Mexico. The field that we have in question today is Gladiola, is indicated on this plat, and its location in relation to other fields in the area is set out on this drawing.

Q Can you tell from that drawing the trend and the relationship to the other Devonian Field?

A Yes, sir, you can.

Q I'll hand you at this time Exhibit No. 2 and ask if you will identify and explain that exhibit.

A Exhibit 2 is a tabulation of the well and production data for Gladiola, North Gladiola and the Ralph Lowe operated leases. This exhibit shows the gross production by years for Gladiola, along with the base allowable rates at various years and months, the number of wells completed in the various areas by years and months, the bottomhole pressure information as it was obtained. This information is obtained primarily from Oil Conservation Commission records. It shows that the Gladiola portion of this area was discovered in 1950 and that up to the time that the North Gladiola area was discovered by Mr. Lowe, there were twelve wells in the Gladiola area that had produced approximately three and a half million barrels of oil. Mr. Lowe discovered this North Gladiola area in March of 1956. This information also tabulates the bottomhole pressures that were obtained in the North Gladiola area on the Lowe operated properties.

Q How up-to-date is that?

A It's basic data, it takes us up to the 1st of 1958.

Q Is there anything significant as to that data?

A Yes, I think it is, but I think we'll cover it down the line in our testimony, Mr. Quinn.

Q I will introduce then Exhibit No. 3 at this time and ask you to identify that and tell the Commission what it purports to show.

A Exhibit 3 is a tabulation; it's a tabulation in three parts.

The first part shows the general completion depth and the amount of Devonian formation penetrated in the Gladiola area. The second portion lists the operators in the field, the number of wells that they have, and the average Devonian penetrated down to a subsea datum point of 8150 -- back up -- the second portion lists the operators in the field, the number of wells that they have and the gross footage of Devonian that these wells have above a datum point of 8150. It has nothing to do with the Devonian penetrated. The third part of this tabulation is an allocation of the average Devonian thickness above the 8150 datum point by areas.

I would like to hold this out for a minute and discuss it later.

Q Just go ahead and discuss that.

A Well, let's do it a little bit later on when we talk about these plats.

Q I give you then Exhibit 4 at this time and ask you if you will identify that and explain to the members of the Commission what that is and what it purports to show.

A Exhibit 4 is a structural map made up by one of Mr. Lowe's geologists. It's contoured on top of the Devonian as penetrated in the approximate 90 wells that have been drilled in the area. The plat also indicates the wells that were making water as of the 1st of March of '58, and further it indicates the wells that were standing by to be plugged.

Q Is there a copy of that exhibit on the board?

Q Is there a copy of that exhibit on the board?

A Exhibit 4 is up on the board and is identified by its Devonian structure map title blocks.

Q This is Exhibit 5. Would you explain that exhibit?

MR. BUELL: May it please the Commission, I wonder, for the purpose of the record, since this exhibit was prepared by someone other than the witness, if he would testify that he adopts it as his own?

MR. QUINN: I was going, at the conclusion of introduction of all exhibits, I was going to ask him if they had been prepared either by him or under his direction.

MR. BUELL: I want to bring it up now before he discusses it. I realized you hadn't introduced it; if he will state that he adopts it as his own.

MR. QUINN: Will you state that, Mr. Landua?

A No, sir, the work is not my own, but I agree with the work.

Q I give you then Exhibit No. 5 and ask if you will explain to the Commission this exhibit and what it contains.

A Exhibit 5 is also upon the blackboard and it's a correlary to Exhibit 4. Exhibit 5 indicates the amount of the Devonian material above 8150 feet subsea for each well in the field.

Q Do you have anything further to say on that exhibit?

A Yes. Now I would like to refer back to Exhibit 3 and say that when nature put this big island of oil down in this great big Devonian sea, that it was in contact with, it created --

Q (Interrupting) Pardon me, that is Exhibit 4, is it not?

A Yes.

Q Instead of 3?

A Yes, I'm going to refer to Exhibits 3 and 4, whatever these numbers are, Exhibits 4 and 5. I'll be referring to Exhibits 4 and 5 in this discussion.

This big island of oil has a mountain in the southwest corner. The areal extent of this mountain is about 600 acres and its thickness is about 200 feet. Its about 16 percent of the productive area. Now the remaining 84 percent of the productive area by our tabulation on Exhibit 3 indicates that this other 84 percent only has 52 feet of Devonian material above this 8150 foot bench mark. We think it's an unusual type of structure, and it has a distinct bearing on the performance of this field.

Q Do you care to refer back to Exhibit No. 3 at this time, or have you referred to that?

A No, sir, I think that's all that I need to say at this time.

Q This is Exhibit No. 6. Will you take a look at that and identify it and state for the Commission what that exhibit purports to show?

A Exhibit 6 is a summary of the production and bottomhole pressure information in the north segment of this Gladiola Pool. The bottomhole pressure information was obtained in the Ralph Lowe operated wells, and the production was obtained from Oil Conservation Commission records and was for the North Gladiola area as a whole

up to the time it was combined with the South Gladiola area.

In our opinion this summary is very significant. It indicates that during the period prior to pipe line proration in June of 1957, that the reservoir was performing in a nature whereby 1850 barrels per pound drop to about 6400 barrels per pound drop was being obtained. One pressure survey was obtained during this pipe line proration period. At that time, as we previously stated, the production rate had been cut back for this North area. Our information indicates that the reservoir performed in a manner whereby 19,000 barrels of oil were produced for each pound drop in bottomhole pressure during that period. Immediately after the period, we obtained another pressure survey and it indicated again that we were down in the range of 6,000 barrels for each pound drop in bottomhole pressure. In our opinion this indicates that this reservoir would be produced much more efficiently if these rates were cut down in the neighborhood of 190 to 200 barrels per day and allow the natural water drive that's present in this field to work to our benefit.

Q Going on through the exhibits, I'll hand you this Exhibit No. 7 and ask you to identify that and state for the Commission what the purpose of that exhibit is.

A Exhibit 7 is a tabulation of the wells currently producing water in the subsea depth of their producing interval. I would like to call particular attention to the Commission that this appearance of water in our opinion both in the North and South

segment of the Pool has been very erratic. For instance, Mr. Hammond has a well down there that produces some water, and its completion interval is a minus 8057 to minus 8067.

Again in the South area there's evidence of presence of water as low as a minus 8131 in some of the Hancock wells. In the north end, we have evidence that water is as high as a minus 8117, in Mr. Lowe's well it has gone to 100 percent water, and as low as 8156 in another well that Mr. Lowe has in the north area. We think this tabulation is very significant in that it indicates that the water advanced, even though on the edges it has been very erratic.

Q Do you have anything further to say on that exhibit at this time?

A No, sir.

Q Will you take this exhibit which is marked No. 8, identify it and explain what the purpose of this exhibit is and what it shows.

A At this stage in the development and production of the Gladiola area, there have appeared a number of problem wells. Some are incapable of making top allowables that have been assigned to it under its depth factor, manner of proration, and some are making excessive rates of water, and some are making very small percentages of water. When Lawton State No. 2 went to water, our first problem was to determine whether we had left oil in this well bore, so we took the logs that we had obtained in this well, the drill stem test data that had been obtained in the well,

the core analysis data that had been obtained in the well, and made a composite study. Our geological group analyzed this data, I analyzed the data, we had it analyzed by outside consultants. The agreement was unanimous that a very substantial portion of oil had been left in this well, even if the workover that we're attempting now is partially successful.

