

CASE 2118 (REOPENED)

THE OHIO OIL CO. - DEC. 13, 1961

Case No.

2118

Application, Transcript,
Small Exhibits, Etc.

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
December 13, 1961

REGULAR HEARING

IN THE MATTER OF:

Application of The Ohio Oil Company for the establishment of 80-acre oil proration units in the Lea-Devonian Pool, Lea County, New Mexico. Case No. 2118 will be reopened pursuant to Order No. R-1826 to permit the applicant and other interested parties to appear and show cause why the Lea-Devonian Pool should not be developed on 40-acre proration units.

Case 2118

Application of The Ohio Oil Company for 160-acre spacing, Lea-Devonian Pool, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order requiring 160-acre proration units and 160-acre spacing for the Lea-Devonian Pool, Lea County, New Mexico. Applicant further seeks the establishment of special rules for said pool which would include an oil allowable factor in excess of the 80-acre allowable factors provided by the statewide rules. Said Lea-Devonian Pool is currently governed by temporary 80-acre rules.

Case 2459

BEFORE: Mr. A. L. Porter, Chairman
Mr. E. S. Walker
Honorable Edwin L. Mechem

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TRANSCRIPT OF HEARING

MR. PORTER: The next case on the docket is Case 2118.

MR. WHITFIELD: In the matter of the application of The Ohio Oil Company for the establishment of 80-acre oil production units in the Lea-Devonian Pool, Lea County, New Mexico.

MR. COUCH: Mr. Porter, and members of the Commission, we are prepared, if it suits the Commission's pleasure, to proceed in the Devonian case first, or in the Bone Springs case first.

MR. PORTER: Case 2118, I believe, refers to the Devonian, Mr. Couch, so we'll proceed with that.

MR. COUCH: In the presentation of 2118 we would like to consolidate that, then, with Case 2459, also pertaining to the Devonian Pool.

MR. PORTER: Are there any objections to counsel's motion? The cases will be consolidated. Mr. Couch, do you have some exhibits to post?

MR. COUCH: No, sir, we don't have any to post. We have them prepared in sufficient copies to pass them out for those people following the case, and sufficient for those people in the audience to follow the case.

MR. PORTER: We're going to take a short break anyway.

(Whereupon, a recess was held.)

MR. PORTER: The hearing will come to order, please.

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MR. COUCH: Are you ready to proceed?

MR. PORTER: Yes.

MR. COUCH: I am J. O. Terrell Couch appearing for The Ohio Oil Company in this consolidation of Cases 2118 and 2459. The records of the Commission will reflect the appearances have been entered in both of these cases by Atwood, Malone, our New Mexico counsel, verifying that I'm associated with them in the presentation of this case.

I would like to make a preliminary statement in connection with this matter. To go back just a bit and realize that when the Ohio requested temporary 80-acre proration units for this Lea-Devonian Pool last year the discovery well had just been completed in the pool not many months before. It was the only well in the pool and the deepest oil production then or since then in the State of New Mexico.

The Commission, recognizing the significance of this discovery and the importance of the matters involved there, promptly provided appropriate rules to guide the development of the pool in its early stages and established the temporary 80-acre proration units as we requested.

That order, entered under those circumstances, was to me an appropriate step in the exercise of this Commission's statutory duty to insure the conservation of oil and gas in this state. The effective discharge of that duty involves not only the



prevention of waste, but also the encouragement of non-wasteful production of oil and gas.

We all recognize this can be done only by preserving to each owner, each oil and gas operator, his statutory right to a realistic opportunity to produce his just and equitable share of the oil and gas. Inherent in the preservation of this statutory right is the establishment of a proration unit for each separate pool, which unit must be the area that can be efficiently and economically drained and developed in that pool by one well.

In fixing the size of the proration unit in each pool, the statutes, of course, require the Commission to consider the economic loss caused by the drilling of unnecessary wells, the prevention of waste and the protection of correlative rights, prevention of reduced recovery from the drilling of too few wells and the avoidance of adding to the risks of development which necessarily accompanies the drilling of an excessive number of wells.

This language, of course, as you gentlemen realize, is a paraphrase of the statute, in many instances an actual quote from the statute. This is not an easy task; to properly perform it, there must be continuing reconsideration and evaluation, from time to time change in past policies in order to give adequate recognition to advancement and development and changed conditions

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within the oil and gas industry. This the Commission and its Staff have done in the past. For example, the revision of the rules on multiple completions, the authority to commingle, the recognition and approval of automatic custody transfer, the special consideration given in the case of water flooding operations; two examples pertaining directly to this case, the first the temporary 80-acre proration unit order issued as it was on the limited information available, and the second, the prompt addition by this Commission on its own motion of an additional depth factor in the allowable rule to recognize and provide extra allowable for this deepest production in the state.

I feel certain that the Commission and its Staff will continue in the future to move forward in step with scientific knowledge and economic reality and will, where necessary, depart from past policies and past restrictions wherever the facts justify such action.

So much for the past, and so much for the future, I'm equally certain that the Commission and its Staff will afford the same objective to the problem facing it today and us today. The Case 2118 and the order issued called on the Ohio to obtain additional information concerning the Devonian Pool and to return at this time prepared to establish a proper size of the proration unit for this pool. We have obtained, and are prepared to present



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that evidence. It's our conclusion that the evidence justifies and requires the establishment of a hundred sixty-acre proration units for the Lea-Devonian Pool. I believe this Commission will agree with our conclusion when the evidence is in.

Gentlemen, we'll have two witnesses in this case, Mr. Roy Young and Mr. J. D. Wheeler.

MR. PORTER: Let's have both witnesses sworn at this time, please.

(Witnesses sworn.)

ROY M. YOUNG

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

DIRECT EXAMINATION

BY MR. COUCH:

Q Will you please state your name, by whom you are employed, and what capacity?

A My name is Roy M. Young. I'm employed by the Ohio Oil Company in the capacity of a reservoir engineer.

Q Mr. Young, have you previously testified before this Commission?

A Yes, sir, I have.

Q Have your qualifications as to educational training as a petroleum engineer been contained in the records of previous



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hearings?

A Yes, they are.

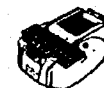
Q Mr. Young, will you, for the record, identify yourself with respect to the pool in question here and your past connection with it in Commission hearings?

A Yes, sir. I was the same Roy M. Young who testified in the original hearing of Case 2118 which resulted in Commission Order R-1826 which granted temporary 80-acre spacing and 80-acre proration units in the Lea-Devonian Pool. I also testified in Case 2206 which resulted in Order R-1906, which permitted shutting in of certain wells and the transferring of their allowables to other wells for the purposes of taking interference tests.

I have continued to study all the available engineering and geological data relative to this pool for the purposes of determining, in my opinion, the proper well spacing that should be supplied to the Lea-Devonian Pool to, one, prevent waste and protect correlative rights; two, to encourage the rapid development of the pool and to aid in the prevention of the drilling of unnecessary wells.

(Whereupon, Ohio's Exhibit No. 1 was marked for identification.)

Q Mr. Young, would you please refer to what has been marked Ohio's Exhibit 1 in this consolidated case? Would you state, Mr. Young, what Exhibit 1 is and give us a brief



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description of what it contains?

A Exhibit 1 is a map of the Lea Unit Area located in Township 20 South, Ranges 34 and 35 East, Lea County, New Mexico. The Ohio Oil Company is the operator of this unit and owns approximately 45% of the working interest. The Lea Unit, on Exhibit 1, is outlined by the hashed line. It contains approximately 2,560 acres. All the acreage in the unit is Federal acreage except one 160-acre tract in the Southeast portion of the unit which belongs to the State.

Q That's actually in the Southeast corner of the unit, is it not?

A Yes, sir, it is.

Q All right. Now, I observe that you show five colored spots on that exhibit in the Lea boundary.

A They indicate the five unit wells which have been completed in the Devonian. Each well has been shown in a different color. The purpose of this is to simplify the presentation of some of the other exhibits. Each well has been assigned a separate color and will be used throughout in the exhibits presented here today.

Q What are the five wells, what are the designations in the Commission records?

A The five wells currently producing from the Devonian



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are the Unit Lea ones 1, 2, 4, 5 and 6. Each one of these, except No. 6, is an oil-oil dual, dualized into the Devonian and Bone Springs formations. The Devonian production in this pool is the deepest oil production in the State of New Mexico.

Q All those wells, except No. 6, are Devonian-Bone Springs oil producers, are they not?

A Yes, sir, they are.

Q With respect to Well No. 6, have we requested Commission approval of that well as a dual completion?

A Yes, sir, that was done in an Examiner Hearing on December 11, 1961.

Q What dual are we requesting approval of there?

A Requesting permission to effect the dual in the Lea-Devonian Pool and the Lea-Pennsylvanian Gas Pool.

Q Actually asking for an approval of that dual?

A Yes, sir.

Q Now, there are two wells shown on Exhibit 1 which offset the Lea Unit. Will you identify those and give us the pertinent information about them?

A Yes. Those are the United States Smelting Federal No. 1 located in the Southeast Quarter, Northwest Quarter of Section 11 and the Sinclair Federal Lea No. 1 located in the Southwest Quarter, Northwest Quarter of Section 7, Township 20, South,



Range 35 East.

Q That's one on the East side of the unit, the Sinclair well, and one on the West side, the Smelting well?

A Yes. Both of those were unsuccessful in obtaining Devonian production.

Q Now, the symbols underneath the colors show the No. 6 to be a drilling well and No. 7 to be a drilling well. Number 7 is actually still drilling, is it not?

A Yes, sir, it is drilling below 12,000 feet at the present time.

Q No. 6 has been completed as a Devonian producer, you have testified. Will you give us the pertinent information on that completion?

A Yes, No. 6 was completed as a Devonian producer on December 2, 1961. On a seven and a half hour flow test it flowed 1165 barrels per day on 11-64 choke.

Q Exhibit 1 shows some contour lines. Will you give us some information about those, please?

A Yes, Exhibit 1 is contoured on top of the Devonian structure. These contours depicted on Exhibit 1 are based on the original seismic contours corrected by 265 feet to reflect the information obtained from the drilling of the seven wells.

Q The 265-foot correction was a general correction throughout

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these contours, was it not, Mr. Young?

A Yes, sir.

Q Merely showing the seismic reflection had indicated this to be at a slightly different subsea depth?

A Yes, sir.

Q Is it your opinion that these contours accurately represent configuration of the Devonian structure in this area?

A Yes, sir, it is.

Q What is the area you have shown in yellow on Exhibit 1, Mr. Young?

A The yellow area containing 2280 acres is the proposed first revised Devonian participating area. The application for approval of this participating area has been approved by the State Land Commissioner and is now pending approval with the United States Geological Survey.

Q Have the productive limits of the Devonian Pool been defined?

A No, sir, they have not.

Q Do you have any gas-oil or water-oil contacts encountered in any of the present wells?

A No, sir.

Q What are the present horizontal pool limits as defined by the Commission in the Devonian Pool?



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A They include the Northeast Quarter of Section 11, the West Half and the Southeast Quarter of Section 12.

Q You also have shown on Exhibit 1 a heavy line marked X-X¹ and some lines going from the wells to that line. What does that indicate, please?

A The cross section of the Devonian formation has been prepared along the line denoted X-X¹ and has been prepared as Ohio's Exhibit 2.

(Whereupon, Ohio's Exhibit 2 was marked for identification.)

Q Mr. Young, in the preparation of Exhibit 2, what information did you use?

A Exhibit 2 was prepared with the use of the gamma ray neutron logs of the five unit wells and the gamma ray electrical log of the Sinclair Federal No. 1. These logs have been aligned on a subsea depth of minus 10,700 feet.

Q These are all the logs, are they not, of wells completed into the Devonian or drilled into the Devonian formation in this area?

A Yes.

Q All the electric logs?

A These are all the gamma ray logs that are available. The United States Smelting Federal No. 1 was drilled into the Devonian, but was not logged.



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Q I see. And that, of course, there's no showing of that on this cross section?

A No, sir, there is not.

Q How are these logs arranged on Exhibit No. 2?

A They are aligned on a subsea depth of minus 10,700 feet.

Q And they go from West to East across the field?

A Yes.

Q From the left to the right of the exhibit?

A Yes, sir.

Q After each of these wells, above these wells on the cross section, do you give the pertinent information identifying the well?

A Yes, included in the information is the name of the well, the elevation, location and completion date.

Q Is the top of the Devonian formation indicated on this Exhibit 2?

A Yes, sir. It is shown as a solid heavy line across Exhibit 2.

Q Do you have a little thinner line also shown on that exhibit, what does that represent?

A That's the top of the Woodford shale.

Q On each log you have certain symbols shown there, what do those represent, please?

A Indicated on each log is the perforation or open hole



producing interval of each well.

Q The Well No. 1 has penetrated more of the Devonian formation than any other producing well in the field, is this not right?

A That is correct.

Q What about the depths to which the other four unit wells have been drilled?

A The other four unit wells were drilled to a total depth equal to or to a shallower depth to the bottom perforations in No. 1.

Q Two of those wells being 5 and 6, you don't show perforations on those, why not?

A Those are open hole completions.

Q I see some red coloring on Exhibit 2. Will you please state what that is for and what it indicates?

A The red coloring shows, in my opinion, the location and the amount of the net pay encountered in each well.

Q Mr. Young, I happened to observe my copy of the exhibit doesn't show any red coloring on Well No. 5. Does yours?

A Yes, sir.

Q There's some there anyway?

A Yes, sir, net pay of 33 feet.

Q Have you computed the average net pay encountered in

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those five unit wells?

A Yes.

Q What does that figure? A Fifty-five feet.

Q Is that intended to be all of the pay in the Devonian formation in those wells?

A No, sir, this figure represents only that net pay exactly penetrated by the drilling operations in the respective wells.

Q Do all the wells except No. 1, in your opinion, have some additional net pay that was not penetrated?

A Yes, sir, they do.

Q This method of completion was followed for conservation practices, was it not?

A Yes, sir.

Q You didn't consider it essential to penetrate all of the available pay in order to effectively complete the well?

A No, sir.

(Whereupon, Ohio's Exhibit No. 3 was marked for identification.)

Q Mr. Young, please look at Exhibit 3. This is entitled the "Production History Graph, Lea Devonian Pool, Lea County, New Mexico". Mr. Young, will you tell us briefly what is shown on Exhibit No. 3?

A Yes, sir. Exhibit No. 3 is a production history graph



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of the Lea-Devonian Pool. It shows the monthly oil production, the cumulative oil production, the number of wells and some bottom hole pressure data. As of November 1st, 1961 four wells were producing from the Lea-Devonian Pool. The cumulative production of those four wells was 335,446 barrels.

Q The bottom hole pressure information is plotted on this Exhibit 3. Can you tell us what bottom hole pressures those are?

A The bottom hole pressures plotted on Exhibit 3 are the bottom hole pressures of the individual wells and shows only the initial and most recent bottom hole pressure that have been measured in the individual wells. Additional bottom hole pressure data for wells 1, 2 and 4 will be given in a later exhibit.

Q And there's no additional bottom hole pressure data on No. 5 except what's shown here?

A That is correct.

Q Before we get through, all the bottom hole pressure data will be before the Commission?

A Yes, sir.

Q What is the significance of the pressure data as shown on Exhibit 3 in your opinion?

A The pressure data shown shows that the Lea-Devonian has not experienced any appreciable pressure decline.

Q This is after production of over 300,000 barrels of oil?



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A That is correct.

Q Do you have an opinion as to why there has been no appreciable pressure decline in this pool?

A In my opinion the reason there has been no appreciable pressure decline is that the Lea-Devonian, like most other Devonian Pools in Southeast New Mexico, has an excellent water drive.

Q Does that lead you to any conclusion with respect to drainage in this pool?

A Yes, sir. Therefore, it is my opinion that effective and efficient drainage will occur from wide areas within the structure shown in Exhibit 1.

Q Now, the pressure in No. 5, the second pressure taken there and the initial pressure, seem to be lower than the pressures in those other wells. Do you have an opinion as to why that situation exists?

A Yes, sir. Well No. 5 is on the eastern part of the pool. The eastern part of the pool is sealed by a fault; therefore, it's my opinion that the water drive active upon the Lea-Devonian Pool is moving in from the West and North. The movement of this water into the reservoir creates a pressure gradient. Therefore, we would expect a pressure gradient from West to East across the Devonian pay.



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Q Would this result, or would you expect that the pressure in the well near that sealing fault would be lower or higher than the other well?

A I would expect it to be lower.

Q So that that information on Well No. 5 as shown on Exhibit 3 is reasonable, in your opinion?

A Yes, sir.

Q And would be expected in a reservoir of this kind?

A Yes, sir.

(Whereupon, Ohio's Exhibit No. 4 was marked for identification.)

Q Would you please look at Exhibit 4? Mr. Young, please identify Exhibit 4.

A Exhibit 4 is a copy of the coregraph through the Devonian section in Well No. 2.

Q The Commission has, in its prior orders, requested that we obtain core data, did they not?

A Yes, sir.

Q And we, of course, wanted that information for ourselves?

A Yes, sir.

Q The core analysis from No. 2 shows certain information about that well. Will you tell us what information it shows?

A Yes, this core analysis shows that Well No. 2 has 81



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feet of net pay with the porosity of 5.49% and a permeability of 47.8 millidarcys.

Q Is this the only coring that has been done in this field?

A It's the only coring that has been done in the Devonian Pool.

MR. PORTER: What was that porosity figure you gave?

A 5.49%.

MR. PORTER: Thank you.

Q (By Mr. Couch) Now, the Commission Order R-1826, authorizing temporary 80-acre proration units for this pool, also required that interference tests be taken before the permanent rules were authorized, is that right, Mr. Young?

A Yes, sir, it did..

Q Were these tests conducted?

A Yes, sir. They were begun in April, 1961 following the Commission order permitting the shut-in of wells and transferring their allowable.

Q Now, in April, 1961, when No.2 and 4 had been completed, did you have any indication at that time with regard to the likelihood of declines in reservoir pressure in this pool?

A Yes, sir. It became apparent at that time that no measurable pressure decline had been experienced to that date.

Q What was your thought about the possibility of pressure



drawdown and interference testing with the strong water drive?

A With the strong water drive as indicated, the chances were slim of obtaining any substantial pressure drawdown in a shut-in well during an interference test.

Q So, what did you conclude to do in effecting to obtain information?

A Instead of making a single long term conventional test, the interference tests were designed to determine whether the small pressure changes expected from transient or unsteady state flow would recur. This basically consists of accurately measuring the early bottom hole pressure behavior of flowing and shut-in wells after the entire reservoir has been shut in and then repeating the procedure.

Q The next four exhibits, beginning with Exhibit 5, are designed to present this information to the Commission?

A That is correct.

(Whereupon, Ohio's Exhibits Nos. 5, 6, 7 and 8 were marked for identification.)

Q With regard to the first testing, will you describe the beginning of that, referring here to Exhibit 5?

A The first test was begun by shutting in the three existing wells for 37 hours. The allowable for Wells No. 1 and 4 was transferred to Well No. 2. Amerada pressure recording gauges

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were placed in Wells 1 and 2.

Q Now, Mr. Young, you mentioned in connection with Exhibit 1 that certain color coding would be followed. Is this where you are now beginning to follow it as well as on the production history graph?

A Yes.

Q Are you beginning to use it again?

A Yes, sir.

Q What does the blue spot indicate?

A The blue dots always indicate the pressure data measured in Well No. 2.

Q And the red?

A The pressure data as measured in Well No. 1.

Q And for convenience have you included a little chart on the right side of this interference test exhibit and the subsequent ones to show the location of the wells and their status during the tests?

A Yes, sir, I have.

Q Again following the same color coding?

A Yes, sir.

Q Now, you had, I believe, stated that Amerada pressure gauges were placed in Wells 1 and 2?

A Yes, sir.

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Q And then from the shut-in conditions, what did you proceed to do with respect to Well No. 2?

A Well No. 2 was then opened to flow at a rate approximately equal to three times the normal well allowable.

Q How long was it produced at that rate?

A This rate was produced for a twenty-four hour period.

Q As shown by Exhibit 5? A Yes, sir.

Q The initial pressure of Well No. 2 was at what amount?

A 6073 psi.

Q And the flowing pressure was then measured during the flow period and at the end of the twenty-four hours what was it?

A 5099 psi.

Q What was the initial pressure measured in Well No. 1?

A 6065 psi.

Q This was the shut-in well?

A Yes, sir.

Q What was the pressure measured in that well at the end of the twenty-four hour period?

A 6043 psi.

Q What did that indicate, Mr. Young?

A That indicated a pressure change or pressure decline of 22 pounds in that shut-in well. This, in my opinion, established pressure interference and therefore, drainage between



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these two wells which are 1867 feet apart.

Q What happened to the pressure in No. 2 when it was shut-in at the end of the twenty-four hour period?

A The bottom hole pressure in No. 2 built up in six hours to substantially its initial pressure.

Q That is substantially the pressure it had at the start of the flow test?

A Yes, sir.

Q In your opinion is that a rather rapid buildup?

A Yes, sir.

Q Now, following this interference test on April 27, 28, what was done with Well No. 2 after it built up?

A Well No. 2 was shut-in for a period of seventy-two hours, Wells No. 1 and 4 remained shut-in.

Q No. 4 had been shut-in back there at the same time No. 1 had been, had it not, prior to the commencement of this April 27 test?

A Yes, sir.

Q So 1 and 4 remained shut-in?

A Yes, sir.

Q And when did the next interference test start?

A On May the 1st a twenty-two day interference test was begun. This test basically consisted of flowing the Well No. 2

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again at three times the allowable with Wells 1 and 4 shut-in.

Q Looking at Well No. 6, you again have the diagram to the right of the exhibit showing the three wells involved in the test. These were the only three wells then completed in the pool, were they not?

A Yes, sir.

Q Do you have No. 2 after a seventy-two hour shut-in period producing at three times an 80-acre allowable with 1 and 4 shut-in, is that right?

A That's correct.

Q Which wells had the Amerada pressure gauges in them during the first seventy-two hours of this test?

A Again, Wells 1 and 2.

Q And the same color coding follows?

A Yes, sir.

Q And is shown on the exhibit?

A Yes, sir.

Q What was the initial pressure of Well No. 2 at the commencement of this test as measured here and shown on this report?

A 6065 psi.

Q At the end of seventy hours what was the measured bottom hole pressure in the flowing Well No. 2?

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A 5094 psi.

Q The pressure at the beginning of the test in Well No. 1 was how much?

A 6072 psi.

Q What happened to the pressure in Well No. 1 during this time?

A The pressure declined to 6044 psi in seventy hours. This was a measured change of 28 psi.

Q As compared with 22 pound decline measured on the first test?

A Yes, sir.

Q These same two wells are the ones we discussed a while ago, they are how far apart?

A 1867 feet apart.

Q What did this test indicate to you, Mr. Young?

A This test indicated that pressure interference and therefore drainage was occurring between Wells 2 and 1.

Q Over a distance of 1867 feet at least?

A Yes, sir.

Q You attempted to maintain the flow rate of Well No. 2 during this period May 1st to May 22nd at approximately three times the allowable of the normal well as a practical operational matter. Were you able to do that?



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A No, sir, this could not be done. These tests were made before the installation of LACT Unit. Therefore, tank storage problems entered into the test and the flow rate for No. 2 had to be changed periodically.

Q The flow rate for Well No. 2 is also indicated on this interference test as shown in Exhibit 6, right?

A Yes, sir.

Q Flow rate had also been indicated on the previous exhibit?

A Yes, sir.

Q Did you run Amerada gauge in Well No. 4 during this time?

A Yes, sir. On May the 12th an Amerada gauge was run in Well No. 4 to record that well's bottom hole pressure behavior during the period May 12 to 15. The data obtained during that test are shown on the right side of Exhibit No. 6.

Q Starting in about the middle of Exhibit No. 6?

A Yes, sir.

Q Moving over to the right. What was the initial pressure recorded in Well No. 4 at that time?

A 6087 psi.

Q And that pressure occurred at what point in time from the commencement?

A That occurred at 268 hours.



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Q That is, the well had been shut-in for that period of time?

A No, sir, the well had been shut-in much longer than that. This 268 hours is the time that Well No. 2 had been flowing from the commencement of this test on May 1st.

Q When was the maximum pressure decline observed in Well No. 4 during the time this Amerada gauge was in the hole?

A The maximum pressure decline was measured at 307 hours. That decline was 14 psi.

Q You show the hours along the bottom of each of these exhibits, do you not?

A Yes, sir, along with the actual days involved.

Q That was at 307 hours; now at 309 hours of the test what occurred with respect to Well No. 2?

A Because of tank storage problems at that time, Well No. 2 was shut-in for an hour and a half.

Q When it was placed back on production, were you able to place it back at the same flow rate?

A No, sir, it was placed on flow rate of 775 barrels of oil per day, whereas in the prior forty-eight hours it had flowed 1110 barrels of oil per day.

Q And that production flow rate was because of the tank storage problem, as you told us?



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A Yes, sir.

Q Moving on from the period of 309 hours where No. 2 was shut-in and then placed back at reduced rate, what occurred insofar as Well No. 4 is concerned at the end of 335 hours of the test?

A The pressure measured in Well No. 4 at the end, or at 335 hours, was 6079 psi, which indicated a measured pressure change of 8 psi during the time that the bomb was in Well No. 4.

Q That's an 8-pound differential between the beginning measurement and the final measurement?

A Yes, sir.

Q And in the intervening period of 307 hours there was a decline measured up to 14 psi, is that right?

A Yes, sir.

Q Did you deem further testing advisable to continue to check the results you were obtaining?

A Yes, sir.

Q What did you do then with Wells 1 and 4 at the end of this test on May 15?

A Wells 1 and 4 remained shut-in throughout this test, and on May 22, Well No. 2 was shut-in. This meant, then, all three of the existing wells were shut-in on May 22.

Q Then, starting on May 23, was Well No. 2 opened up again after having been shut-in for a period?



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A Yes. Additional tests similar to the one we've just described were conducted on May 23 to 26. During that period Well No. 2 was opened on an 18/64" choke to flow 1216 barrels of oil per day.

Q Are the results of this test during the period May 23, 26, 1961 shown on your Exhibit No. 7?

A Yes, sir.

Q What does that exhibit show with reference to the bottom hole pressure measured in Well No. 1 during that period?

A The bottom hole pressure in Well No. 1 declined from a measured 6028 to 5999 psi, which indicates a pressure change of 29 psi and substantiates within 1 psi the change recorded in the test on May 1 through 4.

Q And also with reference to the 22-pound drop measured in the very beginning test, is that right?

A Yes, sir.

Q What happened insofar as the measurements were concerned with respect to Well No. 4 to the bottom hole pressure of Well No. 4 during this period?

A The bottom hole pressure in Well No. 4 during this test showed no decline. During the 69-hour period the pressure measurements actually showed an increase from 6096 to 6106 psi.

Q That's in Well No. 4?

A Yes, sir.



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Q Which is a considerable distance there from Well No. 2?

A Yes.

Q Mr. Young, in presenting this interference test data to this Commission, we are furnishing them all the data we obtained in running these tests, right?

A Yes.

Q This doesn't especially help us, does it?

A No, it sure doesn't.

Q But they're facts? A They're facts.

Q Considering all these facts in the tests conducted up to now that we have discussed, what, in your opinion, has been established with regard to pressure interference between Wells 2 and 1?

A It is my opinion that we have definitely established pressure interference between Wells 2 and 1.

Q Now, these tests that we have run there between Wells 2 and 4 have been considered by you too, haven't they?

A Yes, sir, these results did not conclusively establish interference between these two wells.

Q What's your viewpoint about that? Does it surprise you that it didn't conclusively establish interference?

A This is not surprising when analyzed in the light of fluid flow consideration within porous media. The pressure draw-



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down at any point removed from the well bore of a producing well is a logarithmic function of distance from the well. Since the distance between Wells 2 and 4 is 2640 feet, or 773 feet further than the distance between Wells 2 and 1, the pressure drawdown between Wells 2 and 4 would be much smaller than the pressure drawdown between Wells 2 and 1.

Q By that logarithmic function, you mean it just works a little faster or the ratio increases the further you get away?

A The amount of drawdown gets smaller and smaller as you get away from the producing well.

Q Insofar as actual pressure drop is concerned?

A Yes, sir.

Q And it increases at some sort of a ratio in there?

A Yes, sir.

Q I believe that helps me understand. In a reservoir such as this one, with a strong water drive, did you really expect to find any substantial pressure drawdown in Well No. 4?

A No, I did not. If we could measure it, it would be extremely small.

Q Now, the type of test that you used here in conducting these, obtaining this data, do they seem to you to be the only way to attempt to obtain a pressure interference data in this pool at this time?



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A Yes, sir.

Q What is your opinion concerning the test as shown here on Exhibits 5, 6 and 7?

A It's my opinion that these tests clearly show interference established between Wells 2 and 1 and are inconclusive in showing interference between Wells 2 and 4.

Q Does that mean there's no pressure interference occurring between 2 and 4 at all?

A No, sir, it does not, and in my opinion means that the pressure interference that is occurring is of small magnitude principally because of the high permeability, the size of the reservoir, and the effectiveness of the water drive.

Q All this testing you have shown so far was made using Amerada pressure gauges, is that right?

A That's right.

Q Are those gauges standard for measuring bottom hole pressures in the industry?

A Yes, sir.

Q What's your opinion as to their accuracy?

A They are the most accurate means of measuring bottom hole pressure available.

Q In conducting these tests and attempting to obtain this information, did the Ohio consider some other method of



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recording this bottom hole pressure?

A Yes, sir, there has been a surface recording bottom hole pressure gauge developed by the Shell Development Company. That gauge is available commercially through the Petroleum Engineering Service, Inc. in Houston, Texas. The Ohio engaged these people to use their equipment to repeat, to attempt to repeat these interference tests that we have thus far shown.

Q Mr. Young, those people that have that surface recording bottom hole pressure gauge, what do they contend its accuracy is?

A The published information of the instrument shows that the instrument has a repeatability of .01%.

Q What is the advantage of that type of pressure recording over the Amerada gauges that we use in these bombs?

A The greatest advantage of this bomb is the fact that it is surface recording and can be left in the hole for an indefinite period, whereas in most cases we are limited in the Amerada pressure bomb to a seventy-two hour period. The longer that we could leave these bombs in the hole, the longer pressure behavior we would record, and therefore, would show a greater pressure change.

Q We didn't consider we were going to get more accurate measurement with the surface recording equipment specifically,



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did we?

A No, sir.

Q We were trying to get some equipment that we could obtain continuous pressures from, without having to pull the bomb and change the chart at the end of seventy-two hours?

A Yes, sir.

Q We did bring those people out there to attempt to use their surface recording equipment, did we not?

A Yes, sir.

Q Do you have still another exhibit for presentation of interference test data, marked Exhibit 8? Will you look at that exhibit, please, Mr. Young? In running this test using this surface recording equipment, and the fellow had only one of them, isn't that right?

A That's correct.

Q Pretty expensive equipment, isn't it?

A Yes, sir.

Q We were going to use Amerada gauges along with this, were we not?

A Yes, sir.

Q What were your plans, in general, to run this test?

A The plan in this test was to run the surface recording equipment in Well No. 1 and use Amerada gauges in Wells 2 and 4.



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Q Wells 1 and 4 were to be kept shut-in?

A Yes, sir.

Q And No. 2 to be flowed at a triple allowable?

A Yes, sir.

Q And this diagram on the right side of this exhibit now shows the green spot, Well No. 5. Is that the interval it was completed in?

A Yes, sir.

Q That well to be in a flowing or shut-in condition?

A It was to be a flowing condition, flowing a single allowable.

Q Did you actually put the surface recording equipment on Well No. 1?

A Yes, sir, we did.

Q And Amerada gauges in Wells 2 and 4?

A Yes, sir.

Q What did you do then with Wells 2 and 5, flow them as you had planned?

A Yes, sir.

Q Looking at Exhibit 8, will you give us the information shown on that exhibit, bringing the results of the interference test of October 2 through 7 to the Commission here?

A Well, after three and a half hours of flow time,



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mechanical troubles developed in the surface recording bottom hole pressure gauge. These difficulties could not be corrected.

Therefore, the use of this equipment was terminated. Shown in Exhibit 8, however, is the first three and a half hours' data that was recorded with that instrument. It shows that Well No. 1--

Q These are the red spots?

A Yes, sir. -- declined from 6070.2 to 6066.8 psi.

This was a pressure change of 3.4 psi.

Q At that time No. 2 was flowing at the triple allowable, No. 5 flowing at single allowable?

A Yes, sir.

Q For a combined production rate of, according to this exhibit, how much, how many barrels of oil?

A 1502 barrels of oil per day.

Q This surface recording thing just had trouble with the line going down to it and they were unable to record any additional pressures?

A That's correct.

Q And were then released from the job?

A Yes, sir.

Q What did you do then, Mr. Young, in order to get some benefit from the interference test?

A We went ahead with our plans without that instrument.



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and used regular Amerada pressure gauges to continue the interference test of October 2 through 7.

Q During the first forty-two hours of this test what was the pressure information measured in Well No. 4?

A The pressure information measured was that the initial pressure of your Well No. 4 was measured as 6085 psi and declined to 6070 psi, indicating the pressure change of 15 psi.

Q These are the two wells that are farthest apart, are they not?

A Yes, sir.

Q But here we were, in effect, flowing four allowables per day out of the reservoir at the time this was being done?

A Yes, sir.

Q Did you change the charts, then, the Amerada charts in Wells 4 and 2 at about this point in your test?

A Yes, sir, they were changed at about forty-seven hours.

Q And that is indicated on Exhibit 8?

A Yes, sir.

Q Did you rerun the Amerada charts in those two wells?

A Yes, sir, we did.

Q And what was the absolute pressure measured in Well No. 4 at the time that you reran the Amerada bomb with the new chart in it?



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A 6081 psi.

Q Observing the readings, then, from that chart, what pressure information did you obtain from Well No. 4?

A The pressure in that chart declined to 6068 psi at the end of ninety-six hours of flowing time of the two flowing wells.

Q At that time were the flowing wells shut-in?

A Yes, sir, both of them were shut-in.

Q No. 1 was also shut-in all during this time, was it not?

A Yes.

Q After we moved the surface equipment off we did not immediately rerun the chart in No. 1?

A No, sir.

Q Did you put it back in No. 1 at the time that you shut-in the two flowing wells?

A Yes, sir.

Q What pressure information did you obtain from the readings there in Well No. 1?

A The pressure readings showed that Well No. 1 built up 1 psi from 6058 to 6059.

Q This was after the shut-in?

A Yes, sir.

Q What occurred according to the measurements in Well No. 4 following the shut-in after the pressure change of 13



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pound drawdown, what occurred after that?

A Well No. 4 showed a build-up of 2 psi from 6068 to 6070 psi.

Q You had slight increase, then, in No. 4 and in No. 1 after the producing wells were shut-in?

A Yes, sir.

Q Mr. Young, will you summarize your opinion as to the pressure interference information and what it establishes?

A It's my opinion that pressure interference, and thus drainage, has occurred over the minimum 1867 feet, which is the distance between Wells 2 and 1. It is also my opinion that interference does occur between Wells 2 and 4, but that the interference is of such small magnitude that it can not be conclusively measured by these tests in this reservoir.

Q What is the acreage within a circular drainage area having a radius of 1867 feet?

A 251 acres.

Q And is that radius I just gave you the distance between Wells 1 and 2?

A Yes, sir.

Q Does this pressure interference data, with all other available data, indicate to you whether a well in the Lea-Devonian Pool can effectively and efficiently drain substantially



the excess of 80 acres?

A Yes, sir, it does.

Q Which way does it indicate that it will or it won't?

A It indicates that a well in the Lea-Devonian will effectively and efficiently drain substantially in excess of 160 acres.

Q Now, Mr. Young, you've also prepared, or had prepared under your supervision, a document marked Exhibit 9. What does that document present?

(Whereupon, Ohio's Exhibit No. 9 was marked for identification.)

A Exhibit No. 9 shows my volumetric calculations for the recoverable oil per acre for the Lea-Devonian Pool.

Q Mr. Young, in making these calculations, have you based them on certain factors that you have available to you pertaining to this pool?

A These calculations were based on the factors shown under the section Basic Data in Exhibit 9.

Q Starting at the top you show the net pay of how much?

A 65 feet.

