BEFORE THE
OIL CONSERVATION COMMISSION
STATE OF NEW MEXICO

CASE 249: Application of the Commission on its own motion for an order directed to Bagley-Siluro-Devonian Pool operators to show cause why pool shall not be placed on a 40-acre spacing pattern with allowable adjustment. When the case was postponed last month, Order R-69-B (interlocutory) was issued to cover the interim period until regular order can be written.

TRANSCRIPT OF HEARING

May 19, 1953
Date

BEFORE: Honorable Ed. L. Mechem, Governor
Honorable E. S. Walker, Land Commissioner
Honorable R. R. Spurrier, Director, OCC

STATE OF NEW MEXICO)
ss
COUNTY OF BERNALILLO)

I HEREBY CERTIFY That the within transcript of proceedings before the Oil Conservation Commission is a true record of the same to the best of my knowledge, skill, and ability.

DONE at Albuquerque, N. M., this 26th day of May 1953.

E. E. Greeson

My Comm. Ex.:
August 4, 1956

E. E. Greeson
Notary - Reporter

COMMISSIONER SPURRIER: The next case on the docket is Case No. 249.

(Mr. Graham reads the call of the case.)

MR. SETH: If the Commission please, Oliver Seth appearing for the Amerada Petroleum Corporation.

This matter began in December, 1950, with the application of Amerada for 80-acre proration units and regular spacing in the Bagley-Siluro-Devonian Pool in Lea County. A hearing was held by the Commission in April 1951 and a temporary order, R-69, was entered at that time providing for 80-acre proration units and uniform spacing.

In April of the following year, upon application of Amerada and the Commission upon its own motion, the matter came up again at the expiration of the year's order. At the time a hearing was had, and the Commission entered an order extending the previous one for an additional year. That was Order R-69A.

That order expired in April of this year. In the April hearing the matter was continued for one month until this hearing on the interim order. In order to consolidate the record in this case, I would like to present four exhibits.

These exhibits, as indicated, are to make it

more convenient for the Commission in this hearing and to consolidate the record.

Exhibit A is a copy of Order R-69A. Exhibit B is a copy of Order R-69. Exhibit C is a copy of the notice. Exhibit D is the interim or interlocutory order.

We would like to move the admission of these exhibits.

COMMISSIONER SPURRIER: Without objection, they will be received.

MR. SETH: I would like to introduce to the Commission Mr. Woodward and Mr. Maxwell of the Amerada Petroleum Corporation, who will conduct the hearing.

MR. WOODWARD: If the Commission please, my name is John Woodward, appearing for the Amerada Petroleum Corporation. This is Amerada's written statement in Case 249.

At this time I would like to swear our witnesses appearing in this case, Mr. John A. Veeder and Mr. R. S. Christie.

(Witnesses sworn.)

MR. WOODWARD: At this hearing, it is Amerada's contention Order R-69A should be extended for a period of one year from this date, and for cause Amerada would show the following: First, that the Commission has twice found the evidence justifies the temporary order for one

year. The temporary order R-69 and R-69A has not resulted in waste or prejudiced correlative rights.

The same considerations justifying these orders still apply to a further extension of 80-acre spacing in the Bagley-Siluro-Devonian Pool for an additional period of one year.

Developments in the pool since April 1952 also support an extension of Order R-69A in all its particulars.

40-acre spacing of the Devonian at Bagley would result in the drilling of unnecessary wells.

To save time and establish a more complete predicate for consideration of the question now before the Commission, it is requested that the records of previous hearings in this case be incorporated by reference and made a part of this record.

(Off the record.)

COMMISSIONER SPURRIER: Without objection, it will be granted.

MR. WOODWARD: The first witness in support of Amerada's position is Mr. John A. Veeder. He is a geologist for the Amerada Petroleum Corporation.

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JOHN A. VEEDER,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. WOODWARD:

Q Will you state your name, please?

A John A. Veeder.

Q Where do you live, Mr. Veeder?

A Midland, Texas.

Q By whom are you employed?

A Amerada Petroleum Corporation.

Q In what capacity?

A District geologist.

Q Have you previously testified before the Commission in your capacity as geologist or expert witness?

A I have.

MR. WOODWARD: Does the Commission accept Mr. Veeder's qualifications?

COMMISSIONER SPURRIER: It does.

Q Mr. Veeder, I hand you what has been marked Exhibit E. Can you state what it is, please?

A Exhibit E is an aerial map of the Bagley field showing all the Devonian producers, and it also shows the productive limits of the Devonian, which is within the hachured outline.

Q Have you previously examined Schlumberger electrical logs for Devonian wells in this area?

A I have.

Q Which wells? Would you indicate the wells you have examined?

A On all Devonian and Pennsylvanian producers and dry holes in the Devonian-Bagley pay field.

Q Those were Schlumbergers for the wells completed prior to the hearing of last year?

A That's right.

Q I hand you what has been marked Exhibit F. Will you state what it is?

A Exhibit F is a Schlumberger on the Amerada No. 1 or BTN Devonian producer completed since the last hearing last year.

Q That is the only Schlumberger you have examined since the hearing last year?

A That's right.

Q I hand you what has been marked Exhibit G. Will you state what it is, please?

(Off the record.)

A Exhibit G is the data production sheets of our Devonian producers in the Bagley field. On these sheets we have shown the well name, have indicated the top of the Devonian, the top of the Devonian pay, and also the

production and completion.

Q Mr. Veeder, I hand you what has been marked Exhibit H. Will you state what that is, please?

A Exhibit H is a structure map. On top of the Devonian of the Bagley field. This is a contoured map at -- contour interval is fifty feet.

Q I hand you what has been marked Exhibit I. Will you state what it shows?

A Exhibit I is a structure map of the Bagley field on top of the Devonian pay at contour interval in this instance also fifty feet.

1b Q Will you please explain why it was necessary to have a contour map on top of the pay and on top of the Devonian?

A In the Bagley field, the Devonian reservoir is capped by an impervious bed. Because of that, we have drawn the two structural maps.

MR. WOODWARD: Exhibits E to I are offered in evidence.

COMMISSIONER SPURRIER: Without objection, they will be received.

(Off the record.)

Q Mr. Veeder, based on the Schlumbergers you have examined, the completion data sheets and the structural maps, what in your opinion is the probable productive

limits of the Devonian at Bagley?

A The probable productive limits is that area enclosed within the hachured lines in Exhibit E.

Q And this is the area now covered by Order R-69A?

A That's right.

Q What is the acreage of that area?

A That area is approximately 2400 acres.

Q How many productive wells have been completed in the Devonian at Bagley to date?

A There have been twenty-one Devonian producers completed.

Q Whose wells are those?

A The Amerada has sixteen Devonian completions. Texas-Pacific has five.

Q And how are these Devonian wells indicated on the Exhibit E?

A On Exhibit E the Devonian wells are indicated with the red circle. The Pennsylvanian wells are indicated by the green circle.

Q Mr. Veeder, the two structural maps, Exhibits I and H, were prepared under your direction and supervision?

A That's right.

Q Will you describe the geological structure that is indicated by those maps?

A Both the structure map on top of the Devonian and

the Devonian pay indicate an asymetrical anticlinal structure.

Q Do you know of any structural irregularities in the Devonian at Bagley that would prevent movement or absolutely obstruct movement of the oil through the pay?

A I know of none.

Q Have you examined cuttings and cores from Devonian wells at Bagley?

A I have.

Q From your examination of the Schlumbergers and from those cuttings and cores, what in your opinion is the porosity of the pay at Bagley?

A The Devonian reservoir has very good vuggy and fractured type porosity. And it is my opinion that this porosity is continuous and connected throughout the reservoir.

Q Then, Mr. Veeder, from a geological standpoint, is there anything in the structure or lithology of the Devonian which would indicate a need for smaller spacing units than established by Order R-69A?

A There is none.

Q Have you obtained any additional geological information since the hearing in May of last year that would show any change of condition that would prevent an extension of the order?

A I have not.

Q You have read the written statement submitted by Amerada at this hearing?

A I have.

Q Is that statement true and correct to the best of your knowledge?

A It is.

MR. WOODWARD: I have no further questions.

COMMISSIONER SPURRIER: Does anyone have a question of this witness?

MR. MACEY: Mr. Woodward, I would like to ask Mr. Veeder some questions, but a lot of it would be concerned with Mr. Christie's testimony which might later be put on and I would like to reserve the right to have Mr. Veeder recalled after Mr. Christie's testimony is entered, if that is in order.

COMMISSIONER SPURRIER: Very well. Does anyone else have a question? If not, the witness may be excused.

(Witness excused.)

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R. S. CHRISTIE,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. WOODWARD:

Q Will you state your name, please?

A R. S. Christie.

Q Where do you live?

A Tulsa, Oklahoma.

Q By whom are you employed, Mr. Christie?

A Amerada Petroleum Corporation.

Q In what capacity?

A Petroleum engineer.

Q Have you previously testified before this Commission as a petroleum engineer or as an expert witness?

A Yes, sir, I have.

MR. WOODWARD: Will the Commission accept Mr. Christie's qualifications?

COMMISSIONER SPURRIER: They do.

Q Mr. Christie, what isthe average oil-gas ratio for all wells in the Bagley-Devonian Pool?

A The average oil-gas ratio for the Devonian-Bagley Pool is approximately thirty cubic feet per barrel.

Q What is the gravity of the oil?

A Approximately 46 degrees API.

Q Mr. Christie, I hand you what has been marked Exhibit J. Will you state what it is, please?

A Exhibit J is a graph showing the monthly oil production, the cumulative oil production, the monthly oil production, the bottomhole pressure and the number of wells

in the field.

Q Mr. Christie, what was the initial pressure at Bagley?

A The initial reservoir pressure in the Bagley field was 4,285 PSI at a datum of minus 6700 feet.

Q What was the average bottomhole pressure of all wells in April 1951?

A The average bottomhole pressure of all wells in April 1951 was 4,258 pounds. A year later the average pressure was 4,213 pounds. And as of April 1, 1953, the average pressure was 4,155 pounds, which indicates a total drop from the initial of 130 pounds. During that interval the total production, the cumulative production, has been approximately four and a half million barrels.

Q Will you state what Exhibit J would indicate to you about the form of reservoir energy present at Bagley?

A The bottomhole pressure decline for the amount of production that has been produced, including oil and water, indicates a very active water drive.

Q You say very active water drive?

A Yes, sir.

Q And this water drive, is it augmented by any gas in solution to any appreciable extent?

A As I testified previously, the gas-oil ratio is only thirty cubic feet per barrel; therefore, there is

very little help from the gas, although it does slightly help the drive.

Q At the present time, is there any need, in your opinion, for secondary recovery operations at Bagley?

A No, sir.

Q Mr. Christie, will you state what Exhibit J indicates to you about the permeability of the Devonian reservoir?

A Actually, there is no data on there that indicates the permeability directly. But the bottomhole pressures are reasonably uniform and they build, have a very rapid build-up after shut-in, which indicates a high degree of permeability.

Q Have these Devonian wells had a uniform capacity to produce?

A Yes, I think they have.

Q Would that tend to substantiate or have any bearing on your opinion concerning the permeability of the Devonian at Bagley?

A It further indicates a good permeability, I believe.

Q Mr. Christie, given an anticlinal structure without structural irregularities, and a reservoir of continuous porosity and good permeability containing a high gravity oil under an active water drive, what area

in your opinion will be efficiently drained by one well in the Devonian at Bagley?

A Well, in my opinion one well will drain at least 80 acres.

Q What is the average cost of wells completed in the Devonian at Bagley?

A The average cost of Amerada wells drilled to the Siluro-Devonian is $220,000 per well. This, of course, is what you might call the direct cash outlay, and doesn't include any geophysical work or geological work or reconnaissance or anything like that. It is actual cash outlay.

Q How much steel is needed to complete these Devonian wells?

A Approximately a hundred and seventy-five to eighty tons per well.

Q How much steel was used in completing the average well drilled by Amerada last year?

A Amerada completed 206 producing wells last year at an average depth of 8,064 feet, which is considerably above the average for the nation. And in completing those 206 wells, we used an average 122.6 tons of steel.

Q As compared with the average at Bagley.

A As compared with the average of 178 to 180 at Bagley.

Q Then, in your opinion, will 80-acre spacing and the continuance of Order R-69A tend to promote economic operation at Bagley?

A In my opinion, it will; yes, sir.

Q In your opinion will it promote efficient use of materials?

A Yes, sir.

Q Mr. Christie, what is the allowable fixed by Order R-69A?

A One and a half times the normal 40-acre allowable with the deep pool adaptation.

Q Has this allowable resulted in coning or any other form of underground waste?

A We haven't noticed any, no, sir; there hasn't been any apparent, at least.

Q In your opinion would an extension of the order cause waste?

A No, I don't believe it would.

Q It would tend to reduce the hazard of waste in any way?

A Yes, it would. The drilling of any well will naturally -- It is attendant with hazard. Most of us are familiar with those; blowouts and fires and so forth. So that at any time you increase the number of wells drilled, you increase hazard by that proportion.

Q To your knowledge, is the operation of Order R-69A today breaching correlative rights in the field?

A No, I don't believe it has.

Q Mr. Christie, considering in your opinion one well will efficiently and economically drain 80 acres and not result in waste or breach correlative rights, is there any reason in your opinion for setting 40-acre spacing at Bagley at this time?

A No, sir.

Q Mr. Christie, you have read Amerada's written statement in this case?

A Yes, sir, I have.

Q Is that statement true and correct to the best of your knowledge?

A Yes, sir.

MR. WOODWARD: That is all I have.

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CROSS EXAMINATION

BY MR. WHITE:

Q Mr. Christie, you gave oil-gas ratios on the average as being thirty cubic feet per barrel. What is the difference between the oil-gas ratio as between the various wells, what is the greatest variance?

A They vary very, very little. I would -- I don't have the figures exactly on hand -- but I would say they

vary between, oh, maybe twenty to forty, something like that. They are very low, all of them.

Q And they are uniform?

A Yes, reasonably uniform. You must understand when they are that low, they are very hard to measure. So that you have ten percent error in your measurement, you have quite a variation in your gas-oil ratio at that low figure.

Q Are any of these wells producing water?

A Yes, sir.

Q And what amounts do the various wells produce?

A I believe there are nine wells in the field producing water. The water production for the month of March was approximately 35,000 barrels. The precentage varies from -- Well, of the eight wells shown on this tabulation I have, they vary from seven percent to eighty-one percent -- ninety percent, excuse me.

Q In view of the testimony as to structures that has been introduced, how do you account for the difference of seven percent as against ninety percent?

A Probably depends on structural position. If low on the structure and near the water table, they will produce more water.

Q And in your opinion the one producing ninety percent water, that well has no evidence of coning?

A No, I don't think so. It is inevitable when you have a water drive field you are going to have to produce water sometime during the life of the field.

2b Q What variance is there as to the bottomhole pressures?

A The last survey, the pressures varied from 3,481 pounds, which is an abnormally low well -- It has always had a low bottomhole pressure. The maximum pressure was 4,232 pounds. If you delete that one particular well that has always had a low bottomhole pressure, the variation is much less. It varies from approximately 4,038 to 4,232.

Q Are all these wells meeting their allowable?

A No, sir.

Q How many of them are meeting their allowables?

A I believe there are five wells on the schedule that are not making full allowable.

Q Are they pumping or flowing?

A The majority of them are on gas lift. I mean the ones that are not making the top allowable are on gas lift.

MR. WHITE: That's all.

COMMISSIONER SPURRIER: Anyone else have a question of Mr. Christie?

MR. GRAHAM: Let me ask one question.

BY MR. GRAHAM:

Q Mr. Christie, what is your conception of the term "correlative rights", for the record?

A My conception of correlative rights is everybody get what they are entitled to as near as you can devise a formula for that.

Q The interested owner, for instance, he shouldn't injure the reservoir unnecessarily.

A No, sir; and I don't think he wants to injure the reservoir.

Q Is there anything in the operation of that pool that would indicate waste as defined by the statute, that is, underground?

A I don't believe so.

Q What is the drainage situation there for other interest holders, the royalty holders, for instance? Are they getting their fair share?

A We assume they are, based on the Commission's orders, which we are operating under.

COMMISSIONER SPURRIER: Anyone else?

MR. ANDERSON: Yes.

BY MR. ANDERSON:

Q Mr. Christie, I take it that there is no attempt to show that the field cannot be developed on a 40-acre pattern and have a profitable return per well; is that

correct?

A No; we are not attempting to prove that. We feel that any additional wells would be unnecessary wells. We don't need any more wells to get the oil that is in place.

Q But the reserves are fairly substantial per acre, I gather from your testimony.

A Well, on the average, yes, they are.

Q Yes.

A But when you talk about the economical production as compared to your cost, why, you have to take into account all dry holes and marginal wells that will never pay out. You can't single out any one well and show it will produce twice as much oil as you need to pay the well out. You have to take an average figure.

COMMISSIONER SPURRIER: Anyone else? Mr. Macey.

BY MR. MACEY:

Q Mr. Christie, Mr. Walker has never sat in on a Bagley 80-acre spacing case before. I wonder if you would explain to him what you meant by the word "coning"?

A Coning is caused by producing a well at too high a rate, and pulling the water in at an accelerated rate, which tends to cone into your well bore and possibly trap off some oil if you pull your water in too fast.

Q Now, can you tell me --

A That is a very difficult thing to do where you have an active water drive, because to cause coning you have to produce at a very high rate to cause coning if your permeability is high.

Q Do you happen to know offhand what the original water-oil contact was in the Bagley Pool?

A I don't have that figure on the tip of my tongue. Mr. Veeder may have it.

(Off the record.)

MR. VEEDER: Well, I can give you an approximate figure. Will that do? You see, the discovery well, the BTA, we took the water and the plugged-back depth on that well is 10,965, which would be above your water-oil contact.

MR. MACEY: What would that be converted to subsea datum?

MR. VEEDER: I beg your pardon?

MR. MACEY: What would that be on a subsea datum?

MR. VEEDER: The subsea datum would be minus 6,719.

MR. MACEY: Mr. Veeder, I was aware of the fact that on the initial hearing in this case that the water-oil contact was set at minus 6,775. And, also, don't you have wells considerably deeper than 6,719 that are

not producing water today?

MR. VEEDER: That's right; that figure I gave you I told you was above the water-oil contact. This is a rough figure I gave you.

MR. MACEY: You mean to tell me the Amerada hasn't determined the water-oil contact pretty accurately?

MR. VEEDER: I think we gave it in previous hearings.

MR. MACEY: Was it 6,775? That is what I want to find out.

(Off the record.)

MR. WOODWARD: If the Commission please, Mr. Veeder, you might identify that transcript. That is the transcript of the prior hearing of this case, which has been made a part of this record.

MR. VEEDER: This is Case 249A which was read and presented before the Oil Conservation Commission July the 24th, 1951. The water-oil contact at the Bagley field was given at minus 6,745.

MR. MACEY: Do you know offhand what that was based on?

MR. VEEDER: Based on interpretation of samples, cores, drill stem tests, every means we had to determine water-oil contact.

MR. MACEY: In connection with present producing characteristics of the field, the Mathers No. 1-A, which is, I believe, located in the northwest of the northeast of Section 3, is that well producing water?

MR. CHRISTIE: Mathers 1-A is producing as of April, '53, producing ten percent.

MR. MACEY: Can you tell me what the lowermost water in that well bore that is exposed to the well bore, and convert it to subsea datum?

MR. VEEDER: On the Mathers 1-A?

MR. MACEY: Yes, sir.

MR. VEEDER: The total depth is 10,995, which is a minus 6,738.

MR. MACEY: You have got a plug-back depth, then?

MR. VEEDER: Our plug-back depth was 10,966, minus 6,709.

MR. MACEY: And that is the lowest point open to the bore hole at the present time?

MR. VEEDER: At the present time.

MR. MACEY: In other words, the original water-oil contact, which was minus 6,745, you are now producing water from a depth of minus 6,709; is that correct?

MR. VEEDER: That is apparent.

MR. MACEY: Mr. Veeder, are you familiar with the Texas-Pacific Coal & Oil Company completions?