Q In that connection, Mr. Landua, I hand you this exhibit that has been marked Exhibit No. 9. I believe that concerns the same well which you are talking about, the Lawton No. 2.

A Exhibit 9 is a tabulation by months from the Form C-110 which Mr. Lowe's company has turned in to the Commission. It tabulates the production data from Lawton State No. 2 by months. It indicates that the well has produced 135,414 barrels of oil up to February the 21st, at which time it went to 100 percent water. Prior to that time it produced no water.

Q This is Exhibit No. 10. Would you explain to the Commission what the purpose of this exhibit is and what it purports to show?

A Exhibit 10, when we had obtained water in four other wells in the northern portion of the field, we were disturbed about the appearance of water, but the water encroachment wasn't as rapid as it was in this Lawton State 2. We put our wells on the pump, go ahead, and continued to get some oil even though we felt that waste was occurring we were willing to sit by and try to obtain some more data to see just how extensive it was; but when Lawton State 2 went to 100 percent water, why that's like getting your

grocery bill cut off, your grocery money cut off, so we had our geological group and myself prepare a cross-section of Mr. Lowe's operated wells. It's Exhibit 10. This cross-section in effect shows that if the water is actually up to 8117 in Lawton State 2, that nineteen out of the twenty-four wells that Mr. Lowe operates should be producing some water.

Further than that, it also shows that Lawton State 3, which is another well on the Lawton State Lease, should be virtually 100 percent water, and it's a pipe line oil well. Lawton State 2 is surrounded by pipe line producing oil wells, and their subsea depths vary from 8075 as the top producing interval down to 8115 as a top producing interval.

Q This is Exhibit No. 11, our last exhibit. Would you look that over and state to the Commission what the purpose of that is and what it contains?

A Exhibit 11 is a tabulation of our average flowing tubing pressures that were obtained on February 24th and on March 10th. Not being able to take bottomhole pressures as rapidly as we would like to, we got a reading on our flowing oil wells. Our flowing oil wells continued to make pipe line oil and we think that there is a correlation between the flowing tubing pressures and the flowing bottomhole pressures in this type of reservoir.

Now this tabulation indicates that we have had an increase in flowing tubing pressures from 40 pounds to approximately a hundred pounds. We think that this reduced rate of production

reduces the differential pressure that exists between the oil zone in this reservoir and the underlying and edge water zones. When we reduce this differential pressure, we think we reduce the environment or the possibility of water encroaching too rapidly, and in that way we increase our ultimate recovery tremendously.

Q You say encroaching too rapidly, you mean at a rapid rate?

A Yes, just about like Lawton State 2.

Q Do you believe that could be called encroachment?

A If you say rapid encroachment, I suppose you could.

Q Does this represent all the exhibits that you have at this time, Mr. Landua?

A Yes, it does, Mr. Quinn.

Q Were all those exhibits prepared by you or under your direction?

A Yes, both.

Q You agree with what those exhibits show, and from what information did you prepare them?

A Various records, records that we have in Ralph Lowe's file, Oil Conservation Commission records, geological records which are exchanged between companies, and as I say, our old files.

Q Do you have any conclusion which you would like to draw, referring back to the various exhibits, in regard to this matter?

A Yes, I do, Mr. Quinn. I feel that this data shows that 85 percent of the Gladiola Field,as it's combined today, has a relatively thin pay section compared with other Devonian producing

areas along this trend in southeastern Lea County. We had a suspicion that this thin-type of reservoir was being produced too rapidly up to about a year ago, and since that time we have had indications or red flags appear all along our operation in this field that indicated that we should reduce this rate. We think that the relative thinness of the pay section is a very pertinent matter to consider when talking about producing rates in this reservoir. Another conclusion is that during the past six months, the number of wells in our operations, as well as in the operation of the field as a whole,has increased very rapidly. We think that the reduction in bottomhole pressure that has occurred, particularly in the north end of this field, has been too rapid, particularly in view of the fact that the field has a natural drive which appears to have the ability of maintaining pressures by itself at commercial rates of production. When we maintain these pressures we lower our operating costs, we delay the cost of installation of pumping equipment, and we create a condition that's conducive to more economical recovery of oil.

Q Is it your opinion, Mr. Landua, that allowing some flexibility with this lower proration which has been set at 190 barrels would be of benefit both to the royalty owners as well as the working interest owners in this field?

A I don't think there's any question but that it can benefit everyone who has any money invested in this field.

Q Are you asking for an arbitrary figure of 190, or in that

neighborhood?

A Mr. Quinn, we don't feel that we're equipped to set this figure. The only thing that we can say to the Commission here is that in our opinion there have been happenings at the rates that this field has been produced that say you'd better lower this rate.

Q Do you think the lower rate would be fair to both working interests and royalty owners in the field?

A Yes, sir.

Q Is it your opinion that this would be in the interest of conservation and prevention of waste?

A Yes, sir.

Q Would you state to the Commission whether or not in your opinion the greatest amount of oil will be produced eventually by the lower proration figure set?

A I think there's absolutely no question about it.

Q Is it your opinion that the lower figure of 190 barrels, if that figure will allow each lease to recover its fair share of the recoverable oil in the reservoir?

A I missed your question, Mr. Quinn.

Q Is it your opinion that the lower figure of 190 barrels which has been set will allow each lease to recover its fair share?

A Yes.

Q Of the recoverable oil in the reservoir, is that right?

A Yes, sir.

Q Is there any other information or statement that you would

like to make to the Commission at this time, other than the information you have already given, based on these exhibits which have been entered?

A Yes. Mr. Quinn, I think I overlooked one point. Because of the relative thinness of this Devonian pay section in 85 percent of this field, it's our conclusion and we have facts to indicate it by the performance in three wells, that workovers, successful workovers are going to be impossible. This also contributes tremendously to leaving much oil in this reservoir. As a summary statement, I would like to say that these past per well producing rates have resulted in happenings to certain individual wells that appear to us to have caused waste and reduction of ultimate recovery already. These producing rates should be reduced immediately in order to prevent further waste and prevent the further reduction of ultimate economical recovery of oil.

MR. QUINN: That's all that we have at this time.

MR. COOLEY: Mr. Quinn, would you like to formally offer your exhibits at this time?

MR. QUINN: Yes, I would. We would like to formally offer these exhibits in evidence, numbered from 1 to 11, at this time, for the record.

MR. PORTER: Lowe's Exhibits 1 through 11. Is there objection to the introduction of the exhibits? They will be admitted. Anyone have a question?

MR. BUELL: Guy Buell. I might suggest that it might save

time overall in the cross examination if we can have about a five or ten minute recess to look at some of the exhibits. I think we can eliminate some of the questions that we would ask. I believe it would save time overall.

MR. PORTER: We will have a five minute recess.

(Recess.)

MR. PORTER: The meeting will come to order, please. Mr. Buell.

CROSS EXAMINATION

By MR. BUELL:

Q Mr. Landua, I notice in your testimony you referred to encroachment or rapid encroachment. Do you use that word synonymously with coning?

A No, sir.

Q In your opinion is coning taking place in this field at this time?

A I don't think I'm in a position to say.

Q You just don't know?

A No, sir.

Q Would you define for me, please, it would help a lot, Mr. Landua, just what you mean by encroachment?

A Simply stated, encroachment is an advance, in this case, of water.

Q Would you not normally expect that in a water drive reservoir, encroachment of water?

A Certainly, I wouldn't expect it in such an erratic nature

as we have here, if the reservoir was handled properly.