Q You previously testified about Well No. 1 being the only one to penetrate the entire Devonian pay, that's correct, isn't it?

A Yes, sir, it has a net pay of 98 feet.

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Q In your opinion is that the maximum net pay that will be encountered in wells in this pool?

A Yes, sir.

Q And you've also testified that you computed the average net pay penetrated by the five wells shown on the cross section that is presented here as Exhibit 2?

A Yes, sir. The average net pay of those five wells is 55 feet.

Q You have chosen here, for purposes of calculating recoverable reserves, to take the figure that's in between those two, have you not?

A Yes, sir. The average net pay used here is to represent what one would expect as the average net pay over the entire pool. I would expect it to be on the order of approximately two-thirds the maximum, which is 98 feet.

Q Is that what your 65 feet comes out to?

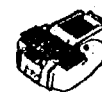
A Yes, sir.

Q Moving to the next factor there, the porosity in the Lea-Devonian Pool, you show that to be how much?

A The porosity is 5.49, and measured in the core analysis from cores taken from Well No. 2.

Q What about connate water saturation?

A Connate water saturation is 43%, as measured by special



capillary tests made by cores from Well No. 2.

Q The formation volume factor?

A 1.185 from the fluid analysis of crude produced from Well No. 1.

Q Do you have one estimated factor, the recovery factor, what did you use for that?

A I have used a recovery factor of 50%, which is consistent with my opinion that the producing mechanism is a water drive.

Q In using standard engineering formula, have you made, then, a calculation, volumetric calculation as to the number of barrels per acre in the Lea-Devonian Pool average?

A The average recoverable oil reserve from Lea-Devonian Pool will be 6,658 barrels per acre.

Q Using this data of recoverable reserves, have you had prepared under your supervision a document showing the comparative economics for development of this pool?

A Yes, sir, that is Exhibit 10.

(Whereupon, Ohio's Exhibit No. 10 was marked for identification.)

Q Will you look over that exhibit for a moment, please?

I observe that you have headed this 40-acre spacing versus 80-acre spacing versus 160-acre spacing. Have you made calculation to reflect comparative economics for each of those proration sizes?

A Yes, sir, I have.

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Q What area have you used to make these calculations for, Mr. Young?

A I have used an area of 2280 acres, which is the proposed participating area for the Lea-Devonian Pool.

Q Mr. Young, do you think in a situation of this kind it is more reasonable to use a substantial area in determining the economic facts of life rather than to take just one proration unit and figure economics on it?

A Yes, sir.

Q Why do you feel like that, Mr. Young?

A In presenting economics for the development of a pool such as this it seems to me to be more realistic to present the economics for an area rather than on a per well basis. The economics, which any operator would consider in developing any pool, must be based on the overall area and then extended to an average well cost and profit.

Q Using that 2280 acres, how many wells would be required for 40-acre spacing?

A 57 wells.

Q For 80-acres?

A 29 wells.

Q And 160?

A 15 wells.

Q What is the investment cost per well that you have determined from calculations of your costs, Mr. Young?



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A The average cost to drill and complete a Devonian well would be \$510,000.00.

Q And have you, then, extended that figure to show the total cost to invest to develop the 40-acre spacing on this area you are talking about?

A Yes, sir.

Q All these figures are shown on Exhibit 10, are they not?

A Yes, sir, they are.

Q What is the figure for 40 acres?

A \$29,070,000.00.

Q And 80-acre spacing? A \$14,790,000.00.

Q And 160-acre?

A \$7,650,000.00.

Q You have included, then, your calculation of your ultimate reserves. How did you arrive at that 15,180,240 barrel figure?

A That is the 2280-acre area times the expected recovery per acre which was shown in Exhibit No. 9.

Q Have you, then, taken into account the value of the oil at the price we are currently receiving?

A Yes, sir. Shown in Exhibit 10 is the, my calculation for the working interest net operating income per gross barrels of oil produced, including income from gas produced with the oil.



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This amounts to \$2.06 per barrel.

Q And your gas computation is shown above under ultimate reserves, is it not?

A Yes, sir.

Q Based on 300 cubic feet per barrel produced over the life of the field?

A Yes, sir.

Q Then, applying this net working interest operating income, what would you anticipate the total operating income from this field to be?

A \$31,271,294.00.

Q Have you computed profit figures based on these computations?

A Yes, I have.

Q What does it show for 40-acre proration units in the Devonian?

A The net profit for 40-acre is \$2,201,294.00, which is a net profit per well of \$38,619.00, or a profit to investment ratio of .08 to 1.

Q And for 80 acres?

A The net profit for 80-acre spacing would be \$16,481,294.00 for a net \$568,320.00. This is a profit to investment ratio of 1.11 to 1. In my opinion it is not particularly attractive



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considering the risk involved in drilling 14,500 foot wells at a half a million dollars each.

Q You have also, then, computed the total net profit for the development to 160-acre density. Will you briefly review the figures?

A The total net profit for 160-acre spacing would be \$23,621,294.00 or a net profit per well of \$1,574,753.00. This is a profit to investment ratio of 3.09 to 1. In my opinion this profit to investment ratio is justified when considering the risk in this deep drilling and the amount of investment required.

Q Mr. Young, we have been talking about profit figures here. Are these computed before or after income taxes?

A These are profits before income taxes.

Q Income tax comes out of that. Now, you have treated this working interest income as 7/8ths of the production, haven't you?

A That is correct.

Q And that doesn't take into account the overriding royalties that some of these cases are subject to?

A It does not include that. Neither does it include any royalty in excess of 1/8th.

Q In some of these Federal Government leases they have sliding scale royalty in some instances?



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A Yes.

Q So that these excess as well as overriding royalty as well as income tax all have to come out of the profit you are talking about here?

A Yes, sir.

Q Mr. Young, in attempting to further analyze the available data that we have, and moving now from the realm of economics and cost and the problems of risk of drilling these deep wells, have you attempted to make an analysis of what should have happened in Well No. 1 during the time that it produced the amount of oil it did produce up to October 1st, 1961?

A Yes, sir, I have.

(Whereupon, Ohio's Exhibit No. 11 was marked for identification.)

Q Will you please look at what's been marked Ohio's Exhibit 11? Mr. Young, as of October 1, 1961, what was the cumulative production from Well No. 1?

A 133,719 barrels.

Q My copy of this exhibit has that figure on it in ink. Did you make a mistake in this exhibit?

A Yes, sir. That was a reproduction error.

Q That's the only mistake in it, isn't it?

A Yes, sir.

Q Mr. Young, you have a schematic diagram there of a



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cylinder. Describe to us what that represents.

A This cylinder represents a production area of 251 acres about Well No. 1.

Q That 251 acres is the area that would be included within a radius of 1837 feet, is it not?

A 1867 feet.

Q 67 feet. That's the distance between Wells 1 and 2?

A Yes, sir.

Q Are you assuming, then, that this Well No. 1, for the purpose of this calculation, was producing only from that area and from nowhere else?

A Yes. Exhibit No. 11 is a calculated pressure decline for Well No. 1 to October 1, 1961, based on a maximum radial drainage of 251 acres.

Q That shows here that cylinder is 98 feet high. That is the net pay that was encountered in Well No. 1?

A Yes, sir, it is.

Q You have taken that into account?

A Right.

Q Attached to the front page of the Exhibit 11 there are two pages of engineering formulae symbols and data. Describe this briefly, these computations for us, and state whether they result in an accepted engineering formulae.



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A Page 2 shows the material balance equation for an oil reservoir which is producing when the reservoir pressure is above the bubble point pressure of the reservoir fluid. This is true in the Lea-Devonian Pool. This is an accepted reservoir engineering equation and takes into consideration water influx and produced water.

Q In using this equation, since the equation took into account water influx and produced water, there hasn't been any such production from No. 1, what did you do about those two factors in the equation?

A I have, in using this equation, for this presentation, assumed that water influx is zero and that we have no produced water. Then the equation on page 2 reduces to the simple relationship shown at the bottom of page 2.

Q All right. That's simple to an engineer?

A Yes, sir.

Q And accepted by engineers generally?

A Yes, sir.

Q You have also, then, on page 3, shown your calculation for original oil in place, is that right?

A That's the original oil in place calculated using the basic data for Lea Unit No. 1 in the 251 acres surrounding Well No. 1.



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Q Let's go back to that front page. Based on these calculations, and assuming that Well No. 1 was producing from no greater area than the 251 acre limit just to that area of 98 feet of pay, what should have been the pressure drop in that well as of October the 1st?

A The pressure decline in that well should have been 1153 psi, based upon the calculation made, assuming that No. 1 is producing from only the radial 251 acres surrounding that well.

Q What was the measured pressure change from the initial pressure at the time of completion until October 1 of '61?

A The measured pressure change was actually a 12 psi increase.

Q The significant thing there is what?

A The significant point is that the measured pressure showed no decline in bottom hole pressure.

Q Since there has apparently been no pressure decline in Well No. 1, and since that pressure decline would have been over a thousand pounds per square inch, if the drainage area of that well had actually been limited to this 251 acres, what is your opinion as to the conclusion to be drawn from these calculations?

A It is my opinion that No. 1 is draining an area substantially in excess of 251 acres. The fact that there has been no measurable pressure decline further establishes, in my opinion,



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that the drainage is efficient and effective.

Q Well, then, is it still your opinion that these wells can drain efficiently and effectively in excess of 160 acres?

A Yes, sir, it is.

Q How about in excess of 251 acres, now that we have the consideration of this exhibit?

A Yes, sir, it is.

Q Have you prepared another exhibit, designated Exhibit 12, using this same radius, the same 251 acres, and applying it to the actual locations of the wells previously drilled and to some assumed locations?

A Yes, sir, I have.

(Whereupon, Ohio's Exhibit No. 12 was marked for identification.)

Q Describe that exhibit for us, will you please?

A The area used in Exhibit No. 12 is the same area that was used in the economic consideration. As shown in Exhibit 10, fifteen wells would be required to develop the Lea-Devonian to a density of 160 acres per well. The development plans of the Lea Unit operators have not been determined for the entire unit, and the undrilled locations I have shown on Exhibit 12 are purely speculative.

The locations, however, do serve to demonstrate how effectively



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the Lea-Devonian Pool could be developed and completed on 160-acre spacing. Exhibit 12 was prepared by constructing a 251-acre minimum radial drainage area about each suggested location. The most outer boundary of the total minimum drainage area of the indicated wells is shown as a heavy outline and vividly demonstrates the minimum radial drainage area that might be expected under the suggested drilling program.

Q Each of those 251-acre minimum areas, in effect, represents that same 251 acres you showed as the cylinder on your Exhibit 11?

A Yes, sir.

Q Mr. Young, since there's no oil pool in the State of New Mexico that's been granted 160-acre spacing and 160-acre proration units, have you any thought concerning the provision for an allowable for wells on these proration units?

A Yes, sir. During the interference test of Well No. 2, that well was produced at three times the allowable of an 80-acre well.

Q How much was that figure, Mr. Young?

A The maximum rate, as I recall, was 1218 barrels per day, which is in excess of the three times the 80-acre allowable.

Q It's over a thousand barrels?

A Yes, sir, it was.



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Q All right.

A During a seventy-two hour drawdown test in August of 1960, the No. 1 well was produced at 600 barrels of oil per day. In my opinion these high rates of production in these two wells demonstrate the capabilities of the Lea-Devonian wells to produce large volumes without causing damage or waste in the reservoir.

Q Do you have a recommendation as to what the Commission should do with regard to allowables for these wells?

A It is my recommendation that the Commission not only adopt 160-acre spacing and 160-acre proration units for this pool, but that the allowable be one and one-half times the normal allowable assigned an 80-acre well for this depth.

Q Mr. Young, in order to effectively understand the effect of such an allowable as you propose and compare it with other allowables, have you had prepared Exhibit 13?

A Yes, sir.

(Whereupon, Ohio's Exhibit No. 13
was marked for identification.)

Q What does Exhibit 13 present, Mr. Young?

A It shows the relationship of total daily withdrawals for Lea-Devonian Pool for 40-acre spacing versus 80-acre spacing versus 160-acre spacing.

Q Will you run through those figures and point out the methods that you have used there to show that?



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A The data included in this exhibit is based on a normal unit allowable of 34 barrels of oil per day, the same 2280-acre area that you used in the economic calculation. For 40-acre spacing the allowable factor at this depth is 9.33, which would result in a top well allowable of 318 barrels of oil per day. The number of wells required for 40-acre spacing would be 57; if the entire pool was developed would result in a top field allowable of 18,126 barrels per day.

Q Now, how about 80 acres?

A With 80-acre the allowable factor is 10.33, a top well allowable of 352 barrels per day. For full development, 29 wells would be required, resulting in a top field allowable of 10,208 barrels per day.

Q That is if the pool is developed on the 80 acres that's authorized by the temporary order?

A Yes, sir.

Q And assume that normal unit allowable of 34 barrels a day, the daily production after full development would be slightly over 10,000 barrels of oil?

A Yes, sir.

Q Now, on 160-acre development with 15 wells, what would be the per well allowable assuming 34 barrels as a normal unit allowable?



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A The per well allowable, using the allowable factor which I have recommended to the Commission, would be 527 barrels of oil per day.

Q That means by applying your one and a half times an 80-acre allowable, applying that factor to the 10.33 --

A Yes, sir.

Q -- you get an allowable factor of how much?

A 15.50.

Q And with 15 wells at total development, what would then be the daily allowable production from this field?

A 7,905 barrels of oil per day.

Q So in the aggregate, with total development daily allowable, daily takes would be less--

A Yes.

Q -- than either under 40 or 80 acres?

A Yes, sir.

Q What would be your thought about the relationship of the smaller total daily withdrawals from this pool after full development?

A Since the Lea-Devonian is a water drive reservoir, and since water drive reservoirs are rate sensitive, it is possible that the lower daily withdrawals with the wider well spacing might result in a more efficient depletion of the reservoir.

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Q In your opinion, would producing that smaller amount each day after this total development cause any waste?

A No, sir, it certainly would not.

Q It might prevent waste, might it?

A Yes, sir, it might.

Q What about the correlative rights of the parties, including the royalty owners, would they be protected under the allowable that you have recommended?

A Yes, sir.

Q Mr. Young, we've come to Exhibit 13 on December 13, will you summarize your conclusion, based on the information that you have, and make your final recommendations, or your recommendations to the Commission here?

A In summary, it is my opinion that one well completed in the Lea-Devonian Pool is capable of efficiently, effectively and economically draining substantially in excess of 160 acres. This opinion is supported by my interpretation of the pressure interference tests and the material balance calculations, as well as by other factors I have presented.

It is also my opinion that the development of the Lea-Devonian Pool on 160-acre spacing will not cause any measureable decrease in the recovery from the drilling of too few wells. On the contrary, 160-acre spacing will result in uniform development



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of a wider area within a shorter period of time, resulting in more effective depletion of the reservoir. I strongly recommend to this Commission that pool rules be established for the Lea-Devonian Pool requiring 160-acre proration units, and 160-acre spacing pattern. Each proration unit to consist of a single Governmental quarter section.

Furthermore, it is my recommendation that the well on each proration unit be located in the approximate center of the Northwest Quarter, or Southeast Quarter of a Governmental quarter section. I further recommend that the pool rules permit a tolerance of 150 feet in the location of any well.

As to oil allowable for the wells in the Lea-Devonian Pool, I recommend that the allowable be established by applying 150% to the 80-acre proportional factor as provided for in Statewide Rule 505, as amended, with the allowable for any non-standard proration unit which has been proved to be increased or decreased in the proportion that the number of surface acres included in such unit bears to 160 acres.

It is my opinion that the recommendations which I have made will not cause waste, but on the contrary, will prevent economic waste and will also protect correlative rights of all interested parties.

Q Were Exhibits 1 through 13 prepared under your



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direction and supervision or by you, Mr. Young?

A Yes, sir, they were.

MR. couch: At this time we offer in evidence Ohio's Exhibits 1 through 13 and state that this concludes the direct testimony from this witness.

(Whereupon, Ohio's Exhibits Nos. 1 through 13 were offered in evidence.)

MR. PORTER: Any objections to the admission of the exhibits? They will be admitted. The hearing will recess until 1:30, at which time Mr. Young will take the stand for cross examination.

(Whereupon, the hearing was recessed until 1:30 P.M.)

AFTERNOON SESSION

(Whereupon, the hearing was resumed at 1:30 P.M. on Wednesday, December 13, 1961.)

MR. PORTER: The hearing will come to order, please.

Anyone have a question of Mr. Young?

MR. NUTTER: Yes, sir.

MR. PORTER: Mr. Nutter.

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Young, this Exhibit No. 1 of yours, these contour maps are from the seismic survey, I believe you said, is that



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correct?

A It's based on the original seismic.

Q Then you adjusted the vertical height of the contours by 265 feet as a result of encountering the Devonian or Woodford shale?

A Yes, sir. From the drilling of the seven wells, the average correction between the actual log tops and what the original seismograph contour showed was 265 feet.

Q Has there been any lateral change in the structure, as the original seismic picture showed it, as compared with what you have found by the drilling of the seven wells?

A No, sir, I don't believe so, Mr. Nutter.

Q The same structure, just vertical adjustment?

A Yes. Actually, it was taken and I took the original seismograph contours and contoured 65 feet, or two-thirds, between contour lines, and then those contour lines were immediately put on to this map.

Q I see. Now, on the Exhibit No. 1 you show the Sinclair well out to the East and the United States Smelting well to the West, neither of which was productive in the Devonian. What did those wells encounter in the Devonian, Mr. Young?

A The Sinclair well was wet, it was across the fault and it's about approximately four to five hundred feet low to the



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unit wells.

Q And there was porosity, but the porosity was filled with water?

A I believe that's correct.

Q How about the United States Smelting well?

A The United States Smelting well was not logged, it was drilled into that. My information is that it did have porosity.

Q Did it make water in the Devonian?

A They did not complete in it. They did not set pipe.

Q Did they take a drill stem test?

A Not that I know of.

Q Well, what did they find?

A I would like to correct that last answer, Mr. Nutter.

There were two drill stem tests taken in the United States Smelting well.

Q In the Devonian? A Yes, sir.

Q What were the depths of those two tests, please?

A The first one was 14,295 to 530.

Q What did they recover?

A 525 feet of mud, thirty minute shut-in pressure, 390 psi.

Q What about the second test, they didn't recover any salt water on that?

A No, sir. The second test was taken at 14,548 to 619,



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recovering 14,000 feet of sulphur water.

Q The first well that Ohio drilled is the only one that has penetrated the Devonian formation to any depth, is that correct?

A That is correct, of the producing wells. Now, the Sinclair well, and possibly the Smelting well, penetrated more than the other producing wells.

Q But, on the six wells that Sinclair or that Ohio has drilled, you have six or five?

A Five.

Q On the five wells that you have drilled, after going deep into the Devonian on the first well and finding that the pay was in the upper part of the Devonian, you've refrained from drilling deep into the Devonian on any of the remaining four, is that correct?

A That's correct.

Q No porosity down there in the lower Devonian?

A Not in the No. 1 well.

Q Did you encounter any water at all in that well?

A I don't believe we did, Mr. Nutter.

Q So there isn't anything on any producing well as yet to help determine the existence of an oil-water contact, and the only thing you would have would be the No. 1 well, and the United States



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Smelting well?

A Yes, I believe my testimony showed that the productive limits had not been defined.

Q There must be a water table in here somewhere?

A Yes, sir, there is.

Q The No. 1 well has three main portions of net pay, as I interpret your Exhibit No. 2, Mr. Young, being in the range from 14,350 down to about 370 and 75, and then the second group being the next three kicks that are colored red and the lowermost section of net pay, which is continuous there. Do any of these other wells of this third and lowermost section have net pay in them?

A In my opinion they do, but it's unpenetrated.

Q You just haven't penetrated it at this time?

A Yes, sir.

Q Do you have any evidence that there's any vertical communication that's going to enable you to drain that lower pay from these remaining four wells?

A Other than possible fractures within the Devonian formation, which core analysis shows does exist, those fractures, I believe, would give you your vertical communication.

Q Did Exhibit No. 4 demonstrate vertical fragmentor fracture?

A You will notice the center column right next to the graph on Exhibit No. 4 is a sample description that gives an



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indicated fractured vuggy porosity.

Q Although this doesn't specifically state the direction of the fractures or that they would be vertical or horizontal?

A No, sir, it doesn't.

Q You used in your computations of reserves in a later exhibit, 65 feet of net pay, is that correct?

A Yes, sir.

Q Although the average of the wells on your cross section No. 2 would be 55?

A Yes, sir.

Q Because, I presume, that you feel the major part of the structure lies North and South rather than East and West, and you don't have a really true representation of the structure by the East-West cross section?

A I don't follow the question.

Q If you use 65 feet of net pay, would that indicate that you think more of the structure could be depicted on a North-South cross section than can be depicted on the East-West cross section?

A I use the 65 feet because the maximum pay that we've seen is in the No. 1 well, this 98 feet. The average net pay for the entire pool, in my opinion, has to be something less than 98 feet. The existing five wells show a penetrated net pay of 55.



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Now, there is going to be areas in the pool which will have even less than the 55.

Q Yes.

A So, there has to be an average somewhere. Right now we can't really pinpoint.

Q You don't think that the East-West cross section right now with its 55 feet is representative of the pool or the structure?

A Well, I would think it would be representative, but there again, there is some unpenetrated pay even in these wells. Also to the East and West on the outside of these five wells your pay is becoming more thin and, therefore, when you average it over the entire pay you'd still have something less than the maximum.

Q In arriving at the 55 feet of net pay, you have only taken the penetrated portion of the porosity here?

A The penetrated, yes, sir.

Q Just what amount of porosity did you consider in calculating net pay? What would it be comparable to on Exhibit No. 4, the core analysis?

A In most cases it's about two or three percent.

Q What was the original bottom hole pressure, the first pressure that was ever taken in the pool, Mr. Young?

A The first pressure that was ever measured in the pool



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was in the No. 1 well, and it was 6,046 psi.

Q Would that be this red point, the first red point for No. 1 on Exhibit 3?

A Yes, sir.

Q That is the pool original bottom hole pressure?

A It's the initial pressure that was measured, Mr. Nutter.

Q Is that in the bottom of the well or is that taken to some datum that could be comparable to the other bottom hole pressure that was recorded then?

A These were all at the subsea datum.

Q What is that datum, please?

A It's minus 10,744.

Q And all bottom hole pressures on all of these exhibits are all corrected to that same datum?

A Every pressure which we have presented today, and every one that has been measured, except one, was actually measured at that subsea depth. The No. 6 well was corrected several hundred feet. That's the only one that has been corrected.

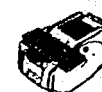
Q So, they were all taken at the same depth?

A They were all measured at the same subsea depth.

Q And no correction?

A No correction except on the No. 6 well.

Q To what do you attribute the fact that the No. 2 and 4



wells, on their original completion, had considerably higher than the initial bottom hole pressure for the pool?

A The only explanation I could give there, Mr. Nutter, is that from the production of the No. 1 well we had established pressure gradients within the reservoir. This being a water drive reservoir, and No. 2 and No. 4, from our structure map appears to be closer to the edge water contact, may have, pressure gradients may have been established by that time giving those two wells higher pressures. You notice the most recent pressures have the same relationship.

Q Yes, sir. If we assumed that these more recent pressures are the result of this gradient, to what would you attribute the lower pressure in the discovery well when it was first completed, then?

A I have no explanation of that, Mr. Nutter.

Q And No. 5, you feel, has the lower pressure because it's over near the fault?

A That seems to be--

Q And hasn't been receiving the full benefit of the water drive from the West and the North?

A That seems to be the reasonable explanation for that.

Q Even prior to the time that the well had been produced and when its initial pressure was taken in August of '61?

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A Yes, sir.

Q On Exhibit No. 5, Mr. Young, you shut the No. 2 well back in and had an immediate rise to 6,066. Did you have a bomb in No. 1 at the same time to find out what happened to the pressure there?

A No, sir, we did not.

Q So there's no companion curve on the No. 1 available to show what reaction it had to the shutting in of the No. 2?

A No, sir.

Q I presume, Mr. Young, on Exhibit No. 6, that from 307 hours to 335 hours the slight increase in pressure in the No. 4 well, you would attribute to the fact that the producing rates of the No. 2 had been reduced, and then raised back up, but not to the original level of the No. 2 production, right?

A Not necessarily, Mr. Nutter. This data, this test is presented for the Commission's information, it's the actual recorded data, the pressure and the actual flow rate. Now, whether there is this quick communication between these wells I say is inconclusive. Certainly, in my opinion, during this time there is some pressure interference between Wells 2 and 4, but certainly these tests are inconclusive as to proving it.

Q You are not necessarily saying that the increase from 307 hours to 335 hours is due to the reduction in the production



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rate from the No. 2?

A No, sir.

Q I suppose, then, it would follow that on Exhibit No. 7 the increase in the bottom hole pressure of No. 4 wouldn't be due to maintaining the flow rate of No. 2 at a constant rate?

A No, sir. I think we've pointed out in the direct that this data was certainly, didn't help us in the case.

Q Now, on Exhibit No. 8, Mr. Young, up here on Well No. 4, from our No. 42 to our No. 48 we don't have any pressure recorded. But the last pressure prior to changing the charts in the well was 6,070 and the next pressure was 6081. To what do you attribute the 11 pound difference?

A This is a characteristic in using the Amerada bomb to record these bottom hole pressures continuously. Any time that you have to pull the Amerada bomb, when you get back on bottom your absolute pressure is not always the same.

Q Well, this is an 11 pound differential here?

A Yes. Here again, these are what we measured with the bomb. They're presented as a complete record of all the interference testing we did. Now, it's my opinion that there was not that much change in that pressure, it's only a characteristic of having to change the Amerada chart, the chart in the Amerada bomb.

Q This characteristic here indicates an 11 pound differ-



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ential pressure measured in the course of just two or three hours according to the bomb?

A Yes, sir.

Q Which is an inherent error of so many percent, the 11 pounds. In some of these comparisons that you have made, you have noted differences in pressures of 1 pound from beginning to ending of interference tests and so forth?

A Yes, sir.

Q Is this a reliable comparison when just taking the bomb out of the hole and putting it back in would result in an 11 pound differential?

A I didn't get the question.

Q Do you think it's proper to cite a 1 pound differential in pressure on an interference test when the bomb has such characteristics as to result in an 11 pound pressure differential merely from removing it from the well and putting it back in?

A I wasn't saying that these 1 or 2 pounds are actual measurements of interference. Again, they are the data we obtained and I presented them to the Commission. These few pounds that you are referring to, yes, they are probably inherent characteristics in the bomb.

Q Just for the sake of the record, Mr. Young, would you describe the chart that's used in an Amerada bomb and depict how



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many inches it takes to measure 100 pounds differential on that chart?

A The maximum chart scale is two inches.

Q And two inches is showing how much pressure here?

A In these tests, a 10,000 pound element was used.

Q So the two inch travel of the needle there, or the pencil, represents a 10,000 pound differential from zero to 10,000?

A That's correct.

Q And it would be difficult to measure a one pound when you're measuring 10,000 pounds in two inches?

A I certainly agree with you.

Q What specific criterion did you use to arrive at your recommended allowable factor of 15.50 for these Devonian wells? I realize you said 150% of an 80-acre allowable, but is that based on any particular thing?

A No, sir, we have proven in the interference tests that these wells are capable of producing two and three times an 80-acre allowable. The one and a half times an 80-acre allowable is something considerably under what we have proven they are capable of producing. I recommended the one and a half times the 80-acre allowable.

Q But the specific number, one and a half times the 80-



acre allowable is not based on any calculated payout, or anything like that?

A No, sir.

Q Just an arbitrary 150% of the existing allowable?

A It is an efficient rate for those reservoirs. I think these wells are capable of efficiently producing that rate.

Q I want to know what the basis of the 150% was, if any.

A No basis.

Q In calculating the allowables on Exhibit 13 at 40 acres, 80 acres and 160 acres, you note that the 40-acre allowable, if the field were developed with 57 wells, would total 18,000 barrels; with 29-80-acre, 10,200 barrels; and 7900 barrels with 15 on the 160-acre wells. I didn't quite follow exactly what you meant when you believed that possibly these lower allowables on the 160 acres would result in a more efficient drainage of the pool with less likelihood of water encroachment prematurely. Would you elaborate on that a little bit, please?

A Since water drive reservoirs are rate sensitive, Mr. Nutter, the lower production rate, as determined by using the 15.50 and 160-acre spacing might possibly, the slower rate might possibly give you a more efficient depletion of your reservoir by the water drive. That doesn't necessarily mean that the other two rates would be inefficient.



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Q You state that the water drive reservoir is rate sensitive. As far as the individual well is concerned, if you had a bottom water drive, or water below the lowermost perforation, the increased withdrawals, say, of 527 barrels per day as compared to 318 barrels per day, may enhance the opportunity of the water to coming on an individual well, wouldn't it?

A To have water coning, Mr. Nutter, you must have good vertical permeability. In most of these limestones, according to the core analysis, we do have tight streaks here and there which, in my opinion, would prevent water from actually coning into these wells.

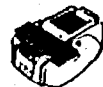
Q If these tight streaks would keep water from coning in on the wells, would they not also keep the perforations on the four wells that haven't gone into the lowermost section of the Devonian from producing the reserves in the lowermost section?

A Well, it could.

Q And notwithstanding that fact, Ohio hasn't drilled into the lowermost pay in the last four wells?

A No, sir.

Q On your Exhibit No. 11, where you are computing the pressure decline actual versus the computed pressure decline for the drainage area of 251 acres, you were using Well No. 1, is that correct?



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A Yes, sir, for example, I was using Well No. 1, I was using its cumulative production, its actual net pay, and then 251 acres surrounding.

Q As far as we know at this time, this well has the most net pay of any well in the reservoir, is that correct?

A Yes, sir.

Q So this computation would not be typical of the reservoir either using the 55 feet of pay average on cross section No. 2 or on the reserves as computed on Exhibit No. 9?

A The absolute magnitude of the calculated pressure decline would not, but the significance of it is applicable to any well in the field.

Q Although this well, as far as we know, is the best well insofar as net pay is concerned and not a typical well?

A That's right.

Q Referring back to Exhibit No. 1 again, Mr. Young, it appears that the five wells which Ohio has drilled to date have been drilled in either the Northwest Quarter Quarter section or the Southeast Quarter Quarter section of each of the respective Quarter sections, would that be correct?

A Yes.

Q So, in effect, you have actually drilled the well to date, including the No. 7, which is now drilling below 12,000



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feet on a uniform 80-acre spacing pattern?

A Of the completed wells in the Devonian, there is still the one per Quarter section.

Q Yes. Well, how about the No. 7, there's two wells counting the No. 7?

A The No. 7 is not scheduled as a Devonian completion. Its target is the Lea-Pennsylvanian gas sand.

Q It will not go to the Devonian?

A Our current plans are not to carry it to the Devonian at this time.

Q I was wondering how you would dedicate 160 acres to those two wells, what depth is the Pennsylvanian encountered here?

A It's about 12,300.

Q What about the Bone Springs, is it present in this area also?

A Yes, sir.

Q What depth is it?

A The Bone Springs pay is about 9500 feet.

Q Of the five wells which have been, well, actually you have four wells completed now as Bone Springs and Devonian duals, is that correct?

A That's correct.

Q And you have the No. 6 well, which is to be completed



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as a Pennsylvanian and Devonian dual. Your No. 7 will be a dual in the Pennsylvanian and Bone Springs?

A Yes, sir.

Q Or will it be a single --

A That's our current plan.

Q A dual in the Pennsylvanian-Bone Springs?

A Yes, sir.

Q In going into the cost on these wells, you haven't considered any other pay, in arriving at your net payouts and return per dollar invested and so forth, have you?

A No, sir, I have not.

Q Now, this \$510,000 which is your estimated cost of a well, is that for a single completion to the Devonian?

A Yes, sir.

Q So, so far you don't have a single completion to the Devonian, do you?

A No, sir.

Q So these costs, as related on Exhibit No. 10, are for a hypothetical well which has not as yet been drilled then?

MR. COUCH: I think this is getting toward a legal question involved here. Hypothetical in the sense that it hasn't been drilled, but very practical and very necessary in this hearing, because in looking at the cost for development of this



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pool under the statutes of our State, we must consider it as a pool by itself. The statutes say it is not permissible to consider the other developments, the other possibilities that may or may not exist in arriving at the proration unit for this Devonian Pool. As a legal matter, that would be my objection to implying here that we've tried to present something hypothetical. We tried to present it as we conceive the law to be.

MR. NUTTER: I will withdraw that question and ask another one.

MR. COUCH: All right.

Q Has a \$510,000 well been drilled as yet as a single completion in the Devonian?

A No, sir.

MR. NUTTER: I believe that's all, thank you.

MR. PORTER: Mr. Morris.

CROSS EXAMINATION

BY MR. MORRIS:

Q Along the same line, Mr. Young, as to the wells that have been drilled and are dually completed, has the cost of any well been allocated so much to the Devonian, so much to the Bone Springs? Do you feel that such an allocation could be made with any reasonableness?

A So far as I know there has been no allocation of that nature done, Mr. Morris.



Q For purposes of recovery from any given well that's been dually completed, it will be hard under your system of book-keeping to figure when the Devonian completion has paid for itself or when the Bone Springs completion has paid for itself?

MR. COUCH: Mr. Morris, I don't wish to be arbitrary in interrupting, but this witness, I believe, does not know the methods that our Accounting Department uses to keep records and to keep books on allocations of costs in this manner. I just don't believe he has the information, and I don't believe he's able to give you the way we would allocate it for the purpose of determining payout. These figures were prepared intending to reflect what we thought were the legal requirements determining the cost figures.

MR. MORRIS: Mr. Couch, do you not believe that inasmuch as the wells in this area are actually dually completed and probably others will be dually completed, that it would be unreasonable to ignore the fact that the cost of the well should be allocated between zones, and in figuring the cost of what a well to the Devonian is going to be you need to make such an allocation to determine what the costs have been to date for this particular zone?

MR. COUCH: Mr. Morris, if I followed that, again, from the legal standpoint, I understand that the reasonable opportunity to recover reserves from each pool is to be determined with

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relationship to the costs for production from that pool. We have, in the past, testified as to the cost necessary to be added to this \$510,000 in order to dually complete the wells in the Bone Springs, for example. In other words, the actual dollar costs have been made a matter of record, the average cost in the first hearing of this case, I believe we had some testimony on that score. Does this approach an answer to the point?

MR. MORRIS: I believe the point has been made. I'm not going to pursue that line any further.

Q (By Mr. Morris) Mr. Young, in response to Mr. Nutter's first question you answered that you believed the seismic information you had in this area still to be good. Do you believe that the Lea Unit covers the geologic structure in this area that is productive from the Devonian formation?

A Since the productive limits have not been defined, Mr. Morris, I don't believe that question could be answered.

Q The Lea Unit was established insofar as possible to contain the production of acreage in the Devonian?

A It would be my opinion that the unit was put together based upon that seismic picture.

Q And that picture has not changed to date?

A No, sir.

Q Do you believe that other Devonian wells will be drilled



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in this area but outside the present boundaries of the Lea Unit?

A I am sure there will be wells drilled. As a matter of fact, there is one drilling North of the unit now which is the Texaco Quail Federal No. 1 in the Northwest of the Southwest of Section 1, Township 20 South, Range 34 East.

Q Is that projected to the Devonian?

A It's my understanding that it is.

Q Do you feel that other wells that might be drilled would be productive in the Devonian that would be located outside the Lea Unit?

A Until drilling operations establish that fact, I don't think anyone could answer that, Mr. Morris.

Q Mr. Young, if the participating area is established as proposed on your Exhibit No. 1, is there any reason why the operator of the unit could not voluntarily space his wells on a 160-acre program without any compulsion from the Commission as to whether it would have to be 40, 80 or 160, he could still drill his wells on a 160-acre unit if he so desired?

A That is possible.

Q The only consideration, then, would be the allowable that that well would receive to make it justifiable?

A What do you mean "justifiable", Mr. Morris?

Q In other words, if an operator should, in his own mind,



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decide that 160-acre spacing was desirable within the unit and that 80 was not, he could, without any Commission compulsion whatsoever, space his wells one well to a 160-acre unit?