MR. VEEDER: Well, I am as far as the Schlumbergers, the samples and completion reports they have turned in.

MR. MACEY: Can you tell me whether the Texas-Pacific Coal & Oil Company No. 3 State C, which is located in the northwest southwest of Section 2, what the lowest point that that well is exposed to the bore hole is? Whether total depth of bottom perforations.

MR. VEEDER: The bottom perforations on the Texas-Pacific 3C State, 10,994, which is a minus 6,740.

MR. MACEY: Is that well producing water?

MR. VEEDER: I don't have that knowledge.

MR. MACEY: Mr. Christie, do you know whether that well is producing water in any appreciable quantities?

MR. CHRISTIE: No, I don't know it.

MR. MACEY: I would like the Commission to take notice of the fact that the Texas-Pacific wellsproduce, if any, they produce extremely small volumes of water. As required by Order 69A, the operators are required to submit production records on the field. And they cooperated with the staff of the Commission very generously. But the fact remains that the record will show that Texas-Pacific No. 3, State C, doesn't produce water from

the depth of minus 6,740, where we have got a well within approximately three-quarters of a mile producing water from a higher subsea depth of 6,709.

MR. CHRISTIE: Mr. Macey, I don't believe that is unusual. It is very possible to have wells on the edge producing at a higher level because the water may be traveling upstructure through your permeability. And if you have a water drive from any particular side of your field, you are more apt to have water from that direction than some other part of the field.

MR. MACEY: The water drive is migrating from the west.

MR. CHRISTIE: We have more wells producing water from the west, and we assume that may be the case.

Q (By Mr. Macey) You say a well on the edge of the field. How far is the 1-A Mathers from what you determine is the edge of the field?

A (By Mr. Christie) It is about the third location from the west edge.

Q You mean about the third 40's location?

A Three 40's.

Q In connection with your testimony is the BTA producing water?

A The BTA just started producing water very recently.

Q What is the lowest water open in that? I think you gave it previously.

MR. VEEDER: That was minus 6,719.

Q Any other wells around BTA No. 1 producing water?

A BTD No. 1, which is a southwest offset -- No; it isn't producing any water. Nothing very close there, Mr. Macey.

Q The BTA is pretty much on the east side of the field, isn't it?

A Yes.

Q The BTA, according to my interpretation, is located two 40-acre locations east of the Texas-Pacific Coal & Oil Company No. 3 State C.

A One location.

Q You mean it is a direct offset?

A You are speaking of the TP No. 3B?

Q 3C.

A Oh. 3C.

Q And the BTA.

A That's right; it is two locations west. The TP well is two locations west.

Q How do you account for the fact that the BTA is producing water on the east side of the field at a higher structural position than the Texas-Pacific well --

As a matter of fact, I think that the record will show that the well is completed considerably higher. How do you account for that?

3b A It quite often happens when you drill a well into water and plug back, you won't always get a good shutoff. In time, it might show up. That happens quite often. Excuse me. What is the percentage on that?

(Off the record)

A VOICE: Three per cent.

Q Mr. Christie, would you say that the water drive is a very decisive factor in the overall recovery of the oil from the Bagley-Siluro Devonian Pool?

A Yes, sir.

Q Don't you think the effective control of withdrawal from that pool of oil and water are very essential to overall recovery?

A Yes, sir.

Q Isn't it a fact that the monthly water production from the equivalent number of wells, which is I believe 21, has jumped from - I have got to look the graph over here, I guess. - has virtually doubled in the past nine months?

A In the last nine months?

Q Yes. Comparing June with April.

A Yes; the graph so indicates.

Q Do you think that is conducive - I agree you have got to produce water in a water-drive field. But I would like to know if you think the doubling of the water production is an indication of good recovery methods, especially in view of the fact that the water is a prime consideration in the overall recovery.

A Oh, I don't think it is alarming. A thousand barrels a day from a reservoir of that size, a little over one thousand, isn't excessive, I don't believe. As long as your bottomhole pressure isn't being pulled down by reason of the withdrawal, I don't believe you are injuring it appreciably.

MR. MACEY: Could we have a recess for a few minutes, Mr. Spurrier?

COMMISSIONER SPURRIER: Very well. We will recess for five minutes.

(Recess)

COMMISSIONER SPURRIER: The meeting will come to order, please.

Mr. Macey and Mr. Christie.

Q (By Mr. Macey) Mr. Christie, if you can't possibly answer this next question, why, maybe you can obtain the information. But, at one time the BTD No. 3,

which is in the southeast of Section 35, that well produced water at one time, did it not?

A Yes, sir.

Q And the well was worked over and recompleted; is that correct?

A Yes, sir.

Q Can you furnish the Commission with the recompletion information?

(Off the record.)

A The well was originally, as BTD No. 3, was originally completed at minus 6,710, an open hole. The well was plugged back to minus 6,623. And the present producing interval is minus 6,481, 6,568, and minus 6,563 to minus 6,578, and minus 6,593 to minus 6,612. So that the overall producing interval now is minust 6,481 to minus 6,612. The plug-back depth was minus 6,623. And by doing that, the water was shut off and it is now a clean oil well.

Q Producing pipe line oil.

A Pipe line oil.

Q This question probably should be directed to Mr. Veeder. In connection with the Devonian, when drilling wells in the Bagley, this top, what you call the top of the Devonian, and then go through what you call a cap zone; is that right?

MR. VEEDER: That is correct.

Q What is that cap zone?

MR. VEEDER: A chirty limestone. And the Devonian reservoir is a Dolomite and a chirty Dolomite.

Q Has it ever been cored?

MR. VEEDER: Yes.

Q Does it have any porosity or permeability?

MR. VEEDER: In the cap zone?

Q Yes, sir.

MR. VEEDER: Very, very little porosity in the Devonian cap.

Q Do the cores indicate any presence of any oil or gas?

MR. VEEDER: If so, it would be very isolated.

Q Well, how come Amerada recompleted the BTD No. 3 in the top cap?

MR. VEEDER: What are those figures again you had, Bob?

MR. CHRISTIE: Minus 6,481 was the top.

MR. VEEDER: What is the base?

MR. CHRISTIE: 6,612.

MR. VEEDER: Well, that 6,612, that would be 82 feet below the base of the cap; is that right?

Q Yes, that's right. But what about the 6,481?

MR. VEEDER: That is -- I had nothing to do with that perforation. That is entirely production and

they wanted to be sure they included everything. And it is just the method of perforating.

Q They included 49 feet of the top cap. And theymay have had a purpose in it. You can't tell me Amerada goes in there shooting holes in the casing for the purpose of getting all inclusive.

MR. VEEDER: Well, it wasn't selective perforations. It was perforating one entire zone. And I wasn't consulted on that reperforation.

MR. WOODWARD: If the Commission please, I think Mr. Christie can explain Amerada's practice.

MR. CHRISTIE: We have a field man here. We will ask the field man.

MR. MILLIKIN: Mr. Macey, I think I can answer that. I don't remember the incident specifically. We have been fortunate enough sometimes to get some oil where there wasn't any. And, as far as I know, that cap has never been touched prior to the time this was perforated. I think it was perforated just to prove that the other evidence we have is correct. And having tested it, we have confirmed the fact that our Schlumbergers and electric logs and our cores show there is no production there. I think we are satisfied. But inasmuch as we were working it over, there was an opportunity to confirm our prior information, and it was so

perforated. And when we went into the lower perforations, there was no advantage in shutting those off. There wasn't anything there to hurt anything, and no reason to try and squeeze it.

COMMISSIONER SPURRIER: Do you agree with that, Mr. Christie?

MR. CHRISTIE: It sounds reasonable; yes, sir.

MR. WOODWARD: I don't believe I have anything more right now.

COMMISSIONER: Does anyone else have a question of either Mr. Christie or Mr. Veeder?

MR. ADAIR: Mr. Chairman, my name is John Adair representing the Texas-Pacific Coal & Oil Company.

BY MR. ADAIR:

Q Mr. Christie, there is nothing unusual at all, or alarming, is there, in the fact that this field is producing some water?

A No, sir; it is customary for any water-drive field.

Q In order to produce oil, you are going to have to produce water?

A Yes, sir; and during the life of the field.

Q And that would be true, regardless whether on 80-acre or 40-acre spacing?

A Yes, sir.

Q And that would be true, regardless of allowable, set as the Commission has set it at one and a half times the 40-acre allowable for that depth, or whether it was set at some higher figure or lower figure?

A That is correct.

Q You wouldn't expect -- In fact, you might produce percentagewise, produce more water at a lower allowable than a higher allowable; is that true?

A It could be possible.

Q You have seen it happen in other fields, have you not? Where the water production, percentagewise, went up compared with the oil when you reduced the allowable?

A It is possible for a short time. I don't know whether it would remain that way definitely or not.

Q And the two wells Mr. Macey interrogated you and Mr. Veeder about are plug-backs, drilled into the water and plugged back?

A Yes, sir.

Q And it isn't at all unusual for those wells to come along at a later date and begin to make water?

A No, sir.

Q Very often happens?

A Yes, sir.

Q Particularly in a water-drive field where you

have tremendous pressures and the pressure is being more or less maintained.

A Yes, sir.

Q Do you recall at the hearing in April '51, I believe, when the Commission set this allowable at one and a half times the top unit allowable for the deep adaptation, that one of the reasons given to the Commission in requesting that allowable was that there was one exception in the field that was drilled on the 40-acre basis, and this one and a half times was set in order to protect the correlative rights and prevent lease drainage as a result of that exception; do you recall those instances?

A No, I don't. I would have to refresh my memory on that.

Q Does it sound familiar to you?

A No, it doesn't entirely.

Q Now, you have one well drilled on a 40-acre basis, do you not?

A Yes, sir.

Q And you have other wells drilled on an 80-acre basis?

A Yes, sir.

Q And to prevent drainage, you have to set this allowable, do you not, in order to prevent the 40-acre

tract from getting more than its share of oil from the field?

A I do remember we requested in asking permission to cut the 40-acre well down to two and a half what the others were producing.

Q And the Commission came up with this present order giving the 40-acre well its normal statewide allowable.

A Yes, sir.

Q And one and a half times for the other 80-acre wells.

A Yes, sir.

Q So far as the wells that are on pattern, most of the wells that are on pattern are not making water, are they; is that true?

A Well, there are nine --

Q With the exception of the one BTA well that was drilled into water.

A There are nine wells, Amerada wells, in the field making water.

Q I don't believe any of our wells are making water.

A Nine out of sixteen are making a small percentage, up to ninety percent.

Q Are you of the opinion waste will or will not

take place if the present order is continued for a temporary period of one year?

A I don't believe it will.

Q Do you think it is a reservoir of rather high quality?

A Yes, I think it is.

Q Do you have the figures on pound pressure drop per million barrels of oil produced? Somewhere in the neighborhood of thirty-seven pounds pressure drop per million barrels of oil produced?

A I don't have it calculated in that manner. But I do have a figure here of cumulative production to April 1st. The barrels per pound drop was approximately 35,000 barrels for each pound dropped.

MR. ADAIR: That is all.

COMMISSIONER SPURRIER: Anyone else? Mr. Woodward.

MR. WOODWARD: If there are no other questions on cross examination of this witness, I would like to have Mr. Christie have the opportunity of making a general statement and summary.

COMMISSIONER SPURRIER: I think we have another question.

MR. MACEY: Mr. Christie, are you familiar with our deep well adaptation system and why it was devised?

A Yes, sir.

MR. MACEY: You are familiar with the curve that was drawn up based on well cost?

A Yes, sir.

MR. MACEY: As progressively increasing with depth.

A Yes, sir.

MR. MACEY: Does it cost any more money to drill a well on a 40-acre tract than it does on an 80-acre tract?

A No, sir.

MR. MACEY: That's all.

COMMISSIONER SPURRIER: Anyone else?

4b MR. CHRISTIE: I don't believe I have much more to add; except to say, in our opinion, the Bagley-Siluro-Devonian reservoir is a typical Devonian reservoir with an active water drive. And it isn't logical to expect the water encroachment not to be at an uneven rate. Due to the variation in the porosity and permeability, it is almost impossible to have a vertical rise to where you would have a level water table. So it isn't surprising you might find water in most any well in any part of the field if they are down close to the purported water table.

We believe the field is being operated efficiently and no physical waste being created, and correlative

rights are being protected as near as possible.

MR. WOODWARD: Mr. Christie, in your opinion there is nothing unusual about an irregular water table?

A That is my opinion.

COMMISSIONER SPURRIER: Does anyone else have a question of the witness? Mr. Macey.

MR. MACEY: Mr. Christie, I think it was in answer to Mr. Adair's question about the volume of water produced; if the overall production were reduced on the well that was producing water, and you say that the water volume would tend to remain the same, that is the volume, not percentagwise, the volume would remain the same or decrease with the oil production if cut down?

A I think temporarily it would probably be decreased. I don't know how long that would last.

MR. MACEY: In connection with that, if the allowable on the 80-acre spaced field, 80-acre spaced wells, there is one well that is an exception, but the regular pattern wells, if the allowable were reduced on those wells, would it affect water production on the other wells? I mean, aren't the wells making all the water from marginal right today?

A The majority of them are; yes, sir.

MR. MACEY: If the Commission decides to cut back the allowable on the top allowable wells, it wouldn't

affect the marginal wells, would it?

A It wouldn't affect oil production appreciably, I don't believe.

MR. MACEY: That's all.

MR. MAXWELL: I am Richard Maxwell, representing Amerada.

If the Commission please, I would like very briefly to conclude our case.

This matter we have been discussing today is not, as you gentlemen know, a question of first impression. R-69 and its extension R-69A have been very workable orders as demonstrated by the fact that they have worked very well in the last two years.

We have brought out today that operations in the pool over the last two years have fully confirmed the predictions we made as to the nature of the pool at the outset. We have shown this order has not resulted in waste and the information that we have and our engineering conclusions therefrom indicate that the extension of the order will not result in waste in the future.

Theorder has permitted uniform development in the Bagley field. We believe that we have shown it has promoted conservation of effort, energy, materials, equip-

ment and money. Conversely, 40-acre spacing in Bagley would result in the drilling of unnecessary wells, and obviously would result in expenditure of effort, money, equipment not necessary to produce the oil in the Bagley field.

The initial basis for this temporary order is even stronger today. The conditions that were put before the Commission to sustain the issuing of the temporary 80-acre order in Bagley have been fully confirmed. And we have shown that there is a stong basis today for continuing this 80-acre order in the Bagley field.

COMMISSIONER SPURRIER: Anyone else to be heard in this case?

MR. ADAIR: Mr. Chairman, in the interest of time, rather than having one of our witnesses sworn, I would ask permission to offer in evidence some Texas-Pacific exhibits which show the result of interference tests taken in the field. Will you receive those without the necessity of putting on a witness?

COMMISSIONER SPURRIER: Without objection, they will be received.

MR. ADAIR: And also one PI test. That is -- these are labeled TP Exhibits 1 and 2.

(Off the record.)

MR. CAMPBELL: If the Commission please, I would

like to make a statement summarizing the general position of Texas-Pacific Coal & Oil Company in this case.

Jack Campbell from Roswell, New Mexico.

I will read it and hand it to the ailing reporter.

The Bagley-Siluro-Devonian field has been developed from its inception upon an 80-acre basis. The original order and subsequent orders were as exceptions to the state-wide spacing rule.

We believe that spacing of wells must be determined upon evidence available in each separate pool, which is the method now being used by the Commission. Evidence presented here relative to the production history of this pool has convinced us that this is an exceptional oil pool and that the present spacing and rate of production does not result in physical waste. With regard to correlative rights, there is only one exception to the spacing pattern in this pool and in that case a proper allowable adjustment has been made.

We believe that the continuation of this order for another year will not result in present or ultimate waste and correlative rights will not be adversely affected.

COMMISSIONER SPURRIER: Anyone else? If there is nothing further, we will take the case under advisement and go on to the next case.

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COMMISSIONER SPURRIER: Anyone else? If there is nothing further, we will take the case under advisement and go on to the next case.

BEFORE THE

OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

Santa Fe, New Mexico

* * * * *

TRANSCRIPT OF PROCEEDINGS

CASE NO. 249

Regular Hearing

June 1, 1954

BEFORE THE
OIL CONSERVATION COMMISSION
STATE OF NEW MEXICO
Santa Fe, New Mexico
May 19, 1954

IN THE MATTER OF: Application of the Commission upon its own motion for an order directed to operators in the Bagley-Siluro-Devonian Pool, Lea County, New Mexico, to show cause why said pool should not revert to 40-acre spacing with allowable adjustment (to conform with stipulations of Order R-69-C which granted permission for temporary 80-acre spacing and 80 acre spacing units to be maintained for the pool for a period ending June 1, 1954).	Case No. 249

BEFORE THE FULL COMMISSION

TRANSCRIPT OF PROCEEDINGS

MR. WOODWARD: Mr. Woodward, Amerada, would like to make a preliminary statement as to its position in Case 249 at this time. Amerada is recommending that the present order R-69-C be continued for a period of one year and indefinitely thereafter with leave to any operator or any interested person to request a different spacing pattern upon a change of condition. The sole purpose of this recommendation is to eliminate the necessity of continuing or holding a further hearing in the matter so long as all interested parties are satisfied with the present order. Amerada's witness will be Mr. Christie.

R. S. C H R I S T I E

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

DIRECT EXAMINATION

By: MR. WOODWARD:

Q Mr. Christie, state your name for the record, please?

A R. S. Christie.

Q Where do you live, Mr. Christie?

A Tulsa, Oklahoma.

Q By whom are you employed and in what position?

A Amerada Petroleum Corporation as petroleum engineer.

Q Have you previously testified before this Commission in the past as petroleum engineer and as an expert witness?

A Yes, I have.

MR. WOODWARD: Are Mr. Christie's qualifications accepted?

MR. SPURRIER: They are.

Q Are you familiar with the statements and contentions made by Amerada at the hearing in this case in May of last year and reflected in its brief at that time?

A Yes, I am.

Q Are you familiar with the operations and developments at Bagley since that time? A Yes, sir.

Q On the basis of operations since the last hearing, do you wish to modify or add to any of the statements or contentions previously made by Amerada in this case?

A I would like to bring the record up to date for the past year. In that connection I would like to present Amerada's Exhibit No. 1, referring to Exhibit No. 1, you will note that the bottom hole pressure curve has declined very little in the past year's operation. The present average bottom hole pressure is 4142 pounds. The exhibit also shows accumulative production for the pool, the monthly oil production, the monthly water production, and the total number of wells. The monthly oil production for the month of March

averaged or was approximately 122,800 barrels, water production was 70,800 barrels. There has been no new development in the field in the past year.

Q These statements are summarized on a chart or graph that you hold in your hand? A Yes, they are.

Q We ask that the chart or graph be introduced as Amerada's Exhibit 1.

(Marked Amerada's Exhibit No. 1, for identification.)

MR. SPURRIER: Without objection it will be admitted.

Q Will waste or injury to correlative rights be injured in it if we continue the present spacing at Bagley, at this time?

A In my opinion, it will not.

Q Is it your recommendation that Order R-69-C be continued then? A Yes, it is.

MR. SPURRIER: Does anyone have a question of Mr. Christie? If not, he may be excused.

(Witness excused)

MR. WOODWARD: It is understood that this case being continued all prior records are incorporated in this record. If not, we will ask that they be incorporated.

MR. SPURRIER: Without objection they will be incorporated. You maybe excused, Mr. Christie. Anyone else have a comment in the case?

MR. CAMPBELL: We have a witness. Mr. Yuronka, would you swear him please?

(Witness sworn.)

MR. CAMPBELL: If the Commission please, I wish to enter an

appearance in this case on behalf of Texas Pacific Coal and Oil Company. My name is Jack M. Campbell, Roswell, New. Mexico.

J O H N Y U R O N K A

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

DIRECT EXAMINATION

By: MR. CAMPBELL:

Q You state your name, please?

A John Yuronka.

Q By whom are you employed, Mr. Yuronka?

A Texas Pacific Coal and Oil Company.

Q In what capacity? A District engineer.

Q Where do you maintain your office?

A Hobbs, New Mexico.

Q Are you a petroleum engineer? A Yes, sir.