Q Have you analyzed water production, Mr. Landua, from the standpoint of net pay and original oil in place that you would assign to the wells that are currently making water?

A No, sir, we haven't. We have some wells but not all the wells.

Q Let me ask you this. Strictly now from the standpoint of capacity, will all the wells operated by Lowe make the top allowable well for March, it's 237, is it not, would normally be the normal unit allowable?

A State your question again, please.

Q For the purpose of this question, I am interested only in capacity, from capacity to produce the water, will all the wells operated by Lowe produce at the rate of 237 barrels per well per day?

A No, we have one making 100 percent salt water.

Q All right. Other than the Lowe State No. 2, are all the wells currently capable of producing 237 barrels of oil per day?

A Yes, sir.

Q All of them. Did all of these wells make their assigned allowable in January?

A I'm not sure. I would have to examine the records.

Q Wouldn't that be included in some of the exhibits that you introduced?

A The total production would be in there.

Q Would you mind looking at your exhibits?

A It would be difficult to do because you were given some of this back allowable in that area.

Q In other words, you are not prepared at this time to answer that question?

A State your question again.

MR. BUELL: Would you read it back?

REPORTER (Reading): "Did all of these wells make their assigned allowable in January?"

A I will give you the figures and you can divide it out.

Q If you don't know offhand, it's not important enough to take a lot of time.

A Okay.

Q Do you make your statement on the current ability of your wells to produce on recent production tests or just your general knowledge of their capabilities?

A We don't have too many individual well tests, we have the production by leases. We have some individual well tests.

Q In other words, then, you based your answer on your general knowledge of the wells and not on individual well capacity tests?

A That would be true.

Q From this same general knowledge that you have of your wells, Mr. Landua, in your opinion would they produce, do they have the capacity to produce at a sustained rate of 125 percent above 237 barrels per well per day?

A I just don't know.

Q Sir?

A I don't know whether they have or not.

Q You just don't know.

A I'm of the opinion that they would.

Q All right. Would you give me the complete open interval in your log statement?

A Yes, sir. You want it in subsea depth?

Q Subsea, yes, please. Isn't it on the cross-section?

A I have the top of the Devonian on the cross-section, not the top of the producing interval.

Q Would you give the complete, the top and the bottom?

A Yes, it's 8117 to 8157.

Q 8157?

A Yes.

Q Now, in your direct, when you were talking about water being at minus 8117, you were referring to the top interval?

A Yes.

Q And I'm sure you made that statement because you felt since it went to 100 percent water that you had water that high in that well?

A Yes, sir.

Q Had that well made water previously to February 21st?

A Not to our knowledge.

Q None at all?

A No.

Q If it made it, you would know about it?

A Yes.

Q Based on your general experience as a reservoir engineer, Mr. Landua, does that appear to you to be the effect, that well going to 100 percent water, does that appear to you to be the effect of coning or premature encroachment or would that not indicate to you that you have a mechanical problem there?

A I don't know what you mean by mechanical problem.

Q All right. I'll ask you this way then. Normally in a water drive reservoir where you have coning or premature encroachment, don't you observe that initially the well will make a small amount of water and then gradually increase?

A I don't know whether that would occur when you had coning or premature encroachment. I've seen it occur both ways. We have it happening in this field where your water production is small and then increases very rapidly, and then we have the one well where it went from 100 percent oil to 100 percent water.

Q In other words, in your opinion, you have ruled out completely any mechanical trouble in that well as the cause of your 100 percent water trouble?

A No, sir, because I don't know what you mean by mechanical trouble.

Q Well, what do you engineers in the profession usually mean and what do you mean when you refer to mechanical trouble in a well?

A You could mean that you could have a casing leak, that's about the only one that I know of.

Q What about breakthrough in your cement?

A I don't know that I would call it mechanical.

Q You wouldn't call cement trouble mechanical?

A I don't know that I would call it mechanical.

Q Do you think something of that nature could have happened to your Lawton State 2?

A Well, it produced 502 days without any trouble, I would think that if you had environment that is conducive to a bad mechanical condition, possibly it would have appeared sooner.

Q Possibly?

A Yes.

Q I believe you mentioned that you were getting ready to work the well over, apparently you think you can do something with it?

A We think that this water appeared so rapidly, we just have to gamble with the possibility that this condition may be unusual. We're going to spend some money to see.

Q In other words, certainly in your thinking you haven't written that well off as a producing well?

A Not until after we do this workover.

Q You have a pumping unit on that well?

A No.

Q How did you ascertain, then, that it went to 100 percent

salt water?

A The well was flowing very nicely and then overnight the tubing pressure went to zero, stopped producing. We got a swabbing unit out on the well and swabbed it for two days. In these swabbing tests is when we got this information.

Q Do you have any idea, Mr. Landua, of the amount of water you produced when you were swabbing the well?

A 26 barrels an hour.

Q Sir?

A 26 barrels an hour. Standing fluid level was seven to eleven hundred feet from the top of the ground.

Q Would you state briefly for me again the wells operated by Lowe, other than your Lawton State No. 2, that are currently making water?

A Would I do what?

Q Your wells other than State No. 2 that are now making water, would you give me the names?

A The names?

Q Yes.

A Shell Browning No. 1, State "A" No. 2, Markham State No. 1, and Aztec Adamson No. 2.

Q From the standpoint of water production on those wells, Mr. Landua, what has generally been their history, has the rate gradually increased since they initially started cutting water?

A I would say that it's still increasing in all four wells.

Q In other words, you have observed a gradual rise in the water percentage in these four wells that you have just named?

A I don't know what you mean by gradual.

Q Well, I'm trying to avoid going into detailed questions on each well, Mr. Landua. I mean by gradual, just a normal sloping curve. If you don't think it was gradual, express it in your own words. I'm just trying to save time.

A I don't know whether it was gradual, because you would have to make a bench mark.

Q But you have noticed from month to month on your reports to the Commission that the water cut has been increasing?

A I'll say that it has varied appreciably. We haven't plotted up the dope to see if there is a trend.

Q Do you have any other wells other than the four you have just named and your Lawton State No. 2 that are currently making water?

A We have a plat that has the wells circled that are reported to be making water.

Q Are those circled in red on Exhibit No. 5, Mr. Landua?

A Exhibit 4 and 5, yes, sir.

Q Are they also circled on the copy that went into the records?

A Yes.

Q Would you go over to either Exhibit 4 or 5 for a minute, Mr. Landua?

A Yes.

Q Let me ask you this. Do you know of any wells that are located structurally higher that are producing water?

A What do you mean, structurally higher?

Q I mean high as opposed to low.

A Well, here is one that is higher than this one that's making water.

Q This one here, which well is that?

A Aztec Adamson 2 is higher than Sinclair Kendricks 1.

Q When did that well start making water?

A Just very recently.

Q Has that water production been reflected on any reports that you have submitted to the Commission?

A No, sir, we haven't submitted a report for March yet.

Q What was this water cut, what percent?

A I don't have the exact data because it has been on the pump about a week. I would say in the neighborhood of 20 to 25 percent.

Q Can you express that in barrels for me?

A Yes, sir. I would say about 80, well, I don't know. I would rather --

Q But around 20 percent?

A Yes, sir.

Q Do you know of any wells other than the one you mentioned, the Aztec well, that is located structurally high and producing water?

A Structurally high, you have to compare it with something. I would say Mr. Hammond's well down here is located structurally high compared to other wells here and with the north end.