MR. COUCH: Mr. Morris, if I may intervene again, whether the operator could do that or not I think would depend certainly on law questions with regard to the plans of development which we're required to file and obtain approval of by the Land Commissioner and by the United States Geological Survey with regard to the development of a unit. There would be questions, insofar as royalty owners are concerned, as to our obligations to develop on some pattern different from that which the Commission has designated as the proper proration unit, we feel, and there would be the question of our obligation to drill any offset wells that were drilled on a pattern different from that which would be in effect under the proration unit fixed by the Commission.

I think all of these things involve legal matters as to the obligations that could arise and the pressure that could be put on the operator to develop the field on a pattern that he himself had chosen, and that had not received the sanction of this Commission; as far as the planning of the operator is concerned, Mr. Young could certainly answer that question as to whether the operator could successfully maintain a pattern. Under these other



legal obligations, I think there are some serious questions about it.

MR. MORRIS: Thank you, Mr. Couch.

Q (By Mr. Morris) As you are aware, the Commission, in 80-acre pools, has followed the pattern of giving one depth factor to a 40-acre tract and then allowing just a single normal unit allowable to be added on to that to arrive at the 80-acre allowable. If the Commission should follow the same pattern in arriving at the allowable for a 160-acre proration unit such as you have proposed, you'd come up with something considerably less than the one and a half times the 80-acre allowable that you have proposed, would you not?

A Yes, sir.

Q As a matter of fact, you'd come up with a factor of 12.33 for your 160-acre tract rather than 10.333 that you have for an 80-acre tract?

A Yes, sir.

Q Following the Commission pattern?

A Yes, sir.

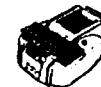
Q Do you feel that the allowable that a well on 160 acres would receive with a factor of 12.33 would be too low to justify the drilling of wells in this area?

A What do you mean too low, Mr. Morris? I didn't follow

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your question.

Q Could you realize an economic payout based upon a factor of 12.33 for a well located on a 160-acre proration unit?

A Yes, sir, you could.

Q You don't feel that you would have to have 150% of an 80-acre allowable in order for it to be economical?

A No, sir.

Q Mr. Young, has any thought been given to the institution of a pressure maintenance project sometime during the life of this pool?

A From all the available data at this time, Mr. Morris, I think the pressure is going to be maintained naturally with the extremely effective water drive that appears to be operating on the Lea-Devonian.

Q You think that that pressure will be maintained to the economic limit of the pool?

A Yes, sir.

Q Mr. Young, do you believe that one well on a 160-proration unit would recover substantially the same amount of oil as two wells in that 160-acre unit spaced and developed as though they were on 80-acre proration units?

A In my opinion there would be no measureable difference.

Q No measureable difference?



A Yes, sir. I recognize the fact that there's others that believe otherwise, but my opinion is there won't be any measureable. Certainly there wouldn't be enough additional oil recovered to justify drilling the second well.

MR. MORRIS: I believe that's all, thank you.

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

MR. COUCH: I would like to ask a few questions, if I may, to clarify on redirect, Mr. Porter.

MR. PORTER: Yes, sir.

REDIRECT EXAMINATION

BY MR. COUCH:

Q Mr. Young, for purposes of clarification, principally with relation to the contouring shown on Exhibit 1, in addition to the correction you made of the 265 feet, did you also make some slight changes in the minus 10,700 foot contour as a result of information from Well No. 6?

A Yes, sir, and also a slight adjustment from information obtained on Well No. 5.

Q That simply had the effect of broadening out that minus 10,700 contour, did it not?

A Yes, sir. There was also a slight revision in the minus 10,800 foot line in the vicinity of United States Smelting No. 1. It had a tendency to pull it in slightly.

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Q Those slight differences would be readily apparent from comparing this Exhibit No. 1 with the Exhibit 1 in the original case?

A Yes.

Q That actually had the original geophysical contouring on it?

A Yes, sir.

Q And the difference being, then, in the numbers that were shown as to the subsea?

A Yes, sir.

Q With regard, now, to pressure differentials recorded on these tests, I would like for us to try to clarify just a bit the pressure differentials that occur during the time that a single chart is in the hole in one of these Amerada bombs. The difference between the pressure differential shown there and the pressure differential that's recorded at the end of one clock and then when you change the bomb and run another chart in the hole, you get a different pressure reading at that time. What's the difference in the last case where you change charts and pull the bomb out and run it back in the hole with a new chart?

A The bomb is giving you a different absolute magnitude in your pressure.



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Q In other words, it's starting at different numerical points?

A Yes, sir.

Q The bomb is subject to some error there in the recording of this initial absolute pressure when it's put in the hole, is that right?

A Yes, sir.

Q When that clock is in the hole and the bomb is then recording pressures, what about the relative pressure changes shown on that chart during one test? Is that subject to this same possible error? Is this absolute pressures now or is this intended to show relative pressure change?

A It tends to show the relative pressure change.

Q Not subject to this initial recording error of absolute pressure?

A Well, certainly not to the magnitude of the absolute pressure change from one chart to the other.

Q Was it then because of the recognition of this difference between those two situations that you did attach more importance to smaller pressure changes recorded during a continuing test on one chart than you did to those pressure changes which occur as a result of changing charts?

A Yes, sir.



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Q With regard to the basis for the recommendation of one and a half times the normal 80-acre allowable, are you aware whether in the past in 80-acre pools in this State the Commission has on one or more occasions fixed an allowable at one and a half times a 40-acre allowable for those 80-acre pools?

A No, sir, I'm not.

Q Mr. Young, it has been pointed out by cross examination that the Ohio did not drill, after the test wells did not drill its subsequent Devonian wells all the way through the Devonian pay section. Do you know the reason that we did not?

A In my opinion that is a conservation measure in these water drive reservoirs, by not penetrating to the water-oil contact, if there is fractures, you would have less likelihood to produce water prematurely.

Q And you would be, try to be doubly safe and prevent that possibility from occurring?

A Yes, sir.

Q It certainly wasn't any sort of effort to fail to produce any oil out of that Devonian?

A That's correct.

Q And with further production history and further development, these wells could then be deepened, couldn't they?

A Yes, sir.



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Q If we were satisfied that the lower portion of the pay was not being produced by the existing well?

A That's correct.

Q Mr. Young, will you refer to your Exhibit 10, I believe it is, with the schematic drawing of the cylinder.

MR. NUTTER: Exhibit 11.

MR. COUCH: Exhibit 11. Thank you, Mr. Nutter.

Q If, in that schematic drawing, instead of using 98 feet of net pay you had used 55 feet or some smaller amount of net pay and had then computed the recoverable reserves within the cylinder area covering the 251 acres, could you tell us by estimate at this time whether the calculated pressure drawdown would have been greater or less than the drawdown of 1150 psi which you calculate under this particular example?

A With less net pay in this calculation, the pressure decline would be greater than is shown in Exhibit 11.

Q That is with the same cumulative withdrawal from it?

A Yes, sir.

Q So that this is an example that could be applied, this same formula used, using the cumulative withdrawals of any well?

A Yes, sir.

Q And the net pay of that well?

A Yes, sir.



Q In selecting No. 1, it had the most cumulative withdrawal of any of the wells in the field, didn't it?

A Yes, sir.

Q By taking the well with the greatest cumulative production, would that be the well that you would expect if it had a limited draining area that it would have a greater pressure decline?

A Yes, sir.

Q Is that one reason you chose Well No. 1 for the example?

A Yes, sir.

Q Mr. Young, do you have any actual cost figures, or what it cost Ohio and the non-operators in the unit to drill to the Devonian and make the Devonian completion in some of these wells, exclusive now of any cost that was incurred only for purposes of dualing?

A I don't believe I follow the question, Mr. Couch.

Q Do you have any actual cost figures of what it cost to drill any of these Devonian wells, any one of those wells, the actual cost to drill it to and complete it in the Devonian formation?

A No, sir.

Q Do you have any cost estimates on what additional cost was required to dually complete these wells?

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A The average cost of dually completing these wells in the Bone Springs is \$25,000.00.

Q Do you have any actual total cost figure for any one of these wells for the total cost of it, including the Bone Springs dual?

A Yes, sir.

Q Will you give us that actual cost figure and which well it was?

A The No. 1 well dualled into both zones cost \$657,000.00.

Q All right. Do you have any actual cost figures on any other well?

A The No. 2 well cost \$541,000.00.

Q Any other cost figures?

A No. 4, \$515,000.00.

Q Keep going, you have got them.

A No. 5, \$559,000.00. Those are all actual cost figures that it cost to dually complete those three wells. I have an FEA cost on the No. 6.

Q That's the one that's recently completed?

A Yes, sir.

Q What is the FEA cost? A \$572,000.00.

Q That's dualled into the Pennsylvanian?

A This's the estimated FEA cost for the Devonian-Bone Springs.



Q That's right, the well was originally planned that way?

A Yes, sir.

Q In arriving at the average cost of \$510,000.00 that you talk about, did you use those actual cost figures you have just given?

A I used the average cost figure exclusive of Well No. 1.

Q You said you used the average?

A I used the actual cost figures exclusive of Well No. 1.

Q Why did you throw that out?

A Because it was so much higher than the others by a hundred thousand dollars.

Q You wanted to get a realistic figure?

A Yes, sir.

Q What else did you deduct from there?

A The average cost without No. 1 of the five wells is \$537,000.00.

Q How did you get down to the \$510,000.00?

A The cost to dual an existing Devonian well into another zone is \$25,000.00.

Q At least that's the Bone Springs?

A The Bone Springs. Therefore, the estimated cost for Devonian completion would be \$510,000.00.

Q That assumes that you have no problems in making this

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dual completion?

A Yes, sir.

MR. COUCH: Thank you. I believe that's all.

MR. PORTER: Mr. Utz.

RECROSS EXAMINATION

BY MR. UTZ:

Q What is the depth of the Bone Springs in this area?

A Approximately 9500 feet.

Q The Pennsylvanian?

A 12,300.

MR. UTZ: Thank you, that's all.

MR. PORTER: Anyone else have a question? The witness may be excused.

(Witness excused.)

MR. PORTER: Call your next witness, Mr. Couch.

MR. COUCH: Mr. J. D. Wheeler is to be our next witness.

J. D. WHEELER

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

DIRECT EXAMINATION

BY MR. COUCH:

Q Will you please state your name, sir, and your position with the Ohio Oil Company?

A My name is J. D. Wheeler. I'm the Division Manager of



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the Houston Production Division of the Ohio Oil Company. The Houston Division includes all of New Mexico, with the exception of the Northwest Quarter.

Q Mr. Wheeler, you have considered, I'm sure, the Lea Unit very carefully, haven't you?

A Yes, sir.

Q And from management's standpoint, do you have some comments that you would like to add to this record today?

A Yes, sir, I do have.

Q Would you please proceed?

A Some thirteen months ago at the hearing for temporary 80-acre spacing I outlined our development plan for the Lea Unit. I stated that while we were asking for 80-acre spacing, it was our intention to step out 160 acres at a time in order to evaluate the various reservoirs as quickly as possible. This has been done insofar as the North end of the field is concerned.

The title question in the South end of the field has prevented similar development in that area. While engineers have been gathering the data which has been presented here today, management has been concerned with other problems, and it is about those matters that I wish to speak briefly today. The problems like money, how much money is going to be allocated to the Houston Division. How much of that money are we going to have to spend



for development wells. How much are we going to have to have left to drill wildcat wells, and similar problems.

Slightly over two years ago I also appeared before this Commission in connection with our request for 80-acre spacing in the Bluit-Pennsylvanian field, since merged with the Allison-Pennsylvanian field. The Commission granted that request, and I'm happy to say that uniform development has resulted, the field is essentially completely developed and is performing in the manner that indicates the field will be properly depleted and the operators are making money.

The Ohio Oil Company has drilled a total of 122 wells in this field and a number of them part interest, with Ohio as an operator. This development cost approached four million dollars. Had we drilled one well to 40 acres we would have approximately doubled our development costs.

With the economics of that field in mind, I'm sure we would not have drilled on each 40 acres, but without the protection of the 80-acre order, I feel sure that unnecessary wells would have been drilled. Recently we completed a 15,000 foot plus Devonian wildcat in the Wilson Pool of Western Lea County a few miles South of the Lea Unit, at a cost of over six hundred thousand. The cost of drilling this expensive dry hole, of course, came out of the company till, but actually the money was in the till because we,

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in this division, with the help of this Commission, refrained from drilling unnecessary wells in the Allison-Pennsylvanian field. Last month at the API meeting in Chicago Lyon V. Terry of Laymon Brothers, New York, gave a paper before the production group entitled "The Producer's Problem of Diminishing Returns". The paper was primarily presented to point out some of the reasons that oil stocks have lagged behind on the securities market.

Some items from his paper seem to agree with my analysis of our problem here today, and while these are not exact quotes, any figures that I use are quotes from the paper. Mr. Terry stated that the squeeze is on between the constant price of produced crude and the increasing cost of finding, developing and producing it. Figures presented indicated the spread between these two figures has decreased from \$1.70 per barrel in 1948 to \$.35 in 1957.

While those are the last figures, there isn't any reason to think that the situation has improved any since 1957. Three solutions were mentioned for overcoming this dilemma. One was an increase in price. Second was cut the cost, third was to go out of business. A number of smaller companies in recent years have found the situation so tough that they have sold out. Of course, there isn't too much chance for increasing price with the great amount of foreign crude that's available at a lower price than



we're able to produce our oil. Therefore, it's cut costs or else.

Many companies, most companies, in fact, have already taken many steps to cut costs, streamlining corporate organization, reducing personnel, installation of automatic computers, and so forth. The remaining major opportunity is to reduce the number of development wells drilled to deplete a reservoir. Frequently wells unnecessary for reservoir drainage are drilled for the sole purpose of increasing the operator's daily allowable. Now, Terry, in his paper, recommended an allowable that would be based 100% on acreage. In other words, he recommended that if you drill on 160 acres instead of 80 acres in this field, you should get double the allowable. Of course, that would be a real fine arrangement financially, but we didn't see fit to make that recommendation.

Mr. Young did recommend one and a half times the 80-acre rather than the double that Mr. Terry had suggested. We believe that double allowable under the present supply and demand situation would give this field too great an advantage in the competition for allowables and markets.

On the other hand, there must be some additional allowable or present worth figures would make it advisable to over develop the property. Our request for 160-acre spacing is definitely not a hardship case, as indicated by Mr. Young's Exhibit No. 10, which shows a \$568,000.00 profit per well, or a 1.11 to 1 profit to

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investment ratio on 80-acre spacing. However, it is my firm conviction that the oil industry is shirking its duty to its country and even to the state in which it operates if we fail to eliminate the drilling of unnecessary wells when the physical facts in the case indicate that such elimination will not result in the reducing of ultimate recovery from the field. Failure to eliminate the drilling of unnecessary development wells results in increasing the cost disadvantage between the domestic and foreign oil.

It causes budget money that should be spent in drilling wildcat wells to be spent on development wells. This, in turn, cuts down on the available reserves of the country by reducing the discovery rate. The additional development wells will, in turn, deplete the already discovered reserves at a faster rate, so once, again I'm back here with the same plea I made a couple of years ago, which was, when justified, wider spacing for development wells and closer spacing for wildcats.

I think that completes what I had in mind saying.

MR. COUCH: Thank you. Your witness.

MR. PORTER: Anyone have a question of Mr. Wheeler?

MR. MORRIS: One question.

MR. PORTER: Mr. Morris.

CROSS EXAMINATION



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BY MR. MORRIS:

Q Mr. Wheeler, some discussion was given when Mr. Young was on the stand to the problem of allocating cost between wells that have been dually completed. I was wondering if you could comment on what the Ohio's practices are and what you feel should be done in that regard?

A Mr. Morris, that could be done in a number of ways. My own opinion is that since we have to drill a well to the Devonian in order to produce the Devonian, and since this is the reservoir that has the real reserves, that we would probably allocate the cost of drilling and completing the well to the Devonian and then charge to any other reservoir the cost of the dual completion. It can be done in any number of ways. It's strictly up to the Accounting Department how they want to carry it.

Q You wouldn't allocate the cost to each pool based upon reasonable equal return on your investment from each of the two pools?

A Oh, I don't believe we'd be that precise about it, no. I would think we would probably charge the cost to the Devonian of drilling the well to the Devonian and completing it.

Q You charge about \$500,000.00 to the Devonian and about \$25,000.00 to the Bone Springs?

A I think that will make the best picture for both



reservoirs.

MR. MORRIS: Thank you.

MR. PORTER: Any further questions? You may be excused.

(Witness excused.)

MR. PORTER: Anyone else desire to present any testimony in the case? The Commission will hear anybody who would like to make a statement at this time.

MR. BLACK: C. R. Black with Texaco, Inc. out of Midland, Texas. As brought out in testimony in this case, Texaco is presently drilling the Texaco Quail Federal No. 1 immediately North of the Lea Unit. It is anticipated that the well will be dually completed in the Lea-Devonian and Lea-Bone Springs. Texaco believes that the evidence presented by the Ohio is certainly indicative of the fact that a well completed in the Devonian reservoir is capable of effectively and efficiently draining in excess of 160 acres.

Texaco will always urge that the widest and most feasible spacing pattern for the initial development of any reservoir be established. Texaco believes that if the engineering data that is gathered as the pool is developed will not support the wide spacing pattern, it is never too late to come in and infill drill in order to prevent physical waste.

On the other side, if the reservoir is developed on a closer



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spacing pattern and a wider spacing pattern would have efficiently and effectively drained the reservoir, it is too late then to recover the investment cost of drilling these unnecessary wells.

In this particular case the drilling of one unnecessary well results in an investment loss or economic waste of approximately \$500,000.00. Texaco believes that this investment could be used by the industry for the exploration and development of other reservoirs in this State, and would certainly be an economic benefit to the industry and to the State of New Mexico.

Therefore, Texaco, as a prospective operator in the Lea-Devonian field, wishes to concur with Ohio's application for 160-acre spacing and respectfully urges that the Commission approve the application as submitted by the Ohio Oil Company.

MR. KASTLER: Bill Kastler from Roswell, New Mexico, appearing on behalf of Gulf Oil Corporation. Gulf is a non-operator and participating party in the Lea Unit. As such, we have a direct interest in this case. We believe that the Ohio Oil Company has presented a reasonable interpretation of the facts as they appear to exist at this time. That the drainage pattern of Well No. 1 as an example appears to be greater than 80 acres, indeed it appears to be justified that it is on the 251 acres claimed, or perhaps even greater.

We, therefore, concur in the request for 160-acre spacing



in this pool, and we also concur in the request for one and a half times allowable. Thank you.

MR. PORTER: Mr. Anderson.

MR. ANDERSON: As it has been pointed out, in the course of this hearing today, all, or at least the greater portion of the acreage that is involved in this application is in the Lea Unit area which consists mostly of Federal lands with one or two tracts of State of New Mexico land. Now, the wide spacing, or maybe we shouldn't call it wide, the wider than usual spacing that is sought by Ohio is not inconsistent with the principle of unitization in which operations we feel that we should get the greatest recovery of oil or gas without drilling unnecessary wells.

At the present time, as established by them, we've got five Devonian wells drilled in the northern third of what looks like is the Lea-Devonian Pool. From the evidence put on, some pressure surveys indicate that drainage does occur over a larger lateral distance than that which would be necessary for drainage of some sort in a 160-acre spacing if we considered per radial drainage.

Other pressure information appears to be inconclusive. The 160-acre spacing for oil is a departure, to my knowledge anyway, of any of the orders that have been issued by the Commission. Of course, we do have some unusual circumstances. One of them that is foremost in my mind is that the entire area, or at least



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probably all of the area that, or possibly, let's make it

probably that will be productive in the Ohio, at least based on what information we have now, is unitized.

Another thing is that this Devonian production lies at the greatest depth of any oil production, at least so far as I know, in New Mexico. We, in the Survey, have considered the matter of spacing; as far as 40-acre spacing is concerned, why none of us are thinking about that at all. We feel that we certainly, and forget about that in the Lea-Devonian. We feel that the evidence today has put out a good case for 160-acre spacing, certainly as good a case as could be made for it at this time for 80-acre spacing in any of the testimony or any of the knowledge that we have of the field, and I think some of you will recall that when the application for Devonian participating area and the Bone Springs participating area was filed with the Survey, we had discussions at some length of the reservoir characteristics, and all of the geological information that was available at that particular time and later.

So, based on what knowledge we have of it, and the testimony here today, we feel in the Survey that it would be both desirable and appropriate to develop this Lea Pool on 160-acre spacing, at least until such time as we have the entire productive area developed on that basis. Then, if the necessity exists for drilling



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infill wells on an 80-acre pattern to take care of probably some of the geologic or reservoir characteristics of which we are unaware today, we can go ahead and do that. We can't undrill them if we go on 80-acre spacing now.

As far as the requested allowable is concerned for 160-acre tract, it seems to me that the allowable requested, one and one half times the normal allowable for that depth, would certainly not be inappropriate. So far as the Geological Survey is concerned, we feel that 160 acres would be appropriate in this case and we recommend that the Commission adopt it.

MR. PORTER: Mr. Morris.

MR. MORRIS: If the Commission please, I have a telegram from Sinclair Oil and Gas Company signed by Mr. Joe Mefford. "Sinclair Oil and Gas Company concurs with Ohio Oil Company in recommending 160-acre oil proration units for the Lea-Devonian Pool with a top allowable of a regular 40-acre depth factor allowable plus three additional unit allowables.

MR. COUCH: I have a closing statement.

MR. PORTER: Mr. Couch.

MR. COUCH: I notice a little consternation there, I don't know what Mr. Mefford means when he says the three allowance. Maybe he means the three 80's. With respect to allowance, and without criticism of Mr. Mefford, I wasn't sure what he had in



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mind. I would like to say that the recommendation for one and a half times the allowable has had support in the past in that there are fields in which 80-acres were approved several years ago, I believe there are two of them in which the Commission saw fit to grant one and a half times the 40-acre allowable for the wells as developed in the field on 80's.

MR. PORTER: One was one and a half and one was two.

MR. COUCH: One was double?

MR. PORTER: Yes, sir. I don't believe it's producing under that arrangement at the present time, but that was the original order.

MR. COUCH: I think that's correct. It was, I would say, principally for this reason that we arrived at the one and a half times figure. Actually our approach to the recommended allowable was to attempt to ascertain what these wells could efficiently provide without waste and to consider then the modification Mr. Wheeler has suggested of being certain that this pool was not going to receive more than its fair share of the allowable in the southeastern part of the State, and using that with its past history of the Commission is where the one and a half figure came from.

I'll also say this, that Mr. Wheeler has, I think was waiting for me to ask him a question. I thought he was going to say it



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on his own up there. That, in this case, if the Commission should feel that the one and a half times is too much for any reason, the Ohio, at least, for it is not qualified here to speak for the other owners in the field, would not object to a hundred sixty-acre allowable based on two additional normal allowables plus the present 80.

We think that the field will justify the one and a half times allowable, and that was the basis for our recommendation, but we recognize that there is room for difference in consideration here, and I wanted our position to be shown in the record with regard to the allowable situation.

I have here three letters that I would like to put in the record; one from Edwin B. Cox and Edwin L. Cox, one from Drilling and Exploration Company, Inc., and one from Pure Oil Company, all being working interest owners in the Lea Unit, and also to advise the Commission that the other working interest owners, J. Hammond and W. T. Ross and wife have been fully notified of this hearing and are aware of what has been proposed and have indicated their approval of our proposals.

I offer these three letters as Exhibit 14 in our case. Those three letters also approve what we're asking for. I think virtually all has been said that could be said or needs to be said at this time. I'm not going to attempt to summarize the



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data or advert to it or further evaluate it. It's there. It speaks for itself. I'll just make this one observation. We have here brought to the Commission all of the available data that we have. The interference test did not show the dramatic pressure decline that perhaps would have made this a very obvious and fat case. What they did show was in the reverse, that the pressures and the permeabilities in this reservoir, the effectiveness of this water drive is such that you just can't get any dramatic drawdown between these wells producing at these rates.

With that we commit to the hands of the Commission our application here. Thank you, gentlemen.

MR. PORTER: I would like to go further with my statement of facts for the record. Concerning the fact that it was established from 80-acre pools, as I recall in the Knolls Pool which was a Devonian Pool, and the Bagley-Siluro-Devonian Pool, the factor of one and a half both came about prior to the establishment of 80-acre factors. We had no 80-acre factors in existence at that time.

Does anyone else have anything? The Commission will take the case under advisement and we will take a short recess.



I N D E XWITNESSPAGE

ROY M. YOUNG

Direct Examination by Mr. Couch	6
Cross Examination by Mr. Nutter	58
Cross Examination by Mr. Morris	76
Redirect Examination by Mr. Couch	83
Recross Examination by Mr. Utz	91

J. D. WHEELER

Direct Examination by Mr. Couch	91
Cross Examination by Mr. Morris	97

EXHIBITMARKEDOFFERED

Ohio's No. 1	7	58
Ohio's No. 2	12	58
Ohio's No. 3	15	58
Ohio's No. 4	18	58
Ohio's No.s 5, 6, 7 & 8	20	58
Ohio's No. 9	40	58
Ohio's No. 10	42	58
Ohio's No. 11	47	58
Ohio's No. 12	51	58
Ohio's No. 13	53	58

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FARMINGTON, N. H.
PHONE 325-1182ALBUQUERQUE, N. M.
PHONE 243-6691

STATE OF NEW MEXICO)
COUNTY OF BERNALILLO) ss

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 22nd day of December, 1961.

Ada Dearnley
Notary Public-Court Reporter

My commission expires:
June 19, 1963.

DEARNLEY-MEIER REPORTING SERVICE, Inc.

FARMINGTON, N. M.
PHONE 325-1182

ALBUQUERQUE, N. M.
PHONE 243-6691



NEW MEXICO OIL CONSERVATION COMMISSION

SANTA FE, NEW MEXICO

5-1-61

APPLICATION FOR MULTIPLE COMPLETION

Operator Continental Oil Company		County Lea	Date
Address Box 1377, Roswell, New Mexico		Lease State A-2	Well No. 2
Location of Well J	Unit 2	Township 25S	Range 37E

1. Has the New Mexico Oil Conservation Commission heretofore authorized the multiple completion of a well in these same pools or in the same zones within one mile of the subject well? YES _____ NO X
2. If answer is yes, identify one such instance: Order No. _____; Operator, Lease, and Well No.:

3. The following facts are submitted:	Upper Zone	Intermediate Zone	Lower Zone
a. Name of Pool and Formation	No. Justis Tubb-Drinkard Undesignated Abo	No. Justis Devonian	
b. Top and Bottom of Pay Section (Perforations)	5971'-6048'	6400'-6593'	6955'-7049'
c. Type of production (Oil or Gas)	Oil	Oil	Oil
d. Method of Production (Flowing or Artificial Lift)	Flowing	Flowing	Flowing

4. The following are attached. (Please mark YES or NO)

- Yes a. Diagrammatic Sketch of the Multiple Completion, showing all casing strings, including diameters and setting depths, centralizers and/or turbolizers and location thereof, quantities used and top of cement, perforated intervals, tubing strings, including diameters and setting depth, location and type of packers and side door chokes, and such other information as may be pertinent.
- Yes b. Plat showing the location of all wells on applicant's lease, all offset wells on offset leases, and the names and addresses of operators of all leases offsetting applicant's lease.
- Yes c. Waivers consenting to such multiple completion from each offset operator, or in lieu thereof, evidence that said offset operators have been furnished copies of the application.*
- Yes d. Electrical log of the well or other acceptable log with tops and bottoms of producing zones and intervals of perforation indicated thereon. (If such log is not available at the time application is filed, it shall be submitted as provided by Rule 112-A.)

5. List all offset operators to the lease on which this well is located together with their correct mailing address.

Elwyn C. Hale, c/o Howard P. Holmes, P. O. Box 667, Hobbs, New Mexico

Humble Oil & Refining Co., P. O. Box 2347, Hobbs, New Mexico

Union Texas Petroleum Corp., P. O. Box 196, Midland, Texas

Skelly Oil Company, P. O. Box 38, Hobbs, New Mexico

Richmond Drilling Co., P. O. Box 1547, Midland, Texas

6. Were all operators listed in Item 5 above notified and furnished a copy of this application? YES X NO _____. If answer is yes, give date of such notification _____.

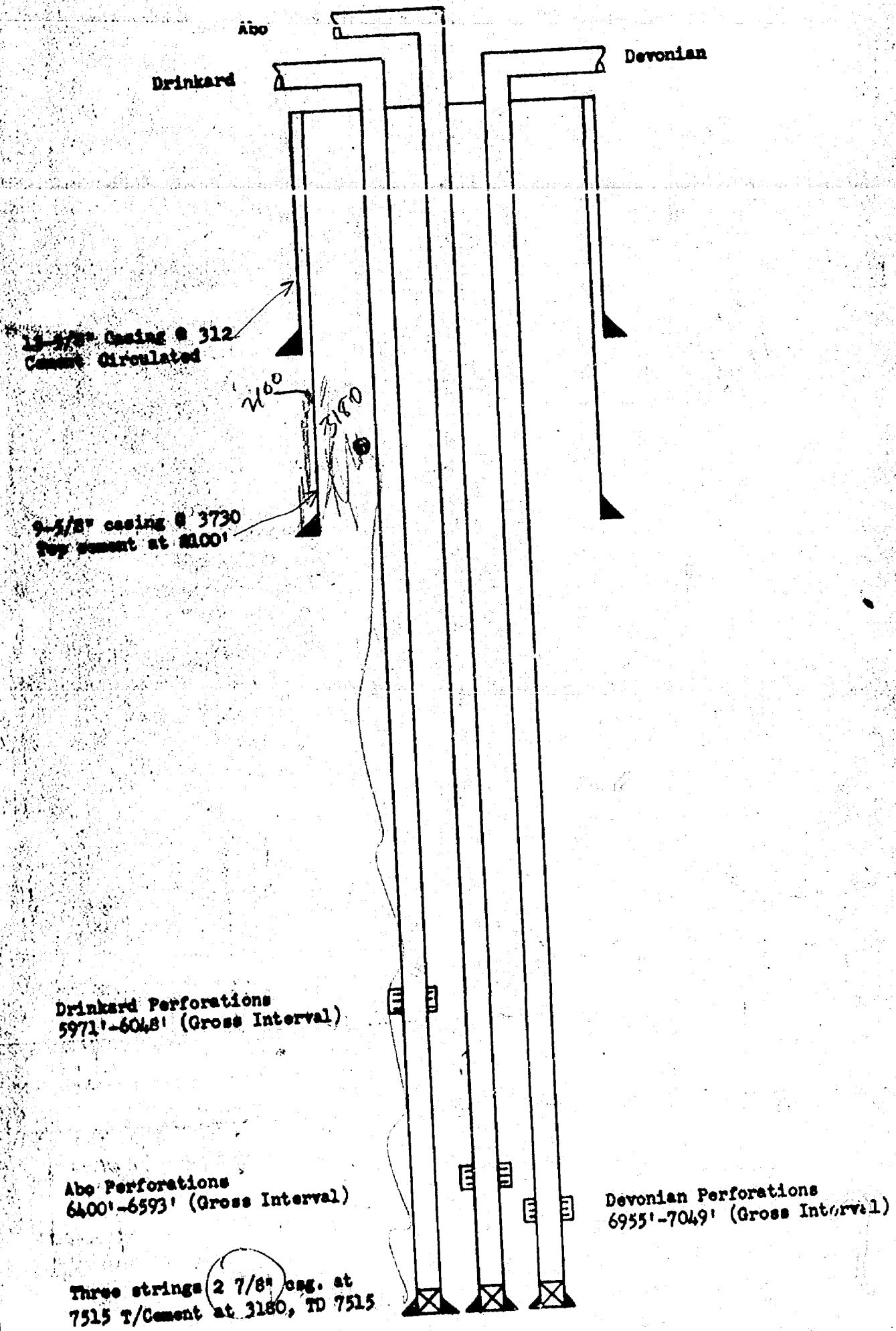
CERTIFICATE: I, the undersigned, state that I am the Division Superintendent of the Continental Oil Company (company), and that I am authorized by said company to make this report; and that this report was prepared under my supervision and direction and that the facts stated therein are true, correct and complete to the best of my knowledge.

Signature

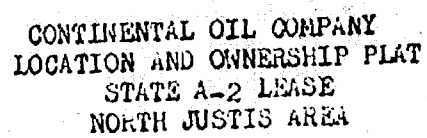
- * Should waivers from all offset operators not accompany an application for administrative approval, the New Mexico Oil Conservation Commission will hold the application for a period of twenty (20) days from date of receipt by the Commission's Santa Fe office. If, after said twenty-day period, no protest nor request for hearing is received by the Santa Fe office, the application will then be processed.
- NOTE: If the proposed multiple completion will result in an unorthodox well location and/or a non-standard perforation unit in either or both of the producing zones, then separate application for approval of the same should be filed simultaneously with this application.