Q Have you testified before this Commission on previous occasions? A Yes, sir.

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

MR. SPURRIER: They are.

Q Mr. Yuronka, are you acquainted with the wells of Texas Pacific Coal and Oil Company in the Bagley-Devonian field in Lea County, New Mexico? A Yes, I am.

Q How many wells does Texas Pacific Coal and Oil Company have drilled and completed in the Devonian, Bagley field?

A There are five producing and two shut in.

Q Are all of these wells on 80 acre spacing pattern?

A Yes.

Q What about the two wells which are shut in?

A Those two are on 40 acres. They were originally drilled as pay but the pay formation was dry and completed as Devonian and shut in.

Q They were shut in in order to comply with the 80 acre pattern now in effect? A Yes.

Q As you know, the present order of the Commission in this case requires certain reports to be filed periodically in addition to the regular reports to the Commission. Are you acquainted with the nature of those reports? A Yes.

Q Do you prepare those reports for those wells?

A Yes, sir, I do.

Q Has Texas Pacific Coal and Oil Company submitted those reports as required by the order of the Commission?

A They have.

Q Do those reports contain the information with reference to pressure declines in the field since the last hearing on this pool?

A They have merely stated the bottom hole pressure of the wells at the time and compared them with the previous bottom hole pressure.

Q Have you made an analysis of the history of the production of those wells since the last hearing a year ago on this matter?

A Yes, I have.

Q Will you state to the Commission what your investigation shows relative to the pressure decline in this pool as related to the oil production?

A At the cumulative rate of production, January 1, 1954, 30,827 barrels of oil per pound drop in bottom hole pressure had been produced from the reservoir, this is equivalent to 32 psi

drop per million barrels of stock tank oil produced.

Q In your opinion, as an engineer, does that drop of only 32 pound per square inch per million barrels of oil reflect a good reservoir condition? A Yes, sir, it does.

Q You have stated that the Texas Pacific Coal and Oil Company have two wells completed but shut in on 40 acre spacing, have any tests been made with reference to pressures in those wells?

A Yes, sir, they have.

Q Have comparisons been made between the pressure decline in those wells and pressure decline in other wells throughout the pool?

A Yes, they have.

Q Will you state to the Commission what the results of those comparisons show?

A Bottom hole pressure decline in those wells have been comparable to those wells that are producing in the field. One well bottom hole pressure on State D-1 in July of 1953 was 4229 and the south offset State-B-1 was also 4229. In January of 1954, State-D-1 had a bottom hole pressure of 4189 and State B-1 had a bottom hole pressure of 4189. This would indicate that there is interference , there would be interference if there was 40 acre spacing.

Q Based upon your analysis of the production history in this field, is it your opinion, that one well in this Devonian reservoir is efficiently draining 80 acres? A Yes, sir.

Q What is the source of the reservoir energy, the principle source of reservoir energy in this pool?

A Water drive.

Q Do you have any data on the production of water from the Texas Pacific wells?

A Yes, sir, I have. Of the five wells producing, four of them are producing less than one percent water. The only well that we have producing more than that is State C-3 and it produced 17 percent water.

Q Based upon this and the other testimony which you have overheard, what is your opinion with reference to the continuation of the operation of this field under the present 80 acre spacing plan and the present allowable?

A Well, it seems to me some what superfluous to submit the monthly reports as they are available on the C-115 and also in the engineering committee monthly report.

Q In your opinion, as an engineer, do you believe this field can continue to be operated under the present orders without any waste being committed? A Yes, sir.

MR. CAMPBELL: That is all.

MR. SPURRIER: Anyone have a question of the witness? If not, the witness maybe excused.

(Witness excused.)

MR. CAMPBELL: I wish to state on behalf of Texas Pacific Coal and Oil Company, we concur in the recommendation of Amerada that this order of the Commission be extended for one year and indefinitely thereafter, subject to the right of any one, including the Commission to come in and seek a change in the spacing pattern. As Mr. Yuronka indicated we feel that the history of this pool has developed to the point where it may not be necessary any longer to submit these monthly reports in as much as the same information, as I understand it, is reflected on other reports submitted to the Commission, however, that is an administrative matter.

We simply make that as a suggestion, if the Commission continues to continue the pool under the operations of the present order of the Commission.

MR. SPURRIER: Anyone else have anything in Case 249?

MR. WALKER: Don Walker, Gulf Oil. Gulf's interest is relatively small in this pool as we only have a joint interest in Amerada's B T well No. 1. We concur with the recommendation to extend the provisions of R-69-C, not only for the one year period but indefinitely thereafter unless the Commission or some other operators asks for a re-hearing.

MR. SPURRIER: Anyone else? If not, we will take the case under advisement, and move on to Case 582.

STATE OF NEW MEXICO)
: ss.
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, Court Reporter, do hereby certify that the foregoing and attached transcript of proceedings before the New Mexico Oil Conservation Commission at Santa Fe, New Mexico, is a true and correct record to the best of my knowledge, skill and ability.

IN WITNESS WHEREOF I have affixed my hand and notarial seal this 25th day of May, 1954.

Ada Dearnley
Notary Public, Court Reporter

My Commission expires:
June 19, 1955.

BEFORE THE

OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

CASE NO. 249

April 24, 1951

E. E. GREESON
COURT REPORTER
UNITED STATES COURT HOUSE
TELEPHONE ~~2-0573~~ 2-4547
ALBUQUERQUE, NEW MEXICO

BEFORE THE
OIL CONSERVATION COMMISSION
April 24, 1951

- -

Case 249: The application of Amerada Petroleum Corporation for a temporary order establishing proration units and uniform spacing of wells for the Bagley-Siluro-Devonian pool, comprising SE/4 sec. 34, S/2 sec. 35, SW/4 sec. 36, T.11 S, R.33 E; and W/2 sec. 1, all sec. 2, E/2 sec. 3, E/2 sec. 10, all sec. 11, W/2 sec. 12, T.12 S, R.33 E continued to April 24.

(Mr. Graham reads the notice of publication.)

MR. HINKLE: Members of the Commission, for the purpose of the record, my name is Clarence Hinkle, member of the firm of Hervey, Dow and Hinkle and appearing here on behalf of the Amerada Petroleum Corporation.

Before proceeding with the evidence in case 249, I would like to make a brief statement relating mostly to the facts and circumstances which have preceded the filing of this application by the Amerada Petroleum Corporation for a temporary spacing order of the year in the Bagley field.

In the Fall of 1949, an application was made by the Amerada Petroleum Corporation to the Commission to establish 80-acre proration units for the uniform spacing of wells and for the purpose of fixing the allowable in the Bagley-Siluro-Devonian pool in Lea County.

A protest to this application was filed by the Texas Pacific Coal and Oil Company. The hearing was held before the Commission on December 20, 1949, and thereafter an order was entered by the Commission on January 23, 1950 denying the application of the Amerada. In the order denying the application the Commission made the following findings:

"The evidence is insufficient to prove that the proposed plan of spacing would avoid the drilling of unnecessary wells, secure the greatest ultimate recovery from the pool or protect correlative rights.

"The evidence is insufficient to prove that one well drilled on each 80-acre tract would efficiently drain the recoverable oil from the pool."

After making these findings, the Commision in the order stated, "The application of Amerada Petroleum Corporation is denied."

An appeal was taken by the Amerada to the District Court of Lea County. After the case had been docketed, the attorneys for the protestant, The Texas Pacific Coal and Oil Company requested that the Court hold a pre-trial conference for the purpose of considering the nature and scope of review by the Court of the order appealed from, including the question of what evidence may be presented when the appeal is heard.

After the pre-trial conference was held the Court made certain findings in the form of a pre-trial order. Among other things the Court found that the Court was without power to substitute its own independent judgment for that of the Commission as reflected in the order complained of. It also found that the nature and scope of the review in the case would be confined generally to the validity of the order and specifically to (a) the power of the Commission to enter the order complained of, (b) the existence of substantial evidence before the Commission supporting the order complained of and (c) the reasonableness of the order.

After the pre-trial order was entered on December 27, 1950, the Amerada voluntarily dismissed its appeal with prejudice.

The Amerada is now before the Commission on a new petition for a temporary order of one year to permit the development in the Bagley field to proceed on an 80-acre basis. As previously stated the order entered by the Commission in Connection with the original application was based primarily on there being insufficient evidence. At the time that order was entered only five Devonian wells had been drilled in the area. One of these was a dry hole. Since the order was entered, there have been 13 additional wells drilled, ten of which are producers. In all, there have been 18 wells

now drilled to the Devonian formation.

Because of the additional wells which have been drilled since the original order was entered and the information which has been accumulated by production experience, we believe that there is a change of circumstances and condition which did not exist at the time of the original application being filed.

We now feel that the evidence available will show beyond a reasonable doubt that one well will drain 80-acres and that under the present conditions it is in the interest of conservation and the prevention of waste that the field be developed on an 80-acre spacing unit.

MR. KELLOUGH: My name is Booth Kellough. I represent the Amerada Petroleum Corporation.

(Witnesses sworn.)

(Recess.)

MR. KELLOUGH: In order that there may be no misunderstanding, we wish to make it clear at the outset that we are asking by our application for a temporary order for one year and the evidence which we are introducing today is in support of our temporary application. In that connection, do you have anything further Mr. Adair that you wish to admit.

MR. ADAIR: If the Commission please, when this matter first came up before the Commission in December, 1949, we

did not feel that there was sufficient data available from the reservoir to justify a permanent 80-acre spacing order. Although there have been many wells drilled, some ten wells drilled and completed as producing wells since that time. We still feel that there is not sufficient evidence available for a permanent 80-acre spacing order. However, we do not object to the temporary order advocated and requested by Amerada.

So that the record will be clear and so that we can shorten this hearing may we all have an understanding that the evidence presented here is only in support of a one year order which will automatically expire at the end of that year unless after further hearing it is continued in effect.

I believe we can shorten the cross examination of the witnesses and avoid a good deal of legal argument.

MR. FOSTER: Mr. Chairman.

MR. SPURRIER: Mr. Foster.

MR. FOSTER: I am E. H. Foster with Phillips Petroleum Company. We originally supported the application of Amerada for 80-acre spacing and a permanent basis and we want the record to reflect that we are still supporting their application for their order on a temporary basis.

MR. KELLOUGH: I wish to say that Mr. Adair's statement is in accordance with our understanding.

J O H N A. V E E D E R,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

By MR. KELLOUGH:

Q Please state your name?

A John Veeder.

Q Where do you live?

A Midland, Texas.

Q By whom are you employed?

A Amerada.

Q In what capacity?

A District geologist.

Q How long have you been the district geologist?

A Approximately six months.

Q You have testified previously before this Commission in your capacity as geologist?

A That is right.

MR. KELLOUGH: Are the qualifications of this witness acceptable to the Commission?

MR. SPURRIER: They are.

(Marked Amerada Exhibit No. 1, Case 249.)

Q I hand you what has been marked Amerada Exhibit No. 1 and ask you to state what that is?

A This is a map of the Bagley Oil field?

Q Does that - excuse me.

A I will, go ahead

Q Does that show the name of the leases and the locations of wells?

A That is right. It shows the Devonian producers and also the Penrose pay producers. The Devonian producers are the large circles and and the pay producers are the small circles.

Q Does that map also show the spacing pattern proposed for any future wells?

A That's right.

Q It shows the 80 -

A That's right, it shows the 80 acre spacing.

Q How is the spacing pattern indicated on this map?

A Spacing is 80 acre spacing with the wells located in the northeast and southwest of each quarter section.

Q Each quarter quarter section?

A Right.

Q The crosses on the map indicated a possible location under the pattern, is that correct?

A That's right.

Q On this Exhibit 1, you will also notice certain dotted lines surrounding proposed 80 acre units. Will you explain what is the purpose of putting the dotted lines on that map, what they represent?

A The dotted lines are the proration units which have been placed because of the different lease holds in the different units.

Q The arrangement of the proration units which has been requested is the east half and west half of each quarter section, is that right?

A That's right.

Q The dotted linesindicate those units which we are requesting exemptions be made because of property ownership?

A That's right.

Q Mr. Veeder, at the previous hearing of this matter on December 20, 1949, how many completed Devonian wells were there?

A There were four completed wells in the Devonian.

Q How many devonian dry holes?

A At that time there were no devonian dry holes.

Q At the present time how many completed Devonian wells are there in the Bagley Pool?

A There are 14 completed Devonian wells.

Q Amerada owns how many of that 14?

A Ten.

Q The other four are owned by Texas Pacific Coal and Oil Company, is that right?

A That's right.

Q How many dry holes have been drilled to theDevonian at the present time?

A Four dry holes in the Devonian.

Q How many drilling wells are there now?

A There are four drilling wells.

Q How many pay wells have been drilled in this Bagley field?

A There are a total of three pay wells.

Q And how many pay wells are now drilling?

A There are two pay wells now drilling.

Q Mr. Veeder do you have a schedule showing the production, the completion data of all the Devonian wells?

A That's right.

(Marked, "Amerada's Exhibit No. 2" for identification.)

Q I am handing you Amerada's Exhibit No. 2, will you please explain to the Commission the data which is carried on this exhibit?

A We have shown the total of 16 Devonian wells and started from left to right, The well number, the top of the Devonian with the subsea datum; the top of the Devonian pay with the subsea datum; the thickness on the Devonian cap, and the Devonian completion history.

Q And the Devonian completion history shows what?

A Well -

Q In general.

A Shows the spudding completion date total depth, casing perforation acid treatment; gas-oil ratio I. P. and gravity.

Q That has been tabulated as to all present Devonian wells?

A That's right.

MR. KELLOUGH: We offer Exhibit two.

MR. SPURRIER: It will be accepted.

(Marked, "Amerada's Exhibits 3 through 16", for identification.)

Q Mr. Veeder, I hand you Exhibits 3 to 16, inclusive, and ask you to state what these exhibits are.

A These are Schlumberger's. On the Schlumberger's we have indicated the top on the Devonian the total depth casing set perforation.

MR. KELLOUGH: We offer in evidence Exhibits 3 through 16.

MR. SPURRIER: They will be accepted.

Q Have you prepared a structural map?

Map, marked, "Amerada's Exhibit 17" for identification.)

Q I hand you what has been identified as Amerada's Exhibit No. 17, and ask you to state what that is?

A That is a map,contour map, on the subsea datum top of the Devonian contour interval, fifty feet.

Q How did you pick the top of the Devonian in the preparation of that map?

A The top of the Devonian was picked from Schlumberger's in all cases.

Q Have you prepared another structural map?

A That's right. We have a structural map on the subsea datum top of the Devonian pay.

(Map, marked as "Amerada's Exhibit No. 18, for identification.)

Q I hand you what has been marked as Exhibit 18, and ask you if this is the structural map on the top of the Devonian pay to which you referred?

A That is right. On top of the Devonian pay subsea datum.

Q How did you pick the top of the Devonian pay in the preparation of this exhibit 18?

A The top of the Devonian pay was picked by samples in cores.

Q Will you explain why you prepared two structure maps?

A Two structure maps were prepared because in the Bagley field we find we have a divergence of Devonian cap. The one well No. 2 Caudel, in the western limits of Bagley field which has only 7 feet of cap. Another well in the south end of Bagley field a dry hole Amerada No. 1 DBTJ. BTJ has a Devonian cap of 101 feet.

Q Also, will you refer to the Simmons well and show how that is located structurally on the two maps?

A On the Simmons, the top of the Devonian, the Simmons well is actually 45 feet higher than the No. 2 Caudel, which is a producer of the Devonian. The reason for the No. 2 Caudel, of course being a producer is the thinness of the Devonian cap.

Q This Devonian cap that you speak of is Devonian formation but is impervious and nonproductive, is that right?

A That's right, the cap is a chirty limestone in contrast to the formation below which is a chirty dolomite.

Q From the information which you have at this time, Mr. Veeder, do you have an opinion as to the probable productive limits of

the Bagley Pool?

A Yes, I have, using the structure map, the top of the Devonian pay, we have outlined an area in red which at this time we would interpret to be the productive limits of the Devonian Bagley field.

Q In other words, you have designated on Exhibit No. 1, by red lines what in your opinion is the productive limits of the Bagley Devonian Pool at this time?

A That's right.

MR. KELLOUGH: We wish to offer in evidence Exhibits 17 and 18.

MR. SPURRIER: They will be accepted.

MR. KELLOUGH: We wish also at this time to amend our application to conform to Mr. Veeder's testimony as to the probable productive limits. At the time we prepared our application, I believe that we requested that the spacing order cover slightly different land than has been designated by red on Exhibit No. 1, so we at this time move to amend our pleading to request the order which we are asking for to apply to the land indicated within the boundaries of the red line on Exhibit 1.

Q How many acres, Mr. Veeder, is there within the probable productive limits as you have designated?

A There are twenty-three hundred and twenty acres within the red line on the map.

Q Have you made an examination of the Schlumberger's on all wells in this pool?

A That's right.

Q Have you examined the samples from all wells?

A That's right.

Q And have you made a visual examination of the cores which have been taken from those wells that have been cored?

A That's right, all cores that were available.

Q How many wells have been cored, do you know?

A Amerada has cored four wells in the Devonian and I believe Texas Pacific has cored two.

Q Do you have with you samples of some cores?

A Yes, I have several samples of cores.

Q Let's have the reporter identify these.

(Marked Exhibits 19 through 23, for identification.)

Q Referring to Exhibit 19, state what well that core was taken from and what depth.

A I have three cores on Amerada BTC No. 3, the first core was from ten thousand ninety-three to seven hundred ninety-four.

Q What exhibit number is that that you are speaking of at this time?

A Exhibit 20.

Q Go ahead with the rest of them.

A This core shows the good vugular type porosity which we reported previously in the Devonian.

Q You are speaking of Exhibit No. 20?

A That's right.

Q Will you take each one of these cores, Mr. Veeder, and state what well they came from and what depth and then explain what the core shows from a visual examination of it?

A The next core is Exhibit 19 and it is also a core in the Amerada BTC No. 3, depth 10,927. This also shows good vugglar and fractured porosity . Next, this core is from the Amerada BTC No. 3, Exhibit 21. This is from a depth of 10,895 to 10,896. This also shows essential vugglar type porosity. Exhibit No. 22, from Amerada No. 1 BTJ, depth 11,124 to 11,125. This core shows essentially vugglar porosity. Exhibit 23 is the last core, it is from the Texas Pacific No. 2 State C, depth 10,898. This again shows good fractured and vugglar porosity.

Q Would you consider that these cores are representative of the formation?

A Yes, I would.

MR. KELLOUGH: We offer Exhibits 10 through 23, inclusive, in evidence.

MR. SPURRIER: They will be accepted.

Q Do you have an opinion, Mr. Veeder, as to the porosity and permeability of the Bagley reservoir?

A I would consider the porosity of the Bagley Devonian reservoir as good and also the permeability.

Q Would you say that there was connected porosity throughout the reservoir?

A I would say, yes.

Q Would you say there was continuous permeability?

A Yes.

Q Now, by that you mean uniform?

A No. That is continuous, that is continuous of void space between your pore zone and your formation, in your formation.

Q You would consider it as one connected pore zone?

A That's right.

Q In your opinion, Mr. Veeder, is the Bagley pool comparable to Jones Ranch pool in Texas and the Knolls pool in Lea County, New Mexico?

A That's right.

Q How does the porosity and permeability at Bagley compare to Knolls and Jones Ranch?

A I believe the porosity is comparable or better than the Knolls field and I also think it is better than the Jones Ranch.

Q Those two pools are being produced on 80 acre spacing?

A That's right.

MR. KELLOUGH: That is all.

MR. ADAIR: I have no questions.

MR. SPURRIER: Does anyone have any questions of this witness? If not, the witness may be excused.

(Witness excused.)

R. S. CHRISTIE,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

By MR. KELLOUGH:

Q Will you please state your name?

A R. S. Christie.

Q Where do you live?

A Fort Worth, Texas.

Q By whom are you employed?

A Amerada Petroleum Corporation.

Q In what capacity?

A Division Petroleum Engineer.

Q How long have you been a petroleum engineer for the Amerada?

A Since 1929.

Q You previously testified before this Commission?

A Yes, sir.