Q In other words, what you are saying with reference to the Hammond well is that there are wells located structurally lower than he is?

A The map indicates that.

Q As a matter of fact, he is right on the edge of the field, Mr. Landua, as reflected by your exhibit?

A Depends on what you call edge. He's supposed to have 105 feet of Devonian above the 8150. Depending on the spacing, you might get another well in here.

Q Let's ask it this way, Mr. Landua. Looking to the productive limits line,as reflected by your Exhibits,to the west and to the south are there any wells located between Hammond's well and your productive limits? It's an outpost well, isn't it?

A It's the last well on the south end, let's put it that way.

Q Yes. As a matter of fact, Mr. Landua, in a water drive field such as I believe everyone agrees we have here, isn't it the normal thing to expect that low structural wells will produce water?

A At what point in the life of the field?

Q You are the witness. Answer the question if you can. Qualify it any way you want to.

A I would say that sometime in the life of the field you would

expect the low wells to produce water, yes, sir.

Q Well, you talked a lot about the relative thinness of 85 percent of this field?

A Yes, sir.

Q Certainly that would have something to do with the time at which your low wells would go to water, wouldn't it?

A Yes, sir.

Q All right, sir. What's the total cumulative production from this pool, do you know?

A I think around nine million barrels, up to the first of the year.

Q Quite a bit of oil, isn't it?

A Yes, sir.

Q All right now, in your opinion, based on your knowledge of the facts that exist in this field, and balanced with your knowledge of the amount of oil that has been withdrawn, you don't find it unusual for these edge wells to be making water, do you, Mr. Landua?

A This is a 3600 acre field and my studies have been based on individual wells, not so much field as a whole.

Q You are reducing the allowable on the field as a whole?

A To protect the individual wells.

Q To do what?

A To protect the individual wells and preserve correlative rights.

Q I believe I understand you now. You are saying that this reservoir as a whole is not rate sensitive, but certain localized wells are, is that right?

A No, I'm saying that there has been some bad things happen to individual wells and it has been caused by the rates that have been in existence.

Q Mr. Landua, as a matter of fact, in a reservoir of this type, isn't the only unusual occurrence that we have all observed, isn't that the behavior of your Lawton State No. 2 well?

A I think it's unusual and bad practice for water to appear at different depths as it has.

Q Go back on your general theories now. Do you know of any water drive field that has produced a substantial amount of oil that has an exactly level water-oil contact?

A You mean exactly level by the --

Q I mean that is opposite to your --

A You mean not even a foot's variation in the water level?

Q You say this one is unusual --

A Yes.

Q Based on your experience, that is what you encounter in any water drive field after you have had substantial production?

A No, sir, I don't know about all water drive fields. I can't answer that question.

Q Have you had any experience at all in a water drive field other than this one?

A Yes, sir.

Q Where?

A Deep Rock-Ellenburg in Andrews County, Texas and Denton Pool in Lea County, New Mexico.

Q What did you observe there from the standpoint of a level or stable water-oil contact after substantial amounts of production?

A It varies.

Q It varies, doesn't it?

A Yes.

Q So that is not unusual, the only unusual fact that we have that we may not be able to explain at this point of this hearing is your Lawton State No. 2, isn't it, Mr. Landua?

A Unusual fact --

Q Yes, sir.

A You say --

Q Unusual as opposed to normal and expected.

A Yes.

Q Now you are recommending 190 barrels a day as a maximum efficient rate, are you not?

A No, sir, I'm not recommending a figure.

Q What are you recommending?

A I'm just recommending that it be cut to some figure that the Commission can set.

Q Well, the Commission this morning cut it substantially down to 226, would that be all right with you?

A No, sir.

Q You think it ought to be lower than that?

A Yes, sir.

Q Without us going through the entire increment from 226 down to zero, can you give me some idea of what you think would be a reasonable rate?

A We have this figure that was obtained in June and August that indicated in our opinion that we ought to try it around 190 to 200 barrels a day for a period of time and see what happens.

Q In other words, you would feel better with 190 than you would with 226?

A Yes, sir. I would.

Q For April?

A Not for April, for right now.

Q Surely. And you are recommending that as maximum and efficient rate, correct?

A No, sir. I don't know how to define maximum and efficient rate.

Q Are you recommending that the Commission set a maximum and efficient rate?

A No, sir.

Q What are you recommending, Mr. Landua? Why are we here?

A I'm recommending that the Commission set a rate that's lower than what has been in existence so that we can observe and see if the things that we consider are bad production practices

will continue to occur.

Q Are you not asking, then, isn't the effect of your recommendation to set a maximum efficient rate?

A No, sir.

Q You talk about this beneficial performance that you observed during the June '57 pipe line proration?

A Yes, sir.

Q How was this beneficial performance demonstrated?

A By the pressure survey for one thing.

Q Sir?

A By the pressure survey that we had that indicated that we were letting the natural water drive work for us.

Q In your application you say pressure performance observed in certain wells?

A Yes, sir.

Q Without naming them, the certain wells, could you tell us generally which wells they were?

A Yes, sir. They were all located in the north part of this reservoir.

Q Let me ask you this, Mr. Landua. Have you observed field-wide pressure performance as reflected at that time on a field-wide basis?

A Well, the field-wide pressures with the two areas together has only been taken one time and that was by the New Mexico Commission. We have taken our pressures on our operated leases,

which are just in the north end of the field, and the Commission has in their records which I have tabulated on Exhibit 2, indicates the pressures that were reported by the Commission in the Gladiola area as they were measured, and I have read those.

Q In other words, you have analyzed pressures on a field or reservoir-wide basis rather than, as your application states, certain wells?

A I have done both.

Q The point I'm trying to make, I believe you realize it, Mr. Landua, is that beneficial performance as observed by you was not on a field-wide or reservoir basis?

A That's true.

Q And you have not looked at it?

A At that time the North Gladiola was considered a field by itself, South Gladiola was considered a field by itself.

Q And you have not taken those data and looked at those data and seen how they fit in on the field-wide picture?

A Yes, we have compared them.

Q You have done that?

A Yes, sir.

Q Then when you did that, you observed, did you not, Mr. Landua, that as a matter of fact you had normal pressure performance that you have been experiencing prior to this period of proration, did you not?

A What do you mean, normal?

Q I mean that your pressures reflected during that period fit the pattern, the attitude of the curve as exemplified by past pressures; I am speaking about a pressure curve, I am sure you as an engineer are familiar with it?

A Yes.

Q They assume attitudes you would expect on that curve?

A I wouldn't know what to expect.

Q Have you plotted performance against cumulative?

A Pressures?

Q Yes.

A No, sir. We have just made a table on it.

Q Do you think it might be beneficial to you from the standpoint of analyzing a little further these beneficial pressures to have looked at them on a field-wide curve, pressure versus cumulative?

A I don't know what it would show us, Mr. Buell, because we are concerned about damage that has already been done.

Q You don't know what it would show?

A We don't know how it would help us in our recommendation.

Q All right. You have shown the productive limit line on your Exhibit 4 and 5 in this water drive field to be minus 8150?

A I don't know that I would define it as a productive limit line. We have used it as a bench mark to work from in trying to determine how much Devonian material we have in these different areas of the field.

Q Mr. Landua, what is the usual connotation attached to a zero contour line on an isopac? Isn't it normally your productive unit?

A No, we have tied that down, we have said it is 8150.

Q Sir?

A We have said that the zero line there is at 8150. We have tied it down. We are not saying that is the water-oil contact.

Q It's productive limits?