NMOCC-4, HGD, JWK, JRP, File

CONTINENTAL OIL COMPANY
 PROPOSED METHOD OF TRIPLE COMPLETION
 (Tablingless)
 STATE A-2 NO. 2
 NORTH JUSTIS FIELD



R-37-E



Scale: 1" = 2000'
Date: 6-11-62

Exhibit No. 1

LEA DEVONIAN POOL
WELL COST DATA

	DRILLING COST \$	COMPLETION COST \$	DRILLING AND COMPLETION COST \$	SURFACE EQUIPMENT COST \$	GRAND TOTAL \$
Well No. 1	396,096	261,315	657,411	39,740	697,151
Well No. 2	374,201	187,371	541,572	22,840	564,412
Well No. 4	366,761	148,545	515,306	5,981	521,287
Well No. 5	368,523	190,931	559,454	5,948	565,403
Well No. 6	<u>305,286</u>	<u>185,667</u>	<u>490,953</u>	<u>12,113</u>	<u>503,066</u>
TOTAL	1,790,867	973,829	2,764,696	86,622	2,851,319
Average Per Well	358,173	194,766	552,939	17,324	570,264
Average Per Well Excluding #1	348,693	178,129	526,821	11,721	538,542
Estimated Cost to Dual			<u>25,000</u>		
Estimated Cost Per Devonian Well			\$ 501,821		
Number of Devonian Wells to Date			<u>7</u>		
Approximate Total Devonian Well Costs to Date			\$3,512,747		

NMOCC Case No. 2118 & 2459
Marathon Exhibit No. 7
Date 12-19-62

2.2
565 800
730
700

34
273.4
3
9
1035
3
5714.4

160
2 NVA
36
10.33
36

619
309
37
714
1264
4978
4724

800
1264
4978
4724

LEA DEVONIAN POOL
SHUT-IN BOTTOM HOLE PRESSURES
POOL DATUM -10,744'

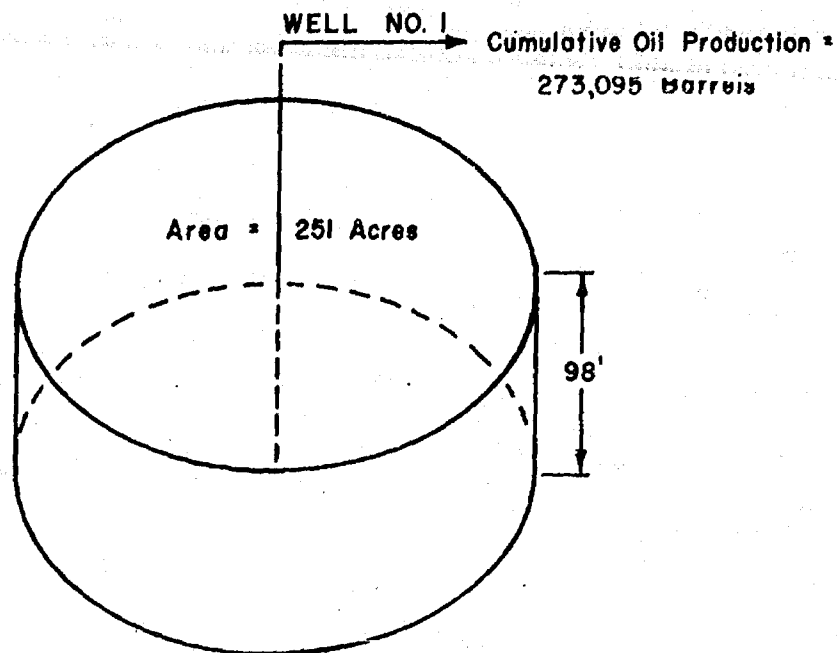
DATE	WELL NO. 1		WELL NO. 2		WELL NO. 4		WELL NO. 5		WELL NO. 6		WELL NO. 9	
	SI Time (Hours)	BHP (psi)	SI Time (Hours)	BHP (psi)	SI Time (Hours)	BHP (psi)	SI Time (Hours)	BHP (psi)	SI Time (Hours)	BHP (psi)	SI Time (Hours)	BHP (psi)
7-15-60	161	6046										
8-15-60	65	6054										
10-13-60	23	6057										
4-13-61			28	6089								
4-26-61					36	6091						
4-27-61	37	6065	36	6073								
5- 1-61	133	6072	71	6065								
5-12-61					456	6087						
5-23-61	648	6028			672	6096						
8-21-61							26	6016				
10-2-61	264	6069	53	6082	53	6085						
10-6-61	363	6058										
12-6-61							24	5963	93	6065		
2-13-62	24	6036	27	6044			24	6046	29	6065		
5- 2-62	46	6036	48	6044	47	6033	53	6033	27	6060		
7-11-62											22	6014
8- 2-62	23	6025	24	6038	26	6041	28	6005	26	6033	29	6038
11-7-62	24	6019	28	6024	27	6031	27	5997	25	6024	28	6015

NMOC Case No. 2118 & 2458

Marathon Exhibit No. 5

Date 12-19-62

PRESSURE DECLINE CALCULATED FOR LEA UNIT NO. 1
FROM
JULY, 1960 TO NOVEMBER, 1962
BASED ON MAXIMUM RADIAL DRAINAGE OF 251 ACRES



$$\text{Pressure Decline} = \frac{N_p}{c_e N} \times \frac{B_o}{B_{oi}}$$

$$\text{Pressure Decline} = \frac{273,095}{(23.2 \times 10^{-6})(5.04 \times 10^6)} \times \frac{1.241}{1.185}$$

$$\text{Pressure Decline} = \frac{338,911}{139}$$

$$\text{Pressure Decline} = 2438 \text{ psi}$$

Measured Pressure Decline from July, 1960
to November, 1962 = 27 psi

NMOCC Case No. 2118 & 2459
Marathon Exhibit No. 161
Date 12-19-62

The Material Balance for an oil reservoir producing when the reservoir pressure is above the bubble point pressure of the reservoir fluid is given by the following equation:

$$NB_{oi} c_e \Delta p = N_p B_o - W_e + B_w W_p$$

where:

N = original oil in place

N_p = cumulative oil production

B_o = oil formation volume factor

W_e = cumulative water influx

B_w = water formation volume factor

W_p = cumulative water production

Δp = reservoir pressure decline

B_{oi} = initial oil formation volume factor

c_e = effective fluid compressibility

$$c_e = \frac{S_o c_o + S_w c_w + c_f}{S_o}$$

S_o = oil saturation

c_o = oil compressibility

S_w = water saturation

c_w = water compressibility

c_f = formation or rock compressibility

For a volumetric reservoir $W_e = 0$ and $W_p = 0$ and the above equation reduces to:

$$NB_{oi} c_e \Delta p = N_p B_o$$

The reservoir pressure decline at any time is thus given by the following expression:

$$\Delta p = \frac{N_p}{c_e N} \times \frac{B_o}{B_{oi}}$$

Basic Data for Lea Unit No. 1:

Porosity (ϕ)	= 5.49%
Water Saturation (S_w)	= 43%
Net Pay. (h)	= 98 feet
Area (A)	= 251 acres
Initial Formation Volume Factor (B_{oi})	= 1.185
Oil Compressibility (c_o)	= 9.99×10^{-6} vol/vol/psi
Water Compressibility (c_w)	= 3.00×10^{-6} vol/vol/psi
Rock Compressibility (c_f)	= 6.25×10^{-6} vol/vol/psi

Original Oil in Place in 251 Acres Surrounding Lea Unit No. 1

$$N = \frac{7758 Ah \phi (1 - S_w)}{B_{oi}}$$

$$N = \frac{(7758)(251)(98)(0.0549)(0.57)}{1.185}$$

$$N = 5,040,000 \text{ bbls. of stock tank oil}$$

Effective Fluid Compressibility

$$c_e = \frac{S_o c_o + S_w c_w + c_f}{S_o}$$

$$c_e = \frac{[(0.57)(9.99) + (0.43)(3.0) + (6.25)] 10^{-6}}{(0.57)}$$

$$c_e = 23.2 \times 10^{-6} \text{ vol/vol/psi}$$

Gulf Oil Corporation

ROSWELL PRODUCTION DISTRICT

P. O. Drawer 1938
Roswell, New Mexico

W. B. Hopkins
DISTRICT MANAGER
F. O. Mortlock
DISTRICT EXPLORATION
MANAGER
M. I. Taylor
DISTRICT PRODUCTION
MANAGER
C. Vivian
DISTRICT SERVICES MANAGER

December 17, 1962

Oil Conservation Commission
State of New Mexico
Post Office Box 871
Santa Fe, New Mexico

Attention: Mr. A. L. Porter, Jr.

Gentlemen:

Reference is made to the application of Marathon Oil Company
in Cases No. 2118 and 2459 Consolidated (Re-opened) scheduled for hearing
on December 19, 1962.

Gulf Oil Corporation is a Working Interest Owner in the Lea
Unit and has other acreage in the vicinity. It is recommended that 160-
acre spacing be adopted in the Lea-Devonian Pool on a permanent basis
with an allowable assigned consistent with such spacing. It is further
recommended that the allowable be based on a proportional factor of no
less than 12.33.

Yours very truly,

W. B. Hopkins
W. B. Hopkins

JHH:sz

cc: Mr. J. O. Terrell Couch
La Fonda Hotel
Santa Fe, New Mexico



LEA DEVONIAN POOL

PERTINENT DATA

1. Location of Field:

Approximately 14 miles west-southwest of Monument, New Mexico,
Section 12, T-20-S, R-34-E, Lea County

2. Completion Data Lea Unit Well No. 1:

a.	Formation	Devonian
b.	Total Depth	14,735
c.	Top of Devonian	14,285 (-10,611)
d.	Top of Devonian Pay	14,349 (-10,675)
e.	Completion Data	7-8-60
f.	Perforated Interval	14,347-375 14,393-489
g.	Treatment	500 gal MA 4,000 gal Acid
h.	Initial Potential Test	
	(1) Potential (BOPD)	516
	(2) Choke Size (in.)	8/64
	(3) GOR (CF/B)	321
	(4) Casing Pressure (psig)	pk.
	(5) Tubing Pressure (psig)	1570

3. Reservoir Fluid Characteristics:

a.	Saturation Pressure (bubble point)	567 psi @ 202°F
b.	Formation Volume Factor @ Original Pressure	1.185
c.	Solution Gas Oil Ratio (CF/B)	318
d.	Oil Viscosity @ Original Pressure (cp)	0.310
e.	Oil Gravity (°API @ 60°F)	58.2

4. Reservoir Characteristics:

a.	Porosity (%)	4.7
b.	Permeability (md)	9.6 and greater
c.	Water Saturation (%)	30.0 est.
d.	New Pay (ft.)	98
e.	Reservoir Temperature (°F)	202
f.	Original Reservoir Pressure (psig)	6046 @ -10,744
g.	Probable Reservoir Mechanism	Water Drive

NMOCC Case No. 2118

Ohio Exhibit No. 2

Date Nov 16

BEFORE THE
OIL CONS. COMMISSION
SANTA FE, N.M.
CASE 2118

BEFORE THE OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

IN THE MATTER OF THE ESTABLISH-)
MENT OF POOL RULES FOR THE LEA-)
DEVONIAN POOL SITUATED IN SECTIONS) No. 2118
11 and 12, TOWNSHIP 20 SOUTH, RANGE)
34 EAST, N.M.P.M., LEA COUNTY, NEW)
MEXICO.)

ENTRY OF APPEARANCE

The undersigned, Atwood & Malone of Roswell, New Mexico,
a firm of attorneys all of whose members are duly licensed to prac-
tice law in the State of New Mexico, hereby enters its appearance as
co-counsel with J. O. Terrell Couch, Esquire, Houston, Texas, for
The Ohio Oil Company, Petitioner in the above styled and numbered
case.

ATWOOD & MALONE

Roswell, New Mexico
November 28, 1961

By *Allen L. Malone*
Post Office Drawer 700
Roswell, New Mexico

No. 34-61

DOCKET: REGULAR HEARING - WEDNESDAY - DECEMBER 13, 1961

OIL CONSERVATION COMMISSION - 9 A.M., MORGAN HALL, STATE LAND OFFICE
BUILDING, SANTA FE, NEW MEXICO

- ALLOWABLE:
- (1) Consideration of the oil allowable for January, 1962.
 - (2) Consideration of the allowable production of gas for January, 1962, for ten prorated pools in Lea and Eddy Counties, New Mexico. Consideration of the allowable production of gas for nine prorated pools in San Juan, Rio Arriba and Sandoval Counties, New Mexico, for January, 1962, and also presentation of purchasers' nominations for the six-month period beginning February 1, 1962, for that area.

CASE 2460: Southeastern New Mexico nomenclature case calling for an order creating new pools and extending and abolishing certain existing pools in Eddy, Lea, Chaves and Roosevelt Counties, New Mexico.

- (a) Create a new oil pool for Delaware production, designated as the Cruz-Delaware Pool, and described as:

TOWNSHIP 23 SOUTH, RANGE 33 EAST, NMPM
Section 19: SW/4

- (b) Create a new oil pool for Wolfcamp production, designated as the South Knowles-Wolfcamp Pool, and described as:

TOWNSHIP 17 SOUTH, RANGE 38 EAST, NMPM
Section 21: SE/4

- (c) Abolish the Angell-Seven Rivers Pool described as:

TOWNSHIP 19 SOUTH, RANGE 28 EAST, NMPM
Section 28: NE/4

- (d) Extend the South Bitter Lake-San Andres Pool, to include:

TOWNSHIP 10 SOUTH, RANGE 25 EAST, NMPM
Section 26: W/2 NW/4

- (e) Extend the Dollarhide-Queen Pool, to include:
TOWNSHIP 24 SOUTH, RANGE 38 EAST, NMPM
Section 18: S/2 SW/4
- (f) Extend the Empire-Abo Pool, to include:
TOWNSHIP 17 SOUTH, RANGE 29 EAST, NMPM
Section 30: W/2 SE/4
- (g) Extend the Eumont Gas Pool, to include:
TOWNSHIP 21 SOUTH, RANGE 37 EAST, NMPM
Section 16: NW/4
- (h) Extend the Justis-Blinebry Pool, to include:
TOWNSHIP 25 SOUTH, RANGE 38 EAST, NMPM
Section 19: NW/4
- (i) Extend the Medicine Rock-Devonian Pool, to include:
TOWNSHIP 15 SOUTH, RANGE 38 EAST, NMPM
Section 22: SE/4
- (j) Extend the East Millman-Seven Rivers Pool, to include:
TOWNSHIP 19 SOUTH, RANGE 28 EAST, NMPM
Section 21: S/2
Section 28: NW/4
Section 29: NE/4
- (k) Extend the East Millman Queen-Grayburg Pool, to include:
TOWNSHIP 19 SOUTH, RANGE 28 EAST, NMPM
Section 12: SW/4 NW/4
- (l) Extend the Pearl-Queen Pool, to include:
TOWNSHIP 19 SOUTH, RANGE 35 EAST, NMPM
Section 23: W/2
- (m) Extend the South Prairie-Pennsylvanian Pool, to include:

TOWNSHIP 8 SOUTH, RANGE 36 EAST, NMPM

Section 17: SW/4

- (n) Extend the North San Simon-Yates Pool, to include:

TOWNSHIP 21 SOUTH, RANGE 35 EAST, NMPM

Section 33: N/2 SW/4

- (o) Extend The Shoe Bar-Pennsylvanian Pool, to include:

TOWNSHIP 16 SOUTH, RANGE 35 EAST, NMPM

Section 26: NW/4

- (p) Extend the Skaggs-Glorieta Pool, to include:

TOWNSHIP 20 SOUTH, RANGE 37 EAST, NMPM

Section 12: SW/4

CASE 2461:

Northwestern New Mexico nomenclature case calling for an order extending existing pools in Rio Arriba and San Juan Counties, New Mexico and deleting a portion of a pool in McKinley County.

- (a) Contract the Red Mountain-Mesaverde Oil Pool to include:

TOWNSHIP 20 NORTH, RANGE 9 WEST, NMPM

Section 21: All

Section 28: All

- (b) Extend the Blanco-Pictured Cliffs Pool to include:

TOWNSHIP 29 NORTH, RANGE 8 WEST, NMPM

Section 5: NW/4

Section 6: N/2

- (c) Extend the South Blanco-Pictured Cliffs Pool to include:

TOWNSHIP 23 NORTH, RANGE 1 WEST, NMPM

Section 5: All

TOWNSHIP 24 NORTH, RANGE 1 WEST, NMPM

All of sections 19 thru 22 inclusive

Section 26: W/2

All of sections 27 thru 30 inclusive

Section 32: All
Section 33: N/2
Section 34: All

TOWNSHIP 27 NORTH, RANGE 5 WEST, NMPM
Section 33: E/2

- (d) Extend the Tapacito-Pictured Pool to include:

TOWNSHIP 27 NORTH, RANGE 5 WEST, NMPM
Section 17: W/2

- (e) Extend the Blanco-Mesaverde Pool to include:

TOWNSHIP 30 NORTH, RANGE 12 WEST, NMPM
Section 1: All
Section 12: All

TOWNSHIP 31 NORTH, RANGE 5 WEST, NMPM
All of partial sections 5 and 6

- (f) Extend the Bisti-Lower Gallup Oil Pool to include:

TOWNSHIP 26 NORTH, RANGE 13 WEST, NMPM
Section 29: S/2 NW/4, SW/4 NE/4, & N/2 SW/4

- (g) Extend the Cha Cha-Gallup Oil Pool to include:

TOWNSHIP 28 NORTH, RANGE 13 WEST, NMPM
Section 14: W/2 SW/4
Section 23: SE/4

TOWNSHIP 29 NORTH, RANGE 14 WEST, NMPM
Section 16: SE/4

- (h) Extend the Devils Fork-Gallup Pool to include:

TOWNSHIP 24 NORTH, RANGE 6 WEST, NMPM
Section 7: W/2 NW/4 & N/2 SW/4

- (i) Extend the Totah-Gallup Oil Pool to include:

TOWNSHIP 29 NORTH, RANGE 14 WEST, NMPM
Section 14: N/2

CASE 2118: (Reopened)

In the matter of the application of The Ohio Oil Company for the establishment of 80-acre oil proration units in the Lea-Devonian Pool, Lea County, New Mexico. Case No. 2118 will be reopened pursuant to Order No. R-1826 to permit the applicant and other interested parties to appear and show cause why the Lea-Devonian Pool should not be developed on 40-acre proration units.

CASE 2459:

Application of The Ohio Oil Company for 160-acre spacing, Lea Devonian Pool, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order requiring 160-acre proration units and 160-acre spacing for the Lea-Devonian Pool, Lea County, New Mexico. Applicant further seeks the establishment of special rules for said pool which would include an oil allowable factor in excess of the 80-acre allowable factors provided by the statewide rules. Said Lea-Devonian Pool is currently governed by temporary 80 acre rules.

CASE 2119: (Reopened)

In the matter of the application of The Ohio Oil Company for the establishment of 80-acre oil proration units in the Lea-Bone Springs Pool, Lea County, New Mexico. Case No. 2119 will be reopened pursuant to Order No. R-1827 to permit the applicant and other interested parties to appear and show cause why the Lea-Bone Springs Pool should not be developed on 40-acre proration units.

ATWOOD & MALONE
LAWYERS

JEFF D. ATWOOD (1883-1960)
ROSS L. MALONE
CHARLES F. MALONE
RUSSELL D. MANN
PAUL A. COOTER
BOB F. TURNER

P. O. DRAWER 700
TELEPHONE MAIN 2-6221
ROSWELL PETROLEUM BUILDING
ROSWELL, NEW MEXICO

November 28, 1961

New Mexico Oil Conservation Commission
State Land Office Building
Post Office Box 871
Santa Fe, New Mexico

Re: Docket of December 13, 1961
Cases No. 2118, 2119 and 2459.

Gentlemen:

As local counsel for The Ohio Oil Company, we enclose here-
with our Entries of Appearance as co-counsel with J. O. Ter-
rell Couch, Esquire, in the three matters referred to above
relating to pool rules for the Lea-Devonian and Lea-Bone
Springs pools.

Very truly yours,

Ross L. Malone
for ATWOOD & MALONE

RLM:ps
encl.

cc: J. O. Terrell Couch, Esq.
Division Attorney
P. O. Box 3128
Houston 1, Texas

RELATIONSHIP OF TOTAL DAILY WITHDRAWALS
LEA DEVONIAN POOL

40-ACRE SPACING VS. 80-ACRE SPACING VS. 160-ACRE SPACING

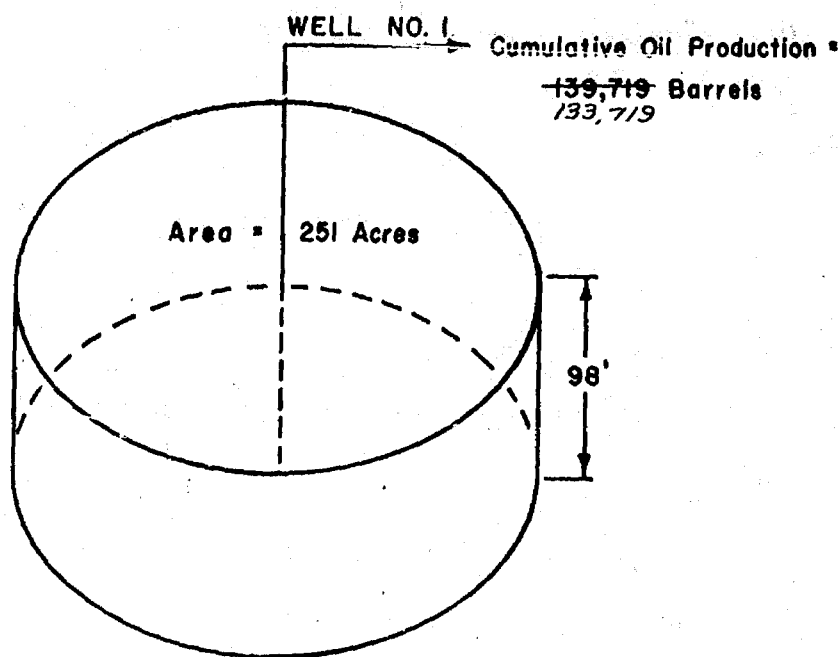
Normal Unit Allowable = 34 BOPD

Spacing	(Acres)	<u>40</u>	<u>80</u>	<u>160</u>
Allowable Factor 14-15,000'		9.33	10.33	15.50
Top Well Allowable (BOPD)		318	352	527
No. of Wells		57	29	15
Top Field Allowable (BOPD)		18,126	10,208	7,905

NMOCC Case No. 2118 & 2459
Ohio Exhibit No. 13
Date 12-13-61

PRESSURE DECLINE CALCULATED FOR LEA UNIT NO. 1 TO
OCTOBER 1, 1961, BASED ON MAXIMUM RADIAL
DRAINAGE OF 251 ACRES

Should 1153 PSI
 12 PSI increase



$$\text{Pressure Decline} = \frac{N_p}{c_e N} \times \frac{B_o}{B_{oi}}$$

$$\text{Pressure Decline} = \frac{133,719}{(23.2 \times 10^{-6})(5.04 \times 10^6)} \times \frac{1.198}{1.185}$$

$$\text{Pressure Decline} = \frac{160,195}{139}$$

$$\text{Pressure Decline} = 1153 \text{ psi}$$

Measured Pressure Change to October 1, 1961 = 12 psi increase

NMOCO Case No. 2118 & 2459
 Ohio Exhibit No. 11
 Date 12-13-61

The Material Balance for an oil reservoir producing when the reservoir pressure is above the bubble point pressure of the reservoir fluid is given by the following equation:

$$NB_{oi} c_e \Delta p = N_p B_o - W_e + B_w W_p$$

where:

N = original oil in place

N_p = cumulative oil production

B_o = oil formation volume factor

W_e = cumulative water influx

B_w = water formation volume factor

W_p = cumulative water production

Δp = reservoir pressure decline

B_{oi} = initial oil formation volume factor

c_e = effective fluid compressibility

$$c_e = \frac{S_o c_o + S_w c_w + c_f}{S_o}$$

S_o = oil saturation

c_o = oil compressibility

S_w = water saturation

c_w = water compressibility

c_f = formation or rock compressibility

For a volumetric reservoir $W_e = 0$ and $W_p = 0$ and the above equation reduces to:

$$NB_{oi} c_e \Delta p = N_p B_o$$

The reservoir pressure decline at any time is thus given by the following expression:

$$\Delta p = \frac{N_p}{c_e N} \times \frac{B_o}{B_{oi}}$$

Basic Data for Lea Unit No. 1:

Porosity (ϕ)	= 5.49%
Water Saturation (S_w)	= 0.57
Net Pay (h)	= 98 feet
Area (A)	= 251 acres
Initial Formation Volume Factor (B_{oi})	= 1.185
Oil Compressibility (c_o)	= 9.99×10^{-6} vol/vol/psi
Water Compressibility (c_w)	= 3.00×10^{-6} vol/vol/psi
Rock Compressibility (c_f)	= 6.25×10^{-6} vol/vol/psi

Original Oil in Place in 251 Acres Surrounding Lea Unit No. 1

$$N = \frac{7758 Ah \phi (1 - S_w)}{B_{oi}}$$

$$N = \frac{(7758)(251)(98)(0.0549)(0.57)}{1.185}$$

$$N = 5,040,000 \text{ bbls. of stock tank oil}$$

Effective Fluid Compressibility

$$c_e = \frac{S_o c_o + S_w c_w + c_f}{S_o}$$

$$c_e = \frac{[(0.57)(9.99) + (0.43)(3.0) + (6.25)] 10^{-6}}{(0.57)}$$

$$c_e = 23.2 \times 10^{-6} \text{ vol/vol/psi}$$

COMPARATIVE ECONOMICS
FOR DEVELOPMENT OF
LEA DEVONIAN POOL

40-ACRE SPACING VS. 80-ACRE SPACING VS. 160-ACRE SPACING

Proposed Participating Area

Wells Required with 40-Acre Spacing
Wells Required with 80-Acre Spacing
Wells Required with 160-Acre Spacing

2280 Acres

57 Wells
29 Wells
15 Wells

Investment @ \$510,000 per Well

For 40-Acre Spacing (57 Wells)
For 80-Acre Spacing (29 Wells)
For 160-Acre Spacing (15 Wells)

\$29,070,000
\$14,790,000
\$ 7,650,000

Ultimate Reserves

Oil
Gas @ 300 cu. ft. per bbl.

15,180,240 bbls.
4,554,072 MCF

W.I. Net Operating Income Per Gross Bbl. of Oil
Produced Including Income From Gas Produced With Oil

Value
Bbl. of oil
300 cu. ft. of gas
Total Gross Value

\$2.81
.06
\$2.87

Costs
Severance & Ad valorem Taxes
Royalty
Lifting Costs

\$0.20
0.36
0.25

\$0.81

\$2.06

Net Operating Income Per Gross Bbl.

W.I. Total Net Operating Income
15,180,240 x \$2.06/bbl.

\$31,271,294

\$ 2,201,294

Net Profit for 40-Acre Spacing
Net Profit per Well
Profit to Investment Ratio

\$38,619

0.08 to 1

\$16,481,294

Net Profit for 80-Acre Spacing
Net Profit per Well
Profit to Investment Ratio

\$568,320

1.11 to 1

\$23,621,294

Net Profit for 160-Acre Spacing
Net Profit per Well
Profit to Investment Ratio

\$1,574,753

3.09 to 1

NMOCC Case No. 2118 & 2254
Ohio Exhibit No. 10
Date 12-13-61

RECOVERABLE OIL RESERVES

LEA DEVONIAN POOL

Basic Data

Net Pay	=	65 feet
Porosity	=	5.49% (Core Analysis)
Water Saturation	=	43% (Capillary Pressure Tests)
Formation Volume Factor	=	1.185 (Fluid Analysis)
Recovery Factor	=	50% (Estimated)

Volumetric Calculation

7758 Bbl/acre-ft. x Porosity x (1-Water Saturation) x Net Pay x Recovery Factor
Formation Volume Factor

$$\frac{(7758)(0.0549)(0.57)(65)(0.50)}{1.185} = 6,658 \text{ bbls/acre}$$

NMOCC Case No. 2118 & 2459
Ohio Exhibit No. 9
Date 12-13-61

NEW MEXICO
OIL CONSERVATION COMMISSION
P. O. BOX 871
SANTA FE, NEW MEXICO

MEMORANDUM

TO: ALL PERSONS INTERESTED IN CASE NO. 2504, APPLICATION
OF CONSOLIDATED OIL & GAS, INC. FOR AN AMENDMENT OF
ORDER NO. R-1670-C CHANGING THE ALLOCATION FORMULA
FOR THE BASIN-DAKOTA GAS POOL

FROM: A. L. PORTER, Jr., SECRETARY-DIRECTOR

SUBJECT: COMPLIANCE WITH RULING ON MOTIONS TO QUASH SUBPOENAS
DUCES TECUM AND CONTINUANCE OF CASE NO. 2504

The Commission has decided to continue Case No. 2504 to the regular hearing on February 14, 1963. The Commission will therefore allow all persons ordered to produce core analysis reports and electric and radioactivity logs to file the same with the Commission prior to December 19, 1962, in lieu of producing the required documents at the December 19th hearing. All persons ordered to produce documents will be required to do so at the December 19th hearing if they have not previously filed the same with the Commission. The case will then be continued to the Regular Commission Hearing on February 14, 1963.

DECEMBER 5, 1962

ir/

No. 37-62

DOCKET: REGULAR HEARING - WEDNESDAY - DECEMBER 19, 1962

OIL CONSERVATION COMMISSION - 9 A.M., MORGAN HALL, STATE LAND OFFICE
BUILDING, SANTA FE, NEW MEXICO

- ALLOWABLE: (1) Consideration of the oil allowable for January, 1963.
- (2) Consideration of the allowable production of gas for January, 1963, for ten prorated pools in Lea and Eddy Counties, New Mexico. Consideration of the allowable production of gas for nine prorated pools in San Juan, Rio Arriba and Sandoval Counties, New Mexico, for January, 1963, and also presentation of purchaser's nominations for the six-month period beginning February 1, 1963, for that area.

CASE 2628:

(De Novo)

Application of Marathon Oil Company for an unorthodox gas well location, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval of an unorthodox gas well location in the Atoka-Pennsylvanian Gas Pool at a point 990 feet from the North line and 990 feet from the East line of Section 30, Township 18 South, Range 26 East, Eddy County, New Mexico. This case will be heard de novo under the provisions of Rule 1220.

CASE 2118:)

Consolidated (Reopened)

2459:)

Application of The Ohio Oil Company (now Marathon Oil Company) for 160-acre proration units in the Lea-Devonian Pool, Lea County, New Mexico.

CASE 2721:

Application of Continental Oil Company for a triple completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks authority to complete its State A-2 Well No. 2, located in Unit J of Section 2, Township 25 South, Range 37 East, Lea County, New Mexico, as a triple completion (tubingless) to produce oil from the North Justis Tubb-Drinkard Pool, an undesignated Abo Pool, and the North Justis-Devonian Pool through parallel strings of casing cemented in a common well bore.

CASE 2504:

(Rehearing - Continued)

Application of Consolidated Oil & Gas, Inc. for an amendment of Order No. R-1670-C changing the allocation formula for the Basin-Dakota Gas Pool, San Juan, Rio Arriba, and Sandoval Counties, New Mexico. In accordance with the Commission's Ruling of October 18, 1962, on motions to Quash Subpoenas

Duces Tecum, George Eaton, David H. Rainey, Frank Renard, and L. M. Stevens will be required to produce all core analysis reports and all electric and radioactivity logs concerning any and all wells that have been cored in the Basin-Dakota Gas Pool by their respective companies, if they have not filed the same with the Commission prior to December 19, 1962. The Case will then be continued to the regular hearing on February 14, 1963.

CASE 2722: Southeastern New Mexico nomenclature case calling for an order creating new pools and extending certain existing pools in Chaves, Eddy, Lea and Roosevelt Counties, New Mexico.

(a) Create a new pool in Chaves County, New Mexico, classified as an oil pool for San Andres production, designated as the Diablo-San Andres Pool, and described as:

TOWNSHIP 10 SOUTH, RANGE 27 EAST, NMPM
Section 16: SE/4

(b) Create a new oil pool for Wolfcamp production, designated as the South Anderson-Wolfcamp Pool, and described as:

TOWNSHIP 16 SOUTH, RANGE 32 EAST, NMPM
Section 23: NW/4

(c) Create a new gas pool for Wolfcamp production, designated as the Big Eddy-Wolfcamp Gas Pool, and described as:

TOWNSHIP 20 SOUTH, RANGE 31 EAST, NMPM
Section 3: SE/4

(d) Create a new oil pool, for San Andres production, designated as the South Prairie-San Andres Pool, and described as:

TOWNSHIP 8 SOUTH, RANGE 36 EAST, NMPM
Section 16: SE/4

(e) Extend the Allison-Pennsylvanian Pool to include:

TOWNSHIP 8 SOUTH, RANGE 37 EAST, NMPM
Section 33: E/2 SE/4

(f) Extend the West Anderson Ranch-Grayburg Pool to include:

TOWNSHIP 16 SOUTH, RANGE 32 EAST, NMPM
Section 5: SW/4
Section 6: S/2

- (g) Extend the Arkansas Junction-Queen Gas Pool to include:

TOWNSHIP 18 SOUTH, RANGE 36 EAST, NMPM
Section 23: NE/4

- (h) Extend the Blinebry Pool to include:

TOWNSHIP 21 SOUTH, RANGE 37 EAST, NMPM
Section 19: W/2 SW/4

- (i) Extend the Brushy Draw-Delaware Pool to include:

TOWNSHIP 26 SOUTH, RANGE 29 EAST, NMPM
Section 14: E/2 SE/4

- (j) Extend the Corbin-Abo Pool to include:

TOWNSHIP 18 SOUTH, RANGE 33 EAST, NMPM
Section 2: NE/4

- (k) Extend the Double A-Abo Pool to include:

TOWNSHIP 17 SOUTH, RANGE 36 EAST, NMPM
Section 21: NW/4

- (l) Extend the Double X-Delaware Pool to include:

TOWNSHIP 24 SOUTH, RANGE 32 EAST, NMPM
Section 14: SW/4

- (m) Extend the Drinkard Pool to include:

TOWNSHIP 21 SOUTH, RANGE 36 EAST, NMPM
Section 24: E/2 SE/4

TOWNSHIP 21 SOUTH, RANGE 37 EAST, NMPM
Section 2: Lot 10
Section 19: W/2 SW/4

- (n) Extend the West Hume-Queen Pool to include:

TOWNSHIP 16 SOUTH, RANGE 33 EAST, NMPM
Section 15: SE/4

- (o) Extend the South Lane-Pennsylvanian Pool to include:

TOWNSHIP 10 SOUTH, RANGE 33 EAST, NMPM
Section 23: S/2
Section 26: NW/4

- (p) Extend the Loco Hills Pool to include:
TOWNSHIP 18 SOUTH, RANGE 29 EAST, NMPM
Section 19: N/2 SW/4
- (q) Extend the Mesa-Queen Pool to include:
TOWNSHIP 16 SOUTH, RANGE 32 EAST, NMPM
Section 16: NE/4
- (r) Extend the East Millman-Seven Rivers Pool to include:
TOWNSHIP 19 SOUTH, RANGE 28 EAST, NMPM
Section 22: W/2 SW/4
- (s) Extend the Monument-Tubb Pool to include:
TOWNSHIP 20 SOUTH, RANGE 37 EAST, NMPM
Section 22: NW/4
- (t) Extend the Paddock Pool to include:
TOWNSHIP 21 SOUTH, RANGE 37 EAST, NMPM
Section 19: W/2 SW/4
- (u) Extend the Round Tank-San Andres Pool to include:
TOWNSHIP 15 SOUTH, RANGE 28 EAST, NMPM
Section 25: E/2

TOWNSHIP 15 SOUTH, RANGE 29 EAST, NMPM
Section 19: SW/4
- (v) Extend the Salado Draw-Delaware Pool to include:
TOWNSHIP 26 SOUTH, RANGE 33 EAST, NMPM
Section 10: NE/4
- (w) Extend the East Turkey Track-Queen Pool to include:
TOWNSHIP 19 SOUTH, RANGE 29 EAST, NMPM
Section 1: SW/4
- (x) Extend the Vacuum-Abo Pool to include:
TOWNSHIP 17 SOUTH, RANGE 35 EAST, NMPM
Section 26: NW/4 NE/4

TOWNSHIP 18 SOUTH, RANGE 35 EAST, NMPM
Section 7: S/2 SW/4

CASE 2723:

Northwestern New Mexico nomenclature case calling for an order extending certain existing pools in Rio Arriba, San Juan, and Sandoval Counties, New Mexico.

- (a) Extend the Aztec-Pictured Cliffs Pool to include:

TOWNSHIP 30 NORTH, RANGE 10 WEST, NMPM
Section 14: NW/4

- (b) Extend the Ballard-Pictured Cliffs Pool to include:

TOWNSHIP 24 NORTH, RANGE 6 WEST, NMPM
Section 5: All
Section 6: All
Section 7: N/2
Section 8: N/2

TOWNSHIP 25 NORTH, RANGE 6 WEST, NMPM
Section 31: S/2

- (c) Extend the South Blanco-Pictured Cliffs Pool to include:

TOWNSHIP 27 NORTH, RANGE 5 WEST, NMPM
Section 7: E/2

- (d) Extend the Tapacito-Pictured Cliffs Pool to include:

TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM
Section 5: W/2

- (e) Extend the Angels Peak-Gallup Oil Pool to include:

TOWNSHIP 26 NORTH, RANGE 9 WEST, NMPM
Section 4: W/2
Section 5: S/2
Section 6: SE/4

- (f) Extend the Boulder-Mancos Oil Pool to include:

TOWNSHIP 28 NORTH, RANGE 1 West, NMPM
Section 14: W/2 NE/4, NW/4 SE/4
Section 23: W/2 E/2

-6-

Docket No. 37-62

- (g) Extend the Cha Cha-Gallup Oil Pool to include:

TOWNSHIP 28 NORTH, RANGE 12 WEST, NMPM

Section 30: NW/4

TOWNSHIP 29 NORTH, RANGE 14 WEST, NMPM

Section 17: S/2 NW/4 & N/2 SW/4

- (h) Extend the Devils Fork-Gallup Pool to include:

TOWNSHIP 24 NORTH, RANGE 6 WEST, NMPM

Section 7: NE/4

Section 16: E/2 NW/4, W/2 NE/4 & W/2 SW/4

- (i) Extend the Puerto Chiquito-Gallup Oil Pool to include:

TOWNSHIP 27 NORTH, RANGE 1 EAST, NMPM

Section 29: N/2 NW/4

lqg/

GOVERNOR
EDWIN L. MECHEM
CHAIRMAN

State of New Mexico
Oil Conservation Commission

LAND COMMISSIONER
E. S. JOHNNY WALKER
MEMBER



STATE GEOLOGIST
A. L. PORTER, JR.
SECRETARY - DIRECTOR

P. O. BOX 871
SANTA FE

December 21, 1961

Mr. Terrell Couch
The Ohio Oil Company
P. O. Box 3128
Houston 1, Texas

Re: Case No. 2118 & 2459
Order No. _____
Applicant:
The Ohio Oil Company

Dear Sir:

Enclosed herewith are two copies of the above-referenced Commission order recently entered in the subject case.