MR. KELLOUGH: Are Mr. Christie's qualifications acceptable?

MR. SPURRIER: Yes, they are.

Q Have you prepared, under your direction and control, Mr. Christie, a production or pressure chart?

A Yes, sir.

(Marked Exhibit 24, for identification.)

Q Referring to Exhibit No. 24, will you please explain what that exhibit shows?

A Exhibit 24 shows the production data for the Bagley-Siluro-Devonian Pool.

Q On the left hand margin of Exhibit 24 are a series of figures. What do they represent?

A They represent the first monthly oil production, the number of wells the cumulative production and the bottom hole pressure.

Q Now, the exhibit has a staggered line running diagonally up the center of it. What does that represent?

A That represents the monthly production.

Q There is a curved line underneath that. What does that represent?

A The cumulative production.

Q Then, under that is a more or less staggered straight line. What does that represent?

A That is the monthly water production.

Q And, also, indicated there is the number of wells?

A Yes, sir.

Q And across the top of the exhibit is a rather straight line. What does that indicate?

A That represents the bottom hole pressure.

Q Now, in substance, Mr. Christie, what does that exhibit show?

A Well, in the first place, it shows the formal development by showing the number of wells completed which is on this graph shows 13. It shows the step up in the monthly production as the wells are completed and as of March of 1951, the monthly production was 91,922 barrels.

(Chairman Shepard returned to the room.)

Q That is the monthly production?

A Yes.

Q Does that exhibit show a small decline in pressure?

A Will you state that question again?

Q Does that exhibit show a relatively small decline in pressure?

A Yes, sir, it does.

Q What is the cumulative production data shown on that exhibit?

A The cumulative production through March 31, is 825,127 barrels. During that interval of production the bottom hole pressure has declined from 4285 pounds to 4258 pounds.

Q What is the gas-oil ratio average in the Bagley pool?

A Well, the average gas-oil ratio is 28 cubic feet per barrel.

Q What is the gravity of the oil?

A The gravity varies from 44 to 46 API.

Q Referring to Exhibit No. 24, is it your opinion as a petroleum engineer that considering the amount of oil that has been produced and the gas-oil ratio that there has been an unusually small pressure decline?

A Yes, sir, I believe so.

Q What does that indicate to you with reference to the type of pool this is?

A That indicates to me that we have a rather permeable reservoir with a very active water drive.

Q Have there been PI tests or productivity tests taken on the wells in this pool?

A Yes, sir, we have taken productivity index on practically every well we have completed in the field.

Q What do they indicate?

A They reflect the same condition as our static bottom hole pressures do. In other words, we have, for dolomite reservoir, a fairly high productive indexes. They vary from .82 barrels per pound drop, to 7.68 barrels per pound drop; Per 24 hour producing day.

Q Does that indicate good permeability?

A Well, the average would be a fair permeability. Of course, the lower productive indexes taken on one of the lower wells where the section is not as thick and the permeability is less in all probability.

MR. KELLOUGH: We offer in evidence Exhibit No. 24.

MR. SPURRIER: It will be accepted.

Q Mr. Christie, do you have with you any core analysis of wells in the Bagley pool that have been cored?

A Yes, sir.

MR. KELLOUGH: Reporter, please identify them.

(Marked Exhibits 25, 26 and 27, for identification.)

Q The core analysis that you referred to are marked Exhibits 25, 26, and 27?

A That's correct.

Q Will you please explain what conclusions are shown by these core analyses and what conclusions you have, identifying them by number.

A Exhibit 25 is a core analysis of Amerada Petroleum Corporation Matters number one. Matters No. 1 was cored from 10,679 feet to 10,965 feet. We had 100 per cent core recovery. The feet of permeable productive formation recovered was 85 feet. The average porosity by analyses was 4.4 per cent. The average permeability was 21 maximum, and 5.5 taken at 90 degrees. The solution of gas-oil ratio in this particular well was 30 cubic feet per barrel. This exhibit showed no sample but what had

some permeability. Any other questions on this particular one?

Q Have you referred now to all three of the core analyses?

A No, sir, I have just explained Exhibit 25 by its core analysis on Matters No. 1.

Q Exhibit 26 is a core analysis on Amerada Caudel No. 2. The well was cored from 11,016 to 11,077; 100 per cent recovery. The feet of permeable productive formation recovered was 58.7. The average permeability was 6.7 for the lower value and 26 for the maximum. The average porosity was 3.7 per cent. Exhibit 27 core analysis of Amerada State BTJ No. 1. This well was cored from 11,099 to 11,140, with 100 per cent recovery. Thirty-one feet of permeable productive formation recovered. The average permeability maximum three million darses and 1.3 million darses for the 90 degree minimum. The average porosity was 4.4 per cent.

Q The core analysis on the well that you are now speaking of is a dry hole, is that right?

A Yes, sir.

MR. KELLOUGH: We offer in evidence Exhibits 25, 26, and 27.

A We also cored our state BTC No. 1, but we have not received a copy of the analysis as yet, but we would be glad to furnish that if you would like to have it.

Q Have you prepared the schedule showing the well cost of

the wells Amerada has drilled in the Bagley pool to the Devonian?

A There has been a schedule prepared in our Tulsa Office.

Q Are you familiar with the figures shown on this schedule?

A In a general way, yes, sir.

Q Are they correct?

A Yes, sir.

(Marked Exhibit No. 28, for identification.)

A This tabulation shows that some of these are estimated because we haven't got all the costs in but they are reasonably accurate. The total cost shows that the well costs vary from approximately 195,000 to 280,000 with the exception of our State BTA No. 1 which was the discovery well, which cost four hundred eighteen thousand six hundred forty-two dollars.

Q You have been referring to Exhibit No. 28.

A Yes, sir.

MR. KELLOUGH: We offer it in evidence.

MR. SPURRIER: It will be accepted.

Q Mr. Christie, do you have an opinion as to the area that it may be feasibly and economically drained by one well?

A Certainly. In my opinion the minimum area would be 80 acres.

Q What is your opinion as to the allowable that should be ordered for this pool?

A Based on a production history my opinion, I don't believe it would hurt the wells to produce one and a half times the present top allowable. And possibly wouldn't hurt to produce them higher than that but it would be better to try at that rate for a period of time to see if there is any injury occurring.

Q When you speak of one and a half of the top allowable for this pool what would that amount to under the present allowable?

A The present allowable I believe is 242 or 243 barrels per well per day. One and a half times that would be approximately 363 barrels per day.

Q Mr. Christie, you are familiar with the arrangement of the proration units which have been proposed by this application?

A Yes, sir.

Q You are also familiar with the well spacing pattern which has been proposed?

A Yes, sir.

Q In your opinion are they fair and reasonable?

A Yes, sir, I believe they are.

MR. KELLOUGH: I believe that is all.

MR. ADAIR: Mr. Christie, your application here requests one and a half time top allowable as your allowable for an 80 acre unit.

A I believe that is correct. We are agreeable to that as I understand it.

MR. Mc CORMICK: As all wells compared to the Devonian have been drilled on a pattern which comforms to this 80acre pattern.

A All completed wells, yes, sir, have been drilled on that pattern.

MR. McCORMICK: Any danger of water coming into these wells and by-passing any oil by producing them at the rate

you suggest?

A I don't believe so, unless they should happen to be completed right at the bottom of the hole close to the water table. We did have one well completed in that manner and it started producing water and we plugged it back and it is a clean oil well at the present time.

MR. SPURRIER: Anyone else have a question of this witness? If not, he may be excused.

(Witness excused.)

C. V. MILLIKAN,

having been first duly sworn, testified as follows?

DIRECT EXAMINATION

By MR. KELLOUGH:

Q Will you state your name, please?

A C. V. Millikan.

Q Where do you live, Mr. Millikan?

A Tulsa, Oklahoma.

Q You are connected with the Amerada?

A Yes, sir.

Q In what capacity?

A Engineer.

Q How long have you been a petroleum engineer?

A Over twenty years.

Q Have you previously testified before this Commission?

A Yes, sir.

MR. KELLOUGH: Are the qualifications of the witness acceptable?

MR. SPURRIER: They are.

Q Mr. Millikan, have you made a study of the Roswell or Artesian water basin as it relates to the principles also involved here?

A Yes, sir.

Q Would you please describe the location of the structure and the general characteristics?

A Of the Roswell Artesian Basin?

Q Of the Roswell Artesian Water Basin.

A Well, knowing that the Roswell Artesian Basin was a limestone in many respects comparable to the type of formation which is producing in many parts of Lea County, it occurred to us that a study of it, an investigation of that water basin and a comparison of it with our oil reservoirs might throw a little light on what we have in these oil reservoirs.

The Roswell Artesian Basin has been drilled with a good many wells, has produced water over a long many, many years. It is generally understood what the situation is and has been thoroughly investigated by many geologists particularly by the United States geological survey. The formation is shallow enough that information can be obtained on it which is rather difficult to obtain in our deeper petroleum reservoirs.

Therefore, it occurs to us that if we could get the information on this it might be helpful in understanding what goes on in the oil field reservoirs.

Q Do you have a map which would represent that reservoir?

A Would you care to accept this? It is a photographic copy.

MR. SPURRIER: It is much better for the record.

(Marked Exhibit 29, for identification.)

A The total area of this Roswell Artesian Basin is shown by the large irregular more or less circular blue line on the exhibit which you have before you, Exhibit No.29. It happens to be orange. That is the area of the out drop of the San Andres line and then for the area within the red irregular long narrow area outlined in red is the Roswell Artesian Basin and that is the productive area and in that area, the San Andres is covered by anywhere from 300 to 900 feet of other sediments.

Q How many wells are there in the productive area?

A There was at one time a maximum of about 1400 wells, at the present time there are a little over 1100. The source of the water for that entire irrigation area is the rainfall on the larger area and it moves with the dip of the rock through a vuggy porosity with some joining and perhaps a small amount of fractures down into the irrigation area.

Q How great a distance would the water migrate in that?

A Some of it migrates a maximum distance of 80 miles from the Sacramento mountains at the most westerly out drop in the San Andres which is about 80 miles. It is probable that the water comes from a somewhat less distance than that, but a majority of it comes a matter of several miles because the closest to the town of Roswell, for example, is between 3 and 4 miles west of the city.

Q What is the well spacing in the productive area at this time?
A The well spacing varies. The productive area is divided into three primary districts which are shown by the hatched lines within the area outlined in red. The north area and the Roswell area which is in the central part and the Artesia area to the south end. The north area, the average well spacing is about 390 acres per well, in the south area it is just a little over 300 acres per well and in the Roswell area primarily because of the rather dense drilling in and adjacent to the city limits, the spacing there is, I believe, it is about 130 acres per well and the average spacing for the entire area is 23 acres per well but here are - of that, for example, in the Roswell area about 30 per cent of that total area, the well spacing is about one well to 640 acres.
Q What is the total production in barrels of water?
A The total amount of water withdrawn from the wells, that is the San Andres as well, which is now 54 per cent of the total water produced in the area is about five million two hundred thousand barrels per day, averaged over an entire year*s time. There is about five months of the year that the production is rather low. But the five million two hundred thousand barrels per day, which is an estimate of the State Engineers and USGS for for 1950 is almost exactly the same as the average daily oil production for the United States for that same period.
Q In your opinion, are the formations and fluid charactistics

of the Roswell Artesian water Basin similar or comparable to Bagley?
A I think they are rather comparable so far as viscosity - although it is possible that the viscosity in the Bagley Pool may be some less than the viscosity of the water that is being produced fro from these wells. The formation is rather similar. While it is rather evident from the outcrop that it is similar we attempted to get to core one of these water wells that was drilled down near Dexter and we do have a few pieces of core here which I would like to submit to the Commission.
Q Do you have the cores with you?
A Yes.

MR. KELLOUGH: At this time we offer in evidence Exhibit 29.

(Marked Exhibits 30, 31, 32 and 33 for identification.)

Q Mr. Millikan, referring to Exhibits 30 to 33 inclusive, will you please state what they are and what they show?
A These are pieces of vuggy lime which I think, except for their somewhat lighter color, you will find them quite comparable to certain of the vugs that appear in some of the Devonian cores which were taken from Bagley. Because of the greater amount of bleaching these cores - the formation there is somewhat softer than theDevonian and due to inexperience, from an oil field standpoint, rather crude equipment that they were cored with, unfortunately our recovery was quite low. But it does show the type of porosity of the vuggy, it is vuggy nature and that it is in general the same general type of porosity which does exist in the Devonian at Bagley, Crossroads, Knolls and even some of the

shallower producing zones.

MR. KELLOUGH: We offer in evidence Exhibits 30 to 33 inclusive.

MR. SPURRIER: They will be admitted.)

A The particular thing that impressed us with this is the distance with which the water moves through these porous formations. It has been demonstrated a number of times that producing one well will definitely effect a static well a distance of one to two miles which means that - and that comes rather quickly - it doesn*t take a matter of days to determine it. I am sorry that we can*t show the same - actually measure the same thing in the oil fields but we are not able to measure differences in pressure in the oil fields so far at five thousand pounds down to four thousandths of a pound which is the unit of measurements that they use in these water wells. Also, we have a little difficulty in, might have a little difficulty in producing these wells in order to get the interference that rates up to anywhere from seven to fifteen thousand barrels a day. So, we do have, usually, some difficulty in establishing interference under reasonable methods of operating our wells. But nevertheless, the change in static pressure, the uniformity with which they decline, the fact that newly completed wells have initial pressures which are comparable with older wells at the time the new wells are completed, does definitely demonstrate and prove the free movement of the fluids in the oil reservoirs.

Q There have been interference tests taken in the past, is that right?

A In the water wells?

Q In the water basin.

A Yes. There have been interference tests taken over a good many years and some of them rather specific, others are more of an observation type. But certainly, where these water levels fluctuate within a single day even up around Roswell which is the most prolific area, a matter of seven feet, two or three feet and start declining on the static well about six o'clock in the morning when the farmer's start opening their water wells for irrigation, then in the evening when those wells are shut down, this static level builds up again to a peak that occurs somewhere between twelve and three o'clock at night. Then, during the irrigation season, each day that water level comes back to not quite as far as it did before and by September or early October they reach the minimum water level in these static wells. From that period on until they start the planting season, there is a constant increase in the water level due to the movement of water in from this large area of some seven thousand square miles that is covered by the large, more or less, circular blue line or orange on the wall chart, and it has also been observed any number of times and reported that there is a rather quick response in the water wells to even a few days in a rainy season, a few rainey days.

Q Amerada made some interference tests in your investigation of this Basin?

A Yes, we made two specific interference tests and we got in one case definite indication over interference for a mile and a half and

the other one almost one mile. Those, of course, were measured in a few hundreds of a foot but these recorders are so precise in their measurement that there could be no question as to the effect of the well which was opened on the recorded well.

Q What conclusion would you draw as a petroleum engineer, by comparison of the Roswell Water Basin to the Bagley Devonian reservoir?

A Certainly, if water can move the distances that there is so much evidence from every standpoint that it does move in the Roswell Basin, certainly it gives us a new idea on the distance that oil can move in an oil reservoir. We sometimes get concerned even about whether it will drain oil from an area - ten acres, and then to 40 acres and when somebody says 80 acres, we get scared and yet, we have got the same type of formation in Roswell that we have in these oil fields and certainly if it can move the distance of several miles which there is ample evidence that it does, certainly it should be able to move it less than two thousand feet maximum distance under 80 acres spacing.

Q Have you prepared some exhibits having to do with the geometry of spacing?

A Yes, I have.

(Marked Exhibits 34 to 41 inclusive, for identification.)

MR. KELLOUGH: I wish to state referring to Exhibits 34 to 41, these have been previously introduced into evidence in a hearing in connection with the Knolls pool, so I will at this time ask the witness just to briefly as possible,

in his own words, present and describe these exhibits in order to refresh the recollection of the Commission.

Q Mr. Millikan, referring to Exhibits 34 to 41 inclusive, will you please state what they show?

A Exhibit 34 is divided into uniform squares with a dot representing - in the center of each - representing the spacing of regular 40 acres. Exhibit 35 is the drawing up leaving out every other horizontal line and all of the vertical lines and alternate dots representing wells. In other words, this is a spacing which we are requesting in the Bagley pool and have referred to and will show that it is a regular 80-acre spacing.

Exhibit 36, each of the squares shown on this Exhibit represents 80-acre, and the distance between the dots representing the wells is exactly the same as it is on Exhibit Number 35, so if we placed Exhibit 36 over Exhibit 35 at an angle of 45 degrees then it will be seen that the dots on Exhibit 35 and 36 do coincide, so that while we do have, asking for wells on alternate 40-acre tracts, it does provide a perfectly uniform 80-acre spacing.

Q Before you proceed. It was testified in a recent hearing having to do with Crossroads that the spacing pattern such as is proposed by Amerada is not a uniform spacing pattern. Do you recall that testimony?

A I think that was mentioned. I think that Exhibits 35 and 36 demonstrate spacing on an alternate 40 is a uniform spacing program. Exhibit 37 represents another type of 40-acre spacing which is permitted under the state-wide rules in the State of New Mexico which provides that the wells may be as close as 330 feet from the line so that here is the same as was shown in Exhibit 34, but shows

the wells as if located 330 feet from the line. Exhibit 38, then, if we consider that a well will drain only to the limits of a square 40 acres with the well in the center of it, then the shaded area on this exhibit rents that area which is not drained by a well. Assuming that a well will drain only to the limits of an area, 40 acres, in the form of a square. However, that has been practiced in the State of New Mexico and permitted and certainly I am sure that the Commission would follow the companies in Oklahoma go to it if it did not drain to the limits of that. Exhibit 39 shows in colors the progressive steps in the colors in going from an actual 40 acre spacing with the well in the center to putting the well 330 feet from out of the corner and if it will drain, then, that entire 40 on which the well is located, then, the distances from this well to the oposite line of the 40 acre tract will be one fourth of a 90 acre tract.

In other words, the present state wide rules of the State of New Mexico do recognize that a well will drain 90 acres and that is in formations which are less permeable and less productive than that which exists in the Bagley pool. Just to show that it has been practiced, this small map which is marked Exhibit 40, is a development map of the Hobbs pool and shows colored in pink those 40 acres units in which the wells are so located as to show that they drain an area of 90 acres.

Q What percentage of the Hobbs pool is that area covered?

A I would say it is 75 per cent of the Hobbs pool was developed that way. In the Monument pool the samekind of map also showing in pink those 40 acre units on which the wells are located 330 feet from the line and where it has also been accepted

that they do drain the entire 40 acre tract and thereby recognize that they drain 90 acres and between 28 and 29 per cent of the entire Monument pool has been so developed.

Q What is your opinion as to the area that may be effectively drained by one well in the Bagley Devonian pool?

A Well, I think that one well will drain substantially more than 80 acres. Probably, well, the more I look at it the more I think that it will drain more than 160 acres.

Q In your opinion, if one well was drilled to every 40 acres within the productive limits of the Bagley pool, would that result in the drilling of unnecessary and wasteful wells?

A Yes, sir.

Q What is your opinion, Mr. Millikan, as to the allowable which should be granted for this pool?

A We are suggesting that the allowable be increased to one and one half times, that is, if we get the 80 acre spacing, that each unit be allowed to produce one and one half time the regular 40 acre allowed with the deep well adaptations, which I believe Mr. Christie testified would be 363 barrels per well.

Q Are there any other considerations in addition to the reservoir performance that would justify the application which Amerada has filed?

A Well, I think that is ample under most any case and certainly under the emergency that we have and the shortage of steel which is definitely going to limit the amount of drilling. I think it is worthy of even more serious consideration.

Q In connection with the question of pipe shortage, how many tons of pipe were used for the average well Amerada drilled last year?

A For all of our wells?

Q An average tonage.

A Last year about 75 tons per well. That is the average for the entire company.

Q What would be the tonage required to drill a Devonian well here at Bagley?

A 175 and 180 tons. Depending where the wells were located on structure.

Q Which is considerably more than twice what the average was?

A Yes, almost two and a half times.

Q Is a considerable amount of that pipe required to be left in the ground and unrecovered?

A Yes. Quite a bit of it will not, cannot be recovered. It is in there under settlement and probably after the years will have formations settle around it that will freeze the pipe and it cannot be recovered.