A Yes.

Q You are at your zero line of pay, that is all it would be?

A Yes, sir.

Q We are in a water drive field, what is going to determine productive --

A (Interrupting) Where?

Q Water-oil contact is going to determine it?

A Yes.

Q So actually your zero contact line, which is your bench line, is also your pick of the water-oil contact, is it not?

A No, sir.

Q How did you prepare that isopac, or the people under your direction, how did they prepare it?

A You mean the source of the data?

Q What sources, that's what I mean.

A We used scouting cards that are put out by these surveys that the companies exchange data on.

Q Scout data alone?

A It's the Reinhardt scouting cards.

Q Mr. Landua, several times in the course of your direct, or at least one that I remember, you mentioned you had used core data. Would you have any objection to making the core analysis available to the Commission that you used in your analysis of this field?

A No, sir. We have a summary here. You mean the detailed data?

Q Yes.

A Yes, we have one that I can give them.

Q Why we are mentioning that, what in your opinion is the average porosity in this reservoir?

A We just have this one core dope and it was four and a half percent porosity on this one core analysis.

Q What average porosity are you using in your reservoir engineering work, you using the four and a half?

A No, we haven't used an average, we don't know what it is.

Q What was the average porosity you used?

A I used for what?

Q In your engineering reservoir work and in this field?

A We don't have any figure for average porosity.

Q You haven't made an analysis of the reserves to your well?

A Yes, we used basic recovery characteristics. We didn't go back to get --

Q (Interrupting) You didn't use an average porosity?

A We didn't go back to try and develop average porosity. We figured it would be impossible.

Q What do you figure is the average permeability?

A I don't know.

Q What is it that is reflected by the analysis that you have?

A Just a second.

MR. COOLEY: Mr. Buell, while he is looking for that, I am not clear on your request. Do you wish to make a total analysis a part of the record?

MR. BUELL: Yes.

Q If you are going to have to look for it, Mr. Landua, and if you are going to submit the core analysis, we can get it from that.

A I have it right here. According to core lab summary, they analyze sixty and a half feet of permeable Devonian. The average was 76 millidarcies, and average porosity was 4.6 percent.

Q That is on your Lawton State 2?

A Yes, sir.

Q Perhaps I should direct this question to Mr. Quinn rather than to you. Would you have any objection to showing the surface traced of the cross-section exhibits you introduced on your Exhibit 4 and 5, so that we might relate those wells to the surface as well as they were reflected structurally by your exhibit?

A That's the way the cross-section was made.

Q Would you have any objection to showing the trace?

A I have no trace.

Q Do you have any objection to putting a trace on your Exhibit 4 and 5?

A No. You mean you want to put it on?

Q I would rather you would. It is your exhibit. I don't want to mark it up.

A I have no objection. I don't want to go to any more work. If you want to put it on, you can put it on.

Q Mr. Landua, several times in your direct testimony you indicated, to me anyway, that you were worried about this water drive being effective from the standpoint of maintaining pressure. In your opinion, based on data available today, would you say that we have had an effective water drive?

A I don't know what your concept of effective water drive is. Some people say you have to maintain pressure at 100 percent to have an effective water drive. Water drive varies by degrees.

Q I'm tired of defining words. I will ask you this question in this manner. You agree that we have about nine million barrels of oil cumulative produced from this reservoir?

A That's what the records show.

Q You don't doubt the records, do you, Mr. Landua?

A No, they are Conservation Commission records.

Q Would you also agree with me that in producing nine million barrels of oil we have experienced a pressure drop of only about

300 pounds?

A This pressure varies by areas. Our pressure study has been by the north area. We had a 400 pound drop in the north area where we produced about two million barrels of oil, in a round figure. Down in your south area, the pressure drop and performance was some different. I don't know exactly what the total pressure drop would be when you are weighing the whole business.

Q Mr. Landua, I'm sure you realize that in most all reservoirs pressure varies throughout that reservoir?

A Yes.

Q Your engineers have a way of weighting pressures so you can arrive at an average pressure?

A Right.

Q Do you agree with me then that taking this average pressure of this reservoir, which is a common and customary thing for engineers to do, that we have produced nine million barrels of oil with approximately a 300 pound pressure drop?

A No, sir, I don't agree because I don't know when the last pressure was.

Q You don't know what the average pressure in the reservoir is, do you?

A At this minute, no.

Q Do you happen to know the saturation or bubble point pressure?

A I have heard that it's below a thousand pounds, but I don't know what it is exactly.

Q Then you couldn't disagree with me if I told you it was 537?

A No, I couldn't disagree.

Q Based on your general knowledge or a study, if you made it, Mr. Landua, in your opinion, producing at the normal unit allowable rate in this reservoir, in your opinion will pressure ever decline to anywhere near the bubble point pressure in this reservoir?

A No, sir. I'm positive that it won't.

Q Sir?

A I am of the opinion that it won't.

Q Will not. You also testified, Mr. Landua, that lead me to believe that in your opinion in a water drive reservoir such as this that absolute pressure maintenance would be the best thing that you could do for effect in the field, is that right?

A Absolute?

Q Yes, sir, I understood you to say that.

A I think that you would get the most ultimate recovery if you had absolute pressure maintenance.

Q In other words, the greater recovery of most oil from this field is to keep that pressure at exactly where it is now?

A Now?

Q Yes, sir.

A No, I can't say that.

Q Well, surely you don't propose injection of some fluids

extraneous fluids to increase it?

A No, sir, but I think maybe if you could reduce the rate low enough that the pressure might go on back up.

Q You think that would be a good thing?

A It could be increased.

Q It would increase ultimate recovery?

A I think it would increase ultimate economical recovery.

Q Let's talk about actual ultimate recovery in physical barrels of oil from this reservoir.

A Yes, sir. I am of the opinion.

Q It wouldn't increase it, would it?

A Sir?

Q Returning this reservoir to its original virgin pressure and maintaining it there to completion would not increase ultimate physical recovery, would it?

A I don't know whether I can answer that.

Q Sir?

A I don't know whether I can answer that.

Q You don't know one way or the other?

A No, sir.

Q Actually, Mr. Landua, as a matter of fact, reducing pressure in this reservoir is going to increase ultimate recovery, isn't it?

A I don't know that either.

Q What happens to your reservoir volume factor in a water drive reservoir such as this when you decrease your pressure?

A If you keep it above saturation pressure, I would think your reservoir volume factor, there again, people define that in different ways, but I would think it would stay about the same.

Q Stay the same. You are not of the opinion and you have never seen any literature or technical papers to the effect that it would increase?

A No, sir.

Q What do you think would happen to the viscosity of the oil if we reduce the pressure in this reservoir?

A I think that it would keep it above the saturation pressure, that it shouldn't vary appreciably.

Q Again I will ask you the same question. You have seen nothing in the literature or technical papers that would indicate otherwise?

A No, sir.

Q Assume for the purpose of this question that in truth and in fact the phenomena that would occur on your reservoir volume factor is that it would increase as you decreased your pressure. What would be the effect of that in a reservoir? I realize you are assuming that it will, since you said it would.

A I don't know.

Q You don't know whether that would increase ultimate recovery or not?

A No, sir.

Q Would your answer be the same with respect to viscosity?

A Yes, sir. I mean I wouldn't know.

MR. BUELL: I think that's all I have at this time.

MR. PORTER: Anyone else have a question of the witness? Mr. Errebo.