Very truly yours,

A. L. Porter, Jr.

A. L. PORTER, Jr.
Secretary-Director

ir/

Carbon copy of order also sent to:

Hobbs OCC x

Artesia OCC

Aztec OCC

OTHER C. R. Black - Texaco Inc. ✓

Mr. Bill Kastler, Gulf Oil Corporation ✓

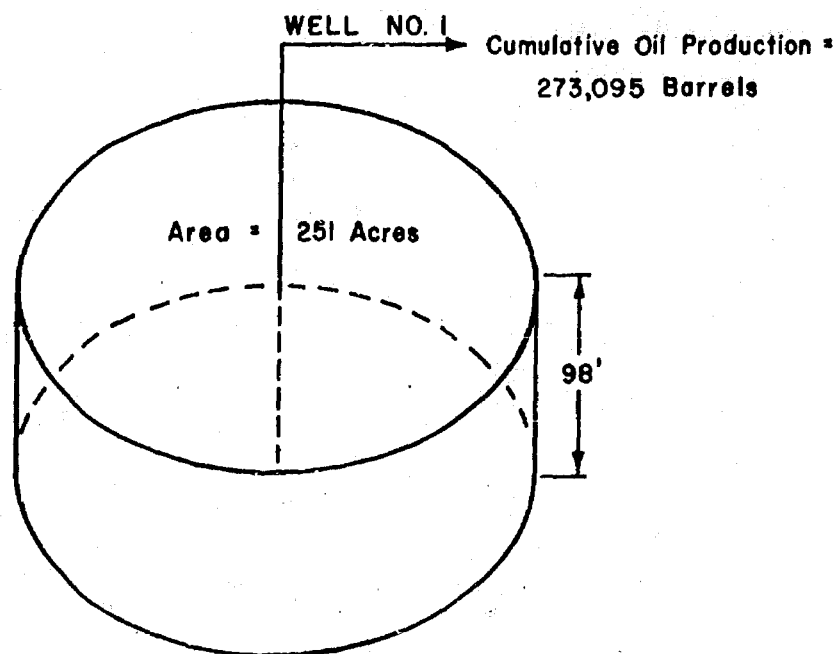
Mr. Joe Mefford, Sinclair Oil & Gas Company ✓

Mr. John Anderson, U. S. G. S. - Roswell ✓

DOCKETED MAILED

Date 12/6/62
JP

PRESSURE DECLINE CALCULATED FOR LEA UNIT NO. 1
FROM
JULY, 1960 TO NOVEMBER, 1962
BASED ON MAXIMUM RADIAL DRAINAGE OF 251 ACRES



$$\text{Pressure Decline} = \frac{N_p}{c_e N} \times \frac{B_o}{B_{oi}}$$

$$\text{Pressure Decline} = \frac{273,095}{(23.2 \times 10^{-6})(5.04 \times 10^6)} \times \frac{1.241}{1.185}$$

$$\text{Pressure Decline} = \frac{338,911}{139}$$

$$\text{Pressure Decline} = 2438 \text{ psi}$$

Measured Pressure Decline from July, 1960
to November, 1962 = 27 psi

NMOCC Case No. 2118 S. 2459
Marathon Exhibit No. 6
Date 12-12-62

The Material Balance for an oil reservoir producing when the reservoir pressure is above the bubble point pressure of the reservoir fluid is given by the following equation:

$$NB_{oi} c_e \Delta p = N_p B_o - W_e + B_w W_p$$

where:

N = original oil in place

N_p = cumulative oil production

B_o = oil formation volume factor

W_e = cumulative water influx

B_w = water formation volume factor

W_p = cumulative water production

Δp = reservoir pressure decline

B_{oi} = initial oil formation volume factor

c_e = effective fluid compressibility

$$c_e = \frac{S_o c_o + S_w c_w + c_f}{S_o}$$

S_o = oil saturation

c_o = oil compressibility

S_w = water saturation

c_w = water compressibility

c_f = formation or rock compressibility

For a volumetric reservoir $W_e = 0$ and $W_p = 0$ and the above equation reduces to:

$$NB_{oi} c_e \Delta p = N_p B_o$$

The reservoir pressure decline at any time is thus given by the following expression:

$$\Delta p = \frac{N_p}{c_e N} \times \frac{B_o}{B_{oi}}$$

Basic Data for Lea Unit No. 1:

Porosity (ϕ)	= 5.49%
Water Saturation (S_w)	= 43%
Net Pay (h)	= 98 feet
Area (A)	= 251 acres
Initial Formation Volume Factor (B_{oi})	= 1.185
Oil Compressibility (c_o)	= 9.99×10^{-6} vol/vol/psi
Water Compressibility (c_w)	= 3.00×10^{-6} vol/vol/psi
Rock Compressibility (c_f)	= 6.25×10^{-6} vol/vol/psi

Original Oil in Place in 251 Acres Surrounding Lea Unit No. 1

$$N = \frac{7758 Ah \phi (1 - S_w)}{B_{oi}}$$

$$N = \frac{(7758)(251)(98)(0.0549)(0.57)}{1.185}$$

$$N = 5,040,000 \text{ bbls. of stock tank oil}$$

Effective Fluid Compressibility

$$c_e = \frac{S_o c_o + S_w c_w + c_f}{S_o}$$

$$c_e = \frac{[(0.57)(9.99) + (0.43)(3.0) + (6.25)] 10^{-6}}{(0.57)}$$

$$c_e = 23.2 \times 10^{-6} \text{ vol/vol/psi}$$

LEA DEVONIAN POOL

WELL COST DATA

	DRILLING COST \$	COMPLETION COST \$	DRILLING AND COMPLETION COST \$	SURFACE EQUIPMENT COST \$	GRAND TOTAL \$
Well No. 1	396,096	261,315	657,411	39,740	697,151
Well No. 2	354,201	187,371	541,572	22,840	564,412
Well No. 4	366,761	148,545	515,306	5,981	521,287
Well No. 5	368,523	190,931	559,454	5,948	565,403
Well No. 6	<u>305,286</u>	<u>185,667</u>	<u>490,953</u>	<u>12,113</u>	<u>503,066</u>
TOTAL	1,790,867	973,829	2,764,696	86,622	2,851,319
Average Per Well	358,173	194,766	552,939	17,324	570,264
Average Per Well Excluding #1	348,693	178,129	526,821	11,721	538,542
Estimated Cost to Dual			<u>25,000</u>		
Estimated Cost Per Devonian Well			\$ 501,821		
Number of Devonian Wells to Date			<u>7</u>		
Approximate Total Devonian Well Costs to Date			\$3,512,747		

NMOCC Case No. 2118 & 2459
 Marathon Exhibit No. 7
 Date 2-19-62

CLASS OF SERVICE
This is a fast message unless its deferred character is indicated by the proper symbol.

WESTERN UNION TELEGRAM

W. P. MARSHALL, PRESIDENT

SYMBOLS
DL = Day Letter
NL = Night Letter
LT = International Letter Telegram

1201 (4-60)

The filing time shown in the date line on domestic telegrams is LOCAL TIME at point of origin. Time of receipt is LOCAL TIME at point of destination.

LA 167 DB 385

D MDA235 PD=MIDLAND TEX 8 506 P CST=
NEW MEXICO OIL CONSERVATION COMMISSION,
ATTN A L PORTER JR= PO BOX 871 SANTA FE

DOCKET MAILED

REGARDING CASES 2118, 2119, AND 2459 SCHEDULED FOR
HEARING DEC 13TH 1961. SINCLAIR OIL AND GAS COMPANY
CONCURS WITH OHIO OIL COMPANY IN RECOMMENDING 160
ACRE OIL PRORATION UNITS FOR THE LEA DEVONIAN POOL
WITH A TOP ALLOWABLE OF A REGULAR 40 ACRE DEPTH
FACTOR ALLOWABLE PLUS THREE ADDITIONAL UNIT ALLOWABLES.
SINCLAIR ALSO CONCURS WITH OHIO IN RECOMMENDING
CONTINUATION OF 80 ACRE OIL PRORATION UNITS AND 80

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

CLASS OF SERVICE
This is a fast message unless its deferred character is indicated by the proper symbol.

WESTERN UNION TELEGRAM

W. P. MARSHALL, PRESIDENT

1201 (4-00)

SYMBOLS
DL=Day Letter
NL=Night Letter
LT=International Letter Telegram

The filing time shown in the date line on domestic telegrams is LOCAL TIME at point of origin. Time of receipt is LOCAL TIME at point of destination.

ACRE ALLOWABLES FOR THE LEA BONE SPRINGS POOL=
JOE MEFFORD.

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

RECOVERABLE OIL RESERVES

LEA DEVONIAN POOL

Basic Data

Net Pay = 98 feet (Neutron Log)
Porosity = 4.7% (Neutron Log)
Water Saturation = 30% (estimated)
Formation Volume Factor = 1.185 (fluid analysis)
Recovery Factor = 50% (estimated)

Volumetric Calculation

7758 Bbl/acre-foot x Porosity x (1-Water Saturation) x Net Pay x Recovery Factor
Formation Volume Factor

$$\frac{(7758)(0.047)(0.70)(98)(0.50)}{1.185} = 10,554 \text{ bbls/acre}$$

NMOCC Case No. 2118

Ohio Exhibit No. 4

Date 11-16-64

OIL DEPT. BEFORE THE COMMISSION
CASE 2118
Plus 2118

RELATIONSHIP OF TOTAL DAILY WITHDRAWALS
LEA DEVONIAN POOL

40-ACRE SPACING VS. 80-ACRE SPACING VS. 160-ACRE SPACING

Normal Unit Allowable = 34 BOPD

Spacing	(Acres)	<u>40</u>	<u>80</u>	<u>160</u>
Allowable Factor 14-15,000'		9.33	10.33	15.50
Top Well Allowable (BOPD)		318	352	527
No. of Wells		57	29	15
Top Field Allowable (BOPD)		18,126	10,208	7,905

NMOCC Case No. 2118 & 2459
Ohio Exhibit No. 13
Date 12-13-61

COMPARATIVE ECONOMICS
FOR DEVELOPMENT OF
LEA DEVONIAN POOL

40-ACRE SPACING VS. 80-ACRE SPACING

Minimum Area Expected to be Productive	800 Acres
Wells Required with 40 Acre Spacing	20 Wells
Wells Required with 80 Acre Spacing	10 Wells
Investment @ \$471,000 per Well	
For 40 Acre Spacing (20 Wells)	\$ 9,420,000
For 80 Acre Spacing (10 Wells)	\$ 4,710,000
Ultimate Reserves	
Oil	8,443,200 bbls.
Gas @ 300 cu. ft. per bbl.	2,532,960 MCF
W.I. Net Operating Income Per Gross Bbl. of Oil	
Produced Including Income From Gas Produced with Oil	
Value	
Bbl. of oil	\$2.77
300 cu. ft. of gas	.06
Total Gross Value	\$2.83
Costs	
Severance & Advalorem Taxes	\$0.20
Royalty	0.35
Lifting Costs	0.25
	\$0.80
Net Operating Income per gross bbl.	\$2.03
W.I. Total Net Operating Income	
8,443,200 x \$2.03/bbl.	\$17,139,696
Net Profit for 40-Acre Spacing	\$ 7,719,696
Net Profit per Well	\$385,985
Profit to Investment Ratio	0.82 to 1
Net Profit for 80-Acre Spacing	\$12,429,696
Net Profit per Well	\$1,242,970
Profit to Investment Ratio	2.64 to 1

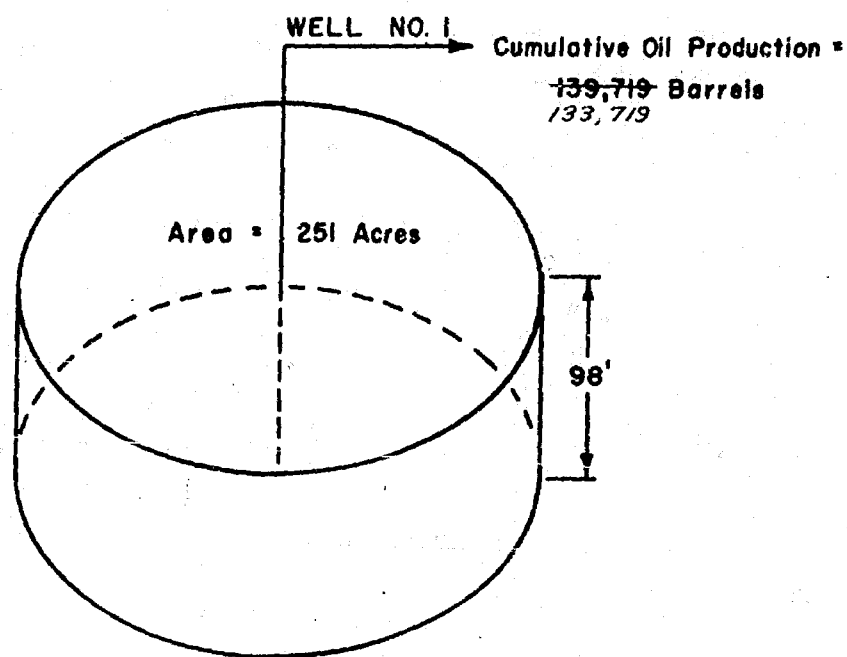
NMOCC Case No. 2118

Ohio Exhibit No. 5

Date 11-16-66

BEFORE THE
OIL CONSERVATION COMMISSION
BEFORE THE SANTA FE, NEW MEXICO
COMMISSION
CASE 2118

PRESSURE DECLINE CALCULATED FOR LEA UNIT NO. 1 TO
OCTOBER 1, 1961, BASED ON MAXIMUM RADIAL
DRAINAGE OF 251 ACRES



$$\text{Pressure Decline} = \frac{N_p}{c_e N} \times \frac{B_o}{B_{oi}}$$

$$\text{Pressure Decline} = \frac{133,719}{(23.2 \times 10^{-6})(5.04 \times 10^6)} \times \frac{1.198}{1.185}$$

$$\text{Pressure Decline} = \frac{160,195}{139}$$

$$\text{Pressure Decline} = 1153 \text{ psi}$$

Measured Pressure Change to October 1, 1961 = 12 psi increase

NMOCO Case No. 21189-2459
 Ohio Exhibit No. 11
 Date 12-13-61

452
 NW 1/4 SE
 1/4 sec 34-11-61

The Material Balance for an oil reservoir producing when the reservoir pressure is above the bubble point pressure of the reservoir fluid is given by the following equation:

$$NB_{oi} c_e \Delta p = N_p B_o - W_e + B_w W_p$$

where:

N = original oil in place

N_p = cumulative oil production

B_o = oil formation volume factor

W_e = cumulative water influx

B_w = water formation volume factor

W_p = cumulative water production

Δp = reservoir pressure decline

B_{oi} = initial oil formation volume factor

c_e = effective fluid compressibility

$$c_e = \frac{S_o c_o + S_w c_w + c_f}{S_o}$$

S_o = oil saturation

c_o = oil compressibility

S_w = water saturation

c_w = water compressibility

c_f = formation or rock compressibility

For a volumetric reservoir $W_e = 0$ and $W_p = 0$ and the above equation reduces to:

$$NB_{oi} c_e \Delta p = N_p B_o$$

The reservoir pressure decline at any time is thus given by the following expression:

$$\Delta p = \frac{N_p}{c_e N} \times \frac{B_o}{B_{oi}}$$

Basic Data for Lea Unit No. 1:

Porosity (ϕ)	= 5.49%
Water Saturation (S_w)	= 43%
Net Pay (h)	= 98 feet
Area (A)	= 251 acres
Initial Formation Volume Factor (B_{oi})	= 1.185
Oil Compressibility (c_o)	= 9.99×10^{-6} vol/vol/psi
Water Compressibility (c_w)	= 3.00×10^{-6} vol/vol/psi
Rock Compressibility (c_f)	= 6.25×10^{-6} vol/vol/psi

Original Oil in Place in 251 Acres Surrounding Lea Unit No. 1

$$N = \frac{7758 Ah \phi (1 - S_w)}{B_{oi}}$$

$$N = \frac{(7758)(251)(98)(0.0549)(0.57)}{1.185}$$

$$N = 5,040,000 \text{ bbls. of stock tank oil}$$

Effective Fluid Compressibility

$$c_e = \frac{S_o c_o + S_w c_w + c_f}{S_o}$$

$$c_e = \frac{[(0.57)(9.99) + (0.43)(3.0) + (6.25)] 10^{-6}}{(0.57)}$$

$$c_e = 23.2 \times 10^{-6} \text{ vol/vol/psi}$$

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASE No. 2118) Consolidated
CASE No. 2459)
Order No. R-1826-A

APPLICATION OF THE OHIO OIL COMPANY
FOR 160-ACRE PRORATION UNITS IN THE
LEA-DEVONIAN POOL, LEA COUNTY, NEW
MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on December 13, 1961, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission."

NOW, on this 21st day of December, 1961, the Commission, a quorum being present, having considered the testimony presented and the exhibits received at said hearing, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.

(2) That the Lea-Devonian Pool was established by Order No. R-1772, dated December 16, 1960, and, as presently defined, consists of the NE/4 of Section 11 and the W/2 and the SE/4 of Section 12, all in Township 20 South, Range 34 East, NMPM, Lea County, New Mexico.

(3) That by Order No. R-1826 entered in Case No. 2118 effective January 1, 1961, the Commission, upon the application of The Ohio Oil Company, established 80-acre proration units in the Lea-Devonian Pool on a temporary, one-year basis; that temporary special rules and regulations for said pool were also promulgated which included a provision requiring the initial well on the 80-acre unit to be located within 150 feet of the center of either the NW/4 or the SE/4 of the quarter section; that said order prescribed an 80-acre proportional factor of 10.33 for allowable purposes.

(4) That the present application by The Ohio Oil Company seeks the establishment of 160-acre proration units in the

-2-

CASE No. 2118)
CASE No. 2459) Consolidated
Order No. R-1826-A

Lea-Devonian Pool and the promulgation of special rules and regulations for said pool including a provision granting 150 percent of the 80-acre allowable as the 160-acre allowable for the pool.

(5) That the application for 160-acre proration units was consolidated with the case in which operators in the subject pool were to appear and show cause why the pool should not be developed on 40-acre proration units.

(6) That the evidence presented at the hearing of this matter indicates the presence of an active water drive in the subject pool; that the data derived from interference tests between wells in the pool is inconclusive to establish drainage over great distances, but that the results of such tests may have been affected detrimentally by the water drive.

(7) That in the limited area in which data was available on this Devonian reservoir at this time, it will not cause waste to allow development on 160-acre proration units, and development on 80-acre proration units might cause the drilling of unnecessary wells.

(8) That the evidence presented at the hearing of this matter failed to justify the establishment of 160-acre proration units on a permanent basis; however, 160-acre proration units should be established in said pool on a temporary, one-year basis.

(9) That during the one-year period this temporary order will be in effect, the well location requirements for said pool should remain the same as those prescribed under the previous 80-acre order, and the allowable production from each 160-acre proration unit should be retained at a normal 80-acre allowable figure.

(10) That during the one-year period in which this order will be in effect, the applicant should gather all available information relative to drainage and recoverable reserves in the subject pool.

(11) That this case should be heard again by the Commission at its regular monthly hearing in December, 1962, at which time the applicant and other interested parties should be prepared to prove the size of proration unit on which the subject pool can be most efficiently developed.

IT IS THEREFORE ORDERED:

(1) That temporary special rules and regulations for the Lea-Devonian Pool in Lea County, New Mexico, are hereby promulgated as follows, effective January 1, 1962:

-3-

CASE No. 2118)
CASE No. 2459) Consolidated
Order No. R-1826-A

SPECIAL RULES AND REGULATIONS FOR THE
LEA-DEVONIAN POOL

RULE 1. Each well completed or recompleted in the Lea-Devonian Pool or in the Devonian formation within one mile of said pool, and not nearer to nor within the limits of another designated Devonian pool, shall be spaced, drilled, operated and prorated in accordance with the Special Rules and Regulations hereinafter set forth.

RULE 2. Each well completed or recompleted in the Lea-Devonian Pool shall be located on a unit containing 160 acres, more or less, which consists of a single governmental quarter section; provided, however, that nothing contained herein shall be construed as prohibiting the drilling of a well on each of the quarter-quarter sections in the unit.

RULE 3. The initial well on any 160-acre unit in said pool shall be located within 150 feet of the center of either the NW/4 or the SE/4 of the quarter section on which the well is located. Any well which was completed in the Lea-Devonian Pool or which was drilling to the Devonian formation within one mile of said pool prior to January 1, 1961, is granted an exception to the well location requirements of this rule.

RULE 4. For good cause shown, the Secretary-Director of the Commission may grant exception to the requirements of Rule 2 without notice and hearing when the application is for a non-standard unit comprising less than 160 acres. All operators offsetting the proposed non-standard unit shall be notified of the application by registered mail, and the application shall state that such notice has been furnished. The Secretary-Director of the Commission may approve the application if, after a period of 30 days, no offset operator has entered an objection to the formation of such non-standard unit.

The allowable assigned to any such non-standard unit shall bear the same ratio to a standard allowable in the Lea-Devonian Pool as the acreage in such non-standard unit bears to 160 acres.

RULE 5. A 160-acre proration unit (158 through 162 acres) in the Lea-Devonian Pool shall be assigned a proportional factor of 10.33 for allowable purposes, and in the event there is more than one well on a 160-acre proration unit, the operator may produce the allowable assigned to the unit from the wells on the unit in any proportion.

(2) That this case shall be reopened and heard again by the Commission at its regular monthly hearing in December, 1962, at

-4-

CASE No. 2118) Consolidated
CASE No. 2459)
Order No. R-1826-A

which time the applicant and other interested parties shall appear and be prepared to prove the size of proration unit on which the subject pool can be most efficiently developed.

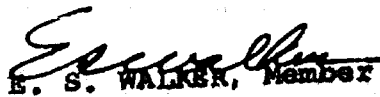
(3) That jurisdiction of this cause is retained for the entry of such further orders as the Commission may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

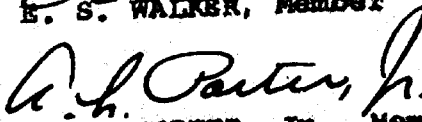
STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION



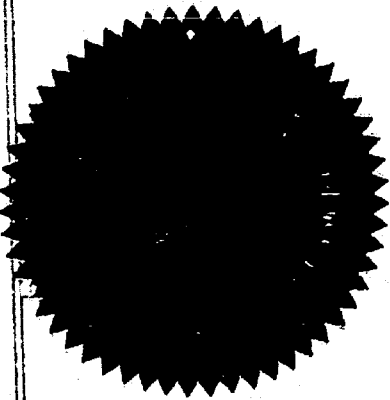
EDWIN L. MECHEM, Chairman



E. S. WALKER, Member



A. L. PORTER, Jr., Member & Secretary



esr/

NEW MEXICO
OIL CONSERVATION COMMISSION
P. O. BOX 871
SANTA FE, NEW MEXICO

MEMORANDUM

TO: ALL PERSONS INTERESTED IN CASE NO. 2504, APPLICATION
OF CONSOLIDATED OIL & GAS, INC. FOR AN AMENDMENT OF
ORDER NO. R-1670-C CHANGING THE ALLOCATION FORMULA
FOR THE BASIN-DAKOTA GAS POOL

FROM: A. L. PORTER, Jr., SECRETARY-DIRECTOR

SUBJECT: COMPLIANCE WITH RULING ON MOTIONS TO QUASH SUBPOENAS
DUCES TECUM AND CONTINUANCE OF CASE NO. 2504

The Commission has decided to continue Case No. 2504 to the regular hearing on February 14, 1963. The Commission will therefore allow all persons ordered to produce core analysis reports and electric and radioactivity logs to file the same with the Commission prior to December 19, 1962, in lieu of producing the required documents at the December 19th hearing. All persons ordered to produce documents will be required to do so at the December 19th hearing if they have not previously filed the same with the Commission. The case will then be continued to the Regular Commission Hearing on February 14, 1963.

DECEMBER 5, 1962

ir/

DOCKET: REGULAR HEARING - WEDNESDAY - DECEMBER 19, 1962

OIL CONSERVATION COMMISSION - 9 A.M., MORGAN HALL, STATE LAND OFFICE
BUILDING, SANTA FE, NEW MEXICO

- ALLOWABLE: (1) Consideration of the oil allowable for January, 1963.
- (2) Consideration of the allowable production of gas for January, 1963, for ten prorated pools in Lea and Eddy Counties, New Mexico. Consideration of the allowable production of gas for nine prorated pools in San Juan, Rio Arriba and Sandoval Counties, New Mexico, for January, 1963, and also presentation of purchaser's nominations for the six-month period beginning February 1, 1963, for that area.

CASE 2628: (De Novo)
Application of Marathon Oil Company for an unorthodox gas well location, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval of an unorthodox gas well location in the Atoka-Pennsylvanian Gas Pool at a point 990 feet from the North line and 990 feet from the East line of Section 30, Township 18 South, Range 26 East, Eddy County, New Mexico. This case will be heard de novo under the provisions of Rule 1220.

CASE 2118:) Consolidated (Reopened)
2459:) Application of The Ohio Oil Company (now Marathon Oil Company), for 160-acre proration units in the Lea-Devonian Pool, Lea County, New Mexico.

CASE 2721: Application of Continental Oil Company for a triple completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks authority to complete its State A-2 Well No. 2, located in Unit J of Section 2, Township 25 South, Range 37 East, Lea County, New Mexico, as a triple completion (tubingless) to produce oil from the North Justis Tubb-Drinkard Pool, an undesignated Abo Pool, and the North Justis-Devonian Pool through parallel strings of casing cemented in a common well bore.

CASE 2504: (Rehearing - Continued)
Application of Consolidated Oil & Gas, Inc. for an amendment of Order No. R-1670-C changing the allocation formula for the Basin-Dakota Gas Pool, San Juan, Rio Arriba, and Sandoval Counties, New Mexico. In accordance with the Commission's Ruling of October 18, 1962, on motions to Quash Subpoenas

Duces Tecum, George Eaton, David H. Rainey, Frank Renard, and L. M. Stevens will be required to produce all core analysis reports and all electric and radioactivity logs concerning any and all wells that have been cored in the Basin-Dakota Gas Pool by their respective companies, if they have not filed the same with the Commission prior to December 19, 1962. The Case will then be continued to the regular hearing on February 14, 1963.

CASE 2722: Southeastern New Mexico nomenclature case calling for an order creating new pools and extending certain existing pools in Chaves, Eddy, Lea and Roosevelt Counties, New Mexico.

(a) Create a new pool in Chaves County, New Mexico, classified as an oil pool for San Andres production, designated as the Diablo-San Andres Pool, and described as:

TOWNSHIP 10 SOUTH, RANGE 27 EAST, NMPM
Section 16: SE/4

(b) Create a new oil pool for Wolfcamp production, designated as the South Anderson-Wolfcamp Pool, and described as:

TOWNSHIP 16 SOUTH, RANGE 32 EAST, NMPM
Section 23: NW/4

(c) Create a new gas pool for Wolfcamp production, designated as the Big Eddy-Wolfcamp Gas Pool, and described as:

TOWNSHIP 20 SOUTH, RANGE 31 EAST, NMPM
Section 3: SE/4

(d) Create a new oil pool, for San Andres production, designated as the South Prairie-San Andres Pool, and described as:

TOWNSHIP 8 SOUTH, RANGE 36 EAST, NMPM
Section 16: SE/4

(e) Extend the Allison-Pennsylvanian Pool to include:

TOWNSHIP 8 SOUTH, RANGE 37 EAST, NMPM
Section 33: E/2 SE/4

(f) Extend the West Anderson Ranch-Grayburg Pool to include:

TOWNSHIP 16 SOUTH, RANGE 32 EAST, NMPM
Section 5: SW/4
Section 6: S/2

DOCKET: REGULAR HEARING - WEDNESDAY - DECEMBER 19, 1962

OIL CONSERVATION COMMISSION - 9 A.M., MORGAN HALL, STATE LAND OFFICE
BUILDING, SANTA FE, NEW MEXICO

- ALLOWABLE:**
- (1) Consideration of the oil allowable for January, 1963.
 - (2) Consideration of the allowable production of gas for January, 1963, for ten prorated pools in Lea and Eddy Counties, New Mexico. Consideration of the allowable production of gas for nine prorated pools in San Juan, Rio Arriba and Sandoval Counties, New Mexico, for January, 1963, and also presentation of purchaser's nominations for the six-month period beginning February 1, 1963, for that area.

CASE 2628: (De Novo)
Application of Marathon Oil Company for an unorthodox gas well location, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval of an unorthodox gas well location in the Atoka-Pennsylvanian Gas Pool at a point 990 feet from the North line and 990 feet from the East line of Section 30, Township 18 South, Range 26 East, Eddy County, New Mexico. This case will be heard de novo under the provisions of Rule 1220.

CASE 2118:) Consolidated (Reopened)
2459:) Application of The Ohio Oil Company (now Marathon Oil Company), for 160-acre proration units in the Lea-Devonian Pool, Lea County, New Mexico.

CASE 2721: Application of Continental Oil Company for a triple completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks authority to complete its State A-2 Well No. 2, located in Unit J of Section 2, Township 25 South, Range 37 East, Lea County, New Mexico, as a triple completion (tubingless) to produce oil from the North Justis Tubb-Drinkard Pool, an undesignated Abo Pool, and the North Justis-Devonian Pool through parallel strings of casing cemented in a common well bore.

CASE 2504: (Rehearing - Continued)
Application of Consolidated Oil & Gas, Inc. for an amendment of Order No. R-1670-C changing the allocation formula for the Basin-Dakota Gas Pool, San Juan, Rio Arriba, and Sandoval Counties, New Mexico. In accordance with the Commission's Ruling of October 18, 1962, on motions to Quash Subpoenas

- (g) Extend the Arkansas Junction-Queen Gas Pool to include:

TOWNSHIP 18 SOUTH, RANGE 36 EAST, NMPM
Section 23: NE/4

- (h) Extend the Blinebry Pool to include:

TOWNSHIP 21 SOUTH, RANGE 37 EAST, NMPM
Section 19: W/2 SW/4

- (i) Extend the Brushy Draw-Delaware Pool to include:

TOWNSHIP 26 SOUTH, RANGE 29 EAST, NMPM
Section 14: E/2 SE/4

- (j) Extend the Corbin-Abo Pool to include:

TOWNSHIP 18 SOUTH, RANGE 33 EAST, NMPM
Section 2: NE/4

- (k) Extend the Double A-Abo Pool to include:

TOWNSHIP 17 SOUTH, RANGE 36 EAST, NMPM
Section 21: NW/4

- (l) Extend the Double X-Delaware Pool to include:

TOWNSHIP 24 SOUTH, RANGE 32 EAST, NMPM
Section 14: SW/4

- (m) Extend the Drinkard Pool to include:

TOWNSHIP 21 SOUTH, RANGE 36 EAST, NMPM
Section 24: E/2 SE/4

TOWNSHIP 21 SOUTH, RANGE 37 EAST, NMPM
Section 2: Lot 10
Section 19: W/2 SW/4

- (n) Extend the West Hume-Queen Pool to include:

TOWNSHIP 16 SOUTH, RANGE 33 EAST, NMPM
Section 15: SE/4

- (o) Extend the South Lane-Pennsylvanian Pool to include:

TOWNSHIP 10 SOUTH, RANGE 33 EAST, NMPM
Section 23: S/2
Section 26: NW/4

- (p) Extend the Loco Hills Pool to include:

TOWNSHIP 18 SOUTH, RANGE 29 EAST, NMPM
Section 19: N/2 SW/4

- (q) Extend the Mesa-Queen Pool to include:

TOWNSHIP 16 SOUTH, RANGE 32 EAST, NMPM
Section 16: NE/4

- (r) Extend the East Millman-Seven Rivers Pool to include:

TOWNSHIP 19 SOUTH, RANGE 28 EAST, NMPM
Section 22: W/2 SW/4

- (s) Extend the Monument-Tubb Pool to include:

TOWNSHIP 20 SOUTH, RANGE 37 EAST, NMPM
Section 22: NW/4

- (t) Extend the Paddock Pool to include:

TOWNSHIP 21 SOUTH, RANGE 37 EAST, NMPM
Section 19: W/2 SW/4

- (u) Extend the Round Tank-San Andres Pool to include:

TOWNSHIP 15 SOUTH, RANGE 28 EAST, NMPM
Section 25: E/2

TOWNSHIP 15 SOUTH, RANGE 29 EAST, NMPM
Section 19: SW/4

- (v) Extend the Salado Draw-Delaware Pool to include:

TOWNSHIP 26 SOUTH, RANGE 33 EAST, NMPM
Section 10: NE/4

- (w) Extend the East Turkey Track-Queen Pool to include:

TOWNSHIP 19 SOUTH, RANGE 29 EAST, NMPM
Section 1: SW/4

- (x) Extend the Vacuum-Abo Pool to include:

TOWNSHIP 17 SOUTH, RANGE 35 EAST, NMPM
Section 26: NW/4 NE/4

TOWNSHIP 18 SOUTH, RANGE 35 EAST, NMPM
Section 7: S/2 SW/4

CASE 2723: Northwestern New Mexico nomenclature case calling for an order extending certain existing pools in Rio Arriba, San Juan, and Sandoval Counties, New Mexico.

- (a) Extend the Aztec-Pictured Cliffs Pool to include:

TOWNSHIP 30 NORTH, RANGE 10 WEST, NMPM
Section 14: NW/4

- (b) Extend the Ballard-Pictured Cliffs Pool to include:

TOWNSHIP 24 NORTH, RANGE 6 WEST, NMPM
Section 5: All
Section 6: All
Section 7: N/2
Section 8: N/2

TOWNSHIP 25 NORTH, RANGE 6 WEST, NMPM
Section 31: S/2

- (c) Extend the South Blanco-Pictured Cliffs Pool to include:

TOWNSHIP 27 NORTH, RANGE 5 WEST, NMPM
Section 7: E/2

- (d) Extend the Tapacito-Pictured Cliffs Pool to include:

TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM
Section 5: W/2

- (e) Extend the Angels Peak-Gallup Oil Pool to include:

TOWNSHIP 26 NORTH, RANGE 9 WEST, NMPM
Section 4: W/2
Section 5: S/2
Section 6: SE/4

- (f) Extend the Boulder-Mancos Oil Pool to include:

TOWNSHIP 28 NORTH, RANGE 1 West, NMPM
Section 14: W/2 NE/4, NW/4 SE/4
Section 23: W/2 E/2

-6-

Docket No. 37-62

- (g) Extend the Cha Cha-Gallup Oil Pool to include:

TOWNSHIP 28 NORTH, RANGE 12 WEST, NMPM

Section 30: NW/4

TOWNSHIP 29 NORTH, RANGE 14 WEST, NMPM

Section 17: S/2 NW/4 & N/2 SW/4

- (h) Extend the Devils Fork-Gallup Pool to include:

TOWNSHIP 24 NORTH, RANGE 6 WEST, NMPM

Section 7: NE/4

Section 16: E/2 NW/4, W/2 NE/4 & W/2 SW/4

- (i) Extend the Puerto Chiquito-Gallup Oil Pool to include:

TOWNSHIP 27 NORTH, RANGE 1 EAST, NMPM

Section 29: N/2 NW/4

iqg/

RECOVERABLE OIL RESERVES

LEA DEVONIAN POOL

Basic Data

Net Pay	=	65 feet
Porosity	=	5.49% (Core Analysis)
Water Saturation	=	43% (Capillary Pressure Tests)
Formation Volume Factor	=	1.185 (Fluid Analysis)
Recovery Factor	=	50% (Estimated)

Volumetric Calculation

7758 Bbl/acre-ft. x Porosity x (1-Water Saturation) x Net Pay x Recovery Factor
Formation Volume Factor

$$\frac{(7758)(0.0549)(0.57)(65)(0.50)}{1.185} = 6,658 \text{ bbls/acre}$$

NMOCC Case No. 2118 & 2459
Ohio Exhibit No. 9
Date 12-13-61

CASE 2118: Application of OHIO OIL
CO. for temporary special rules
governing LEA-DEVONIAN POOL.

Case No.

2118

Application, Transcript,
Small Exhibits, Etc.

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
NOVEMBER 16, 1960

IN THE MATTER OF:

CASE 2118 Application of The Ohio Oil Company for the promulgation of temporary special rules and regulations governing the Lea-Devonian Pool, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order promulgating temporary special rules and regulations governing the Lea-Devonian Pool, Lea County, New Mexico, including a provision for 80-acre proration units.

CASE 2119 Application of The Ohio Oil Company for the creation of a new oil pool for Bone Springs production and for the promulgation of temporary special rules and regulations governing said pool. Applicant, in the above-styled cause, seeks an order creating a new oil pool for Bone Springs to comprise the SW/4 of Section 12, Township 20 South, Range 34 East, Lea County, New Mexico. Applicant further seeks the promulgation of temporary special rules and regulations governing said pool including a provision for 80-acre proration units.