Q If the - an additional well drilled on each 80 acre unit would be be an unnecessary well as you have testified it would, do you know about how many tons of pipe would be consumed in drilling unnecessary wells if this Bagley reservoir as defined was drilled, one well to 40 acres?

A Well, according to our present conseption of the probable producing area there would be about 30 wells on 80 acre spacing or about 60 wells on 40 acre spacing so if it were drilled on

40 acre spacing there would be 30 unnecessary wells.

Q Which would require about 175 tons per well?

A 175 to 180 tons per well. Probably the rest of the wells would average 180.

Q By way of Mattig calculation what would that approximate.

A 5400 tons.

Q If this pool was drilled on 40 acres there would be 5400 tons of steel wasted?

A That is my opinion.

Q In unnecessary holes. Now, the application Ame rada is requesting, the order which Amerada is requesting could save that tonnage?

A Save most of it, probably not all of it. There may be some exceptions necessarily but I would say it would save over 90 per cent of it.

Q Mr. Millikan, in your opinion as a petroleum engineer, will the order which has been requested here by Amerada avoid waste and provide the drilling of unnecessary wells and protect the correlative rights of all persons and result in the conservation of oil and gas.

A Yes, sir.

CROSS EXAMINATION

By MR. ADAIR:

Q Would it be possible during the 12 months period for which you are asking this order for an operator in your opinion to get necessary steel to drill this field from one well to 40 acres?

A Not unless the picture changes dog-gone fast.

Q Can the field during the 12 months period produce at the rate of one and one half times for the normal top unit allowable without waste?

A I don*t know.

Q You think that it can?

A I am willing to try. If it doesn't work out, we can stop it before we create any waste. I don*t believe it can produce much in excess of that without reaching probably the productive limits of the pool. I mean the productive capacity of the pool.

Q Production of the rate of one and one half top unit allowable for that top depth would give you the reservoir information that you would not otherwise get, would it not?

A Perhaps some.

MR. ADAIR: That is all.

MR. SPURRIER: Any questions of this witness, any further questions?

MR. CAMPBELL: I don't believe I heard you say where you took the core in the Roswell Artesian Basin?

A Near the town of Dexter about a mile and a half southwest of Dexter.

Q Do you know the location of the well?

A I may have it here. It is on the Carl Nicholas farm.

Q Nicholas?

A Right.

Q It is your conclusion relative to the movement of water through the Artesian Basin based on the assumption that the entire basin consists of formations similar to that core?

A Yes, sir, or better. Most probably much of it better than that.

Q Well, then - just a minute, please.

A The location of that well is the northeast quarter of Section 24, Township 13 South, Range 25 east in Chaves County.

Q Did you make your interference tests in the same location?

A No. One of them was made a little bit north of there and the other one just north of the town of Roswell.

Q One other question. Did I understand you to say that you were assuming that the intake area of Roswell Artesian Basin coinsides with the outcropping of the San Andres?

A Yes, sir. It can be, of course, extended on into the actual basin itself. Perhaps some of the water would go down into it.

Q You are assuming that all of this water is moving through the San Andres?

A Yes, sir. That is the water that is produced from the San Andres.

Q I think you stated an average of 175 and 180 tons of pipe is necessary for a well?

A Yes, sir.

Q In your operations generally?

A Yes.

Q Pardon me?

A At Bagley.

Q A_t that depth?

A Yes.

Q Do you have any data on what your average allowable per well is elsewhere in wells of this depth?

A About the only other - well, we are producing at Jones Ranch is one hundred eighty barrels on a calendar day. That is of comparable depth.

Q Half the allowable that you get on an allowable and half in this field?

A That*s right.

MR. CAMPBELL: That is all.

MR. SPURRIER: Are there any further questions of this witness? If not, the witness may be excused. Mr. Morrell did you have something?

MR. MORRELL: I did want to clarify possibly for the benefit of the Commission this matter of the Roswell Artesian. I don't wish to pose as an expert because I am not. However, I have apparently some other information to what Mr. Millikan has presented. The thickness of the St. Andres formation in the area of that basin along the Pecos River is approximately 12 or 14 hundred feet.

A My understanding is its maximum thickness is about 12 hundred, 8 hundred to 12 hundred, probably to truncation.

Q The depth from which the water is producing in the basin is more than 9 hundred feet.

A Mostly. I think some of them shallow at 3 hundred.

Q The orange line, the blue line before the Commissioners represents the outcrop of the basal member, you might say of the St. Andres?

A Yes at various parts of the St.Andres.

Q Inasmuch as the San Andres is on the top of the hills 40 miles west of Roswell.

A Were you asking me or telling me?

Q Yes. Is that correct?

A Yes, I think so.

Q In other words as you go west on the highway from Roswell to Ruidoso you cut through the San Andres on the 35 mile hill west of Roswell?

A It is a little further west than that, isn't it?

Q It is 35 or 36 miles, roughly.

A You may know better than I, but down at Cloudcroft you go to - clear to Cloudcroft on the San Andres.

Q Are you familiar with the closed water basin established by the State Engineer, John Bliss?

A Within this area?

Q Yes.

A There are some I understand, to the west of that but not, -- oh, you mean closed to drilling.

Q The closed basin for drilling for water, right.

A Yes. That is represented by that red line.

Q The closed basin has published by Mr. Bliss, does not coinside with that red line in my information.

A Precisely no. It doesn't but the - it covers that area and in some places will extend somewhat to the west.

Q The point I am getting at is the closed basin as defined, which includes the intake area for the water reservoir is only approximately 6 to 8 miles west of your inner red lines you have drawn on your map. In other words, that is the intake

area and that is the point I want to call to the attention of the Commission that the intake area is a very much smaller area than the outcrop area of the San Andres.

A That is your producing area. That is where you have limitations of drilling. That is the closed area nearest the 1100 wells on this two hundred or whatever it would be, seventy square miles, they limited the number of wells which could be drilled because those wells could produce all of the water that would come into that area you are speaking of.

Q You are speaking of your inner red line?

A Right.

Q The area is from six to 8 miles west of yourinner red line which I am speaking of, which is also closed for drilling because it is the intake area.

A No, not because - that is not my understanding. It is closed but not because it is the intake area but because it is so closed to producing area that any wells produced in there will take water away from the wells producing in the red area. Not because th that is the entire source of the water.

Q I want to call attention by reference to state engineer Bliss' records and reports. The major intake area of the basin is six miles west of Roswell with some from the 25 mile with some additional from the 25. The records have the Corps of Engineers will also show and the matter of the water dispute between New Mexico and Texas is based on the fact that they did not want water stored in the Hondo Reservoir which is 8 miles west of Roswell because the two drain into the Artesian Basin.

A Right.

Q That is approximately where the producing zone of water in the San Andres outcrops. Now, you have 300 feet below that producing zone which is not in the permeable water zone. I merely clarify that point on your area.

A Well, except that that doesn't agree with what the United States Geological Survey said about it.

MR. SPURRIER: Are there anymore questions of this witness? If not the witness will be excused.

MR. KELLOUGH: We have no further evidence to submit and on the basis of the evidence we have offered, we request that the Commission enter the temporary order for the period of one year in the manner in which it has been asked for in the application with the one exception that the productive limits be changed to conform with the testimony of Mr. Veeder.

MR. ADAIR: If the Commission please, we see no objection to entering the temporary order requested for so long as the allowable that is fixed is one and one half time the normal top unit allowable. We think that is important for two reasons. One, we think it gives the operators as well as the owners alike their fair share of the state allowable oil production, which they could not get if they were restricted to a 40 acre allowable on the 80 acre basis. We concur in the request for a temporary order.

MR. KELLOUGH: If the Commission please, before the matter is dismissed, there are a number of operators here and I would like to take the liberty, if the Commission cares to ask that they

express their views, if they care to as to our application.

MR. ADAIR: They operate wells in this field?

MR. KELLOUGH: I think Mr. Adail, if you have any objections to any other companies expressing their views, I am sure that you can state what objections you have. It is up to the Commission. I am asking if they wish to hear it.

MR. SPURRIER: We might put it this way, is there anyone that objects to the proposal that Amerada has made?

MR. MORRELL: So far as the interest of the federal government in the Bagley, we have no objections as a temporary order. For allowable not to exceed one and one half times normal allowable, with the understanding that it is temporary, primarily on the basis of shortage of steel.

MR. SPURRIER: Anyone else? If not the case is closed and and will be taken under advisement.

We will proceed with the next case which is Case 268.

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C E R T I F I C A T E

I HEREBY CERTIFY that the foregoing and attached transcript of the hearing in Case No. 249, before the Oil Conservation Commission, on April 24, 1951, at Santa Fe, is a true record of the same to the best of my knowledge, skill and ability.

Dated at Albuquerque, this 15th day of May, 1951.

Ada Dearnley

ADA DEARNLEY

BEFORE THE

OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

TRANSCRIPTION OF HEARING

CASE NO. 249-A

24 July 1951

(DATE)

Original

E. E. GREESON
COURT REPORTER
UNITED STATES COURT HOUSE
TELEPHONE 2-0872
ALBUQUERQUE, NEW MEXICO

BEFORE THE
OIL CONSERVATION COMMISSION
July 24, 1951

CASE NO. 249A: This concerns Amerada Petroleum Corporation's application for an order establishing proration units and uniform spacing of wells for the Bagley-Siluro-Devonian pool, Lea County, New Mexico

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MR. HINKLE: Members of the Commission, Mr. Booth Kellough of Tulsa and myself, Clarence E. Hinkle of Hervey, Dow and Hinkle of Roswell, are appearing on behalf of Amerada Petroleum Corporation. The Amerada Petroleum Corporation had a hearing before the Commission on April 24, 1951, which was on the application of Amerada to establish proration units and uniform spacing of wells in the Bagley-Siluro-Devonian pool in Lea County. After this hearing was held an order was entered by the Commission on May 1, 1951, establishing 80 acre units for the Bagley-Siluro-Devonian pool in Lea County.

I shall put before you plats which show the 80 acre units which were established by that order, including the exceptions which were made in the order and which are shown by the dotted lines. The matter which is before you this morning is upon the application of the Amerada to modify the order which was entered on May 1, being Order No. L-69. Under the order of May 1st, the east half and the west half of each 160 acre legal subdivision, with certain exceptions,

were designated as a unit. That would mean that the east half of the northeast as one unit, of Section 3 as one unit, and the east half of the southeast quarter of Section 3 another. Since the order of May 1st on the hearing that was held, the Amerada has drilled a well in the SE¼ of the SE¼ of Section 3, which wasn't drilled down to the Siluro-Devonian formation. However, the information obtained in the drilling of that well would indicate that it is probably on the edge of the field, and it may not prove productive in the Siluro-Devonian formation. They have also completed a well in the SE¼ of the NE¼ which was completed as a producing well in the Bagley--in the Siluro-Devonian formation.

Now that would be on the unit that would have composed the E½ of the NE¼ of Section 3. The well which I have just referred to is on patented land and the minerals are owned, subject to the lease of the Amerada, by Mr. Nathers. The NE¼ of the NE¼ of Section 3, which is the other 40 acres, which would normally constitute that 80 acre unit, is owned by the United States subject to the lease, of course of the Amerada.

The government and Mr. Nathers have both indicated to the Amerada that they would not be willing to enter into a pooling agreement or arrangement whereby the well which has been drilled in the SE¼ of the NE¼ of Section 3 would constitute a well of that particular unit, 80 acre unit.

And, furthermore, there may be some legal obstacle in the way of pooling a Federal--in the way of pooling Federal land and privately owned land. It has never been tested out. Now, due to the fact that the well that was drilled in the SE SE of Section 3 down to and including the Pennsylvanian, the information obtained doesn't look too promising as far as producing in the lower formation is concerned and due to the fact it doesn't look like it is going to be possible or feasible to pool the SE¼ of the NE¼ with the NE¼ of the NE¼ of Section 3, the application of the Amerada proposes that an exception be made to the order of May 1st, 1951, in that 40 acre unit of Federal acreage constituting the NE¼ of the NE¼ of Section 3 would be treated as a separate unit because it is an isolated tract. And that the SE¼ of the NE¼ and the NE¼ of the SE¼ of Section 3 constitute the 80 acre unit rather than the E½ of the SE¼ of Section 3.

Now, that proposed new 80 acre unit is shown by the cross-hatch from NW to SE on the plats that are before you. And the 40 acres of the Government is shown by the other 40 that is cross-hatched just above it. The application also provides that in the event the Commission sees fit to designate this as a new unit, that the allowable, as provided by the order of May 1, 1951, should be modified. Now, the order of May 1st in Section 2 provides this: "That all wells drilled into the Bagley-Siluro-Devonian pool shall be located in the center of the NW¼ of the SE¼ of each Governmental quarter-section, with a tolerance of 150 feet in any direction to avoid surface obstruction."

Paragraph 4 of the order fixes the allowable for each 80 acre unit as one and one half times the regular 40 acre allowable. Now, Section 5 provides this: "If any well is drilled as an exception to the well spacing pattern set forth above under such order of the Commission, the allowable for such well shall be the top allowable for a 40 acre proration unit with the deep pool adaptation as provided by the Rules and Regulations of the Commission."

Now, whether the language is apt or not, the proponents of the 80 acre spacing intended in Section 5, which I have just read, to mean an exception not to the regular 80 acre unit but an exception to the well being located in the center of the 40 as provided in Section 2 of the order, which provides that each well shall be located approximately in the center of each 40 acres.

For instance, to illustrate that, if it proved that the NW¼ of the NE¼ of that unit there, that would be the N½ of the NE¼ of Section 11, should prove to be on the edge of the pool and the Texas Pacific, who is the lease owner, wanted to locate a well set 330 feet from the north and west boundary rather than in the center of the 40, then it is our contention that this order means that in that event if the Commission allowed the unorthodox location, it would be entitled to a 40 acre allowable. Now, as I say, the language may not be apt, but that was really the intention of the order so far as the parties were concerned. As to what the Commission

intended, I am not able to state. We believe that since the whole proration set up in this area is based on an acreage basis, that it would not be equitable in the event the Commission permits the Government acreage, this isolated 40, to be an exception and to permit a well to be drilled on there, to allow the full 40 acre for that unit while the other 80 acre units would be given only a one and a half allowable. That is on the rest of the 80 acre units.

Because of that and because it would not be on an acreage basis, we believe if the exception is made in this case that the allowable as to the 40 acre exception should be reduced by half of the regular one and a half allowable, which would still keep it on an acreage basis, which our proration units have always been in the state.

Now, if the Commission is not willing to reduce that unit to a 40 acre allowable in order to do equity to all of the other owners, we believe that the--that all of the 80 acre units--should be raised to double the allowable so it will still keep it on an equitable basis. In fact, I think that we would want to insist that if they did, you would see fit to give that 40 acres the regular 40 acre allowable, that all of the rest of the 80 acre units be placed upon a double allowable basis.

Now, with that preliminary statement, Mr. Kellough will proceed to introduce the evidence in support of the application.

JOHN VEEDER,

having been first duly sworn, testified as follows;

DIRECT EXAMINATION

By MR. KELLOUGH:

Q Will you please state your name?

A John Veeder.

Q Where do you live, Mr. Veeder?

A Midland Texas.

Q By whom are you employed?

A Amerada Petroleum.

Q And in what capacity?

A District Geologist.

Q Have you previously testified before this Commission in your capacity as a geologist or as an expert witness?

A Yes.

MR. KELLOUGH: Are the qualifications of this witness acceptable?

MR. SHEPARD: They are acceptable.

Q Mr. Veeder, I hand you what has been marked as Exhibit 1 and ask you to state what that shows.

A This is a map of the Bagley field showing the Devonian and Pennsylvanian producers. The Devonian wells are marked by large circles and the Pennsylvanian by small circles.

Q Now, the red line represents the productive limits of the pool as heretofore ordered by the Commission, is that right?

A Yes, that is the productive limits as submitted at the last hearing.

Q And on this map there appear a number of dotted lines representing units. Will you explain what those are?

A The dotted lines are on the 80 acre tracts which have been exceptions to the standard 80 acre tracts, which are the $E\frac{1}{2}$ and the $W\frac{1}{2}$ of each quarter section.

Q In other words, all other units comprising the east half and the west half are not specifically set out on this map?

A That's right.

Q This map shows by dotted lines the exceptions already granted?

A That's right.

Q Except for the hatched line area in the center? Now referring to the NE of section 3 and the SE, there appear a 40 acre tract adjoined on the south by an 80 acre tract in dotted lines and in hatched lines. What does that represent?

A The 40 acre tract, which is the NE NE of Section 3, is the Federally-owned tract and is the unit which we would like to have presented as an exception.

Q In other words, by the hatched line we have shown the exception we are asking for in this hearing?

A That's right.

Q Now, since the last hearing, Mr. Veeder, how many wells in the whole field have been completed?

A Since the last hearing there actually has been no further Devonian producers completed. However, the Amerada State BTK located in the SE SW of Section 34 was taken to the Devonian

at a total depth of 11,060 feet and found non-productive and was plugged back and completed as a Pennsylvanian well. The No. 2 Nathers in the SE SE of Section 3 was completed as a Pennsylvanian well, and this well structurally was 39 feet lower than the No. 1 Nathers on top of the Pennsylvanian.

Q Now, the No. 2 Nathers down in the SE SE of 3, wasn't taken clear down to the Devonian?

A That's right. The No. 2 Chambers, which was drilled on the NE NW of Section 11, that well was completed as a Pennsylvanian producer. And a further well, No. 3 Caudle located NE NE Section 10 was completed as a Pennsylvanian producer. One further well, the Amerada No. 1 Turner, located in the SE SW of Section 11 was carried to the Devonian and found non-productive in Devonian and Pennsylvanian.

Q In that last well you speak of, it was outside the productive limits as shown by this red line on this map?

A That's right.

Q Mr. Veeder, have you prepared a structure map?

A Yes, I have.

MR. KELLOUGH: First, we offer in evidence Exhibit 1.

Q I hand you what has been marked as Exhibit 2 and ask you to state what that is?

A This is a structure map drawn on top of the Devonian pay contour interval in the Bagley field.

Q That map was prepared by you or under your direction and control?

A That's right.

Q Referring to this structure map, Mr. Veeder, will you point out which contour line represents the probable productive limits of the Devonian pay section?

A We take the water-oil contact at Bagley at a minus 6745. That would conform roughly with a minus 6750 contour which would represent the productive limits of the Devonian.

Q For the purpose of identification, will you take your pencil and hatch that contour in the area of the land involved here in this application?

(Witness complies with the request.)

Q Referring to the structure map, what is your opinion as to whether the Nathers No. 2 well located in the SE SE Section 3 would be productive in commercial quantities in the Devonian?

A I would seriously doubt if the Nathers No. 2 would make a commercial Devonian producer.

Q Is that the reason why it wasn't taken down?

A That's right.

Q What is your opinion as to whether the well drilled in the 40 acres to the north of the tract on which Nathers 2 is located, or in other words, the NE SE of 3, whether a well drilled on that 40 acres would be productive in the Devonian?

A That would make a commercial Devonian producer.

Q Now, all that is based upon information that you have at this time?

A That's right.

Q Referring to the structure map again, what would you say as to the relative structural positions of the NE NE of 3 and the SE NE of 3?

A The structural position of those two quarter sections, of the two 40 acre pieces, are relatively the same structurally.

MR. KELLOUGH: We offer in evidence Exhibit 2. And we have no further questions of this withess.

MR. SHEPARD: Does anyone else have any questions?

By MR. CAMPBELL:

MR. CAMPBELL: Mr. Commissioner, I would like to ask a couple of questions. My name is Jack M. Campbell of Atwood, Malone and Campbell of Roswell, representing the Gulf Oil Corporation.

Q Mr. Veeder, are you acquainted with the ownership of the 40 acres situated immediately north, the lease ownership, of the proposed exception?

A That is owned by Gulf I understand.

Q That is part of a state lease?

A That's right.

Q One other question. According to your interpretation of the contour on your Exhibit 2, it would appear that the NW¼ of the NE¼ of Section 3, is only partially within the structure, is that correct?