By MR. ERREBO:

Q Mr. Landua, to save time of the Commission, can you tell me whether or not you have furnished the individual well pressures used in the average for your fifth and sixth surveys? I don't know on what exhibit that was reflected, but I believe you did offer that. Has that been furnished to any of the other parties in this matter, such as the Pan American or Hancock or any other company?

A No, sir.

Q Could you prepare that information and furnish that to Sunray?

A Yes.

Q Now I assume, Mr. Landua, in making your study of this field upon which your recommendations are based that you have had access to complete reservoir or complete production and test information on the Lowe wells. Do you figure that, you believe that is complete, the information which you have used in making these calculations?

A Of course I don't know exactly how complete, or the degree of completeness you mean.

Q Well, I'm not trying to trap you on that.

A I know, but what's your point?

Q I would like to know if you have measured the oil and water production per day on the Lowe wells before the pipe line proration occurred, and if that was also measured afterwards?

A It's a matter of record.

Q It is a matter of record?

A Commission record.

Q Has been furnished to the Commission?

A C-110, yes.

Q That is furnished periodically, is that correct?

A Yes, sir.

Q Over what interval of time?

A They get them every month. C-110's for the oil. There is another form for the water.

MR. ERREBO: Thank you.

MR. PORTER: I believe you referred to the wrong number form, it should be C-115, if you are referring to the production.

A Yes, that's what I am referring to.

MR. PORTER: Mr. Montgomery.

By MR. MONTGOMERY:

Q You were asked several questions, and some of them I would like to go back again and perhaps review those. One of them was the fact that you were asked, did you see anything unusual in this particular field besides the Lawton State No. 2 producing 100 percent water overnight. Did you see anything unusual about the fact that before proration we were able to obtain some 6,000 barrels of

oil per pound drop, and then during the reduced period, as you testified, we received some 19,000 barrels and then again it went back to its former rate on hundred percent purchases? Do you see anything unusual about that particular item?

A No, sir.

Q What is your conclusion from that information?

A My conclusion from that information is that the water drive worked for us to maintain pressure at lower rates.

Q At the lower rates?

A Yes, sir.

Q In other words, the water was not keeping up fast enough to get the oil out, at the increased rates?

A That's right. The water encroachment into the reservoir was less than the oil withdrawals.

Q Have you seen any other unusual features about this pool? Are there any wells high on the structure? The two wells, Pan American Wells No. 10 and 12, would you mind pointing to the Commission on the map where those wells were?

A Yes, sir, they are located on this edge of the field.

Q Do you know anything unusual about those two wells?

A Well, by Commission records they have not produced the top assigned allowables for this area for quite some time, but I understood just a few minutes ago that they worked over one or both, and I don't know the status of those wells now. Examination of the Commission records in the past has indicated that they have

not been top allowable producing wells.

Q Are those wells flowing?

A To my knowledge, they had Cody pumps on them.

Q What would you gather from that information, these two wells are on the highest part of the structure and probably of the thick pay more than any part of the pool. What conclusion do you draw from the fact that they are marginal wells?

A Apparently the operator has seen fit to not take top allowable out of these wells despite the fact that they have the thickest pay.

Q Are those wells capable of producing top allowable?

A I don't know.

Q We can assume they probably were not. Then why did they not, because there was not enough oil in the well bore?

A Maybe they thought they were too close to the fault and at high producing rates they would draw in wells.

Q There are top allowable wells between those wells and the edge of the pool, are there not?

A These wells on this edge of the pool, yes, sir.

Q Are those wells top allowable?

A By the Commission records, they are, yes.

Q Did you assume that the drive mechanism wasn't sufficient at the increased producing rates to drive the oil through the well bore?

A Something wasn't sufficient for them to take top allowables

out of these wells. They were apparently being produced at capacity even though you had a flush-type field, flush-type condition in that part of the reservoir.

Q Were there any other unusual factors about this field that you found in your study?

A I think it's unusual for it to be so thick in one area and then so thin in so much of the area.

Q The core analysis that you referred to on the Lawton State No. 2, as I recall you said 62 feet of pay in that well?

A No, sir, I said that core lab analyzed 60 and a half feet of Devonian section.

Q Did they analyze any of that core being water bearing and would probably produce water?

A No, sir. There are indications that the whole sixty and a half feet is oil productive, would be oil productive.

Q You answered a question a little earlier when you had it on Exhibit No. 10, the question was did you think there was any coning, and I think your answer was no. I wonder if you will refer to Exhibit No. 10, wherein you said as I recall the minus depth on the well was 8172?

A Yes.

Q Did you make a statement that if that water level was present throughout the pool, some 18 of your 19 wells would be flooded out?

A No, I didn't say that. I should say they should be producing

some water. I don't know that they would be producing 100 percent water.

Q Would that indicate to you that there would be coning in that one well?

A I don't know how to define coning in a hard rock reservoir. This reservoir has fractures and bugs. I don't know how to define coning as regards this particular reservoir.

Q Can you see how there could possibly be any mechanical failures that would cause this well to produce water? The core analysis indicates there was no water whatsoever?

A That's true.

Q Do you have any water above the pay?

A I would say that it would be virtually impossible to be a mechanical failure in this well that would make it produce water.

Q Do you sincerely believe that we were producing this field at too rapid rate, after your some twenty years experience as an engineer?

A Yes, sir.

MR. MONTGOMERY: That's all I have.

MR. PORTER: Does anyone else have a question of the witness? Mr. Fischer.

By MR. FISCHER:

Q Mr. Landua, what's the nature of the workover now on this Lawton State 2?

A We have moved in a small rig and we have pumped 300 sacks

of cement in and in 100 sack batches, and it has gone in on a vacuum, then this morning they used 200 sacks that contain some flow seal plugger material and they were able to pump away 40 sacks and got a pressure buildup. I don't know if they have the 40 feet of perforated interval squeezed off or not.

Q It was squeezed on a retainer?

A Yes, sir.

Q Was it in the nature of a sort of diesel oil cement job?

A No, sir, I don't know the kind of cement, but it's straight cement. I don't know whether it was Portland or slow set.

Q Pardon?

A I don't know whether it was Portland or slow set, but it wasn't a diesel squeeze.

MR. FISCHER: Thank you.

MR. PORTER: Mr. Nutter.

By MR. NUTTER:

Q Mr. Landua, referring to your Exhibit No. 11, wherein you show that some eight or nine or ten wells had experienced an increase in flowing tubing pressures since the rate of production was reduced, now what do you make of that? What's its significance? I wonder if you would elaborate on Exhibit No. 11.

A Well, in our opinion, as we have previously stated, it's an unsaturated crude, it doesn't have much gas in solution, simply stated, this indicates to me that we have less differential pressure under this condition in our oil zone than we do in our water zone

in these wells that we observed.

Q In other words, you feel that the pressure is more equalized from the water into the oil section?

A I don't know that it would be equalized. I would say that the trend is toward equalization.

Q That's what I say, more equalized.

A Yes, sir.

Q Now on your Exhibit No. 6, on these bottomhole, the barrels of production per pound drop in bottomhole pressure --

A Yes.

Q -- Do you feel that at the rate of withdrawals for the first four bottomhole pressures were taken, that the water was failing to come in fast enough to maintain the pressures in there?

A Yes, sir.

Q And you feel that during the period of pipe line prorationing when the rates of production were curtailed, that the water was more or less equalized with the rates of withdrawal of the oil?

A No, sir, it wasn't equal.

Q Or the influxion of the water was closer to equal?

A Yes, sir.