BEFORE:

Gov. John Burroughs
Murray Morgan
A. L. Porter

T R A N S C R I P T O F P R O C E E D I N G S

MR. PORTER: We will take the next case, 2119 -- 2118, I'm sorry.

MR. MORRIS: Case 2118. Application of The Ohio Oil

DEARNLEY-MEIER REPORTING SERVICE, Inc.

PHONE CH 3-6691

ALBUQUERQUE, NEW MEXICO



Company for the promulgation of temporary special rules and regulations governing the Lea-Devonian Pool, Lea County, New Mexico.

MR. COUCH: If it please the Commission, my name is J. O. Terrell Couch, representing The Ohio Oil Company. The record in this case will show an appearance has been entered by Atwood Malone, advising I'm associated with them in this case.

Are there any other appearances to be entered in the case, Mr. Porter? There are none that I know of.

MR. PORTER: I would like to call for other appearances at this time in this case. Mr. Couch, there appear to be no other appearances.

MR. COUCH: If I might suggest this procedure for the consideration of the Commission. Our evidence is arranged in such a manner that we plan to go through our data on the Devonian and then on the Bone Springs.

MR. PORTER: Which is advertised under Case 2119?

MR. COUCH: Yes, sir. Now, I think that it might conserve time for the Commission if we were to consolidate the two cases for the purpose of hearing. They will be -- we can shorten it a little bit by doing that rather than to have to refer to the record and incorporate portions in both cases, or we can present each as an entirely separate case.

MR. PAYNE: Is the area involved the same?

MR. COUCH: Yes, sir.

MR. PORTER: The two applications, as I understand it,



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PHONE CH 3-6691

ALBUQUERQUE, NEW MEXICO

Mr. Couch, involve a dually completed well.

MR. COUCH: That's correct.

MR. PORTER: One in Bone Springs and one in the Devonian.

MR. COUCH: That's correct.

MR. PORTER: The Commission has no objection to consolidation of the two cases.

MR. COUCH: All right, sir. We will then proceed in that way, starting first with the Devonian. We will have two witnesses in the case.

MR. PORTER: Let's have both witnesses sworn.

(Two witnesses sworn)

MR. COUCH: Before getting into the testimony, I would like to make a very brief opening statement to this effect. The Ohio thinks that the significance of this Devonian discovery that is involved in this case 2118, the significance of this discovery both to the State of New Mexico and to those parties interested in the Lea unit is of such a nature that we considered it advisable to come before this Commission as soon as possible to seek pool rules to apply in this area, and with the hope that we can, by an orderly development of this area, really serve the cause of conservation as well as protecting correlative rights. We realize that coming this early we do not have all the data we would like to have, and we are, therefore, asking for temporary rules at this time, realizing that the Commission will, as well, want to look further at additional data as it develops in the area, but we think coming



with what data we have available, presenting that, that we can create more conservation in this area by starting early.

ROY M. YOUNG,

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

DIRECT EXAMINATION

BY MR. COUCH:

Q Will you please state your name?

A My name is Roy M. Young.

Q By whom are you employed, Mr. Young, and in what capacity?

A I'm employed by The Ohio Oil Company in the capacity of reservoir engineer.

Q And have you previously testified before this Commission, Mr. Young?

A Yes, I have.

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

MR. PORTER: Yes, sir, they are.

Q (By Mr. Couch) Mr. Young, in preparing for this case, will you state briefly what you have done in connection with the Devonian Pool?

A In connection with my duties as a reservoir engineer with The Ohio Oil Company, I have made an engineering study of all the available data from the Lea-Devonian Pool. I have directed my study to determine the proper well spacing which, in my opinion, should be temporarily applied to the Lea-Devonian Pool.

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PHONE CH 3-6691

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Q And in seeking these rules that, in your opinion, should be temporarily applied, have you approached it from the standpoint of prevention of waste and protection of correlative rights?

A Yes.

Q And also in development of the pool on the regular pattern?

A Yes, I have.

Q And have also considered the prevention of drilling of unnecessary wells in this area?

A Yes.

(Whereupon, Ohio's Exhibit 1 marked for identification.)

Q Mr. Young, please look at the document you have before you, and it's marked as Ohio's Exhibit 1. Will you state briefly what that Exhibit is?

A Ohio's Exhibit 1 is a map of the Lea area located in Township 20 South, Range 34 and 35 East, Lea County, New Mexico.

Q All right, sir. Proceed to describe briefly what is on that Exhibit.

A The Lea unit area is shown on Exhibit No. 1 as a hashed line. The Lea unit area contains approximately 2560 acres. The Ohio Oil Company owns 44.63198 percent of the Lea unit area under the unit agreement for the development and operation of the Lea unit area. This agreement was approved by the N. M. Oil Conservation Commission Order No. R-1540 dated November 30, 1959, in Case 1823.



Q And in that case a similar map was introduced in evidence at that time, was it not, Mr. Young?

A Yes, it was.

MR. COUCH: I would like to state here, for the record, that as indicated by the record in that case, the unit agreement was approved by the necessary number of parties to insure reasonable control, and that subsequently the agreement has been approved by the Federal government and by the Land Commissioner's office.

Q (By Mr. Couch) All right, sir, now, going to the wells that are shown on Exhibit No. 1, one shown there in the red dot?

A The well shown by a red dot is the only completion in the unit area at this time. That well is the Lea unit Federal No. 1 located in the northwest quarter, southwest quarter of Section 12. This well is an oil-oil dual, and it was completed in the Devonian on July the 8th, 1960. This is the deepest established production in the State of New Mexico. The dual completion was approved by New Mexico Oil Conservation Commission Order No. R-1744, dated August the 23rd, 1960, in Case 2045. The dual completion was effected on October 8th, 1960, with the completion in the Bone Springs.

Q Mr. Young, that was October the 9th, 1960, wasn't it, the dual completion?

A I believe that's correct.

Q All right, sir. And you have referred now to another Commission case in connection with this same area. We would like

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to include, by reference here, incorporate as a part of this case, the record before this Commission in its Cases Nos. 1823 and 2045, both relating to this same area, and this later case to this very well we are just talking about.

MR. PORTER: The Commission will consider the records in those cases as part of this record.

MR. COUCH: All right.

Q (By Mr. Couch) Now, there are three blue dots shown on 1, Mr. Young. Would you state what those represent?

A The three blue dots represent the three wells that are currently drilling in the area. These wells are the U. S. Smelting Federal No. 1 located in the southeast quarter, northwest quarter, Section 11. The second well is the Ohio Federal Lea, Lea unit Federal No. 2 located in the southeast quarter, northwest quarter, Section 12, and the third well is the Sinclair Federal 6025 No. 1 located in the southwest, northwest quarter of Section 7, Township 20 South, Range 35 East.

Q The first two wells you mentioned were both located in Range 34 East?

A Yes.

Q And Sinclair well in 35 East?

A That's right.

Q All right. Now, there is some contouring shown on Exhibit 1. Would you describe that briefly?

A Exhibit No. 1 has been contoured on top of the Devonian



reflection from the seismograph. The contour interval of this map is a hundred feet.

Q All right, sir. Now, proceed to tell us about the discovery well, the Lea unit No. 1. At what point was the Devonian encountered in that well?

A The top of the Devonian in the Lea unit No. 1 was found at 14,285 feet, or subsea depth, 10,611. This is approximately 275 feet high to the contours as depicted on Exhibit 1. It's my opinion, however, that the seismic contours, as shown on Exhibit 1, do reflect the configuration of the Devonian structure in this area.

Q Do you have any other information in connection with the seismic work to indicate its accuracy?

A Yes, there is a dry hole approximately three miles northwest of the unit which can be used to judge the quality of our seismic work. That is Pure Oil Company's Federal "C" No. 1 located in the northwest quarter, northeast quarter, Section 4, Township 20 South, Range 34 East.

Q Now, that well is not on this map, it's too far off the northwest?

A That's correct.

Q And how does that well aid us in evaluating the accuracy of the seismograph work?

A The seismograph work done in the vicinity of both wells, the Pure Federal "C" No. 1, and the Ohio Unit No. 1 indicated that our well should be approximately 325 feet high to the Pure well.



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Their Devonian top is actually 330 feet high to the Pure Federal "C" No. 1.

Q Actually, Mr. Young, isn't it actually just the reverse indication that ours would be 330 feet high, and actually it's 325 feet high?

A I believe that's correct.

Q Now, that is so close, probably should not talk much about that five feet. What is your idea about the extreme closeness of those figures?

A Definitely there is probably some coincidence between the close agreement between the seismograph and the tops of these wells mentioned. However, it's my opinion this does establish the quality of the seismograph work we have in the area and the quality is above par.

Q Mr. Young, you show an area colored in yellow on Exhibit 1. Will you tell us what that represents, please?

A Yes. The yellow area shown on Figure 1 is the area which, in my opinion, based on the available data, is the minimum area which is expected to be productive. This area includes the east half of Section 11, the west half of Section 12, and the west half of the East half of Section 12. This area contains eight hundred acres.

MR. PORTER: I want to pose a question here. How closely does this parallel the present boundaries of the pool as designated by the Commission? Do you know, Mr. Young?

A The present pool limits of the Devonian Pool, as defined



by the N. M. Oil Conservation Commission, includes only the southwest quarter of Section 12.

MR. PORTER: Thank you.

Q (By Mr. Couch) Now, of course, Mr. Young, productive limits of this reservoir have not been defined?

A No, they have not. There was no water-oil or gas-oil contact encountered in the discovery well.

Q And the pool limits as designated by the Commission are the pool limits as so designated?

A Yes, that was the southwest quarter, Section 12.

Q Designated upon completion of this first well?

A Yes.

Q What can you tell us about the production history from this well and the pool, the Devonian Pool, since the completion of the well?

A The cumulative production to November the 1st, 1960 from the Lea-Devonian Pool has been 25,392 barrels, and since the pool was discovered only four months ago, the data available, therefore, is necessarily limited. It's my opinion, however, that the available data does indicate that one well can economically and efficiently drain in excess of 80 acres.

Q Do you have an opinion as to the producing mechanism in this reservoir?

A It's my opinion that the producing mechanism in the Lea-Devonian Pool will be a water drive. This is characteristic of

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ALBUQUERQUE, NEW MEXICO



other Devonian reservoirs throughout Southeast New Mexico.

Q Now, if that is true, what would be your idea as to the drainage within the pool?

A If the Devonian has an excellent water drive, which I believe that it will, it will result in effective and efficient drainage over wide areas within this structure.

Q That is within the structure shown by the contours there on Exhibit 1?

A Yes.

Q Have we attempted to obtain additional information on the production of the well since we completed it?

A Yes. In order to obtain additional information on this Devonian reservoir, we have conducted a special drawdown test on the discovery well. It's my opinion that the results of this test further establish that the Devonian well would drain in excess of 80 acres.

Q Will we later, testify later about this drawdown test, Mr. Young?

A Yes, we will.

Q Have you prepared tabulations of pertinent data of the Lea-Devonian Pool and marked it Exhibit 2?

A Yes, I have.

(Whereupon, Ohio's Exhibit 2 marked for identification.)

Q Mr. Young, looking at Exhibit 2, will you briefly relate

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what it shows, pointing out the important points?

A Exhibit 2 is a tabulation of the pertinent data now available for the Lea-Devonian Pool. It contains the location, completion date of discovery well, reservoir fluid data, and reservoir characteristics.

Q All right, sir, those are the four main headings. Briefly review the completion data under Item 2.

A The completion data for the Lea Unit Well No. 2 is contained in Exhibit No. 2 item 2 the well was drilled to total depth of 14,735. The top of the Devonian was ¹⁴²⁸⁵ / or subsea depth of minus 10,611. The top of the Devonian pay was found at 14,349 feet, or at a subsea depth minus 10,675. The well was perforated in the interval 14,347 to 375, and 14,393 to 489. On the initial potential test made on the well on July the 8th, 1960, the well potential flowing 516 barrels of oil per day on an 8/64ths inch choke with a GOR of 321 cubic feet per barrel, and a tubing pressure of 1570 psig.

Q Mr. Young, that is about all the oil you can get through that size choke, isn't it --

A Yes, it is.

Q -- during that period of time? The reservoir fluid characteristics, review those for us.

A On July the 22nd, 1960, a subsurface reservoir fluid sample was taken from the Lea Unit No. 1. The analysis of this sample reflected that the Devonian crude is a highly unsaturated,



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with a saturation pressure of 567 psi at 202 degrees Fahrenheit. The formation volume factor at original pressure is 1.185. The solution GOR is 318 per barrel. The oil viscosity as is .310 centipoise. The oil gravity is 58.2 degrees API at 60 degrees Fahrenheit.

Q I think you mentioned that fluid sample was taken on July 22 --

A Yes.

Q -- or 21, which was it?

A 22, according to my record.

Q All right, it would be one of those two dates. Reservoir Characteristics, Item No. 4 there, would you briefly review those?

A Yes. Item 4 of Exhibit 2 reflects the reservoir characteristics for the Lea-Devonian Pool. I have calculated a porosity of 4.7 percent from the neutron log. The permeability as determined from the pressure drawdown test was found to be 9.6 millidarcies and greater. The water saturation is estimated to be 30 percent. The net pay in the discovery well is 98 feet. This is taken from the neutron log of the Devonian section. The reservoir temperature is 202 degrees Fahrenheit, and the original reservoir, 6046 at minus 10,744, which is the midpoint of the perforations.

In my opinion, the probable reservoir mechanism will be a water drive since most of the Devonian pools in Southeast New Mexico are characteristically water drives.

Q Now, Mr. Young, we are talking here about characteristics



of this reservoir. Have you also had prepared under your supervision Exhibit 3?

A Yes, I have.

(Whereupon, Ohio's Exhibit 3 marked for identification.)

Q And you have a copy of that before you now. Will you please describe briefly what that Exhibit is, and what it shows?

A Exhibit 3 is a radioactivity log of the Devonian Section in the Lea Unit Federal No. 1. Shown at the top of this Exhibit is the name of the well, the elevation and location. The top of the Devonian is shown by a heavy solid line, at 14,285, or subsea depth of minus 10,611. The perforations are shown at 14,349 to 375, and 14,393 to 489. The purpose of this Exhibit is to demonstrate the amount of net pay which, in my opinion, is present in the well and will permit verification of the accuracy and reasonableness of my selection.

The amount and location of the 98 feet of net pay as shown in Exhibit 3 is shown colored in red on the log.

Q Mr. Young, this is, of course, obviously only a section of the log, a portion of the log, being that portion through the Devonian Section?

A That's correct.

Q Is it your understanding that a complete composite log of this entire well is a part of the record in Case 2045, the dual completion hearing?

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A Yes, it is.

Q Using the basic data concerning this reservoir that you have testified about, Mr. Young, have you calculated by volumetric calculations the recoverable reserves that you expect to find in this Devonian formation?

A Yes, I have.

Q Is that tabulated as Exhibit No. 4?

A Yes, it is.

(Whereupon, Ohio's Exhibit No. 4 marked for identification.)

Q You have a copy of that before you, sir?

A Yes.

Q Without repeating the basic data which you have already testified about, would you just refer briefly to your volumetric calculation formula and state the result of the computation that you made?

A Yes. Using the basic data, as I have previously testified to, and a recovery factor of 50 percent, which is consistent with my opinion that the reservoir will have a water drive, the recoverable oil which I have calculated for the Lea-Devonian Pool is 10,554 barrels per acre.

Q All right, sir. Now, in this yellow area of 800 acres, which you believe to be, in your opinion, is the minimum area expected to be productive, based on these volumetric calculations per acre that you have made, what would be the recoverable reserve in the 800 acres?



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A 8,443,200 barrels, or an average expected recovery per 80-acre well of 844,320.

Q Now, using these volumetric calculations, Mr. Young, have you prepared an Exhibit marked Exhibit No. 5, showing the comparative economics of 40-acre spacing to 80-acre spacing in this Devonian Pool?

A Yes, I have.

(Whereupon, Ohio's Exhibit No. 5 marked for identification.)

Q Will you discuss that Exhibit for us, Mr. Young, starting up at the top and briefly outlining its content?

A In presenting the economics for the development of the pool such as the Lea-Devonian Pool, it seems to me to be more realistic to present economics for an area that can be expected to be productive rather than on a per well basis.

Q That is why you have chosen this 800 acres to demonstrate more realistically what the development would be?

A Yes. If the 800 acres were developed on 40-acre spacing, the number of wells required would be 20, and the wells required with 80-acre spacing would be 10. The cost of drilling and completing the discovery well was six hundred and nine thousand dollars. However, in these calculations, I have used an average development of four hundred seventy-one thousand dollars per well. The total cost to develop the 800 acres, minimum, which is expected to be productive under 40-acre spacing would be nine million four hundred twenty



thousand dollars. And for 80-acre spacing would be four million seven hundred ten thousand dollars.

The ultimate reserves from the 800 acres, which is considered area to be the minimum productive ~~area~~ would be 8,443,200 barrels.

Q And that is the amount you arrived at through your volume calculations previously testified to?

A Yes, it is.

Q All right, sir. Whatabout the gas that is expected to be produced along with that oil, is that shown upon your comparative economics computation?

A Yes, it is. Recoverable gas at 300 cubic feet per barrel will amount to 2,532,960 MCF.

Q And the next item on this Exhibit 5 is computation of the working interest, net operating income per gross barrel of oil, is it not?

A Yes, it is. This is for 7/8ths working interest and does not take into effect any overriding royalties. The net operating income per gross barrel to the operator is two dollars and three cents per barrel.

Q That includes oil and gas?

A Yes.

Q The gas will be produced with the oil?

A Yes.

Q And then you have included here some costs to be deducted from the gross value as shown on your Exhibit, have you not?

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A Yes.

Q Those costs, based upon your experience and the Ohio's experience in similar operations in New Mexico?

A Yes, it is.

Q In your opinion, this 2.03 net operating income per gross barrel is -- is that reasonable and expected net income based upon current prices?

A Yes, it is.

Q All right, sir. Using that net operating income per gross barrel along with your volumetric reserves calculated in place, have you computed then, and shown on Exhibit 5 the total net operating income, gain relating to this 800 acres that is to be expected?

A Yes. And that amounts to seventeen million one hundred thirty-nine thousand six hundred ninety-six dollars.

Q And based on the well costs that you previously testified about, which are average costs as they are expected to be, have you computed, then, the net profit under 40-acre spacing program?

A Yes. That amounts to seven million seven hundred nineteen thousand six hundred ninety-six dollars, or a net profit per well of three hundred eighty-five thousand nine hundred eighty-five dollars. The profit to investment ratio, however, is only .82 to 1, and, in my opinion, not sufficient to justify the risk involved in drilling fourteen thousand seven hundred foot wells with the investment of nearly a half a million dollars.



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Q And have you made similar computations for 80-acre spacing?

A Yes. The net profit for 80-acre spacing will amount to twelve million four hundred twenty-nine thousand six hundred ninety-six dollars, or a net profit per well of one million two hundred forty-two thousand nine hundred seventy. This is a profit to investment ratio of 2.64 to 1. It's my opinion that this profit to investment ratio is a minimum when considering the risk in this deep drilling, and the amount of investment required for each well.

Q Now, we have used these average figures and attempted to apply to a substantial area here, to try to get a clearer picture of how an operator would have to look at this thing from a business standpoint, haven't we, Mr. Young?

A Yes, that's correct.

Q There will be some wells that will produce more than the calculated reserves in place under the acreage allocated to them, and some, possibly, produce less later in the life of the field if they are drilled later, isn't that correct?

A That's right.

Q And this attempts to make an average picture that will give an overall look. Is that particularly appropriate whereas in this case most of this structure appears to be within the boundaries of a Federal unit?

A Yes.

Q I should say Federal and State unit. We've got a hundred



sixty acres of State land in here, do we not?

A Yes.

Q Mr. Young, you have testified about a pressure drawdown test which was conducted on this Lea unit Federal No. 1. Will you describe that test for us briefly? We realize it's a somewhat complicated test in some respects, and I would like for you to just explain briefly the purpose and the effect of this test and the results of it.

A A pressure drawdown test was conducted on the discovery well from August the 15th to 18th, 1960. This drawdown test basically consisted of flowing the well from stabilized shut-in conditions. The well was flowed at a constant rate of 597.5 barrels per day for sixty-eight hours on a 10/64ths inch choke. All bottom hole pressure measurements were made with an Amerada RPG-3 pressure gauge. In this type testing a curve plotted of flowing bottom hole pressure of the hole versus the logarithm of time as the radius moves away from the well bore will be a straight line unless a change in transmissibility is encountered or a reservoir boundary is reached. The slope of this curve, the plot of flowing bottom hole pressure versus logarithm of time can be used to calculate the effective permeability to oil. Using the data ^{for the} first, one and one-third hours of the sixty-eight hours, I have calculated ^{an} average of approximately 9.6 millidarcies within a distance of approximately 264 feet from the well bore.

Q Now, what happens after that first one and a third hours

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of drawdown as far as the pressure is concerned? Did the pressure drop during that first hour and a third?

A During the first hour and a third the bottom hole pressure drawdown was normal, that is, it was a gradual decline until the, until a decline of 73 PSI was observed in the well.

Q Now, from that time on during the remainder of the sixty-eight hours that this well was being flowed at this high constant rate, what occurred insofar as the bottom hole flowing pressure was concerned?

A The bottom hole flowing pressure beyond the one and one-third hours through sixty-eight hours remained constant, or there was no additional decline in bottom hole pressure.

Q Now, what did this indicate, this lack of decline in bottom hole pressure during the remaining sixty-six and two-thirds hours of this test?

A This phenomena can only be observed in a well where the pressure is being maintained constant at some boundary within the reservoir. Similar results would be from a producing well which is surrounded by injection wells, providing a complete replacement of fluids that are being produced in the producing wells.

Q Now, what did this indicate by the permeability in the area around this well, in this reservoir?

A Since the No. 1 well is not surrounded by injection wells, the only explanation is that the radius of drainage after one and one-third hours encounters a zone of extremely high permeability.



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Q And that zone occurs at a calculated distance of how far from that well?

A 264 feet.

Q What can you tell us from these test results as to this permeability increase?

A The permeability increase beyond the 264 feet is of such magnitude that the transmissibility is correspondingly large.

Q That is the transmissibility of the fluid in the reservoir?

A Yes.

Q All right, sir.

A It's sufficient, in fact, that during the sixty-eight hour test the quantity of oil supplied from the zone of increased permeability was equivalent to the quantity produced at the well bore.

Q And the well was still producing at the same pressure and rate that it had reached after the first one and a third hour drop?

A Yes.

Q Now, because of this high potential in volume of oil that was involved here, and the constant pressures that we encountered during the running of this test, because of those things, were we put in the position of not being able to actually calculate the permeability in this area where it's indicated to be extremely high?

A We were unable from the drawdown pressure to establish the permeability. It's extremely high.



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Q In other words, if there had been some slight drop during that period, there would have been a basis for actually computing permeability in that area, is that right?

A Yes, that's correct.

Q But since it continued without drop for so long and such a large volume of oil was involved, and a storage problem there on this new well, why, we were unable to actually calculate permeability during this last part of the sixty-eight hours, is that right?

A That's correct.

Q What else can you tell us about what this test showed?

A This test showed that the area of the increased permeability was too large and the permeability too high to permit an actual measurement on the basis of the volume and rate used. It's my opinion, however, that these tests conclusively show that the wells in this reservoir will be capable of draining areas substantially in excess of 80 acres.

Q Was there some additional data available to us from this drawdown test?

A Yes, there was.

Q Will you give us that, please?

A During these tests we found that the PI of this well was 8.18 barrels per psi per day / drawdown.

Q That is calculated on the basis of that 73-pound drop, that's all we had to calculate?



A Yes, it is.

Q What else?

A Other calculations from the test showed that the effective permeability at the well bore has been increased to 31.16 millidarcies. This was the effect of acidizing the well with acid. This treatment was effective in increasing the permeability by 302 percent in the immediate vicinity of the well bore.

Q Mr. Young, attempting to summarize this data and information that you have presented here, will you give us your opinion concerning the well completed here in the Lea-Devonian Pool as to its capability with respect to drainage?

A In summary, it's my opinion that one well in the Lea-Devonian Pool is capable of efficiently and substantially draining in excess of 80 acres. This is based upon my interpretation of the drawdown test and other factors. It's also my opinion that the development of the Lea-Devonian Pool on 80-acre spacing will not cause any measurable decrease in the ultimate recovery of drilling of too few wells. On the contrary, 80-acre spacing will cause uniform development of a wider area in a shorter period of time resulting in more effective depletion of the reservoir.

Q In other words, wider pattern and regular spacing will more effectively deplete the reservoir. Now, what about the possibility of secondary operations? Is this type of pattern that you are proposing here going to be more readily usable for secondary recovery purposes than a 40-acre spacing applied here?



A Yes, I believe it would. It's a well-known fact that a regular spacing lends itself more readily to any type of secondary recovery that might be used in this pool.

Q And if 40-acre spacing is applied, is it likely, according to your observation of other fields in New Mexico, that there will be clusters of wells, or wells right close to each other up and down this unit boundary, for example, and clusters within the unit?

A Yes, that has been experienced in some fields.

Q It's just human nature to try to get as close to that producer as you can, isn't that right?

A Yes.

Q Now, with respect to the unit agreement itself, Mr. Young, and looking at this thing from a standpoint of correlative rights and rights of royalty owners, what can you tell us about that, as it would be affected by the spacing you propose here?

A In the unit agreement, the royalty interests are unitized, but only as development occurs. That is, the royalty owners will participate in the participating areas as the wells are drained.

Q As wells are drilled?

A As the wells are drilled. The more rapidly the reservoir is developed, the sooner some of the royalty interest and overriding royalty interest will begin to participate in the production from this unit.

Q In other words, that is because of the provisions in the



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PHONE CH 3-6691

ALBUQUERQUE, NEW MEXICO

unit agreement, is that correct, sir?

A Yes.

Q That as the participating areas are approved by the U.S. G.S. and N. M., only when those areas are established where the participants' overriding royalty and royalty owners in that area begin to share in that production, is that correct?

A Yes.

Q So, it would be to their advantage for wider development, wider spacing and more rapid development?

A Yes. It would certainly protect their correlative rights.

Q Same is true with regard to the working interest owners after first term of five years under that agreement, that part of that acreage will be excluded from the unit if it has not been drilled on?

A Yes.

Q How long does it take to drill one of these wells, Mr. Young?

A Approximately six months.

Q So, it's going to take a good while to develop this pool even on the wider spacing that we propose, is it not?

A Yes.

Q Do you consider it would be sound conservation and would protect correlative rights to use this wider spacing as you recommended?

A Yes, I do.



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Q And by providing the 80-acre allowable, do you not provide an additional incentive to the operator to make that step out a little wider spacing?

A Yes.

Q What is your recommendation, Mr. Young, as to the temporary pool rules to be established in the Lea-Devonian Pool?

A I recommend to this Commission that temporary pool rules be established for the Lea-Devonian Pool requiring 80-acre proration units and 80-acre spacing pattern, each unit to consist of any two contiguous quarters/^{quarter} government sections, the wells to be located in the center of the northwest or southeast quarters of any governmental quarter section.

Q Do you recommend any tolerance as to the location of those wells, Mr. Young?

A Yes, I would recommend a tolerance of a hundred fifty feet for surface obstructions. This is to be approved without hearing or notice to, for the interested party.

Q But on application to the Commission showing the obstruction?

A Yes.

Q Mr. Young, are the wells that are presently drilling in this area on pattern under these rules you propose?

A All except one.

Q And which one is that, sir?

A That is Sinclair 6025 Federal Lea No. 1 in the south-



west quarter, northwest quarter, Section 7, Township 7 South, Range 35 East.

Q And what is your understanding as to that well as far as the Bone Springs formation is concerned?

A This well has drilled through the Bone Springs and was running approximately 90 feet low to our discovery well. A correlation point at approximately 10,100 feet showed the well to be running approximately a hundred eighty-eight feet low.

Q This is on down below the Bone Springs you are speaking about?

A Yes.

Q With respect to the Devonian, if that well is, goes to the Devonian and should be completed there, if that's the case, according to our seismic information, would that well be in the same reservoir with the Lea-Devonian Pool?

A According to our seismic data, it would be separated from the Lea-Devonian Pool by a fault shown on Exhibit 1.

Q All right, sir. Now, the U. S. Smelting Well, which is in the northwest quarter of Section 11, is not located exactly in the center of the southeast quarter of that quarter section, is it?

A No.

Q Is it within the hundred fifty-foot tolerance that you have recommended?

A Yes, it is.

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Q We don't know whether it's surface obstruction that required that or not, but at any rate, it's within the hundred fifty-foot tolerance, is that correct?

A Yes.

Q Now, what do you recommend for oil allowables for wells in this Devonian Pool?

A I recommend that the oil allowable be established by establishing the 80-acre proportional ^{factor} ~~rate~~, as provided in Statewide rule 505 as amended.

Q And what about non-standard proration unit if one should be approved in this pool?

A I would recommend that its allowable be proportional to the 80-acre allowable in that proportion that the non-standard unit is to 80 acres.

Q That is on the basis of surface acres?

A Yes.

Q All right, sir.

MR. COUCH: If it please the Commission, this concludes that portion of our testimony directed specifically toward the Devonian. The essential information concerning the Lea Unit, and the development of the area up to this present time is, of course, pertinent to the Bone Springs formation, which we will get into here in a moment. And Exhibit 1, of course, is also going to be of assistance in considering the Bone Springs formation. Therefore, refer to that at this point and would request we go back now to



Exhibit 1, and we will give our testimony with that Exhibit relating to the Bone Springs formation.

MR. PORTER: Let's take a short recess, about a ten-minute recess.

(Short recess)

MR. PORTER: Before we proceed with this case, I would like to announce that there will be no other cases called before noon this morning.

Q (By Mr. Couch) Mr. Young, have you made a similar engineering study with relation to Bone Springs reservoir to that which you testified about in connection with the Devonian Pool?

A Yes, I have.

Q And you have directed your study at the same principle points and ultimate conclusions that you tried to answer, is that right?

A Yes.

Q That study also is based on all available data we have on the Lea Bone Springs Pool?

A Yes.

MR. COUCH: I'm referring to this as the Lea Bone Springs Pool. We have stated in the application as filed, request for creation of a new pool. I do not think that the pool has been officially designated as of this time, but for convenience in the record, I will refer to it as the Lea Bone Springs Pool.

MR. PORTER: Mr. Kapteina, do you recall whether we have

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created the Lea Bone Springs Pool officially yet?

MR. KAPTEINA: We haven't.

MR. PORTER: We haven't.

MR. COUCH: Well, that was my understanding, Mr. Porter, but I do think it will simplify the reference if we can refer to it as the Lea Bone Springs Pool.

MR. PORTER: Certainly.

MR. COUCH: Possibly that will be the name that will be assigned.

Q (By Mr. Couch) Mr. Young, you have already testified about the status of the Sinclair Well over in Section 7 to the East of the Lea Unit?

A Yes.

Q Do you know about how deep the Smelting Well is over in Section 11 on the West side of the Unit boundary?

A According to my information, that well is drilling approximately a thousand feet. As I understand it, they have set surface casing at a shallower depth, but their current drilling depth is around a thousand feet.

Q In other words, it has just been started recently?

A Yes.

Q Now, No. 2 Well shown as a blue dot there in the southeast quarter of the northwest quarter of Section 12 is drilling below the Bone Springs at the present time, is that right?

A Yes, it is, yes, sir.



Q Now, there is one other dot shown on this map within the Lea Unit area down in the southeast quarter of Section 13 --

A Yes.

Q -- has a No. 3 by it. Will you state what that is, sir?

A That is the Ohio Oil Company Lea Federal Unit No. 3.

Q That is the location?

A Yes. It's not drilling as yet.

Q And as indicated by the ^{reflection} ~~well~~ seismograph contours shown on Exhibit 1, that well is obviously intended to test the other high that is shown in that area, is that correct, sir?

A That's correct.

Q There will be some later testimony with regard to The Ohio's plans in connection with that well, is that right?

A Yes.

Q All right, sir. Will you state whether the Lea Unit Federal No. 2 Well, still drilling, but drilling below the Bone Springs, whether it was cored in the Bone Springs?

A Yes, the Unit No. 2 has been cored through the Bone Springs, and all indications are that it will be a producer in the Bone Springs pay.

Q What information do you have on the Bone Springs pay from the No. 1, Lea Unit No. 1 Well?

A We have logs, drill stem tests, completion data, and a drawdown test, pressure drawdown test on the Lea Unit No. 1.

Q All right, sir. Based on the data that we have avail-



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able, is it your opinion that we now have enough data to establish temporary pool rules for the Bone Springs?

A Yes.

Q And, if so, what pool rules would you suggest?

A It's my opinion that the available data is sufficient to establish temporary pool rules in the Lea Bone Springs Pool requiring 80-acre proration units and 80-acre spacing pattern.

Q Mr. Young, have you had prepared under your supervision tabulation of the pertinent data on the Lea Bone Springs Pool?

A Yes, I have, and that is Exhibit 6.

(Whereupon, Ohio's Exhibit No. 6 marked for identification)

Q This is prepared on a format similar to the Exhibit showing pertinent data on the Devonian, is that correct?

A Yes, it is.

Q All right, Mr. Young, let's very briefly refer to the data shown there on Exhibit 6 concerning the Bone Springs Pool.

A Item 2 of Exhibit 6 is completion data for the Lea Unit Federal No. 1 in the Bone Springs formation. The top of the Bone Springs formation is at 8183, or minus 4509 subsea. The top of the Bone Springs pay is found at 9480, or minus 5806 subsea. The well was dually completed by perforating the interval in the Bone Springs pay at 9480 to 9550, and on October the 9th, 1960, the well potential had a flowing rate of 214 barrels per day on a half inch choke with a GOR of 1817 cubic feet per barrel with a hundred psig tubing pres-



sure.

Q All right. Now, Item 3 of the Exhibit presents reservoir characteristics. Would you briefly review those?

A Yes. No reservoir fluid sample has been taken as yet in the Lea Bone Springs Pool, therefore, the reservoir characteristics, some of the reservoir fluid characteristics are unknown, such as saturation pressure. The formation volume factor is estimated to be 1.95, and that estimation is made upon the assumption that the solution gas-oil ratio was equal to the GOR on the potential. That GOR was 1817 cubic feet per barrel. The oil gravity is 42 degrees API at 60 degrees Fahrenheit.

Q All right, sir. And what about the reservoir characteristics in this Lea Bone Springs Pool, shown there as Item 4? I noticed you have two columns, one for Dolomite and one for Sand. Will you explain that and then proceed to give the data pertaining to each of those two portions of the formation?

A The core analysis from the Lea Unit Federal No. 2 through the Bone Springs pay showed that the reservoir extends over an interval of a hundred fifty feet, and contains both dolomite and sand members. The entire hundred fifty feet definitely contains oil saturation, but most of the footage cored in the No. 2 Well had a permeability of less than one-tenth millidarcy. In arriving at the average porosity and permeability figures, as shown in Item 4 of Exhibit 6, I have only considered footages having permeability equal to or greater than one-tenth millidarcy as net pay. These calcula-

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tions show that the porosity in the dolomite is 3.05 percent, and in the sand 10.2 percent. The permeability in the dolomite, 4.39 millidarcies, and in the sand 0.25 millidarcies. I have estimated water saturation to be 30 percent in each. Now, the net pay, as shown in Item d., for the dolomite, is 28 feet. This 28 feet was actually taken from the log of the No. 1 Well. The 19 feet of net pay in sand was taken from the core analysis of the No. 2 Well.

The reservoir temperature is 142 degrees Fahrenheit. Original reservoir pressure, 3983 at minus 5840, which is the midpoint of the perforations.

It is my opinion that the probable reservoir mechanism will be a solution gas drive.

Q Mr. Young, in taking the pay for the dolomite section from the log of Well No. 1, you used 28 feet. Was that more or less pay than was indicated by the core graph that you have on Well No. 2?

A It's greater. The No. 1 Well has two dolomite intervals, the upper having 11 feet of net pay, and the lower having 17 feet of net pay, which I have assigned the well from the FORXO Log.

Now, the core analysis of the No. 2 Well showed that only the lower dolomite had net pay in the No. 2 Well, and that amounted to 19.2 feet.