A That is the NW of the NE of Section 3?

Q Yes, sir.

A That's right. That would be definitely, well, it would be a flank well.

MR. CAMPBELL: That is all.

MR. SHEPARD: Any further questions? Do you have anything more?

MR. KELLOUGH: Not of this witness.

MR. SHEPARD: He may be excused.

(Witness excused.)

R. S. CHRISTIE,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

By MR. KELLOUGH:

Q Will you state your name please?

A R. S. Christie.

Q Where do you live, Mr. Christie?

A Fort Worth, Texas.

Q By whom are you employed?

A Amerada Petroleum Corporation.

Q In what capacity?

A Petroleum Engineer.

Q Have you previously testified before this Commission?

A Yes, sir.

Q In your capacity as Petroleum Engineer and Expert witness?

A Yes, sir.

MR. KELLOUGH: Are the qualifications of the witness accepted?

MR. SHEPARD: They are accepted.

Q Mr. Christie, do you know of any additional data from a reservoir engineering point of view which has been developed prior to the last hearing which is relevant or pertinent to this application?

A No, sir, I do not.

Q What is your opinion or recommendation as to the allowable which should be ordered in the event this application is granted and an exception were permitted?

A It is my opinion if the allowable on the 40 acre exception should be granted one half the allowable given to the wells on the 80 acre units.

Q In other words, if the allowable for the field stays at one and a half times it is your opinion that to maintain equity the allowable and the Government 40 should be one-half of that?

A Yes, sir.

Q Or is it your opinion that if the Commission decides that they should give the Government 40 a full 40 acre allowable then the allowable for the field as a whole should be doubled?

A That is correct. The allowable for the 80 acre wells should have double the allowable for the well on the 40.

Q That is to maintain equity?

A Yes, sir.

Q Is it your opinion that it would be inequitable and disturb the correlative rights to permit the Government 40 to have the full allowable while the rest of the 80 acre

units had only one half?

A Yes, I believe it would.

Q Other wells in the field now are making one and a half?

A Yes, they are.

Q In your opinion will the wells make double?

A I believe now at the present time that all the wells completed in the Siluro-Devonian will make double the 40 acre allowable.

Q Now, will that be for a temporary period or what opinion do you have with reference to that?

A That is rather difficult to say. Based on the potentials that were taken on the wells and based on the performance of the reservoir to date, it appears as though they will make the allowable for sometime. How long that will be is pretty hard to determine.

Q That is problematical.

A Yes, sir.

Q But in the meantime, everybody will be on the same basis?

A Yes, sir.

Q Is it your opinion and recommendation that if a change in the allowable is made under either view which you expressed, that it should be as of the day of the completion of the well which Amerada proposes to drill on the NE NE of 3?

A Yes, sir. I see no reason for making a change until that time. The present allowable of one and a half times a 40 acre allowable with the deep pool adaptation went into effect the first of May; so that we have only a little less

than three months history under that allowable. It will take several months to drill a new well, which will give us additional time to study the reservoir under present producing conditions. For that reason, I think it would be wise to wait until that time.

Q Then would you see any necessity for changing the allowable at all until the exception well, if it is granted, is completed?

A No, sir.

Q Then it is your understanding that Amerada does desire to drill in the NE NE of 3 as an exception?

A That is my understanding, yes, sir.

Q And that you asked the Commission that an 80 acre unit be created comprising the SE NE and the NE SE of 3?

A Yes, sir.

Q The well for that 80 acre unit would be the Nathers No. 1 well?

A That is correct, yes, sir.

Q Now, is it your opinion and recommendation that to maintain equity that well, being the well for the 80 acre unit, should be given the full 80 acre allowable?

A Yes, sir, I think it should.

Q Whatever it is determined to be by the Commission?

A Yes, sir.

Q Is it your opinion that the Nathers No. 1 well located in the SE NE of 3 will drain a sufficient area of 80 acres so

as to give him his fair share of the oil in the reservoir?

A In my opinion it will, yes, sir.

Q Do you know any reason why anyone would be prejudiced by this exception and modification of this order which is being requested?

A No, sir.

MR. KELLOUGH: That is all the questions I have of this witness.

MR. SHEPARD: Any questions?

MR. MORRELL: I would like to ask Mr. Veeder a question.

MR. SHEPARD: Go ahead.

MR. MORRELL: For the purpose of the record and to review, will you give us the top of the Devonian-Siluro formation for the deep well adaptation for allowable purposes?

A I don't have that handy. I can get it for you.

MR. MORRELL: It is between ten and eleven thousand, is that correct?

A I believe that's right.

MR. KELLOUGH: Mr. Veeder, Our geologist may have that information.

MR. VEEDER: Which particular well?

MR. MORRELL: Just for the pool allowable. Is it based on the depth of between ten and eleven thousand feet?

MR. VEEDER: That's right.

MR. MORRELL: The Pennsylvanian well in the same

area is based on a depth of between nine and ten thousand feet.

MR. VEEDER: That is right.

MR. MORRELL: That is all.

MR. SHEPARD: Any other questions? If there are no further questions, you will be excused, Mr. Christie.

(Witness excused.)

MR. CAMPBELL: If the Commission please, I would like to make a correction on the question I asked. I think his answer will be the same. I described the tract as the NE NW of the NE of Section 3. I meant to refer to the SW of the SE of Section 34. Would your answer be the same, that that apparently is on the edge of the structure?

MR. VEEDER: That is the SW of the SE?

MR. CAMPBELL: SW of SE of Section 34. Your contour line moves out to the west there doesn't it?

MR. VEEDER: You would interpret that tract to be structurally lower than the top of the Devonian pay?

MR. CAMPBELL: But apparently your contour would cover that entire 40 as productive.

MR. VEEDER: Yes, sir.

MR. SHEPARD: Any other questions? If not, then you will be excused.

MR. KELLOUGH: We have no other witnesses but I would like to briefly, very briefly, summarize our position which is simply this. That in the opinion of our geologists the

SE SE of Section 3 down here is very probably non-productive. The 40 to the north of it very probably is productive which means that an exception well would have to very likely be drilled somewhere, either in that 40 or on the Government 40. Now, the only way that we can avoid the objection of both royalty owners, the Government and Mr. Nathers, and also avoid the legal question which was raised as to the state's authority to pool government land, is by the procedure which we ask here. And it is the opinion of our technical witnesses that by this arrangement no one will be in anyway prejudiced provided that the allowable for the field is kept on an equitable basis. If it remains at one and a half times, the Government 40 ought to get only half of that. If the Commission decides to give the Government the full allowable, then the allowable for the field should be doubled to maintain equity. That, in brief, is our whole position here.

MR. SHEPARD: The Case will be taken under advisement and we will hear Case No. 290.

MR. CAMPBELL: I believe there may be other statements on this case.

MR. SHEPARD: Any other statements?

MR. MORRELL: Mr. Commissioner, I would like to enter into the record some comments for the benefit of the Commission in considering the application by Amerada Petroleum Corporation. I believe there are several fundamentals which should be considered in connection with this application. And I believe

this is a good time to begin to look at them.

The application stems from an exception to the state-wide rule of 40 acre proration units. The present application under consideration is an exception then to an exception. Rule 505 of the Oil Conservation Commission sets forth oil proration with deep well allowables. It is my understanding and recollection that those deep well allowables are requested and approved by the Commission as being necessary to justify drilling to the depth set forthunder that rule to prevent waste.

In connection with the application of 80 acre spacing, the operators in general are asking for a multiple of that deep well allowable. I do not recall during any of the testimony that the additional allowable is necessary to prevent waste because of the inability to drill and produce wells at the depth specified with only the deep well allowable.

For the purpose of this record, I would also like to state that I have a recent letter from our Washington office which states that they agree that 80 acre spacing seems unnecessary and not conducive to efficient recoveries. Section 13-C of the New Mexico Acts relating to conservation of oil and gas, laws of 1949, does provide for pooling of property. And they also provide that under such enforcement which shall not deprive the owner of a tract of less than the pooling size to recover his just and equitable share in what crude petroleum or natural gases or both may be from the pool and underlying his property.

As a matter of practicability, to consider the 40 acres involved, which is the NE NE of Section 3, it now has or will be under the proposed 80 acre spacing, four direct off sets to the north, south, east and west. In considering drainage of oil and gas it is fundamental that the drainage will have to be considered in covering an area of a **circle.** Statements have been made before the Commission that one well will drain 80 acres. I do not recall that they have described the direction of that 80 acres.

In connection with the supervision of operations on federal acreage, we use the **circle** method in establishing provisions for compensatory royalty. In general, that circle for oil has a radius from the center of the 40 on which a well shall be drilled extending to the center of the adjoining 40, or 1320 feet.

Now, lets draw circles with a1320 foot radius around the four direct offset wells involving the 40 acre Government tract in question. We immediately see an overlapping of the four circles almost to the extent of half of the 40 by each of those circles. The 80 acre spacing program means that the Government 40 would be offset by four wells.

Normal development on a 40 acre drilling program would mean four direct offsets and four diagonal offsets. That would make eight offset wells to the center 40. Under 40 acre proration there would be eight allowables, eight

unit allowables. But when we draw the circles with 1320 foot radius around the diagonal offset wells, we immediately add additional acreage that is not covered by circles around the direct offset wells. Here is a sketch to indicate, the shaded portion being the additional area covered by diagonal offsets. The point there is that single 40 acre allowables to eight offsets would be distributed more uniformly over a larger area, whereas, anytime the 40 acre allowable is increased on the four direct offset wells, you are concentrating the drainage to the 40 acres in question.

At present, the allowable is set by the Commission as one and a half times the normal 40 acre allowable for the existing proration units. As I understand the proposal made this morning, it was a request to consider the Government 40 on a mathematical basis, one half of what ever allowable is granted the 80. If it is fixed or retained at one and a half the normal allowable, which under the present proration schedule for June 1951 amounts to 243 barrels per day, one half of that allowable -- I said 243 barrels per day. That is, one. One and a half allowable is 365 barrels per day.

In other words, we have 365 barrels per day for one and a half normal allowable. If that is cut into one-half to set the 40 acres of an 80 acre unit, the allowable would be 182½ barrels. I wish to call the attention of the Commission to the fact that such reduced allowable, to 182½ barrels, is less than the normal 40 acre allowable for a

well drilled to only nine or ten thousand feet. That normal allowable being 197 barrels.

Then the question comes before the Commission for consideration as to whether an operator, to receive his just and equitable share, should be reduced to an allowable that is less than an allowable for a shallower depth. At the outset I mentioned that the deep pool allowables were established as being necessary. If they are necessary, to protect equities and to allow an operator to receive his just and equitable share, cutting back an allowable for any 40 acre unit below the state-wide deep pool allowable is one that I think that the Commission should give serious consideration.

The presentation of Amerada appears reasonable on the basis of the mathematics. But when we come into the fact that 40 acres is the basic unit in New Mexico the wider spacing can be looked at not on a mathematical basis but on the necessity for continuing the 40 acres as the basic unit, and any increase of a drilling above that size would receive a percentage increase.

The history of 80 acre allowables is interesting. I made a review of the allowable for June 1951, and although not directly related to this case, I am citing it only because of the reference to the 80 acres. In the Crossroads pool the allowable for June for six wells averaged only 351 barrels per well per day, which is the normal 40 acre deep well

allowable for the 12 to 13 thousand foot pool depth. And two additional wells in the Crossroads pool averaged only 230 barrels per day. In the Nowles pool which also has a producing depth of 12 to 13 thousand feet, the allowable for June 1951 was only 350 barrels per well per day for two wells and an average of 212 barrels per well per day for two other pool wells.

These are average figures so that individual wells may be higher than the average.

MR. McKELLAR: Excuse me. Are you talking about allowables or production?

MR. MORRELL: This is allowables. I don't assume production exceeds allowables. It may be less. The essential point is that theconditions after several months of operation under an 80 acre spacing indicate that the reservoirs are not of the character that can warrant continued production at a rate in excess of the present 40 acre deep well allowable.

If by a mathematical formula, such as Amerada suggests, 40 acre drilling under an 80 acre pool at an allowable less than the normal 40, there would be a serious question as to whether or not the operators could afford to drill for the lower allowable. If that was the case, there is the possibility of confiscation of rights, which are provided for under the state laws.

I am making these statements as a generality with respect to 80 acre spacing as now proposed by Amerada and

other operators in both the Bagley-Siluro-Devonian pool and other pools. I don't feel that the Commission should consider the present application of Amerada to be anything unusual merely because it happens to be Government land. I am making my statements as an overall and not that the Government wants anything special.

I think that concludes my statement. Do you have any questions?

MR. SHEPARD: Any questions?

MR. KELLOUGH: No questions. In response to Mr. Morrell, I would like to point out this fact to the Commission; and that is it is true there may be offset wells on the offset 40 surrounding this Government 40, nevertheless, those wells will have attributed to them 80 acres, and all the allowables in New Mexico are on an acreage basis.

If the Commission did attempt to fix allowables based on drainage or circle theories, I venture to say the task would be quite difficult and insurmountable. By taking Exhibit 1 and turning it diagonally, you get a picture of the square pattern spacing locations on 80 acres. And it will be observed that to each well there is attributable 80 acres, whereas, the Government 40 has only 40 acres. And we find it difficult, if not impossible, to follow the reasoning that the United States Government and their 40 acre tract would be entitled to more allowable than anybody else on an acreage basis.

Now, Mr. Morrell, in fact testified with reference, or made some statements, with reference to the production in allowables in other pools. If the Commission would like to hear testimony on that, our witness would be glad to testify. But, it is our opinion that that is not relevant to this issue in this case here before you. That is all.

MR. SHEPARD: Any further statements?

MR. CAMPBELL: If the Commission please, for Gulf Oil Corporation. On behalf of Gulf, which as the record shows has a 40 acre portion of the state lease offsetting the proposed exception, I would like to make a brief statement. I think we can all realize that there are two existing facts which we must recognize here.

One, is that this field is on 80 acre spacing. There is an existing order, a temporary order to May 1, 1952, establishing 80 acre spacing in this field. To my knowledge this is the first application for an exception. Otherwise, the field in the Devonian is on an 80 acre fixed pattern base without exception. That is an order of the Commission, and to my knowledge the order isn't under question at this time.

The only thing in question here is whether an exception should be granted, and if it is granted, what allowable should be given to it.

The second fact, I think we should recognize is that up to now allocation of production for New Mexico is based

solely on an acreage basis. There have been no other factors considered. Insofar as I know that is still the procedure in New Mexico. Recognizing those two facts, Gulf wishes to state they do not object to the granting of the exception requested here, provided there is an equitable adjustment of allowables. They concur with Amerada that if the exception is granted and if the allowable for 80 acre proration units remains at one and a half allowables, that the allowable granted to the exception, it being one half of the acreage in an 80 acre unit, should be one half of the allowable.

Gulf likewise feels if the Commission is of the opinion a 40 acre proration unit, which is the basic in New Mexico, that it cannot go below it, and choses to grant a 40 acre allowable to this tract, then the allowable in the field, the order in existence now, should be amended to provide for double allowables for the 80 acre units. The production knowledge of Gulf in this particular field is very limited. But we believe the Amerada people who have had experience in the field are acquainted with what the wells can do, at least for a period of time. Therefore we urge the Commission, if they grant this exception, to issue allowables on an acreage basis so that there will be two for one. In other words, whatever allowable they give to the 40 acre unit the 80 acre unit should be entitled to twice that allowable and the order now in existence should be amended to provide for that.

MR. MORRELL: May I ask Mr. Campbell a question? Mr. Campbell, you are aware that the Gulf 40 acres to which you refer is on the normal spacing 40 for 80 acre units?

MR. CAMPBELL: That is correct.

MR. MORRELL: Is Gulf willing to drill a well for one half of the present one and one half allowable?

MR. CAMPBELL: That is a policy matter for Gulf to decide.

MR. MORRELL: I just wanted to call that to your attention.

MR. CAMPBELL: They will have to drill a well.

MR. SHEPARD: Any other questions?

MR. SCHUEHLE: I represent Texas and Pacific Coal and Oil Company. Texas Pacific Coal and Oil Company as an operator in the Bagley-Siluro-Devonian Field doesn't have any objection to Amerada's application. However, we do believe equity must be maintained in the allowable. Because in the event the Commission sees fit to grant a full normal 40 acre allowable, that wells drilled on 80 acre spacing must have double that amount, or double the 40 acre allowable.

MR. SHEPARD: Anyone else? Any further questions? Any other statements? If not, we will take the case under advisement and stand adjourned until 1:15.

(Recess.)

STATE OF NEW MEXICO)
: ss
COUNTY OF BERNALILLO)

I HEREBY CERTIFY that the foregoing and attached transcript of proceedings before the Oil Conservation Commission in Case No. 249A, taken on July 24, 1951, is a true and correct record of the same to the best of my knowledge, skill and ability.

DATED at Albuquerque, New Mexico, this 31 day of July, 1951.

E. E. Greeson
REPORTER

My Commission Expires: 5-4-52

BEFORE THE

OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

Santa Fe, New Mexico

TRANSCRIPT OF PROCEEDINGS

CASE NO. 249 & 315

Regular Hearing

April 15, 1952

ADA DEARNLEY & ASSOCIATES
COURT REPORTERS
ROOM 12, CROMWELL BLDG.
PHONES 7-9645 AND 5-9546
ALBUQUERQUE, NEW MEXICO

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

Santa Fe, New Mexico.

April 15, 1952.

IN THE MATTER OF:

The application of the Amerada Petroleum Corporation for an order establishing proration units and uniform spacing of wells for the Bagley-Siluro Devonian Pool, Lea County, New Mexico.

CASE No.: 249 & 315

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MR. KELLOUGH: My name is Booth Kellough, lawyer for the Amerada Petroleum Corporation at Tulsa. We have three 80-acre spacing cases set this morning. The Bagley, the Knowles and the Hightower. Each of these cases, as you know, has rather a long history. In order to expedite the matter and in order to keep the record straight in each one of these cases we have prepared a written statement which contains the statement of the background of the particular case together with our version of the issues which are now probably before the Commission and also a summary of the testimony that the witnesses will present.

If the Commission would like to follow this statement as we present our case, I think it will help considerably in keeping each one separate and eliminating confusion and saving time. We have also prepared all our exhibits and we have them in a folder to be kept with each one of these cases so they may be kept separate.

The Case 249 and the Case also No. 315 which is fourth on the docket are the Bagley case.

In August, 1949, Amerada filed its application to establish 80-acre proration units and uniform spacing of wells for the Bagley-Siluro-Devonian pool in Lea County, New Mexico. (Case No. 191)

The discovery well, known as State BTA #1 (located in NW/4 SE/4 Sec. 2-12S-33E) had been completed in the Devonian formation at a depth of 10,770 to 11,000.

Caudle #1 (SE/4 NE/4 Sec. 10-12S-33E) had been drilled as a dry hole in the Devonian. Amerada, Mid-Continent Petroleum Corporation and Texas Pacific Coal and Oil Company were each then drilling a well in the area asked to be spaced.

The application asked that the spacing order cover an area comprising 3040 acres.

It was requested that all wells be located in the NW and SE quarter of each governmental quarter-section.

An exception was asked for the Mid-Continent well (SW/4 NW/4 Sec. 1-12S-33E) then drilling.

The case was first set on September 8, 1949 and then continued to December 20, 1949.

1. FIRST HEARING

The case was first heard on December 20, 1949. Texas Pacific appeared to protest the application. At that time Amerada had three completed Devonian wells and one drilling. Texas Pacific had one completed and one drilling. There were two Devonian dry holes, one of which was the Mid-Continent well.

Evidence was presented by both sides. Amerada filed a brief in support of its application.

On January 23, 1950, the Commission entered its order denying the application of Amerada on the ground that the evidence was insufficient to prove that one well on each 80-acre tract would efficiently drain the recoverable oil from the pool. Exhibit 1 is a copy of this Order R-2.

2. REHEARING

Amerada filed its application for rehearing together with another brief. The rehearing was denied February 8, 1950. Exhibit 2 is a copy of Order R-8.