Q Do you think there's any possibility, Mr. Landua, that the Lawton State No. 2 well went to 100 percent water as a result of increased production during the period that you were making up back allowable?

A It could very well be, yes, sir.

Q How much production did it make during the month of January?

A 8196 barrels.

Q To achieve a rate of 8196 barrels for the month, do you happen to know what the normal unit allowable for the State would have to be?

A No, sir, I don't.

Q Assuming it was a rate of 39 barrels, does that sound like an unreasonable rate for a normal unit allowable? It used to not be, at any rate.

A I don't know.

Q It's conceivable that we could have a normal unit allowable of 39 barrels?

A Well, I don't know about that.

Q At any rate, the production during the month of January was at a rate of 39 barrels normal unit allowable, Mr. Landua.

A Yes.

Q To you does that indicate that possibly the back allowable was not the contributing factor; if it would be the contributing factor, let me put it this way, would a rate of 39 barrels normal unit allowable also cause the same thing?

A I think any time you increase the producing rate you increase the chance of getting this water up there prematurely. Certainly we had a producing rate here that was above the normal allowable base rate.

Q What was the average daily rate of production during the

time that you were curtailed by the purchaser?

A I think you could. I haven't divided it out, but it reflects it during the month of June, '57, the well produced 5772 barrels.

Q Would that be approximately 192 barrels per day?

A I haven't divided it, Mr. Nutter.

Q Assuming it would be, would that be a more proper rate of withdrawal, in your opinion, than the current allowables are?

A Yes, sir, we think so.

MR. NUTTER: Thank you.

MR. PORTER: Are those all your questions, Mr. Nutter?

MR. NUTTER: Yes, sir.

MR. PORTER: Anyone else have a question of the witness? Mr. Cooley, did you have a question?

MR. COOLEY: Just a minute, please.

By MR. COOLEY:

Q Mr. Landua, you have made considerable reference to the fact that approximately 85 percent of the pool has only about 50 feet of pay?

A Let me say this, Mr. Cooley. It's 50 feet of Devonian, feet of section above the 8150 bench mark.

Q Yes. The inference has been that due to this thinner pay the water encroachment problem would become more acute. Can you please expand on that somewhat as to how the thinness of pay affects the water encroachment as a result of high production rates? What is the significance of this?

A It seems to me that one significant fact is that in the hard rock type reservoir like we have here, with fractures and vugs, once water makes its appearance, you have to handle it. When you have to start handling water, it adds to your production expense, and therefore reduces the amount of ultimate economical oil that you can afford to take from a well bore.

Q How is this any more so in a foot of 150 foot than 50 foot pay, and 200 feet?

A If you have 200 feet of pay section, you have a chance of having some hard streaks along the way that you can do a cement job and get a seal and retard the continued encroachment of this water.

Q In your opinion does the flooding out of your Lawton 2 well represent the movement of the oil that was formerly coming into that well bore off that lease to another lease, or do you feel that its lost forever in production? Does water encroachment move the oil off to another well, or is it actually lost?

A I don't know exactly how it would work.

Q Do you think that some or both may occur?

A I am of the opinion that when the water appears in this well like it has here, it is 100 percent water, and if you can't do anything about it, you are not going to get any more oil from the 40 acre tract.

Q If that, that is the 40 acre tract that the operator owns that is all he is going to get?

A He is out of the business.

Q Considering it from the ultimate recovery from the pool and not each operator's recovery, do you think that the watering out of the Lawton No. 2 represents a loss of the recoverable oil in the Gladiola Pool?

A I am of the opinion that it does.

Q How is that so, has it been bypassed?

A I would say that it has.

MR. COOLEY: That's all the questions I have.

MR. PORTER: Mr. Webb.

MR. WEBB: I just have one question.

By MR. WEBB:

Q In your opinion is this field an edge water drive, or bottom water drive?

A I haven't made up my mind.

Q Would that make a difference, in your opinion, as to what is happening in these wells which are producing water, whether it was a bottom water drive or edge water drive? What I'm getting at, would that help to explain any of the problem wells which you have been talking about?

A You mean the fact that it would be edge drive rather than bottom drive?

Q Well, or vice versa, whichever in your opinion it is.

A The only thing I can say is that certainly the water is present on the edges, and we know that it's present in one place

kind of in the center. It's the only fact that I have about it, Mr. Webb.

Q Just one further question. In talking about the pressure drop, pounds of pressure in the number of barrels that you were able to produce per pound of pressure drop, you used the figure 19,000 barrels during proration, and a return to 6,000 barrels after proration, is that correct? What wells were those based on, was that a field-wide study?

A It was based on the north end, Mr. Webb, and the pressures were measured in the Ralph Lowe operated wells.

Q In the Lowe wells?

A In the Lowe wells only, and the production was taken from the Commission records for that portion of the field.

Q Had there been, of course there had been some recovery of oil subsequent to your check, subsequent to your pressure drop, prior to prorationing; had there also been some additional wells drilled in the field?

A Absolutely.

Q Would that have some effect on your pressure drop?

A I would think it would.

Q You say you are just using Lowe's wells, would that have some effect on your pressure drop in just those wells?

A Well, here is this exhibit that you refer to that tabulates the pressure information at the time of the sixth survey, there were thirty-three wells in the northern portion of the field and

we measured the pressures in 16; our wells were dispersed throughout the northern end of the field.

Q How many wells were there in the field, then, after pipe line prorationing, when you made your next survey?

A Forty-four wells and we measured the pressures in twenty.

Q In twenty?

A Yes, sir.

MR. WEBB: That's all.

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

By MR. KELLAHIN:

Q Mr. Landua, you knew that a field-wide survey on pressures was made by the New Mexico Engineering Committee in September in the Gladiola Pool, did you not?

A Yes, sir.

Q Was that information available to you?

A Yes, sir, I have it tabulated on this sheet.

Q Would you dispute the fact that according to the report made by the New Mexico Engineering Committee that the average of thirty-four wells which were under pipe line proration showed a pressure of 4,446.7 pounds, as against an average of twenty-five wells with full allowable showing a pressure of 4,521.2 pounds?

A I haven't examined that data.

Q It appears on that exhibit -- I mean if the figures I have given you appear on an exhibit -- I mean not on an exhibit but in

the New Mexico Engineering report?

A No, sir, I don't see how it could be.

Q That would be a difference of some 174 pounds of pressure. I notice on your exhibit you show within the limits of the field the Anita's Field No. 1, the Jack L. Hammond Well No. 1, is that correct?

A Are you speaking of this well down here?

Q Yes, sir. Do you know what that well tested? Is it a producing well, was it ever a producing well?

A Well, he has a well on the allowable schedule now, and that is this well here. I don't know if it is the one you are referring to or not.

Q Actually that well tested water, didn't it?

A Mr. Hammond told me that at these high rates, this 257 barrels per day, his well produced about 80 percent water, and he voluntarily cut it back on a 7-64 choke and he's getting about 170 barrels a day as an overall average, and the water percentage has reduced appreciably in this part of the field.

Q Now in the extreme northeastern portion of the field, you show an oil well outside of the limits of the field,do you not?

A I show an oil well up there that's outside the limits of this 8150 contour.

Q That is in the same producing formation?

A Yes, sir.

Q Did you have any reason for excluding it from the contour?

A Yes, because we assume the 8150 bench mark is a base to work from.

Q That is a producing oil well up there?

A Yes, sir. We have two dry holes that are also outside of that contour.