Q Well, we will go into that core graph a little later when we introduce it in evidence, Mr. Young, I'm sure, and the



point I wanted to be sure we had clear here is that you used the larger net pay figure of -- from the data that is available?

A Yes.

Q Giving it the largest you could?

A Yes. This 28 feet of pay will be used in the volumetric oil recovery estimate at a later time.

Q All right, sir. Have you also had prepared under your supervision Exhibit No. 7, and will you look at that, please, sir, and tell us briefly what that is?

(Whereupon, Ohio's Exhibit No. 7 marked for identification)

A Exhibit No. 7 is the FORXO Log through the Bone Springs pay section of the Lea Unit Federal Well No. 1. The top of the pay from this log is shown at 9480, which is minus 5806 subsea. This is the top of the oil saturation as determined from drill cutting samples in the No. 1 Well, and is also correlatable with the core analysis in the No. 2 Well. The perforations in this well are from 9480 to 9550.

Two drill stem tests were run in this well during the drilling of the well. The first was from 9480 to 9560, and the well flowed at the rate of 549 barrels per day. The second drill stem test was run from 9560 to 9600, and the well flowed at the rate of 391 barrels per day on that test.

Q What is the yellow and blue line that is indicated just to the right of your perforations, as I observe them there on Exhibit No. 7?

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A Those colors represent the lithology through the Bone Springs pay section. The yellow indicates sand, whereas the blue indicates dolomite.

Q Does it show the sand was extremely tight?

A Yes, but also indicated the sand had oil saturation.

Q Now, the data that you had available, including the drill tests and logs, didn't show conclusively whether ^{oil} would be obtained from the dolomite or the sand or both, is that correct?

A That's correct.

Q So, what was decided as to where this well would be perforated?

A The well was perforated in the upper 70 feet of what is considered the reservoir.

Q Then, the question is still not resolved definitely whether sand or dolomite or both are contributing to this production, is that right?

A That's right. It's my opinion that the majority of the productivity will be obtained from the dolomite.

Q All right, sir. What does this log show with respect to porosity of the dolomite?

A The porosity of the dolomite is quite erratic in this well.

Q How about the sand?

A The sand shows good porosity.

Q What, then, does the core graph of the No. 2 Well



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show about that sand?

A Most of the sand is very tight, with the exception of approximately 19 feet in the middle sand section.

Q All right, sir. Now, we show -- your net pay figures that you show, show 11 feet in the upper portion, is that right?

A That's correct.

Q And a total of 28 feet, including 17 down below?

A Yes.

Q That is 28 feet you are going to use later on in your reserve calculations?

A Yes, for the dolomite only.

Q Mr. Young, will you look, please, at what is marked The Ohio's Exhibit 8, and tell us what that is, if you will, please?

(Whereupon, Ohio's Exhibit No. 8 marked for identification)

A Exhibit No. 8 is a completion core graph of the No. 2 Well. The interval cored in this well was 9478 to 9665. Shown in the blue and yellow colors is the lithology to correspond with the blue and yellow colors used in the previous Exhibit. The sand again denotes -- the sand is again denoted by yellow, and the dolomite denoted by blue. The top of the Bone Springs pay in the No. 2 Well from the core analysis is 9504, or minus 5818 subsea. These approximately 12 feet low to the No. 1 Well.

Q What does this core analysis indicate as to sand above 9565?



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A All the sand above 9565 has a permeability of less than one-tenth millidarcy, and, in my opinion, cannot be considered as net pay.

Q And what' about the upper dolomite section in this well? It had 11 feet of pay shown in No. 1 Well. What is indicated here by this core graph?

A The core graph No. 2 Well indicates the upper dolomite section in this well has permeability of less than one-tenth millidarcy. As a matter of fact, the thickness of the upper dolomite section is only 4 feet.

Q That is in the No. 2 Well?

A Yes.

Q What is the thickness of the lower dolomite in the No. 2 Well as shown by this core graph?

A Approximately 40 feet.

Q What does the core analysis show with relation to permeability of the dolomite, the lower dolomite, in this 40-foot interval?

A In the interval from 9607 to 9648, there is 19.2 feet of dolomite which has permeability greater than one-tenth millidarcy. This is indicated by the solid red color on Exhibit No. 8. The average porosity for this 19.2 feet is 3.05 percent, and the average permeability, 4.39 millidarcies.

Q Mr. Young, that's 19 feet of this lower dolomite, is that right?

A 19.2 feet.



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Q All right, sir. Now, what about the red boxes that are drawn, or boxes drawn with red lines up here? What do they indicate?

A In the interval from 9565 to 9607 there is 19 feet of sand which has a permeability greater, equal to, or greater than one-tenth millidarcy. The average permeability for this 19 feet of sand is .25 millidarcy.

Q All right, sir. Now, using the reservoir characteristics that you have as further supported by the core graph and the log that you have just testified about, as to Exhibits 7 and 8, have you calculated, made volumetric calculations as to recoverable oil reserves in the Bone Springs formation in this pool?

A Yes, I have. Exhibit 9 is volumetric calculation for the recoverable oil to be expected from the Bone Springs. Exhibit 9 shows a volumetric calculation for the recoverable oil from the dolomite interval and also from the sand interval.

Q You have calculated each of them separate, then, have you?

A Yes.

Q All right, sir. Will you very briefly refer to those calculations, starting with the dolomite?

A Well, the dolomite, I calculate the recoverable oil to be 476 barrels per acre. This is using the factors which we have previously discussed and applying a 20 percent recovery factor. During the life of this reservoir, it's my opinion that some of the



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oil accumulation in the sand will be recovered. However, it's difficult to estimate what recovery factor that we might apply to the sand. I have arbitrarily used 10 percent recovery factor for the sand.

Q Mr. Young, one reason it's difficult to estimate is that the core graph shows that sand has a permeability of only .25 millidarcy average, is that correct?

A That's correct.

Q And it's your opinion that the sand ^{and} the two dolomite intervals are all one reservoir?

A Yes, it is.

Q And that sand is, as you said, going to contribute something during the life of the reservoir, you can't tell for certain how much?

A That's correct.

Q Your calculation gives that per acre reserve of recoverable oil at 540 barrels --

A Per acre, yes, sir.

Q All right. And then, how have you arrived at the total Bone Springs recovery per acre?

A I have added the recoverable from the dolomite and from the sand, and the net result is 1016 barrels per acre.

Q All right, sir. Now, attached to Exhibit 9 as Pages 2 and 3, are some information that is taken from this core analysis that we previously introduced in evidence, is that right?



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A Yes. Page 2 shows the data from the core graph to determine the weighted average permeability and porosity in the dolomite.

Q That is showing the method by which you arrived at the porosity and permeability figures you used in the volumetric calculations?

A Yes.

Q These figures shown on 2 and 3 were just copied off the core graph to bring them here and show what you were using out of that core graph, is that right?

A Yes.

Q All right, Mr. Young, have you also had an exhibit prepared that shows the comparative economics in connection with the Bone Springs reservoir?

A Yes, I have.

Q Was this prepared somewhat along the lines of the exhibit you prepared of comparative economics on the Devonian?

A Yes.

(Whereupon, Ohio's Exhibit No. 10 marked for identification.)

Q This is marked The Ohio's Exhibit 10. Now, in connection with Ohio's Exhibit 10, Mr. Young, have you again, to approach this realistically, considered a substantial area which you believe and have testified is minimum area expected to be productive in the Devonian, have you used that in the Bone Springs also?



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A Yes, same area, same 800 acres.

Q And it is your opinion that is expected to be the minimum area productive in the Bone Springs, is that right?

A Yes.

Q So that the number of wells considered for either 80 or 40 acres ^{are} 20 and 10 respectively, as in the case of the Devonian testimony?

A Yes.

Q Now, what about the investment costs to drill one of these Bone Springs wells, Mr. Young?

A If a singly completed well was drilled to the Bone Springs, the estimated cost would be two hundred twenty-five thousand dollars per well.

Q And what would be then the total investment at 40-acre spacing?

A Four million five hundred thousand dollars.

Q And for 80-acre spacing?

A It would be two million two hundred fifty thousand dollars.

Q Just half as much because you have half as many wells?

A That's correct, sir.

Q All right, in this Bone Springs presentation, have you also made calculations as to what investment would be necessary for a dually completed well in the Bone Springs?

A Yes. The cost of dually completing an existing well in the Bone Springs would be twenty-five thousand dollars.



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Q And 40-acre spacing, that would be a total investment --

A Of five hundred thousand dollars, and for 80-acre spacing, two hundred ~~fifty~~ thousand dollars.

Q Again, with relation to full development of the 800 acres you're talking about?

A Yes.

Q Now, your volumetric calculations per acre, as presented by Exhibit 9, show us an amount that would be expected to be in place under this 800 acres, and what have you calculated that to be, please?

A I have calculated the recoverable reserve to be 812,800 barrels.

Q And how much gas do you calculate will be produced?

A 1,625,600 MCF.

Q That is assumed on a gas-oil ratio of 2000 to 1?

A Yes.

Q Which is slightly in excess of the ratio at the present time?

A Yes.

Q Have you made a computation of net working income, based on a 7/8ths working interest?

A Yes.

Q And that's shown on Exhibit 10?

A Yes.

Q You have used similar cost figures there --



A Yes.

Q -- as to what you did on the Devonian?

A Yes.

Q Your lifting cost on this you have shown slightly less?

A Yes.

Q Why is that?

A We show one cent less lifting cost here because this is a shallower depth. The Devonian being at a deeper depth, we felt like the lifting cost for the deeper depth would be slightly more than that in the Bone Springs.

Q And your net operating income, then, for Bone Springs oil, comes out to what, per barrel?

A Per barrel would be two dollars fifteen cents.

Q That doesn't take into account any overrides?

A That's correct.

Q Now, then, what, according to your reserve calculations and your net operating income computations would be the total working interest income from this 800 acres?

A One million seven hundred forty-seven thousand five hundred twenty dollars.

Q Now, then, would that result in a profit or loss for drilling a well to the Bone Springs? I'm talking about singly completed well in Bone Springs.

A It would amount to a loss.

Q And is the amount of that loss shown on Exhibit 10?



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A Yes.

Q What is it, for 40-acre spacing and for 80-acre spacing both for the 800 acres and per well?

A The net 40-acre would be two million seven hundred fifty-two thousand four hundred eighty, or net loss per well of one hundred thirty-seven thousand six hundred twenty-four. Net loss for 80-acre spacing would be five hundred two thousand four hundred eighty, or net loss per well of fifty thousand two hundred forty-eight dollars.

Q Well, those figures pretty well establish that it would not be economically feasible to drill a well just to the Bone Springs, isn't that right?

A That's correct.

Q Have you, then, proceeded to make computations on what probability would be expected on dually completing into the Bone Springs in an existing well?

A Yes.

Q Would you give us those figures as set out on Exhibit 10?

A Net profit for dual completion for 40-acre spacing would be one million two hundred forty-seven thousand five hundred twenty dollars, for a net profit per well of sixty-two thousand three hundred seventy-six dollars. The profit to investment ratio would be two dollars fifty cents to 1. The total net profit for dually completing for 80-acre spacing would be one million four hundred ninety-seven thousand five hundred twenty dollars, or a net profit per well of a hundred forty-nine thousand seven hundred fifty-two dollars.



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The profit to investment ratio would be 5.99 to 1.

Q What does this indicate to you as to the only feasible method of developing the Bone Springs?

A The only feasible method, in my opinion, in developing the Bone Springs would be to dually complete wells with the Devonian.

Q It comes pretty much down to a salvage operation as far as Bone Springs is concerned, doesn't it?

A Yes.

Q What is your opinion as to whether the Bone Springs, whether one well can efficiently and economically drain in excess of 80 acres in Bone Springs, based upon all this data you have presented to us here?

A It's my opinion that one well in the Bone Springs is capable of draining areas in excess of 80 acres.

Q Mr. Young, do you have a pressure drawdown test on Bone Springs?

A Yes, we have.

Q And this is one of the items and the results of that test that you were taking into consideration in your conclusion as to the drainage area in the Bone Springs?

A Yes.

Q Would you state briefly for us the results of that test, when it was taken and what the results were?

A A pressure drawdown test was made in the No. 1 Well be-



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tween October 14 and 18, 1960. The well was open on a quarter inch choke, and flowed for 77 hours at the rate of approximately 200 barrels of oil per day. Following this drawdown test, a 20-hour build-up was taken. A curve plotted of flowing the bottom hole pressure versus the logarithm of time of the drawdown test showed that the curve had three separate straight line slopes, indicating a change in transmissibility within the reservoir. Recalling that the No. 1 Well, although being perforated over an interval of 70 feet, only 11 feet has been considered net pay. Using that 11 feet, we can calculate from the drawdown test that the permeability within the Bone Springs varies from 2.1 to 60.3 millidarcies. This variation actually has the effect of concentric zones about the well. Zone one has a calculated permeability of 3.4 millidarcies at a radius of 257 feet. This was a flowing time up to three-tenths of an hour. Zone two has a permeability of 2.1 millidarcies at a radius of approximately 57 to 107 feet with the flow time of two to three hours. Beyond the flow time of three hours, the permeability calculated to be 60.3 millidarcies at a radius of beyond a hundred and seven feet. Following the pressure drawdown test a build-up was run, was taken in the well.

Q This is the pressure build-up?

A Yes, this is the pressure build-up, and it reflects a composite of the above results, or has an average permeability of 19.2 millidarcies. This test shows to me, that although the permeability in the Bone Springs might be erratic, there is permeability



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within the reservoir sufficient to conclude that one well can efficiently and effectively drain areas substantially in excess of 80 acres.

Q Mr. Young, in connection with this drawdown test, since there was an initial pressure drop early in the test, but there was then a continuation of a slight decline over the remaining period during which the test was run, that is what permitted us to actually calculate the permeability that you have talked about in this wider area, is that correct?

A Yes.

Q Whereas, in the test run in the Devonian, since the pressure remained constant, there wasn't any method by which an actual calculation could be made after that initial pressure drop?

A That's correct.

Q Mr. Young, if the spacing pattern for this Bone Springs were to be set differently from that which we have requested, or which is finally approved in the Devonian, that would tend to leave some of this Bone Springs oil unrecovered, would it not?

A That's correct.

Q There would be some need of finding some additional pay and in dualing it some other way later on in the life of the field?

A Yes.

Q If a person preferred not to dual but wanted to go ahead and take this risk of drilling a Bone Springs well with this hundred fifty-foot tolerance, they could drill twin wells, could they not?



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A Yes.

Q Are you recommending for this pool, then, the same spacing pattern that you recommended for Devonian?

A Yes, I am.

Q And with respect to the allowable, what allowable are you recommending here in the Bone Springs?

A I would recommend an allowable by extending the -- recommending an allowable be established to apply to the 80-acre proportional factors as provided in 505 State rule as amended.

Q All right, sir, and with the same adjustment you recommended in the Devonian?

A Yes.

Q Mr. Young, considering all that we have presented here, is it your opinion that by applying temporary rules of this character early in the life of this field, that there is greater likelihood and more certainty that there will be a regular development of this reservoir in an orderly fashion so as to promote the purposes of conservation?

A Yes, it is.

Q And although the data we have is very limited, all indications point to these conclusions which you have reached on the basis of this data, that these wells will drain in excess of 80 acres, isn't that right?

A Yes, sir.

Q Mr. Young, you are only recommending temporary rules at



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this time, that's correct, too, isn't it?

A That's correct.

Q Based upon this data, you would not recommend any permanent rules at this time, would you?

A That's correct.

Q There will be additional productive history in this well as development progresses, but because of the length of time to drill a well, that is going to be a little slower in coming than would be ordinarily the case, is that right, sir?

A Yes.

Q So if we waited until we had all the data that we would really like to have to fix permanent rules, this would probably be or could be developed on a regular development pattern, and we could run into some complications with 40-acre spacing, is that so?

A Yes.

MR. COUCH: This concludes our direct testimony from this witness.

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

MR. PAYNE: Yes.

CROSS-EXAMINATION

BY MR. PAYNE:

Q Mr. Young, is this area unitized in both formations?

A Yes, both formations.

Q And Ohio is the operator?

A Yes.



Q Therefore, you have no 40-acre offset obligation in the unit area, do you?

A Not at the present time.

Q You can drill 80-acre wells regardless of what proration the Commission establishes, isn't that correct?

MR. COUCH: Mr. Payne, the witness is considering it from the engineering standpoint. As far as the unit rule, we have no authorization -- the unit agreement does contain provisions which require a meeting of offsets along the unit boundary, for example, and certainly what he -- I'm going further than necessary in answering your question.

Q (By Mr. Payne) Now, Mr. Young, therefore, I take it Ohio could develop the unit area, at least on an 80-acre pattern, notwithstanding the proration units established by the Commission. As Mr. Couch points out, you might have an offset obligation within the unit as to a well drilled outside the unit?

A Yes.

Q However, if one well will drain 80 acres, you would only have to drill one offset well for two 40-acre wells, wouldn't you?

A I don't believe I understand the question.

Q Well, does Ohio usually drill an offset well to prevent drainage of its tracts?

A I believe so.

Q And if two 40-acre wells were drilled outside the unit and directly offsetting the unit, if you drill one 80-acre well

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inside the unit, you would still prevent yours from being drained, wouldn't you?

A Would have an additional offset obligation, though, Mr. Payne.

Q If the obligation is to prevent drainage, and if you are correct in assuming that one well drains 80 acres, then one 80-acre well would protect the unit area from two 40-acre wells?

MR. COUCH: Mr. Payne, I think most of the questions here relate --

MR. MORGAN: Let him answer the question.

MR. COUCH: Mr. Morgan, if I may raise this point. There is a legal matter, depending upon the leases, as to whether this would save the Ohio's offset obligation, that does constitute a legal obligation, which the witness is not prepared to answer, but which I would be glad to answer.

MR. MORGAN: If he is not competent to answer, he should not try.

MR. COUCH: That was my point. I will answer it now or later.

MR. PAYNE: I wish you would go into it.

MR. COUCH: In considering the obligations of offset, one thing you would have to consider would be the allowable of the wells, and two wells with 40-acre allowables would be in excess of the 80-acre allowables the other well would have, and I would think U.S.G.S. as to its tracts are, or the State's, if it were in a par-



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ticipating area, would want us to do something more than drill one well. I think probably they would be justified in that position.

MR. PAYNE: Thank you.

Q (By Mr. Payne) Mr. Young, do you think your application might be premature here in view of the fact that you are drilling an additional well now, and you could take interference tests upon completion of that well?

A No, I don't.

Q You would have better data available as to drainage area, wouldn't you?

A Certainly, if more wells are drilled, Mr. Payne, we will have more data, but there is wells, one well offsetting the unit at the present time, it happens to be on pattern, but with the next well as staked outside the boundary of the unit may be off pattern.

Q Off the pattern you have recommended?

A Yes.

Q Let's talk about that a minute. You propose an original pattern here with the proration unit running either direction, but the well to be located in either the northwest quarter or the southeast quarter of the quarter section, is that correct?

A That's correct.

Q Now, do you feel that you will get more oil, less oil, or the same amount of oil with the rigid pattern as opposed to a flexible pattern where you can drill a well in either area of the



40-acre unit?

A It's my opinion that their greater amount of recovery will be determined by set pattern, rigid rather than irregular.

Q How do you arrive at that in view of the fact each well will drill 80 acres?

A If we were to permit drilling it, the well in either quarter, or any quarter-quarter section, we would probably be faced with drilling clusters of wells about the lease lines.

Q Now, this happens in 40-acre pools, too, doesn't it, Mr. Young?

A Yes.

Q Where you can drill out of any corner, 330 feet out of any corner of the 40?

A Yes.

Q So that, in effect, we have a flexible pattern in all 40-acre pools?

A Yes.

Q Now, with a rigid pattern such as you propose, Mr. Young, what happens when you get to the edge of the pool, inasmuch as the theory underlying the fixed pattern in a pool that has oblong units is based on drainage and counter drainage? What happens to the operator when he gets to the edge? He drills where he is supposed to under the rigid pattern, he gets a dry hole, he wants to move up and drill on the other 40, but under the principle of drainage and counter drainage, the oil under that tract is supposed

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to go to the operator in the next tier -- what would you do then?

A I don't believe I could answer that, Mr. Payne.

Q And you admit it might be a problem?

A Yes. I understand it's a problem.

Q And it might even be a further problem in an area where you are contemplating dual completion, might it not, inasmuch as the pool boundaries, would be highly unlikely that the pool boundaries would be identical?

A It could.

Q So that a man, an operator, might feel that he has commercially productive -- to get a commercially productive well in the Bone Springs by drilling where he is supposed to, but inasmuch as a single completion in the Bone Springs probably would not pay out, he would not drill the well, would he, if he felt that the -- that 40, as far as the Devonian is concerned, might not be commercially productive, while the other 40 would be productive in both the Devonian and the Bone Springs? What I'm getting at is you might leave some Bone Springs production by the rigid pattern, might you not?

A Yes, you could.

Q Now, I believe you testified, too, that one advantage to a rigid pattern was in the case of a secondary recovery, so that you don't have these clusters of wells?

A Yes.

Q Inasmuch as the Devonian formation here, under your assumption



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tion, is water drive pool, what type of secondary recovery project would you anticipate Ohio might initiate?

A Currently, I would have no idea, Mr. Payne, but ten or fifteen years down the line, who knows what method of secondary recovery might be developed. L.P.G. injection is becoming quite popular at the present time. Some other type of secondary recovery operation might be developed in the intervening time, and I think that the rigid regular pattern would always lend itself to better secondary operations.

Q You probably would not ever recommend that you water-flood this pool inasmuch as it's a water drive pool?

A No.

Q Now, Mr. Young, why have you limited your area expected to be productive to the yellow area when the other area is so much larger?

A For economic considerations, Mr. Payne, we have taken a minimum area which we might expect to be productive. It's my opinion that the high structural position in the south part of the unit will be also productive, but, arbitrarily, for our economic considerations, we have just blocked out an 800 acre. Now, I personally think the reservoir is larger than that.

Q You actually think the unit area is a proper size, geologically?

A Based upon our geophysical work, seismograph here, I'm sure the unit was blocked out upon that basis.



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Q Now, Mr. Young, I don't quite understand your economic data here. What is the cost to drill a dual completion in these two formations?

A Well, based upon the figures that we have prepared here, it would cost four hundred seventy-one thousand dollars to drill a single completed Devonian well. Then it would cost twenty-five thousand dollars --

Q Two hundred twenty-five --

A Twenty-five thousand dollars to dually complete that well in the Bone Springs.

Q All right. Now, in your Exhibit as to economics in the Lea-Devonian, you could add twenty-five thousand dollars to the cost of that well, I take it, and then you could also add in all the production that you are going to get from the Bone Springs, in determining your net loss or net profit?

A Yes.

Q You didn't actually approach it on that basis, did you?

A No, I did not.

Q Mr. Young, was your No. 1 Well cored, this discovery well?

A No.

Q So that your figures on porosity, permeability and water saturation are actually estimated, are they not?

A For the Devonian?

Q Yes.



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A Well, porosity was calculated from a neutron log. Permeability came from the drawdown test.

Q Does a neutron log actually measure porosity, as such?

A No, it measures a porosity index which we use a porosity --

Q Who is the purchaser in here, Mr. Young?

A I can't answer that, Mr. Payne.

Q Do you have a pipeline connection?

A No, we don't.

Q You are trucking it all now?

A It's my understanding it's still being trucked.

Q Do you have any idea how much the trucking charges are?

A No.

MR. PAYNE: That's all. Thank you.

BY MR. MORGAN:

Q Mr. Young, you are asking for temporary pool rules here. What would cause you to change your testimony a year from now when most likely the applicant will ask that the pool be made permanent if in case 80-acre spacing is allowed in the Devonian or the Bone Springs or both? What would cause you to recommend it to be in-field wells drilled, or decline to testify that the rules should be made permanent?

A Well, actually, I believe what little data is available is enough to show that one well would drain greater than 80 acres.

Q Well, you know what it's going to cost you to drill these



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wells?

A Yes.

Q That is fixed; that wouldn't change a year from now, materially?

A No, it will be approximately the same.

Q Could it be possible that your recovery estimates would be improved or lessened one way or another, 50 percent recovery in the Devonian?

A We have used 50 percent recovery based upon water drive mechanism. Now, I don't believe it would probably be any greater than that.

Q Maximum, then?

A That is pretty much the maximum, in my opinion.

Q It is also about the minimum, too, is that it?

A No. There's a possibility that there would be no water drive developed. In that case, our recoverable reserve here would be substantially smaller than I have shown, and, therefore, the economics would be much poorer.

Q Well, you are not likely to ever testify that there should be any infield wells drilled, are you?

A Well, based upon the current knowledge of the reservoir, I would have to say no.

Q In other words, you're really recommending these rules be made permanent, aren't you?

A Yes.



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MR. MORGAN: That's all.

BY MR. PAYNE:

Q Mr. Young, along this same line, on your cost of completing these wells, you are using the figures on the discovery well, are you not?

A No. The discovery well singly completed in the Devonian cost us six hundred nine thousand dollars.

Q So that your taking into consideration subsequent wells wouldn't cost as much as the discovery well?

A Oh, yes.

MR. PORTER: We're going to recess the hearing at this point until one-fifteen, for lunch, at which time the witness will be recalled for further cross examination.

(Noon recess at eleven-twenty-five.)

* * * * *

AFTERNOON SESSION

MR. PORTER: The meeting will come to order, please. Mr. Payne, I believe you indicated you had another question.

MR. PAYNE: Yes.

BY MR. PAYNE (Continued):

Q Mr. Young, in the drilling of your No. 1 Well, or in your No. 2 Well, as far as it has been drilled, did you have any indication that there might be any other formation in this area which is commercially productive?

A Yes, there have been shows in other formations.



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Q Which formations might perhaps be better than the Bone Springs?

A We have not tested any of the zones to tell what their productivity will be. There is some gas sands between the Bone Springs and Devonian that have indicated substantial gas flows. There was an oil show in the Brushy Canyon, which is above the Bone Springs, but we did not get flowing drill stem tests.

MR. PAYNE: Thank you.

MR. COUCH: May I interject here? The complete log of this No. 1 Well is in the record. The staff, I'm sure, will be able to refer to that and see what other indications there were up there.

MR. PAYNE: Thank you.

MR. PORTER: Mr. Nutter, did you have a question?

BY MR. NUTTER:

Q Mr. Young, in drawing this yellow area on here, does this more or less conform to any particular contour line on the structure map of the Devonian, or did you just arbitrarily pick out 800 acres there?

A It more or less conformed to the structure, I believe, Mr. Nutter. Not down to the exact contour line, I would not say. It's a combination of albitration and structure.

Q It would appear if it conformed to any contour line, about minus 11,000 would be the closest to it?

A Yes.

Q So that in all probability there, 11,000 would be the



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productive limits there of that structure, and the high to the south, if it was productive, there may be an area in between the two intervals which might be non-productive, is that correct?

A That is possible. We could not ascertain that at this time.

Q Now, did you drill all the way through the Devonian on the No. 1 Well?

A I'm not sure about that, Mr. Nutter.

Q You didn't encounter any water, total depth, however, in drilling this well?

A No. It was dense limestone.

Q What did the No. 1 Well actually cost for the completed well in both formations, Mr. Young?

A In both formations?

Q The dually completed well?

A Six hundred seventy-eight thousand dollars.

Q And approximately what was the cost of dually completing the well in the Bone Springs?

A It was about sixty-nine thousand dollars, but I want to add there, Mr. Nutter, we had to repair a casing leak, which caused the cost of the dual completion to be in excess of what we would have had, had we had a straight dual completion job.

Q Was any communication between the two zones involved in that casing leak?

A No, it was at a shallower depth.



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Q Now, you have already commenced the drilling for No. 2 Well, is that correct?

A Yes, it's drilling below the Bone Springs pay.

Q I suppose you have A.F.E. prepared for the cost of that well?

A Yes.

Q What is your A.F.E. total?

A The A.F.E. total is five hundred sixty-two thousand dollars.

Q Five hundred sixty-two thousand?

A Yes.

Q Have you prepared an A.F.E. for the No. 3 Well yet?

A It has been prepared, but I do not know the total on it.

Q Why do you expect the No. 2 Well to cost five hundred sixty-two thousand dollars when your estimate here is four hundred seventy-one thousand dollars per well?

A We are doing an excessive amount of coring and testing as we drill this well.

Q Do you anticipate that when you come back a year from now, assuming that you get the temporary orders for 80-acre spacing, that you would have some core data to offer to the Commission on the Devonian?

A I believe it's the intention to core the Devonian on this No. 2 Well.

Q If we had core data at this present time, we would not



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have to take an estimate of porosity, permeability, water saturation, and possibly net pay as we have to in making these reservoir evaluations at this time, is that right?

A That's correct.

Q So that the coring would enable the Commission to make a decision based on facts more than estimates or calculations?

A Yes.

Q Now, do you have the curves in which you plotted flowing bottom hole pressure against the logarithm of time prepared to offer as exhibits in this hearing, Mr. Young?

A No.

Q Could you furnish the Commission with the plots of those calculations?

MR. COUCH: Mr. Mutter, as you know, those reports and tests are very complicated, and, frankly, very difficult for most folks to understand. They contain a lot of detailed information also about this reservoir, and we are operating under a unit agreement with other operators. I think I can assure you that all of the working interest owners would agree that we could make those tests available to the Commission staff. We would like to request that they be kept confidential and used by the staff in its deliberations. We think that the results of the tests as reported here constitute sufficient evidence to support the order which we seek. However, as far as the information is concerned, assuming the other operators are agreeable, and I believe they will be, we would be very glad to



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furnish them to you on both tests for Commission use in your evaluation of Mr. Young's conclusions and opinions here, if that would be satisfactory.

MR. NUTTER: These calculations don't involve any super-secret method of determining reservoir boundaries or reserves?

MR. COUCH: No, sir. I would not say super-secret.

MR. NUTTER: I mean, the method itself is an accepted method?

MR. COUCH: Yes, as I understand it, it is; it's an accepted method and being used by more and more companies. We have used it in other areas, and we would, because of the detailed information it has on this unit operation, this deep well, we would like to furnish it with the understanding it would be used on a confidential basis by the Commission staff, if that is acceptable.

MR. PAYNE: That could be done, Mr. Couch, inasmuch as this would not be something that is required to be filed by the Commission. Were it required to be filed as a form, of course, it would have to be open to public inspection.

MR. COUCH: That is true.

Q (By Mr. Nutter) Now, Mr. Young, as I understand it, on the plot on the Devonian formation, you got a break which indicated a change in permeability at two hundred sixty-four feet away from the well bore, is that correct?

A That's correct.

Q Now, could that break in that curve be attributed, not



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to a change in permeability, but to the possibility that those high withdrawal rates -- I think you were withdrawing five hundred ninety-seven barrels per day for sixty-eight hours -- is there any possibility that any water started encroaching during that high drawdown on those wells and would cause that change in that curve?

A No.

Q You don't believe that could be possibly water encroachment?

A No.

Q Water encroachment would have the same effect on the curve, however, would it not?

A If the radius of drainage of the well during testing was to go beyond the limit of the reservoir into a water bank formation, there would be a change in transmissibility because of the difference in the viscosity between the oil and the water, and you would still have a decrease in pressure on this test. Now, in the Devonian, after an hour and a half, we had no further decline in pressure, which indicated that at that time you encountered a zone of extremely high permeability. It's so high we cannot calculate it, because the slope of the line of pressure versus the log of time is actually zero.

Q Now, what would be the effect in the first hour and a half of withdrawing oil out to a fracture and then starting to draw in the fracture after you had reached out to that limit? Would that react in the same manner as a zone of extremely high



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permeability?

A It could very well be that the zone beyond two hundred sixty-four feet is a fracture system.

Q There is a fault depicted here on this Exhibit No. 1, is there not --

A Yes.

Q -- which might or might not have resulted in some fracturing in the formation?

A Well, it could very easily be fractures in the Devonian. That is characteristic of a lot of Devonian reservoirs.

Q Now, in your volumetric calculation on the Devonian, you used a recovery factor of 50 percent. You used the water saturation of 30 percent, both of which are estimates. Now, Ohio Oil Company is an operator in the Denton-Devonian Pool. What recovery factor are you using in the Denton-Devonian Pool?

A We use 50 percent.

Q Was that the original estimate, or is that the revised estimate that you are using today?

A That is the revised estimate.

Q What water saturation do you have in the Denton-Devonian Pool?

A I don't recall, Mr. Nutter.

Q You don't know if it's less than 30 percent, then?

A No, I don't recall.

Q Are you using the same recovery factor for 80-acre spacing



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as you are for 40-acre spacing?

A Yes.

Q And you are using the same recovery factor for 80-acre spacing as for 40-acre spacing in the Bone Springs also?

A Yes.

Q I think in your estimate of reserves, Mr. Young, I noticed that you give a value to 2,000 cubic feet of gas in the Bone Springs of twenty cents, and you give a value of 300 cubic feet of gas in the Devonian Pool, six cents. What is the difference in this figure? Is there that much difference in the gas itself?

A There is that much difference in the G.P.M. content of the gas, although being a small amount, it has close to five gallons per thousand cubic feet of gas, whereas the Bone Springs gas is much leaner, --

Q I see.

A -- and that accounts for the difference.

Q You get a better price for the Devonian than you will for the Bone Springs?

A Oh, yes, sir; on an MCF basis, of course, there will be more of the Bone Springs gas.

Q You have a different royalty cost for the two zones also. To what do you attribute the difference in royalty costs?

A Well, the royalty here is figured on a straight one-eighth. The total gross value per barrel of oil produced in the Bone Springs is more than in the Devonian. The Bone Springs is



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2.97 and the Devonian is 2.83 and that's accounted for in its difference in amount we receive for the gas produced along with the barrel of oil.

Q I see. In other words, a barrel of oil is going to yield more in one pool than the other, so, therefore, you will have to pay more royalty on it?

A That's correct.

Q I see. And you explained the difference in lifting costs already.

A I believe that was covered in my direct testimony.

Q Yes. . Do you know whether United States Smelting, in filing their notice of intention to drill their well out west of the unit, projected it to the Devonian formation or to the Bone Springs, or to what formation did they project their well?

A I could not answer that, Mr. Nutter.

Q To what formation has Sinclair projected its well?

A I believe it was originally projected to the Devonian.

Q And what did you say the present status of that well is?

A Of the Sinclair well?

Q Yes.

A It's drilling below the Bone Springs.

Q So, evidently, it's going on to the Devonian?

A That, I could not answer.

Q Is there any --

MR. COUCH: I think we might clarify that at this point.



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Although Mr. Young doesn't have the information, Mr. Wheeler does.

MR. WHEELER: I understand originally that was a Bone Springs well, and then when it didn't produce from the Bone Springs, their objective is presently ^{the Bend} as a gas well.

Q (By Mr. Nutter) So, there is a possibility of production in between the Bone Springs and the Devonian in this area?

A Yes.

Q In the Pennsylvania.

Q (By Mr. Nutter) In your direct testimony you said if these two pools were developed on different spacing patterns that reserves might be left in the ground, and left unrecovered. Would you elaborate on just what you mean by that?

A I testified that way, Mr. Nutter, because we have shown that the economical way to develop the Bone Springs pay is by dually completing wells. Now, if we have existing Devonian wells, we will dually complete them in the Bone Springs. Now, if we had a different pattern for the Bone Springs and assuming that we were granted temporary 80's in the Devonian, and we had a different spacing pattern --

Q Now, what do you mean by different?

A Well, in open quarter-quarter sections. Now, we propose that both pools be developed, wells drilled in the northwest and southeast quarters of the quarter sections.

Q Oh, you didn't mean if one pool were developed on 80-acre spacing and the other on 40-acre spacing?



A Oh, no, sir.

Q I see. I thought maybe you meant they both would have to be developed on either 40's or 80's or else loss would result.

A Well, I think that would be an acceptable way to develop the pools, to keep them both on the same spacing pattern. If you did not want to dually complete your wells, you could always twin wells.

Q I see. Now, in making your comparison of the earnings of 40-acre wells versus 80-acre wells, you haven't taken into consideration the fact that it would take considerably longer to reach a point of depletion on an 80-acre well than it would on a 40, have you?

A I didn't present any of that testimony.

Q You didn't discount these earnings over a period of twenty years for one and ten years for another?