3. APPEAL

An appeal was taken by Amerada to the District Court of Lea

County, New Mexico. The case was docketed as No. 8485 and service was made. The attorneys for protestant, Texas Pacific Coal and Oil Company, requested that the court hold a pre-trial conference for the purpose of considering the nature and scope of review by the court, including the question of what evidence may be presented.

After the pre-trial conference both parties filed briefs presenting their respective views as to what evidence could be presented on appeal and the jurisdiction of the District Court.

The District Court entered an order on the pre-trial conference in which it found that the review would be confined to the existence of substantial evidence before the Commission to support the order. Amerada's contention that it was entitled to a trial de novo as provided in the statute was denied.

On December 27, 1950, after the pre-trial conference order, Amerada voluntarily dismissed its appeal with prejudice.

4. TEMPORARY ORDER

In December, 1950, Amerada filed a new application for a temporary order to establish 80-acre proration units for a period of one year. The well location pattern was the same as previously requested.

Since the entry of the original order denying the application, 13 additional producing Devonian wells had been drilled.

There had been 18 wells to the Devonian formation drilled at the time of the second application.

The new application was based upon change of conditions and additional information obtained by subsequent development and also the critical shortage of tubular materials necessary for drilling operations.

The application for the temporary order was docketed No. 249. It was set for January 25, 1951, and continued to April 24, 1951.

Texas Pacific Coal and Oil Company concurred in the request for a temporary order provided the allowable was fixed at 1½ times the normal top unit allowable.

On May 1, 1951, the Commission entered its Order R-69 establishing 80-acre proration units for a period of one year from that date. Exhibit 3 is a copy of Order R-69.

5. EXCEPTION

In December, 1950, Amerada filed an application to force pool two 40-acre tracts comprising an 80-acre unit.

However, one of the 40-acre tracts, belonging to the U, S. Government, was located so that an exception would be required in any event. Consequently on June 15, 1951, Amerada dismissed the pooling application and filed an application for an exception to Order R-69 so as to make NE/4 NE/4 Sec. 3-12S-33E a fractional

40-acre unit. The exception was granted and Caudle #5 was drilled on this tract.

6. MOTION TO SHOW CAUSE

The Commission on its own motion set the case for hearing on October 23, 1951, under Case No. 315, directing Amerada, Texas Pacific and other interested operators to show cause why temporary 80-acre spacing order R-69 should be continued. Exhibit 4 is a copy of the notice.

The hearing on the Commission's motion has been continued to this date. Technically, that motion is now moot, since Order R-69 expires by its own terms on May 1, 1952.

7. APPLICATION FOR EXTENSION

On March 24, 1952, Amerada filed its application for an extension of Order R-69 in all of its particulars for an additional period of one year from May 1, 1952. Notice for this application has been properly given.

8. ISSUES INVOLVED IN PRESENT HEARING

The issues are not the same as if the case was being presented to the Commission for the first time. The Commission has already found that the evidence justified a temporary order for one year. If no waste is being committed and conditions have not changed then the order is justified for another year.

Therefore the issues properly now before the Commission

are as follows:

(1) Is any waste now being committed;

(2) Do the same considerations impelling the granting of the temporary order still apply to justify an extension;

(3) Are pressure maintenance operations necessary or feasible at this time.

I now offer into evidence Exhibit Number 1 which is Order No. R-2, Exhibit No. 2 which is Order R-8, Exhibit No. 3 Order No. R-69 temporary spacing order and Exhibit No. 4 which is the notice of the Commission, with respect to this hearing.

MR. SPURRIER: Without objection they will be received.

MR. ADAIR: Eugene Adair representing Texas Pacific Coal and Oil. In order that there be no misunderstanding and so that it may be expedited, may we obtain a ruling that Case 249 and 315 are consolidated, or that 315 is not now before the Commission, so that we can meet those two notices with one series of witnesses.

MR. SPURRIER: Yes, the Commission will so rule.

JOHN A. VEEDER,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

By MR. KELLOUGH:

MR. KELLOUGH: I wish to make it plain that the evidence we are now presenting is in support of our application for a one

year extension of the temporary 80-acre order which is now in effect and also in response to the notice or motion of the Commission.

Q Will you please state your name?

A John A. Veeder.

Q Where do you live?

A Midland, Texas.

Q By whom are you employed?

A Amerada Petroleum Corporation.

Q What capacity?

A District Geologist.

Q You have previously testified before this Commission in your capacity as geologist or expert witness?

A That is right.

MR. KELLOUGH: Are the qualifications acceptable?

MR. SPURRIER: They are.

Q I hand you, Mr. Veeder, what has been marked as Exhibit No. 5 and ask you to state please what that is?

A This is a map of the Bagley-Devonian field showing with red outline the probable limits of production of the Devonian.

Q The red line area shows the area which is asked to be spaced in the application for the extension?

A That is right.

Q And it shows all the Devonian wells to date?

A That is right.

MR. KELLOUGH: We offer Exhibit No. 5 in evidence.

Q How many producing wells are now completed in the Bagley-Devonian reservoir?

A There are 19 producing oil wells to date. Amerada has completed 15, Texas Pacific has completed 4.

Q Mr. Veeder, I hand you what has been marked Exhibit No. 6 and ask you to state what that is?

A This is Schlumberger electrical log on the Amerada No. 5 Caudle, this is completed to Devonian producer.

Q I hand you Exhibit 7.

A This is Schlumberger electrical log on Amerada No. 1 Mathers "A".

Q Exhibit 8?

A Schlumberger on the Amerada No. 2 Mathers "A".

Q Exhibit 9?

A Schlumberger on the Amerada No. 1 State BTM.

Q Exhibit 10?

A Schlumberger on the Amerada No. 1 State BTK.

Q Exhibit 11?

A Schlumberger on the Amerada No. 1 State BTL.

Q Exhibit 12?

A Schlumberger on the Amerada No. 1 C. R. Turner.

MR. KELLOUGH: We offer Exhibits No. 6 to 12 inclusive into evidence.

Q With these exhibits there has now been presented to the Commission, Schlumberger logs of all wells which have been drilled in the Bagley-Devonian Pool?

A That is right.

Q Mr. Veeder, I hand you Exhibit 13 and ask you to state what that exhibit is?

A Exhibit No. 13 is the production data sheet of all Bagley-Devonian wells. On these sheets we have attempted to show, we have shown rather the well number, the top of the Devonian and the datum on top of the Devonian, top of the Devonian pay and also the Devonian, the datum on top of the Devonian pay the Devonian cap and the Devonian completion data.

Q On the right hand column you have the completion data with reference to the casing and the depth and the manner in which the wells were completed?

A That is right, it shows all that data besides the completion information, that is the API, gas oil ratio, gravity and also the spud-in and completion date.

Q That is as to all wells in the Bagley-Devonian Pool, Amerada and Texas Pacific as well?

A That is right.

MR. KELLOUGH: We offer into evidence Exhibit 13.

Q I hand you now Exhibit 14 and ask you to state what that is?

A Exhibit 14 is structure map contoured on top of the Devonian of the Bagley field. Contour interval 50 feet.

Q I hand you what has been marked Exhibit No. 15 and ask you to state what that is?

A No. 15 is a structure map contoured on top of the Devonian pay. Contour intervals 50 feet.

Q Will you state why you considered it necessary and advisable to prepare the two structure maps?

A Two structure maps were drawn up and contoured because there is a presence of an impervious cap on top of the Devonian. The map contoured on top of the Devonian pay shows a true structural position of the Devonian reservoir.

Q In other words, in order to properly evaluate the geology of the Bagley-Devonian Pool it was necessary to prepare two structure maps, is that right?

A That is right.

MR. KELLOUGH: We offer in evidence Exhibits No. 14 and 15.

MR. SPURRIER: Without objection they will be received.

Q Mr. Veeder, considering all of the evidence which is

available to you to date what is your opinion as to the probable productive area of the Bagley-Devonian Pool which you would recommend to be covered by the spacing order?

A The probable productive limits of the Bagley-Pool to date would be included within the red outline. This area covers approximately 2,400 acres.

Q Have you examined all of the samples in the wells at the Bagley?

A I have.

Q Have you made a visual examination of the cores which have been taken from the wells which have been cored by Amerada at Bagley?

A That is right.

Q Concerning the information which you have obtained from your examination of samples and the examination of cores, study of the Schlumberger logs which you offered into evidence, what is your opinion as to the porosity at Bagley?

A The Bagley-Devonian reservoir is very good vugular and fractured type porosity which is connected and continuous throughout the reservoir.

Q By that you do not mean uniform or regular?

A That is right.

Q You mean even though it may be irregular it nevertheless

is in your opinion one continuous portion?

A That is right.

Q Mr. Veeder, from the geological information which has been obtained during the previous years development does that in your opinion show any change in condition from a geological standpoint which should prevent the extension of the 80-acre spacing order for another year?

A There has been no change whatsoever.

Q You have read the statement, the written statement which has been prepared in connection with this Bagley Case, have you?

A That is right.

Q Are the statement of facts therein contained true and correct insofar as your knowledge and information is concerned?

A That is right.

MR. KELLOUGH: That is all.

MR. SPURRIER: Does anyone have any questions of this witness? If not the witness may be excused.

(Witness excused)

R. S. CHRISTIE,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

By MR. KELLOUGH:

Q Would you please state your name to the Commission?

A R. S. Christie.

Q Where do you live?

A Tulsa, Oklahoma.

Q By whom employed?

A Amerada Petroleum Corporation.

Q In what capacity?

A Petroleum Engineer.

Q You have previously testified before this Commission in your capacity as a petroleum engineer or expert witness?

A Yes, sir.

MR. KELLOUGH: Are the qualifications of this witness acceptable?

MR. SPURRIER: They are.

Q What is the average gas-oil ratio for all wells in the Bagley-Devonian Pool, Mr. Christie?

A Average gas-oil ratio for all wells in the Devonian, Bagley-Devonian is 30 cu. ft. per barrel of oil.

Q What is the gravity of the oil?

A The gravity of the oil is approximately 44 to 46 degrees API.

Q I hand you what has been marked as Exhibit No. 16 and ask that you please state what that exhibit is?

A Exhibit 16 is a graph showing the monthly water production,

the total number of wells completed, the cumulative production, the monthly oil production and the bottom hole pressure history of the Bagley-Siluro-Devonian Pool.

Q Will you briefly summarize for the Commission what information is shown on that exhibit?

A The data --

Q (Interrupting) In other words, -- go ahead.

A The data indicates normal development for an oil pool with the monthly production continuing to increase as new wells are brought in. You will note about May of 1951 the allowable was increased in the pool which showed substantial increase in the monthly oil production. At that time the bottom hole pressures in the reservoir decreased at an accelerated rate over and above the previous pressure history.

Q Would you please show that to the Commissioners as you testify? You can stand around where you can see it.

A I have another copy.

Q You were referring to the accelerated production and the drop in pressure during what month in 1951?

A In April or May of 1951.

Q What happened to the pressures after that time?

A Well after the reservoir reached a more or less static condition again after increasing the allowable, the pressures

leveled off again and remained more or less uniform without any appreciable drop until the last survey which has just been completed. I would like to point out that there was an error in one well in the last survey and the red line shows that correction so that the average pressure as of the first of April is 4213 pounds per square inch or 8 pounds above the pressure taken six months previous.

Q Then in the last six months there has actually been an increase in pressure at Bagley?

A Yes, sir, average increase.

Q What was the original reservoir bottom hole pressure as shown in that exhibit?

A The original was approximately 4285.

Q I mean the first pressure that you have shown on that exhibit?

A Approximately 4285.

Q And what did you say the present pressure shown on that exhibit was?

A 4213.

Q How many barrels of oil have been produced during that interval?

A From the beginning of production until April 1st the total production has been 2,573,171 barrels.

Q What has been the drop in pressure, total?

A I will correct that original bottom hole pressure that I attempted to read. It was actually 4273 pounds which shows a total pressure drop from the beginning to April 1st, 1952 of 87 pounds.

Q There has been during the last six months an increase in pressure?

A Yes, sir.

Q Does the pressure and production information which you have depicted on Exhibit No. 16 indicate anything to you with reference to the type of energy found at Bagley?

A In my opinion we definitely have a very active water drive and the pressure history and also the productivity index tests together with our production tests, completion production tests indicate the reservoir of reasonably good permeability.

MR. KELLOUGH: We offer into evidence Exhibit No. 16.

MR. SPURRIER: Without objection they are received.

Q From your production experience, have the wells at Bagley had a high and reasonably uniform capacity to produce, would you say that from your experience as a petroleum engineer?

A Yes, I think they have.

Q Will you briefly state to the Commission for their information the situation that exists under the present 40-acre spacing

order where wells are permitted to be drilled 330 feet from the boundary line of the section and also compare that with the situation which exists with reference to the application for the extension of 80-acre spacing as it pertains to and relates to the drainage area of one well?

A Under the present rules of the Oil Conservation Commission, wells may be drilled 330 feet from the boundary lines of the 40-acre tract. This would authorize the drilling of wells from 330 feet from the lines from each corner of a quarter section and would result in a distance of 1980 feet between wells. Such locations are permitted under the statewide rule of the Oil Conservation Commission and is commonly referred to as 40-acre spacing. Assuming that the statewide 40-acre spacing rule presumes efficient drainage of any reservoir spaced under the authority of that rule, that is a distance of 1980 feet, the result is that the present rule recognizes that efficient drainage does occur for a distance of over 990 feet from a well, or over an area equivalent to 90 acres. 80-acre spacing as requested by Amerada Petroleum Corporation for the Bagley-Siluro-Devonian pool, is on a uniform spacing pattern which would result in a distance of 1866 feet between wells or the efficient drainage of an area of 80 acres in a form of a square. The 80 acre spacing proposal would require each well to drain from a distance of only 933 feet, which is 57 feet less than is permitted

under statewide so-called 40-acre spacing. There are many pools in New Mexico in which many wells have been drilled in the corner of 40-acre tracts instead of the center. This is authorized under the statewide order commonly referred to as 40-acre spacing. Many of these wells, which, as authorized, are presumed to drain an area of 90 acres are producing from reservoirs that are not under an effective water drive and do not have other conditions which are conducive to a large drainage area as exists in the Bagley-Siluro-Devonian Pool.

Q What has been the average well cost of the Amerada producing completed wells at Bagley?

A The average cost of all the Amerada Devonian producing wells at Bagley has been approximately $220,000 per well.

Q Mr. Christie, in your opinion will one well in the Bagley-Siluro-Devonian pool effectively, and efficiently and economically drain an area of 80-acres?

A In my opinion it will.

Q What, in your opinion, should the allowable be if the application for the extension is granted?

A Under the present allowable of 1½ times the normal unit allowable there does not appear to be any waste occuring and I would recommend the same allowable be continued.

Q You recommend the same allowable as contained in Order R-69?

A Yes, sir.

Q In your opinion is there any waste now being committed at Bagley or any inequity existing toward any operators or royalty owners?

A No, I don't believe there is.

Q Is the shortage of steel still critical?

A As far as our Company is concerned, it is as critical as it was a year ago.

Q The conditions in that respect have not changed materially?

A No, sir.

Q What is the amount of steel for the average well of all wells drilled by Amerada during the past year?

A Approximately 75 tons per well.

Q Approximately how many tons of steel does it take to drill one well at the Bagley?

A Approximately 175 tons to 180 tons.

Q And it requires about 2½ times more tonnage of steel to drill a well at Bagley than it has the average well drilled by Amerada during the last year?

A That is correct, yes, sir. I think another thing might be pointed out here in connection with the shortage of steel. It seems to me that it would be well to try and distribute that

as well as we could over not only this State but other States as well, in order to increase our reserves. In that connection I would like to read into the record, if I may, a statement by General Thompson at North Texas Oil and Gas Association Meeting in Wichita Falls several weeks ago.

MR. SPURRIER: Very well.

A The General states, "by the year 1975 the United States will require 12 to 14 million barrels of oil per day." The Texas Commissioner said, "which is about double our present oil requirements. Today we are producing 6,165,000 barrels per day. We have now in addition about 500,000 barrels daily reserve producing ability for domestic wells."

That is not very much reserve - half a million barrels. This is at a rate that we call most efficient, the rate that will most fully utilize the reservoir energy and do no harm to wells.

In 1951 we fully met the greatest demand in history and added to our reserves more than any year before. I think it is well to keep that in mind and try to, instead of drilling unnecessary wells and pools where we have discovered it be better to spread it around and try to discover some new reserves.

Q You mean, Mr. Christie, that the steel and materials which can be saved at Bagley could be used for further development in other areas in New Mexico?

A In New Mexico, primarily in any state as a matter of fact.

Q Amerada is the larger operator in New Mexico?

A Yes, sir.

Q We have other interests and other leases in the State of New Mexico in which we are vitally interested?

A We do.

Q And Amerada contemplates as much exploratory and development work in New Mexico as it possibly can, as can be justified? Is that right?

A That is correct.

Q Will the saving of the materials which would otherwise be wasted in unnecessary wells, could that be employed in the further development and carrying out of the Amerada's exploratory program in the State of New Mexico?

A It could and I am sure it will be.

Q In your opinion has there been any change in condition during the past year which you would say, as a petroleum engineer, should justify or require a denial of the application for the extension?

A Will you state that again, please?

Q Has there been any changed condition, in your opinion, which you think should prevent the application for extension

from being granted?

A No, I believe not.

Q Has Amerada had under consideration the question of whether or not pressure maintenance or secondary recovery operations are advisable or feasible or necessary at Bagley?

A Yes, sir, we have considered it at this time, with the minor drop in bottom hole pressure we doubt whether it would be feasible or necessary at this time. It may be later on that it would be advisable to do that but at the present time it doesn't seem to be advisable.

Q In the event at any future time should it become, indicate that it would become necessary, it would be considered by Amerada would it not?

A Yes, sir, it would.

Q But at the time, in your opinion, in view of the pressure and production history it is not necessary, is that right or feasible?

A That is correct. Yes.

Q Mr. Christie, you are familiar with the work of the Committee of Inter-State Oil Compact Commission in your studies on well spacing?

A Yes, sir, I am. To a certain extent.

Q Are there certain conclusions expressed which conform to

your views which are pertinent to this particular matter? If so, would you read those statements to the Commission?

A I think there are two or three short statements in here that agree with my conclusions if I can find them readily.

I am now quoting from the well spacing report published and distributed by the Interstate Compact Commission of which the State of New Mexico is a member.

"With respect to complete water drive fields Muskat-Aquafier, states and refers to the page in this report or at least in his report, "In complete water drive fields the well density should be only so great as will provide the allowed field withdrawals. The latter, if feasible should be limited to the capacity of the acre to replace the withdrawals without continued and excessive pressure declines." I think that fits the Bagley-Devonian field very well.

Page 53, Paragraph 4. "In water drive reservoirs the energy available for removing oil from remote locations in a reservoir is limited or inherently qualified primarily by time. The efficiency with which this energy may be expended is dependent upon the type of porosity, percentage of porosity and permeability and structural relativity and conformations but not on well spacing."

The report in summarizing has several suggestions for close spacing and several for wide spacing. I would like to quote one

or two under the wider spacing pattern which they suggest.

From Page 55 bottom, number 1. "When reservoirs have considerable structural relativity and high porosity and effective permeability resulting in high productivity indices, which in turn permit high individual well allowables with low producing bottom hole pressure draw down." That is one condition where they recommend wide spacing.

Another is number 4, page 56. "When deep well pays result in high drilling and high operating costs per well, requiring a greater return per well to insure reasonable return on investment."

"When deep well pays indicate low ultimate reservoir recovery, and close drilling is not economically justifiable."

I believe that is all.

Q Mr. Christie, Amerada is interested in producing oil?

A Yes, sir.

Q They don't want to leave it in the ground any more than anybody else?

A That is true.

Q Have you read the prepared statement which has been prepared for this Bagley case?

A Yes, I have.

Q Are the statements of facts which is contained therein true and correct to the best of your knowledge and information and belief?

A Yes, sir.

MR. KELLOUGH: That is all from this witness.

MR. SPURRIER: Does anyone have a question of this witness?

MR. ADAIR: I have a few questions, please.

CROSS EXAMINATION

By. MR. ADAIR:

Q You have been testifying solely thus far about the Bagley-Siluro-Devonian reservoir have you not?