Q Mr. Landua, the Anita Field Well No. 1, Jack L. Hammond, I believe we're not point to the same well -- if you would refer again to your map in Section 25, it would be the well to the extreme eastern part of the field.

A He has a dry hole over here that shows a total of 12,800 feet on my plat.

Q That you show as being inside the limits of your map, do you not?

A I show it as being inside the 8150 contour.

Q It made water initially, did it not?

A I have no information about this well.

Q It just shows as a dry hole?

A Yes, it shows it as a dry hole.

Q That is the one that I was referring to, not the one you referred to that is producing on choke.

A I'm told it is producing on choke.

Q That being the Anita Field No. 1 Jack Hammond, as far as you know it has never produced oil?

A I don't have any information about the dry hole.

MR. PORTER: Anyone else have a question? Mr. Fischer.

By MR. FISCHER:

Q Mr. Landua, would you say that the Gladiola Pool is essentially an anticlinal structure?

A Yes, sir, I would say it's an anticlinal.

Q And did you say that you thought that the water was connected throughout the field, or there was a water table?

A No, sir, I just said that the Devonian around this area contains water and the field is connected to a big acquifer of Devonian water.

Q We can assume, then, possibly that this is a bottom water drive, is that correct?

A Well, I'm sure that water is in contact with the bottom, but whether the drive is as active from the bottom as from the sides is something that I haven't studied.

Q At the same level we can assume then that if this was connected to an acquifer that it, for example, the 8150 level, we can assume that the pressure is equally distributed in the field?

A There's a variation in the field,in the pressure throughout the field.

Q Well, then, I forget if you said, did you think that this Lawton was water coned?

A Was water coning.

Q That the loss of the hole was due to the coning of the water?

A The loss of the hole was due to the appearance of water,

whether it coned, I don't know exactly how it got up there.

Q Well, if your workover is unsuccessful, we could assume then that your relative permeability to water is greater than that to oil?

A Well, in a fractured and vuggy type reservoir, Mr. Fischer, I don't know exactly what relative permeabilities would mean to you.

Q Well, you gave an average permeability number, then we could assume possibly that your relative permeability to water was greater than what it was to oil, by voiding your oil or by voiding your space in that oil, you sucked the water up to where it filled the portion, the area around the hole, and the oil will not come through, due to the, say the service tension or the relative permeability of the water?

A That's true, oil won't come into the well bore.

Q Do you think we can call that coning?

A I just don't know, Mr. Fischer.

MR. FISCHER: Thank you.

MR. PORTER: Any other questions of the witness? The witness may be excused.

(Witness excused.)

MR. BUELL: May I add to my motion for continuance a request that the normal unit allowable be reinstated and continued until this matter can be heard to conclusion? Frankly, I think based on the record made here today that such action is certainly

justified and warranted.

MR. KELLAHIN: If the Commission please, Jason Kellahin for Hancock Oil Company. We have no strenuous objection to a short continuance of this case or a lengthy continuance, depending on what is done with the allowable. We would like to join very strongly with Mr. Buell's motion that in the event of the continuance, the allowable be restored to the normal unit allowable for this pool. We don't feel that the testimony that has been offered here today justifies the continuance of the allowable cutback, and certainly a small operator such as Hancock Oil Company is being very seriously hurt by this curtailed production in this pool. Some of the larger companies can absorb such a loss of revenues, but the smaller companies are being seriously hurt. You would be doing a serious injustice unless there is compelling evidence to the Commission to continue this cutback.

MR. QUINN; I would like to make a statement here before the Commission of our case, and that is before any further motions are made or statements made, and that is that we believe that without reiterating any of the evidence that has already gone in both from the direct examination and the cross examination and what could be called redirect examination, that enough evidence is before the Commission to justify the lower allowable which was set by the emergency order. We have no objection to a continuance of this matter, if it is stipulated that any exhibits which will be offered by any of the protestants in this matter will be furnished

to the applicant in advance of this hearing so that we'll have an opportunity to look them over, as we have presented all of our exhibits here to date; and further that we also have the right to introduce any data which we may obtain subsequent to the hearing, or prior to the hearing, and any other exhibits which we may see fit to introduce at that time.

I would like to point out that there hasn't been an iota of evidence introduced here by any of the protestants.

MR. WEBB: Mr. Porter, may I say something?

MR. PORTER: Mr. Webb.

MR. WEBB: Layton Webb with Sinclair. We are in a certainly unusual and certainly unenviable position here, in that we are not prepared to forward with the case today. It was just not humanly possible for us to get what data we thought the Commission would want in a hearing such as this. As I say, we are in a position where we are forced to ask for a continuance. I think probably if we would have had one week more we could have been ready. We are also in the position where we feel that the evidence presented today, assuming that it did justify the emergency order which the Commission was authorized to act, as I understand the rules under which the Commission acts on emergency orders, the hearing is to be held within fifteen days, and the order either becomes null at the end of fifteen days or becomes permanent, or of course by stipulation of parties or by Commission motion they can enter an interim order. Assuming that the information that the Commission

had when they entered this order at the first of the month was sufficient to show that waste was possibly being caused in this reservoir, I seriously doubt from listening to the testimony which was offered here today whether that testimony would be sufficient for the Commission to continue this order in effect to the detriment of those who are protesting it. Now what I am getting down to is that we cannot oppose the continuation of this order, if the Commission desires to do it, because we are not ready to go forward with our case today; but we do feel that if it is going to be continued, that the continuance, the case should be heard before the first of April, and we would suggest if the Commission has time for either the 31st or the 1st of April, or as I have previously suggested, at least privately to one member of the Commission, it may be possible and certainly appears now that the Jalmat case, the rehearing on the Jalmat case which is set for the 25th will not take longer than a day or a day and a half at the most, and from Sinclair's point of view we will be willing to wait if the case does continue, if you can set it down on the 26th.

Now if you are not going to continue the order, and after we listened to the testimony we felt that probably a continuation of this low allowable is not justified, then any time that the Commission desires to set the case will be satisfactory to us.

MR. ERREBO: Just a brief statement. Sunray-Midcontinent recommends continuance of the case for receipt of additional testimony and also recommends that the normal unit allowable be restored.

We don't believe that the evidence today justifies the continuation of the cut.

MR. PORTER: The Commission has decided to continue this case and try to dispose of it immediately after the Jalmat case on March 26th. We have decided that an interim order will be entered in which the 190 barrel a day allowable will be retained until the permanent order is issued.

MR. BUELL: Will the provision relating to back allowable also be included in the interim order?

MR. PORTER: Yes, sir. Thank you. The interim order will contain substantially the same provisions as the emergency order.

MR. COOLEY: You haven't ruled upon Mr. Quinn's request that all exhibits which the protestants propose to introduce be submitted to Mr. Quinn prior to the time of the hearing.

MR. BUELL: I might say that on behalf of Pan American I have told Mr. Quinn that we will get them to him as quickly as I can. I can't give him a definite date, but just assure him when we do them we will get them to him and it will be prior to the hearing.

MR. WEBB: We would be willing to get them. It will be a reasonably short time before the hearing, though.

MR. KELLAHIN: Hancock Oil Company will supply the exhibits as soon as possible.

MR. QUINN: Thank you, gentlemen.

MR. PORTER: I assume that the hearing is adjourned until

9:00 o'clock.

(Hearing adjourned.)

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C E R T I F I C A T E

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

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

WITNESS my Hand and Seal this 21st day of March, 1958, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Ada Dearnley
NOTARY PUBLIC

My commission expires:

June 19, 1959.