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?

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 acre 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 8 pounds but we used the Engineering Committees Report for the October '51 survey rather than /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 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

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