A Yes, sir.

Q As an engineer in determining whether or not waste will take place, in determining whether or not a reservoir will support 80-acre spacing, or making any other determinations with reference to that reservoir, you should be confined of course to the facts relating to that reservoir, should you not?

A That is correct.

Q Will you refer back, if you will please, to the pressure that you found in April, 1951 when the, just prior to the time that the 80-acre allowable was placed into effect in this pool?

A My records show that the pressure on April 1, 1951, the average pressure per field was 4,258 pounds.

Q What is the present pressure?

A Present pressure as of April 1, 1952 is 4,213 pounds.

Q Which is a drop of only approximately what?

A 45 pounds.

Q And during that period of time do you have the figures

on how much oil has been withdrawn from the reservoir?

A To April 1, 1951 the cumulative production was 951,127 barrels.

Q So that during the year prior from April, 1951 until April, 1951 with a drop of only 45 pounds, you produced in excess of 1,700,000 barrels of oil?

A That is correct. 1,722,000.

Q As an engineer do you not consider this a reservoir of unusual quality?

A I think it shows very good performance.

Q During the past six months your pressure decline has not only been arrested but you have had an increase in pressure, have you not?

A Yes, sir.

Q So from the standpoint of pressure maintenance and operations the feasibility of instituting pressure maintenance operations, that is not necessary. Nature is maintaining pressure in this reservoir?

A That is correct.

Q How many rigs does Amerada have running in the field at the present time?

A I believe we are drilling just one well to the Devonian.

Q But also you are drilling one well to the Pennsylvanian,

are you not?

A Yes, sir.

Q Most of the Devonian reservoir is overlaid with the Pennsylvanian productive formation, isn't it?

A That is correct.

Q So that the operators in this particular field are in fact drilling one well to 40 surface acres at the present time, are they not?

A Yes, sir.

Q By drilling one well to the Devonian and one well to the Pennsylvanian?

A That is correct, substantially correct.

Q Do you know whether or not it is true that Texas Pacific has two rigs running in the field at the present time?

A I do not know. I understood they had one going to the Devonian and one to the Pennsylvanian.

Q That is correct. So that from June 1949 when the original well was drilled up until the present time, a period of almost three years, would you or would you not say that the operators in that field have diligently developed the field?

A I would say they had, yes, sir.

Q They have maintained rigs running in the field at all times, have they not?

A That is correct. I think they probably kept them as busy as they would be able to get pipe for them.

Q So that from the standpoint of correlative rights and standpoint of the producers and the royalty owners getting their fair share of the state allowable oil production they will get more oil during the coming year on the 80-acre spacing program that has been in effect and which is here requested to be continued for one year, they will get more oil that way than if they go to 40-acres at the present time, as far as spacing is concerned, will they not?

A In considering reservoirs?

Q Yes.

A Well, --

Q (Interrupting) The reason for that of course being that they will get an allowable and a half for the 80-acre spacing even if they went to 40-acre spacing during the year in question, they could not drill in 40-acre spacing, isn't that true?

A That is true, yes, sir. It would take them some time to make up that half an allowable if they went to 40-acres.

Q It would take some three to four months to drill a well?

A Yes, sir.

Q In that field. If you have trouble it takes sometimes 6 to 8 months to complete it, doesn't it?

A That is correct.

MR. ADAIR: I believe that is all I have.

MR. SPURRIER: Anyone else have a question?

By MR. WHITE:

Q As to the bottom hole pressures referred to in Exhibit 16, how many wells were these bottom hole pressures taken?

A Generally speaking they were taken in all wells that they could get in conveniently. In most cases I would say 90 to 95 percent of them.

Q Were individual bottom hole pressures of each well uniform or was there a large variance?

A In my opinion they are rather uniform. We had --

Q (Interrupting) You have the figures as to the greatest variance between the wells?

A We had one edge well that had a lower pressure than the other wells.

Q What was that?

A Examination of that well, Amerada State BTD No. 3, showed a bottom hole pressure of 3993.

Q When was that bottom hole pressure taken?

A That was taken as of April 1, 1952.

Q What was the bottom hole pressure prior to that time?

A Of that particular well?

Q Yes, sir.

A You are speaking of the individual well?

Q Yes, sir.

A That particular well showed a decline of 179 pounds over a six month period..

Q Is that the last six months?

A The last six months. That is an edge well incidentally. With the exception of that one particular well the other wells varied from 4178 pounds to 4245 pounds.

Q Does that exhibit show the individual pressure, bottom hole pressure?

A Exhibit 16 does not.

Q Just the average?

A Just the average.

Q Have the exterior limits of the pool been reasonably determined?

A Yes, sir, I think they have.

Q Did you say that there is any possibility or likelihood of the wells coning on an 80-acre spacing or not?

A No, I don't believe they will under 1½ times the normal unit allowable.

Q To what do you attribute the pressure increase about the same time as an increase in production?

A Well, at no time in the history of the field have we had any material increase in the bottom hole pressure with increase in production. With the exception of that period that was pointed out earlier, between March 1951 and October 1951 where the allowable was substantially increased and the bottom hole pressure decreased, the reservoir has been under a rather static condition.

Q Could you furnish us the actual bottom hole pressures per well?

A Yes, sir.

MR. WHITE: That is all I have.

MR. SPURRIER: Anyone else?

MR. ADAIR: One more question.

By MR. ADAIR:

Q Mr. Christie, even though the area limits of the field have been fairly well delineated it is true is it not that the field has as yet not been developed to one well to 80-acres?

A That is correct, yes, sir. There is a possibility of other locations or other wells but from our contouring I believe we have pretty well established the limits of the field.

Q But those wells with one exception, but those wells that have been drilled in the field have been drilled on pattern and there has been only one exception asked for and granted so far

as productive wells are concerned, is that not true?

A I believe that is correct.

Q So, following your idea that each field should stand on its own merits insofar as reservoir information is concerned and insofar as spacing and any orders that the Commission may issue with respect to the firel, this is one field that is not, where the Commissions problem is not complicated by reason of a large number of exceptions either granted or requested.

A That is correct, yes, sir.

MR. ADAIR: That is all.

MR. SPURRIER: Anyone else?

By MR. MACEY:

Q Mr. Christie, on your bottom hole pressure curve, Exhibit 16, what was the shutin time of the bottom hole pressures?

A 48 hours.

Q In every case they were 48 hours?

A Well, essentially 48 hours. It may have been a few minutes one way or another.

Q In your survey that was taken in October, 1951, according to the sheet here, you show a total of -- were all the wells taken on that survey, or almost all of them?

A Almost all of them.

Q The curve that you show as a number of wells, that is

the number of producing wells?

A Yes, sir, that is the number of producing wells.

Q You are going to submit complete bottom hole pressure information?

A Yes, sir, I would be glad to do that.

Q (By MR. WHITE) Was that report from which you read of the Interstate Oil Compact, was that report based on the Bagley-Siluro-Devonian Pool?

A Well, I am not sure what fields are included in the analysis of this report but I'm sure they have considered a large number of fields, both water drive and solution gas drive fields.

MR. WHITE: That is all.

MR. SPURRIER: Anyone else?

MR. KELLOUGH: Mr. Christie, do you have with you at this time a tabulation of the bottom hole pressures prepared in the form requested by Mr. Macey and Mr. White that you could offer into evidence at this time? Or would it be helpful to the Commission to prepare especially a tabulation as to each well?

A I can do it either way. Which ever they prefer. I could read these into the record individually right now if you would like to have them.

MR. SPURRIER: How many are there?

A 16.

MR. SPURRIER: Go ahead.

A These are all static pressures taken at a datum of minus 6700 feet, shut in time approximately 48 hours. I will read first all Amerada wells.

Amerada State BTA No. 1, 4224 pounds also give change plus 4 over the last period.

BTC No. 1, 4234 plus 8 pounds.

State BTC No. 3, 4245 pounds plus 34 pounds.

State BTD No. 1, 4205, plus 41 pounds.

State BTD No. 3, 3996 pounds, decrease 179 pounds.

State BTI No. 1, 4236 pounds, plus 14 pounds.

State BTL No. 1, 4206 pounds, plus 46 pounds.

Caudle No. 2, 4181, plus 15 pounds.

Caudle No. 5, 4222 which is the initial pressure.

I might interject here in passing, that the Caudle No. 5, which is the last well completed, had a pressure approximately the same as other wells in the field which to me shows very good drainage.

Mathers No. 1, 4187 pounds, plus 9 pounds.

Mathers "A" No. 1, 4178, minus 20 pounds.

Mathers "A" 2, 4213, which was initial pressure.

That again is, reflects a very good drainage, I believe it

happens to be the average for all the pressures.

Now, going to the Texas Pacific Coal and Oil Company well tests; their State B No. 1, 4240 pounds, minus 18 pounds.

State C No. 1, 4205, minus 23 pounds.

State C No. 2, 4200, minus 37 pounds.

State C No. 3, 4212, minus 18.

Q (By MR. KELLOUGH:) The second figure that you gave in each case, minus or plus, referred to either the drop or the rise in pressures as between what dates?

A Between October 1, 1951 and April 1, 1952, six months period.

Q I wish to say to the Commission at this time, if there is further pressure information in any form which you desire, we would be glad to prepare and furnish the Commission with anything further they wish in that connection.

By MR. MACEY:

Q Would it be possible, Mr. Christie for you to furnish us with a complete pressure history in tabular form?

A Not only possible, but we will do it.

Q One thing I wanted to ask you, Mr. Christie, in Section 3, the SE of the NE the No. 1 Mathers, what was the pressure on that well?

A 4187.

Q What was the pressure on the No. 5 Caudle in the 40-acre unit to the North?

A 4222.

MR. MACEY: All right.

MR. SPURRIER: Any other questions? If not the witness may be excused. Let's take a five minute brief recess.

(Recess)

MR. SPURRIER: Mr. Campbell, did you make a comment just as we recessed for the record?

MR. CAMPBELL: No, sir. I started to make a statement but he said there was going to be more testimony.

MR. KELLOUGH: I have one more question I would like to ask this witness. Will you please very briefly explain your opinion as to why the pressure has been maintained in Bagley in the manner in which it has?

A The pressure in the Bagley-Siluro-Devonian Pool has remained more or less static or slightly below the original bottom hole pressure because of the rate of withdrawals which have been approximately the same or at times a little less than the rate of influx of water from the surrounding aquafier. The explanation for the increase over the past six months is due to the rather accentuated decrease for the six months previous. Apparently what happened there, as soon as the pressure dropped

and by reason of the larger withdrawals and the reservoir became static again after the water influx caught up with the withdrawals, then the pressures started building up again. It is a good bit similar to hydraulic system or pipe line where you have pressure at one end and a valve at the other. As soon as you open the valve you get a slight drop and if you continue to maintain the pressure at the other end the decrease in pressure will finally be caught up with the pressure in the back. The same thing is more or less true with an Artesian well. If you open a valve on an Artesian well you all know it will flow without any additional artificial lift, it is caused by the head of water behind it.

This reservoir is under a hydraulic system and has a large body of water following the oil in, and any time you change those conditions why you change the conditions in the reservoir and it takes some time for the momentum to catch up to the withdrawals.

MR. KELLOUGH: That is all the testimony we have to offer except that I wish to now --

A (Interrupting) I might point out also that when you are talking about 8 pounds increase or decrease, you are talking about a very small percentage and it is very conceivable to have have that much of an error in your instruments. Where your decline or increase is of minor value it is questionable some-

times as to whether it is the exact figure or not. 8 pounds in 4200 would only be two tenths of one percent or in that neighborhood. But the fact that the increases were more or less consistent would lead us to believe that we actually had a slight increase on this last survey.

Q (By MR. KELLOUGH) That increase would not indicate that there weren't enough wells drilled out there would it?

A No, sir.

MR. KELLOUGH: I would like to offer into evidence the statements of fact which are contained in the written statement and the argument as submitted in memorandum brief.

MR. SPURRIER: Without objection they will be received. Does anyone have a question of this witness? If not the witness may be excused.

(Witness excused.)

MR. SPURRIER: Any one else to appear in this case?

MR. ADAIR: If the Commission please, purely for the purpose of supplementing the testimony given by Amerada, and incidentally let us say that we have all of the information that they put on, we have worked up on our own behalf to put before the Commission if it were needed. However, we believe that Amerada has made a very complete presentation. We have only some information with respect to our own wells that we would like to let the Commission

examine in order to determine whether or not we actually as we think we have a reservoir of very high quality. We will ask Mr. Peck Hardy to be sworn.

PECK HARDY,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

By MR. ADAIR:

Q Will you state your name to the Commission?

A Peck Hardy, Jr.

Q Where do you reside?

A Midland.

Q By whom employed?

A Texas Pacific Coal and Oil Company.

Q What capacity?

A Division Engineer.

Q Where were you educated?

A Graduate of Texas A & M College.

Q Do you hold a BS Degree in Petroleum Engineering from that School?

A Yes, sir.

Q How long have you been employed by Texas Pacific Coal and Oil Company?

A A little over four years.

MR. ADAIR: Are his qualifications as an expert acceptable?

MR. SPURRIER: They are.

Q Have you prepared, Mr. Hardy, or has there been prepared under your supervision a tabulation of certain productivity index tests run by Texas Pacific Coal and Oil Company on its wells in the Bagley-Devonian field?

A Yes, sir.

Q Is that the tabulation?

A Yes, sir.

MR. ADAIR: We offer that as Texas Pacific Coal and Oil Company Exhibit No. 1.

MR. SPURRIER: Without objection it will be received.

Q Will you briefly tell the Commission exactly what the tabulation shows and particularly with respect to producing rates at which the wells were tested and the PI's which you got as a result of those tests?

A Productive index shows the capacity of your wells to produce.

Q What was the PI on State B1 well?

A 16.56.

Q On State C1 what was the PI?

A 40.96.

Q At what rate of production per 24 hours?

A 1,556.6 barrels.

Q State C2 PI?

A 26.2.

Q Rate of production?

A 1,596 barrels per day.

Q State C3 PI?

A 6.54.

Q Rate of production?

A 1,026.7.

Q Do you consider those PI's very good or average?

A Very good.

Q Unusual in West Texas - Eastern New Mexico area?

A Yes, sir, I think they are.

Q I hand you a graph and ask you what that shows?

A This is a graph of the tabular data of the PI's taken on Texas Pacific Coal and Oil Company wells.

Q It shows the same wells that are shown on the tabulation?

A Yes, sir.

Q Only shows PI's graphically, is that correct?

A That is true.

MR. ADAIR: We offer that as Texas Pacific Exhibit No. 2.

MR. SPURRIER: Without objection it will be received.

MR. ADAIR: If the Commission please, Mr. Hardy has prepared

or had prepared under his supervision a tabulation of the arithmetic average bottom hole pressures surveys as we have recorded them. They show a slight difference from the tabulation of the surveys made by the Amerada but the result is the same. They show an increase in the last six months of 33 pounds instead of 81 pounds but we used the Engineering Committees Report for the October '51 survey rather than the figure used by Mr. Christie for Amerada purely for whatever help it will be to the Commission. We offer that in evidence as Texas Pacific's Exhibit No. 3.

MR. SPURRIER: Without objection it will be received.

MR. ADAIR: That is all I have, Mr. Spurrier.

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

(Witness excused.)

MR. SPURRIER: Any more testimony in this case?

MR. ADAIR: That is all as far as Texas Pacific is concerned.

MR. SPURRIER: Any comments?

MR. CAMPBELL: I would like to make a statement on behalf of Texas Pacific Coal and Oil Company. Jack M. Campbell, Roswell, New Mexico. I will read this into the record.

It is an opinion of Texas Pacific Coal and Oil Company that each common source of supply must be considered by the Commission independently. As to the nature and use of the reservoir energy

the productive capacity of the wells, the spacing of those wells, and the protection of correlative rights. The evidence was obtained after three years experience in the drilling and production of 19 wells in the Bagley-Siluro-Devonian common source of supply. Indication was that the reservoir energy is a strong water drive which at the present rate of to approximately one and a half times the normal unit allowable has no decline to any depreciable degree.

The field has 19 wells in the Devonian and only one exception to the present spacing order. Rights are apparently being fully protected. The evidence shows that no waste is taking place. This common source of supply appears to be one which will justify the extension of the present order to make possible proper continued development for this pool.

MR. BOND: I would like to make a statement. L. H. Bond speaking for Stanolind Oil and Gas Company.

We have no material interest in the properties in this pool but we do have extensive drilling and producing operations in New Mexico, and feel that the decision that the Commission renders in this case might well effect our operations in the state.

Our data based on deep well drilling in New Mexico, bears out that the well costs figures that were submitted by Amerada are certainly reasonable for wells to this depth. We feel that our

operators will certainly be encouraged to make investments of almost a quarter of a million dollars per well if they can expecton proper showing to be granted reasonable unit sizes, such as 80 acres. Of course, this would be dependent upon showing the wells would drain 80-acres. In our opinion, wells will drain considerably in excess of that amount where the reservoirs are continuous. In some fields, of low permeability, of course, the time required to drain that area might be excessive, but in a field such as Bagley where Mr. Hardy has testified that PI's s ranged from 6 to as much as 40, that would not be the case. It seems to us that the ability of wells to drain large areas is being realized to an increasing extent in the industry.

I believe Mr. Christie referred to the Interstate Oil Compact Commission's Bulletin. I would mention one other recent publication. The book, "Petroleum Conservation", published in 1951 by the American Institute of Mining and Metallurgical Engineers. In this book, well spacing is discussed for the various types of reservoir control and the conclusion of the article on well spacing is that, if sufficient wells are drilled to permit the desired producing rate without undue pressure differentials, additional wells will have little or no effect on ultimate oil recovery.

The indications are that in most oil reservoirs developed to

date the total number of wells drilled has substantially exceeded the number actually required to obtain efficient oil recovery.

The other consideration is, of course, the conservation of materials. It has been testified that from 175 to 180 tons of steel are required to equip a well in this field. If 80-acre development is maintained as has been requested, this steel could be used in finding new oil reserves.

In conclusion, I would like to concur with the recommendations of Amerada and Texas Pacific that this 80-acre order be maintained in effect. Thank you.

MR. SPURRIER: Anyone else?

MR. WALKER: Dow Walker, Fort Worth, for Gulf. I have a statement here I will give you in a minute although I don't feel we can add anything to the testimony that has been given, we would like to go on record with a statement and say that Gulf does have acreage within the productive limits of the pool and consequently are vitally interested in the case.

We have not at this time available detailed information regarding the Bagley-Siluro-Devonian reservoir but we too have examined the reservoir pressure performance and find that natural sources of reservoir energy are maintaining the pressure very close to that originally existing. We find no justification at this time for the institution of pressure maintenance or second-

ary recovery operations in the field.

Gulf does not now have information available which would conclusively show whether one well is capable of draining 80 acres in this reservoir. However, there is certainly no indication to the contrary at this time, and it is respectfully recommended that the Commission grant an extension to the present order until there is sufficient evidence to determine whether or not the reservoir is being adequately drained by 80 acres.

We would like to concur with recommendations of Texas Pacific and Amerada in this case.

MR. SPURRIER: Anyone else?

MR. FOSTER: Foster for Phillip Petroleum Company. We don't have any acreage in this field under consideration, but many of the facts that have been presented here we are in sympathy with. We are in favor of 80-acre spacing wherever the reservoir conditions permit. We want to go on record as favoring generally 80-acre spacing. We think it is sound in principle and that eventually the Commission here is going to recognize, more and more in this State, the principles back of 80-acre spacing.

MR. SPURRIER: Anyone else? If not the cases will be taken under advisement. The next cases on the docket which are consolidated for the purpose of the hearing, Case 314 and 319.

STATE OF NEW MEXICO)
: SS.
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, Notary Public and Court Reporter do hereby certify that the foregoing and attached Transcript of Proceedings in Case Nos. 249 & 315, before the Oil Conservation Commission, State of New Mexico, at Santa Fe, on April 15, 1952, to be a true and correct record to the best of my knowledge, skill and ability.

DATED at Albuquerque, New Mexico, this 22nd day of April, 1952.

Ada Dearnley
REPORTER

My Commission Expires:

June 19, 1955