A No, this is not discounted. This is just straight profit to investment ratio.

Q Actually, for instance here on the Devonian where you figured on 80-acre spacing, you have total balance twelve million four hundred twenty-nine thousand dollars. That figure, if discounted, would not be so great as it is, would it?

A Well, you are referring to the present value of that twelve million dollars?

Q Yes.

A That's correct.



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Q So then, the present value of the monies to be derived from the two different spacing patterns, the difference between them, or the ratio of one to the other would not be as great as it appears to be by just a straight comparison of the net profits that you have presented here?

A I don't believe I quite follow you, Mr. Nutter.

Q Well, now, on the 80-acre spacing you show a net profit of twelve million dollars, on the 40-acre you show a profit of 7.7 million dollars. However, if you were going to the 80-acre spacing, that period of pay off would be extended over a longer period of time, would it not? And if you discounted the money to its present worth, the ratio between 80-acre and 40-acre spacing would not be as great as it appears to be?

A That's correct.

Q Do you have any idea how many years longer it would take to deplete a pool on 80 acres than it would on 40?

A Well, some very rough estimates that I have come up with indicate that the expected life under 40-acre spacing would be around six years, and expected life under 80 acres, approximately ten.

Q I see.

A Now, those are rough estimates.

Q Also referring to these economics whereon the net profit for 40-acre spacing, here in the Devonian, you have a profit to investment ratio of .82 to 1. Now, you don't mean that your profit



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is going to be 82 percent of the cost of the well, do you? You mean that you will recover the cost of the well plus 82 percent of the cost of the well.

A Oh, well, yes.

Q You didn't want the Commission to think that was a losing proposition?

A Oh, no. It's not a losing proposition.

Q I see.

A The profit I referred to here has the cost of the well deducted from it.

Q Yes, and this is the profit above and beyond the cost of developing it?

A Oh, yes, sir. Otherwise, it would be a loss, and I would show a net loss in the tabulation.

Q Well, I thought I understood it correctly. I wasn't sure. On a solution gas reservoir with the sand as tight as the sand appears to be in the Bone Springs, is the 10 percent a reasonable recovery figure?

A Normally, I would not think sand with .25 millidarcy would give up even 10 percent of its reserves, but now this sand here is sand which you find in between two dolomite members, and we assume that it will be throughout the reservoir. We have picked it up in two wells, definitely, and over the entire area of the reservoir we are having a large area for the sand to drain into the dolomite, and eventually be produced to the wells. Now, as I stated in my



direct testimony, it would be very difficult to assign a recovery factor to this tight sand, and I arbitrarily took 10 percent.

Q Would you share a sneaking suspicion that I have, with me, that 10 percent might be a little high for sand like that?

A Yes, I sure would.

Q In response to a question by Mr. Payne, you stated that secondary recovery may be feasible in the Devonian by looking down the road ten or fifteen or twenty years, some new method being developed. You probably don't have to look that far down the road to see the need of and the feasibility of secondary recovery in the Bone Springs, do you?

A Yes.

Q This is a solution gas drive reservoir --

A Yes.

Q -- which may lend itself to secondary recovery --

A Yes.

Q -- by conventional means that are presently known?

A Yes.

Q Is this 30 percent water saturation typical of Bone Pools in New Mexico, or was this -- this was obtained from a log, the core log, was it not?

A No, this is just another estimated figure that went into the calculations.

Q Well, did you have a water saturation on the core?

A Yes.

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Q What was that? What did it average?

A The residual water saturation from the core graph of the No. 2 Well, Mr. Nutter, just as a rough estimate, I would say it shows that the sand has a residual water saturation of somewhere between 25 and 30 percent, and then in the dolomite it was, it's considerably higher, possibly around 40 percent, 45. Now, I would want to point out here that there is no direct relation between the residual water saturation and the connate saturation of the formation.

MR. NUTTER: I believe that's all, Mr. Young. Thank you.

BY MR. PAYNE:

Q Mr. Young, over a period of unlimited time, do you believe that your No. 1 Well could efficiently drain this entire pool, both pools?

A Would you repeat that question?

Q Do you believe, given unlimited time, that your No. 1 Well would efficiently drain and dry the Devonian and Bone Springs Pool?

A As to the Devonian Pool, if it develops --

MR. COUCH: Excuse me just a minute, Mr. Young. Mr. Payne, do you mean on the basis of the available data he has now, assuming this is all the data he would have?

MR. PAYNE: Yes, sir, what he has now.

MR. COUCH: As to whether or not that is sufficient to indicate whether it would drain the entire pool?



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Q (By Mr. Payne) Given an unlimited period of time?

A Yes. I believe I would answer yes, to both zones.

Q Then, what is the advantage of a rigid pattern, what does it hurt to have clusters of wells if any one of them would drain the entire pool?

A The need, as I stated before, for the rigid pattern would be for any secondary recovery action that might be put in.

Q Didn't you also testify that you thought you would get more oil on a rigid pattern than on a flexible pattern?

A I believe I did.

Q Well, would you care to elaborate on that a bit? If any one well will drain the pool, what difference does it make where you place the remainder of the wells?

A We put a qualification on that. You put a qualification on it, saying, given sufficient time. Now, sufficient time may not be an economical time.

Q In other words, the point of -- you would have to abandon it before it had done that?

A Yes.

Q Now, do you believe this additional oil that you think will be recovered on a rigid pattern in the fairway of the pool, at least, would be offset by the, perhaps the loss or the, or by the fact that on the edge of the pool certain wells might not be drilled if you told the operator which he had to drill it in?

A Let me answer that this way, Mr. Payne. Upon the edge



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of the pool, to protect correlative rights, the Commission has the power to change the set spacing pattern, and as to a legal question they may do it.

Q In other words, what you are advocating is a rigid pattern in the fairway with perhaps exceptions granted subject to the edge?

A Well, it could very possibly be that.

MR. PAYNE: I see. Thank you.

MR. PORTER: Has anyone else a question?

MR. MORGAN: Yes.

BY MR. MORGAN:

Q Mr. Young, it's in my mind you haven't been entirely consistent here in your answers. Now, you said a while ago that you believed that one well drilled on 80 would ultimately recover as much as two wells on the 80; in other words, the two 40's.

A I don't believe there would be any measurable difference.

Q Right.

A Yes.

Q Then, you say that the same amount of oil would be produced in or about the same amount would be produced in six years from two wells on an 80, that is two 40's, adjoining, as would be produced out of one well in ten years on that 80. Is that about what you said?

A I believe that's correct.

Q All right, then, is that consistent with this thought,



that to take a hypothetical figure for allowable for those wells, you will have to be aware that in an 80-acre pattern there would be two 40-normal unit allowables plus one depth value; is that about the way you understand it?

A That's correct.

Q All right. Now, then, would you say, then, that 2 40-acre allowables plus one depth factor for this one 80-acre well would produce as much oil in ten years as you would out of two 40-acre wells with two depth factors and two 40-acre normal unit allowables? Do you think those figures would come out that way?

A I don't believe I followed your question.

MR. MORGAN: Well, Mr. Porter has a figure here.

BY MR. PORTER:

Q As I see it, under the allowables, you have 318 barrels a day.

A That is using ^{34 basic unit} / allowable. I did mine on 33.

Q I believe, I think for the current allowable for the month of November, 318 barrels?

A Yes.

Q And twice that would be 636, whereas an 80-acre allowable for that depth grade would be 352, so you have got compact figures to work with. For 2 40-acre straights, say, we have 2 40-acre wells, the combined would be 636, those two allowables?

A Yes.

Q All right, if you had 80-acre spacing, one well on that



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80, you would have 318 barrels plus 34 barrels, which would be 652, or 352, rather.

A Now, what was the question?

MR. MORGAN: His question was --

Q About 3-5 in ratio?

A Well, you are assuming you deplete the entire wells on top allowables?

Q That's right.

A And that's where you are getting your 3 to 5 ratio?

Q Top allowable wells, yes. In that ratio.

A Well, then, we are both ending up with about the same ratio.

Q That is what I was exploring, whether or not --

A Well, I believe we are.

Q Well, I hadn't worked it out, but that is what I'm driving at, whether that comes out with that result. It didn't seem in proportion to me, with two depth factors and two 40-acre allowables, as compared to one 40-acre allowable -- no, 2 40-acre allowables and one depth factor as in proportion to 10 to 6.

A Yes.

Q On first examination, it didn't appear it would come out that way.

MR. PORTER: Anyone else have a question? The witness may be excused.



MR. COUCH: Mr. Porter, I would like to have one minute on redirect, if I may.

MR. PORTER: Yes, sir.

REDIRECT EXAMINATION

BY MR. COUCH:

Q Mr. Young, you testified this morning in response to Mr. Morgan's question concerning whether you would recommend these proposed rules here for adoption as permanent rules. Now, was that statement made on the assumption that the present available data would be unchanged by future operations in this field, or that, made on the assumption that you had only the present available data, and that that is all you are ever going to have, would you recommend these rules be made permanent?

A It was based on available data.

Q Well, as a matter of fact, Mr. Young, you are recommending these rules be adopted as temporary rules only, are you not?

A Yes.

Q And one reason that you are recommending that it be temporary only is that you realize that additional development in this field may provide us with additional information, or will provide us with additional information, and it's possible, although you do not expect it, it's possible that it will show that a well cannot efficiently and economically drain 80 acres?

A That's correct.

Q That is a possibility?

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A Yes.

Q Which you reluctantly admit because you think this data is right?

A Yes.

Q If that possibility were to arise, if you as a reservoir engineer were to come back before this Commission with information showing this well would not drain efficiently 80 acres, would you recommend 80 acres if you could show it would not drain more than 40?

A No.

Q Is it true, under these temporary operating rules you have recommended, that we would obtain more information sooner, information of the kind needed to really either verify this information we have presented here today, or disprove it, so that we can earlier adopt permanent rules for this field?

A Yes.

Q Considering the length of time necessary to drill these wells, approximately six months, I believe you testified, --

A That's correct.

Q -- do you think it's possible that we might want to ask even a year from now that the temporary rules still be maintained as temporary until we can obtain the necessary data to see just what a well will actually drain in this area?

A That is quite possible.

Q But, do you think that there is something definitely to



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be gained by adopting these temporary rules at this time --

A Yes.

Q -- from the standpoint of reservoir information and protection of correlative rights?

A Yes.

MR. COUCH: Thank you.

MR. PORTER: Any further questions?

BY MR. MORGAN:

Q What efficiencies do you find now compared to a year later, in the matter of use of reservoir energy in producing the infield wells; in other words, those that, if they were drilled on 40-acre pattern now compared to -- if they were drilled on infield wells a year from now, would you find the same production in those infield wells a year from now as you would find today?

A Probably not.

Q What would be the difference, since it's a water drive?

A Since it's a water drive, the infield wells would not produce as much drilled at that time as they would now due to the allowable that is taken out of the early wells. They would be that far behind.

Q And that would be a reason, then, probably, if this were granted, it would be a reason to sustain that a year from now, to sustain the order a year from now, because you could then say these wells, infield wells, have a less likelihood of paying out than they would if they were drilled today?



A Yes.

BY MR. PAYNE:

Q Mr. Young, assuming the Commission sees fit to grant approval to your application here, would The Ohio Oil Company consent to take interference tests between No. 1 and No. 2 wells, and such other tests as the Commission might request from time to time?

MR. COUCH: Mr. Porter, Mr. Young is not in a position nor with authority to commit The Ohio to taking any particular interference tests as to any particular wells. As I have said, we are in this unit with other parties, and what testing we do and what operations we do on the unit, necessarily, those people have to be consulted. I think that I can say that The Ohio's position will be that we will want to find out as much about this reservoir as we can at the earliest possible date, and if interference tests indicate that, if interference tests would give us that information, it could be expected we would run them.

Q (By Mr. Payne) Now, Mr. Young, do you feel interference tests are customary and proper way of determining not efficient drainage, but drainage?

A Yes.

Q Do you feel that in most instances, at least, when you're trying to actually determine the drainage areas of a well that an interference test is about as good a way to get the information as any other?

A That is one means of getting the information. However,

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in a high permeability reservoir where you cannot get a large pressure drawdown by flowing the well at a substantial rate, the interference test could be inconclusive.

Q Interference tests are more effective, too, aren't they, when the wells are newly completed?

A Yes.

MR. PAYNE: Thank you.

MR. PORTER: Any further questions?

MR. COUCH: I would like to ask one or two more in connection with this last cross, Mr. Porter.

REDIRECT EXAMINATION

BY MR. COUCH:

Q As to the timing of these interference tests, Mr. Young, would it be, when we run them and how they would be run would depend on what we discover as we go forward with our development program, would it not?

A That's correct.

Q And, in your judgment, as an engineer, in order to attempt to run an interference test, if there was reason to believe it would show something in this high permeability area, would it be your thought, or your opinion that there should be a transfer of allowable from one well to another to permit a sufficient shut-in time of the well, of one of the wells in running interference tests?

A Yes, that is always helpful on interference tests.

Q And with the volumes produced here, that would probably

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be a necessary measure in this case, to use interference tests if they were useable at all?

A Yes.

Q All right, sir. Now, with respect to Mr. Morgan's question concerning the drilling of additional wells, a year from now, instead of now, whether they would produce the same or less amount of oil, whether we continue on 40-acre spacing or on 80-acre spacing, if you drill a well a year from now nearby another well that has already been drilled, that later well is likely, by the same token, not to produce any more oil than the infield well would produce, is that right?

A That's correct.

Q So, whichever basin you go to, you are still going to face that problem down the line?

A It's directly tied to the timing when the well is drilled.

Q Regardless of the spacing?

A Yes.

MR. COUCH: I have nothing more.

RE-CROSS-EXAMINATION

BY MR. PAYNE:

Q Mr. Young, isn't it true that if an 80-acre spacing order is issued on the basis of engineering, drainage, and that information subsequently proves to be incorrect, yet after a temporary 80-acre order has been in effect, the cream has been skimmed off, so to speak, and 40-acre wells are no longer economical, so that then



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the Commission has to enter an 80-acre order on the basis of economics rather than drainage?

A Yes, that is true.

Q That is a possibility?

A It's a possibility.

MR. PAYNE: Thank you.

MR. PORTER: Any further questions?

MR. COUCH: I think not.

MR. PORTER: This witness may be excused.

(Witness excused)

MR. COUCH: We have one additional witness. Before Mr. Wheeler takes the stand, all these Exhibits here were produced under your direction and supervision?

MR. YOUNG: Yes, they were.

MR. COUCH: Will offer them in evidence.

MR. PORTER: Without objection, they will be admitted.

(Whereupon, Ohio's Exhibits Nos. 1 thru 10 were received in evidence.)

J. D. WHEELER,

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

DIRECT EXAMINATION

BY MR. COUCH:

Q Would you please state your name and position with The Ohio Oil Company?



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A My name is J. D. Wheeler. I'm Division Manager of the Houston Production Division of The Ohio Oil Company, which Division includes Southeast New Mexico.

Q Mr. Wheeler, do you have testimony you would like to present from the standpoint of management in connection with the proposed rules in the Lea-Bone Springs reservoir and the Lea-Devonian reservoir?

A Yes, I do.

Q Would you proceed to present that testimony, please, sir?

A This is really more in the nature of an informative statement than it is testimony. A few weeks after the Lea Unit was completed, Ohio, as operator, called a meeting of the non-operators at our Midland office, and we submitted to them a tentative outline for the development of the Unit, and since the other operators agreed to it, I thought this Commission might be interested in getting a brief review of what our plans are for the next few years in the development of this Unit.

First of all, of course, the discovery well was drilled as a result of the seismograph work, which is shown on Mr. Young's Exhibit 1, and the outline of the Unit was also based on that same shooting work.

Now, the Unit within the hatched area on Exhibit 1 consists of 2560 acres, and if all of the acreage should be productive, it would require 16 wells to outline the productive area on the basis of drilling only one well to 160 acres, and since it takes approxi-



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mately six months to drill these wells, it would require in the neighborhood of four years to just outline the productive area by using two rigs in the field, one in the south area and one in the north area. Now, we have already sent out A.F.E.'s to the other operators in the unit, requesting permission to drill Well No. 3, and we expect them to be approved within the next couple of weeks, and that well will be started very shortly. If No. 3 Well confirms the seismograph work, why, then, we will be in position to keep one rig actively drilling in the south end and one in the north end without the need for waiting until the completion of one well before starting another.

Were these wells costing half a million dollars to complete, why, there would be some tendency, if we were only developing -- if we stepped out from the north end to the south end, why, each time we would want to wait until we saw what the results of that well was before starting another one, but if this semi-wildcat well proves up our seismograph work, we will then be in a position where the completion of each well down here will lead to the drilling of another well in the south end.

So, while, actually, we are asking for 80-acre spacing on a temporary basis here today, our plans are for us to step out a hundred and sixty acres at a time, and we are doing that for the reason that it's important for us to know what we have in this over-all reservoir. Now, you gentlemen, I know, are aware that it's a multiple pay field, and each time we drill a well through the Devonian,



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PAGE 90

we secure valuable information as to the productivity and the aerial extent of these shallower formations.

Now, we, not too long ago, were approached by a company seeking to make a contract for the sale of casinghead gas. Well, if the field is as large as we hope it is, and the Penn gas is productive throughout the field, and the two oil pays develop over this large area, why, it would appear to us that we would be justified in putting in a gasoline plant ourselves there, but that is one of the reasons that we are anxious to step out a considerable distance with each well in order to find out the aerial extent and the ultimate reserves in the field.

Now, it seems important to us to have 80-acre drilling units in this field for several reasons, one of which, of course, is we like to get that extra 40-acre allowable, and the others, though, are that always where you have spacing that -- 40-acre spacing, for instance, why, there are, particularly in a unit, there are going to be some of the operators that are not going to want to step out. They say "that is a little bit dangerous, we would be better off if we just moved 40 acres, and by having 80-acre spacing, we will overcome that argument to some extent."

And then there is also the situation of possible production around the edge of the unit which, if other operators got in and drilled two 40 acres around the edge of the unit, why, I think it would force our hand and force us to protect our interest by drilling to that same density, and would not permit us to move out with



our program as easily and as rapidly as we hope to do.

Now, as we develop this information on all the reservoirs, why, there will come a time sometime down the line when we will have enough information to determine whether 80 acres is justified as a permanent situation, or whether 40 would be better. Perhaps we will find out that 40 might be better for the Bone Springs, if they will pay out because the pay, the Bone Springs pay has definitely far less permeability than is the Devonian. But as to our present information, why, it appears to me that Mr. Young's testimony does justify granting temporary 80-acre spacing.

Oh, I, by the way, am able to answer the question about the pipeline that somebody asked. The oil is being taken by pipeline. Texas-New Mexico has a connection at the oil, and the oil goes to the account of Tidewater at the regular sour crude price of two dollars seventy-seven cents a barrel at the well. I believe that is all I have.

MR. PORTER: Mr. Payne, do you have a question?

CROSS-EXAMINATION

BY MR. PAYNE:

Q Mr. Wheeler, does the legal unit agreement provide for the drilling of a certain number of wells within the unit area?

A No. The unit agreement provides that each well must be approved by all operators, or if they don't approve it, why, there is a clause in there where they may give nonconsent.

Q Does it contain an obligation to drill your No. 1 Well?

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A It contains the obligation to drill the No. 1 Well, and all subsequent wells must be approved by all operators, and the No. 3 Well, as I stated, has been approved at the present time, I believe, by all except one, and we are expecting that approval very shortly.

MR. PAYNE: Thank you.

MR. PORTER: Anyone else have a question? You may be excused.

(Witness excused)

MR. COUCH: Mr. Porter, I have a brief final statement.

MR. PORTER: Does this conclude your testimony?

MR. COUCH: Yes.

MR. PORTER: You may proceed with your statement.

MR. COUCH: Or, if there are any other statements, I will withhold mine and wind it up.

MR. PORTER: Does anyone else have a statement to make? We didn't have any appearances.

MR. PAYNE: We have a statement. Sinclair Oil & Gas Company desires to join The Ohio in proposing flexible proration 80-acre units, Le-Devonian and Lea Bone Springs Pools, Lea County, New Mexico. Sinclair owns 14 percent in the discovery well.

MR. COUCH: In connection with Sinclair's statement, I would like to say we have from each of the other working interest owners in the unit, letter or telegram from each of the working interest owners stating that they approve the requested rules as



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set forth in our application. In connection with the Sinclair telegram, they used the word "flexible" in there. I contacted Mr. Medford who signed that. I received an exact copy of the telegram myself. Mr. Medford assures me it was Sinclair's intention to recommend the rules as we have recommended them and "flexible" was with reference to drill either in northwest quarter or southeast quarter of the/section, or perhaps they were referring to the fact any other forties contiguous / could be put together, so that all working interest owners are very definitely in accord with the proposals we are making to the Commission today in regard to both of these pools.

I think the testimony in this case has established very definitely that by a fixed pattern, when we proceed with a regular development program, that we can more quickly determine the necessary information for permanent rules in this area. Under the provisions of the unit agreement which agreement, by the way, is a part of the record in the original case before this Commission concerning the unit, we are required to file with the U.S.G.S. and with the State a development program covering a certain period of time, and that we have to do periodically during the life of this unit. Once that program is approved, it becomes a drilling obligation to drill these additional wells that are included in it. With the spacing that we have asked for, we will feel in a position to go forward with such program, stepping out, as Mr. Wheeler has outlined, without exposing ourselves, undertake those obligations as a part of the program development that we must fill and get approved. We will undertake



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those obligations with the assurance that we will not have to disrupt that operating program and have to begin drilling offset wells on a 40-acre pattern on a unit boundary. That assurance that we would have under the proposed rules would, I think, ultimately work to the benefit of the State, working interest owners, the royalty owners in outlining this field as soon as possible. That is going to be long enough because of the time it takes to drill these wells. I believe the data we have available now certainly all indicates that 80-acres is much more appropriate in this field than 40 acres, from the standpoint of statutory standards ^{applicable} in consideration of fixing of spacing units by the Commission.

It has been made clear that probably we will not be coming in a year from now asking for permanent rules. I, frankly, don't see how we could be in a position to seek permanent rules a year from now. I am inclined to think we will have substantial additional data by then, but I think we will still be in a position of seeking temporary rules in view of the length of time to drill the wells. I just want to close with this one statement, that we have temporary spacing in this pool right now, the 40 acres under the statewide rule, that is temporary until field rules are adopted for this field. The question just is, whether temporary spacing shall be 40 acres or 80 acres, which will result in the greatest benefit to all interested parties, including the royalty owners and including the operators and the State of New Mexico itself. We think we have got here a field that is a very significant discovery, and we would



earnestly ask this Commission to afford us the opportunity to develop it reasonably and on this type of pattern that we have proposed that we think will work out for the greatest ultimate recovery in the reservoir in the area. Thank you.

MR. PORTER: Does anyone else have anything to offer in this case -- these cases? The Commission will take the case under advisement.

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STATE OF NEW MEXICO)
) ss
 COUNTY OF BERNALILLO)

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

WITNESS my Hand and Seal this, the 21st day of November, 1960, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Ada Dearnley
 NOTARY PUBLIC

My Commission expires:

June 19, 1963

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RECOVERABLE OIL RESERVES

LEA BONE SPRINGS POOL

Basic Data

Porosity	=	3.34% (Core Analysis #2 & #4)
Net Pay	=	16 feet (6 well average)
Water Saturation	=	30% (estimated)
Recovery Factor	=	25% (estimated)
Formation Volume Factor	=	1.50 (estimated)

Volumetric Calculations

7758 Bbl/acre-ft. x Porosity x (1-Water Saturation) x Net Pay x Recovery Factor
Formation Volume Factor

$$\frac{(7758)(1)(16)(0.0334)(.70)(.25)}{1.50} = 483 \text{ bbl/acre}$$

NMOCC Case No. 2119
Ohio Exhibit No. 5
Date 12-13-61

COMPARATIVE ECONOMICS
FOR DEVELOPMENT OF
LEA BONE SPRINGS POOL

40-ACRE SPACING VS. 80-ACRE SPACING

Proposed Participating Area		2280 Acres
Wells Required with 40-Acre Spacing		57 Wells
Wells Required with 80-Acre Spacing		29 Wells
Investment @ \$225,000 per Well		
For 40-Acre Spacing (57 Wells)		\$12,825,000
For 80-Acre Spacing (29 Wells)		\$ 6,525,000
Investment for Dual Completion @ \$25,000 per Well		
For 40-Acre Spacing (57 Wells)		\$ 1,425,000
For 80-Acre Spacing (29 Wells)		\$ 725,000
Ultimate Reserves		
Oil		1,101,000 bbls.
Gas @ 2000 cu. ft. per bbl.		2,202,000 MCF
W.I. Net Operating Income per Gross Bbl. of Oil		
Produced Including Income from Gas Produced with Oil		
Value		
Bbl. of oil		\$2.81
2000 cu. ft. of gas		0.20
Total Gross Value		\$3.01
Costs		
Severance & Ad valorem Taxes	\$0.21	
Royalty	0.38	
Lifting Costs	0.24	
		<u>\$0.83</u>
Net Operating Income per Gross Bbl.		\$2.18
W.I. Total Net Operating Income		
1,101,000 bbls. x \$2.18/bbl.		\$2,400,000
Net Loss for 40-Acre Spacing		<u>\$10,425,000</u>
Net Loss per Well	\$182,895	
Net Loss for 80-Acre Spacing		<u>\$4,125,000</u>
Net Loss per Well	\$142,241	
Net Profit for Dual Completion for 40-Acre		\$975,000
Net Profit per Well	\$17,105	
Profit to Investment Ratio		0.68 to 1
Net Profit for Dual Completion for 80-Acre		\$1,675,000
Net Profit per Well	\$57,759	
Profit to Investment Ratio		2.31 to 1

NMOCC Case No. 2119
Ohio Exhibit No. 6
Date 12-13-61

LEA DEVONIAN POOL
SHUT-IN BOTTOM HOLE PRESSURES

POOL DATUM -10,744'

DATE	WELL NO. 1		WELL NO. 2		WELL NO. 4		WELL NO. 5		WELL NO. 6		WELL NO. 9	
	SI Time (Hours)	BHP (psi)	SI Time (Hours)	BHP (psi)	SI Time (Hours)	BHP (psi)	SI Time (Hours)	BHP (psi)	SI Time (Hours)	BHP (psi)	SI Time (Hours)	BHP (psi)
7-15-60	161	6046										
8-15-60	65	6054										
10-13-60	23	6057										
4-13-61			28	6089								
4-26-61					36	6091						
4-27-61	37	6065	36	6073								
5- 1-61	133	6072	71	6065								
5-12-61					456	6087						
5-23-61	648	6028			672	6096						
8-21-61							26	6016				
10-2-61	264	6069	53	6082	53	6085						
10-6-61	363	6058										
12-6-61							24	5963	93	6065		
2-13-62	24	6036	27	6044			24	6046	29	6065		
5- 2-62	46	6036	48	6044	47	6033	53	6033	27	6060		
7-11-62											22	6014
8- 2-62	23	6025	24	6038	26	6041	28	6005	26	6033	29	6038
11-7-62	24	6019	28	6024	27	6031	27	5997	25	6024	28	6015

NMOCC Case No. 2118 & 2459

Marathon Exhibit No. 5

Date 12-19-62

COMPARATIVE ECONOMICS
FOR DEVELOPMENT OF
LEA DEVONIAN POOL

40-ACRE SPACING VS. 80-ACRE SPACING VS. 160-ACRE SPACING

Proposed Participating Area		2280 Acres
Wells Required with 40-Acre Spacing		57 Wells
Wells Required with 80-Acre Spacing		29 Wells
Wells Required with 160-Acre Spacing		15 Wells
<u>Investment @ \$510,000 per Well</u>		
For 40-Acre Spacing (57 Wells)		\$29,070,000
For 80-Acre Spacing (29 Wells)		\$14,790,000
For 160-Acre Spacing (15 Wells)		\$ 7,650,000
<u>Ultimate Reserves</u>		
Oil		15,180,240 bbls.
Gas @ 300 cu. ft. per bbl.		4,554,072 MCF
<u>W.I. Net Operating Income Per Gross Bbl. of Oil</u>		
<u>Produced Including Income From Gas Produced With Oil</u>		
<u>Value</u>		
Bbl. of oil		\$2.81
300 cu. ft. of gas		.06
Total Gross Value		<u>\$2.87</u>
<u>Costs</u>		
Severance & Ad valorem Taxes	\$0.20	
Royalty	0.36	
Lifting Costs	<u>0.25</u>	
		<u>\$0.81</u>
Net Operating Income Per Gross Bbl.		\$2.06
<u>W.I. Total Net Operating Income</u>		
15,180,240 x \$2.06/bbl.		\$31,271,294
Net Profit for 40-Acre Spacing		\$ 2,201,294
<u>Net Profit per Well</u>	\$38,619	
Profit to Investment Ratio		0.08 to 1
Net Profit for 80-Acre Spacing		\$16,481,294
<u>Net Profit per Well</u>	\$568,320	
Profit to Investment Ratio		1.11 to 1
Net Profit for 160-Acre Spacing		\$23,621,294
<u>Net Profit per Well</u>	\$1,574,753	
Profit to Investment Ratio		3.09 to 1

NMOCC Case No. 2118 & 2459
Ohio Exhibit No. 10
Date 12-13-61

MAIN OFFICE CCC
1960 OCT 23 AM 8:37

The Ohio Oil Co.

P. O. BOX 3128
HOUSTON 1, TEXAS

October 21, 1960

Re: Lea-Devonian Pool in Section 12,
Township 20 South, Range 34 East,
N.M.P.M., Lea County, New Mexico

New Mexico Oil Conservation Commission
P O. Box 871
Santa Fe, New Mexico

Attention: Mr. A. L. Porter, Jr.
Secretary-Director

Gentlemen:

The Ohio Oil Company hereby applies for pool rules to be applicable to the Lea-Devonian Pool in Lea County, New Mexico, and also applies for extension of the pool to include all acreage reasonably shown to be productive from the reservoir at the time of the hearing. The only well now completed in the reservoir is Lea Unit Federal Well No. 1 located in the NW/4 SW/4 of Section 12, Township 20 South, Range 34 East, N.M.P.M. The Ohio Oil Company is operator of that well under the Agreement for the Development and Operation of the Lea Unit Area, which Agreement was heretofore approved by the New Mexico Oil Conservation Commission Order No. R-1540, dated November 30, 1959, in Case No. 1823.

The Ohio requests and recommends temporary pool rules be adopted requiring 80-acre proration units and an 80-acre spacing pattern; each proration unit to consist of any two contiguous governmental quarter-quarter sections, with the well located in the approximate center of either the NW/4 or the SE/4 of a governmental quarter section.

It is further recommended by The Ohio that the pool rules permit a tolerance of 150 feet in the location of any well where necessary because of surface obstructions, such tolerance to be approved upon application of the interested owners, but without notice or hearing.

The Ohio further requests that the oil allowable for wells in the field be fixed by applying the 80-acre proportional factor as provided for in Statewide Rule 505 as amended, provided that if any non standard proration unit is approved the allowable for the well on such unit shall be increased or decreased in the proportion that the number of surface acres included in such unit bears to 80 acres.

The proposed rules are necessary to prevent waste and to protect correlative rights, will encourage the development of the pool on a regular pattern, and will aid in preventing the drilling of unnecessary wells. The Ohio therefore requests that this application be set for hearing before the Commission or one of the

October 21, 1960
New Mexico Oil Conservation Commission
Page 2

Examiners at the earliest possible date and that notice be given as required by the applicable laws and regulations.

To effectively and fairly accomplish the purposes of the requested rules, and pursuant to Statewide Rule 1202, The Ohio requests that the rules proposed by this application be made applicable to any and all wells commenced within one mile of the SW/4 of Section 12, Township 20 South, Range 34 East, from and after the date this application is filed with the Commission, and further requests that no location be approved after said date for any well projected to or completed in said formation within one mile of the SW/4 of said Section 12. As the basis for such action pending hearing The Ohio refers to the evidence and data in the records of the Commission regarding the above identified well and the Lea Unit Area.

A list of the interested parties now known to applicant is attached.

Very truly yours,

THE OHIO OIL COMPANY

By J. O. Terrell Couch
J. O. Terrell Couch

TC:MK

List of Interested Parties known to Applicant
re: Foregoing Application for Pool Rules and
Determination of Pool Limits, Section 12,
in Township 20 South, Range 34 East, N.M.P.M.
Lea County, New Mexico

W. G. Ross and wife, Vee K. Ross
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5th Floor Vaughn Building
1712 Commerce Street
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Edwin B. Cox
2100 Adolphus Tower
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P. O. Box 239
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236 Petroleum Building
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P. O. Box 1877
Midland, Texas

Texaco, Inc.
P. O. Box 1720
Fort Worth, Texas

Pan American Petroleum Corporation
P. O. Box 68
Hobbs, New Mexico

Herbert Aid Estate
c/o J. T. Sivley
212 Booker Building
Artesia, New Mexico

BEFORE THE OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION
OF THE OHIO OIL COMPANY FOR POOL
RULES IN THE LEA DEVONIAN POOL
IN SECTION 12, TOWNSHIP 20 SOUTH,
RANGE 34 EAST, N.M.P.M., LEA
COUNTY, NEW MEXICO.

No. 211⁸

ENTRY OF APPEARANCE

The undersigned, Atwood & Malone, of Roswell, New Mexico,
a firm of attorneys, all of whose members are duly licensed to practice
law in the State of New Mexico, hereby enters its appearance in the
above styled and numbered cause as co-counsel with W. Hume Everett,
Esquire, and J. O. Terrell Couch, Esquire, of Houston, Texas, for
the Ohio Oil Company, Petitioner.

Dated at Roswell, New Mexico, this 24th day of October,
1960.

ATWOOD & MALONE

By

Robert L. Malone
P. O. Box 867
Roswell, New Mexico

Robert L. Malone
11-4-60
RM

DOCKET: REGULAR HEARING, WEDNESDAY, NOVEMBER 16, 1960

OIL CONSERVATION COMMISSION - 9 A.M. - MABRY HALL, STATE CAPITOL, SANTA FE, N.M.

- ALLOWABLE:
- (1) Consideration of the oil allowable for December, 1960.
 - (2) Consideration of the allowable production of gas for December, 1960, for six prorated pools in Lea County, New Mexico, and also presentation of purchasers' nominations for the six-month period beginning January 1, 1961 for that area. Consideration of the allowable production of gas for eight prorated pools in San Juan, Rio Arriba, and Sandoval Counties, New Mexico for December 1960.

NEW CASES

CASE 2118: Application of The Ohio Oil Company for the promulgation of temporary special rules and regulations governing the Lea-Devonian Pool, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order promulgating temporary special rules and regulations governing the Lea-Devonian Pool, Lea County, New Mexico, including a provision for 80-acre proration units.

CASE 2119: Application of The Ohio Oil Company for the creation of a new oil pool for Bone Springs production and for the promulgation of temporary special rules and regulations governing said pool. Applicant, in the above-styled cause, seeks an order creating a new oil pool for Bone Springs production to be designated the Lea-Bone Springs Pool and to comprise the SW/4 of Section 12, Township 20 South, Range 34 East, Lea County, New Mexico. Applicant further seeks the promulgation of temporary special rules and regulations governing said pool including a provision for 80-acre proration units.

CASE 2120: Southeastern New Mexico nomenclature case calling for an order creating new pools and extending existing pools in Chaves, Eddy, Lea and Roosevelt Counties, New Mexico:

- (a) Create a new oil pool for San Andres production, designated as the West Bitter Lake-San Andres Pool, and described as:

Township 10 South, Range 25 East, NMPM
Section 17: SE/4

- (b) Create a new gas pool for Pennsylvanian production, designated as the Black River-Pennsylvanian Gas Pool, and described as:

Township 24 South, Range 26 East, NMPM
Section 12: SE/4

- (c) Create a new gas pool for Ellenburger production, designated as the Custer-Ellenburger Gas Pool, and described as:

Township 24 South, Range 36 East, NMPM
Section 36: NW/4

- (d) Create a new oil pool for Pennsylvanian production, designated as the South Prairie-Pennsylvanian Pool, and described as:

Township 8 South, Range 36 East, NMPM
Section 20: NE/4

- (e) Delete certain portions of the Middle Lynch-Yates Pool, described as:

Township 20 South, Range 34 East, NMPM
Section 15: W/2 SW/4
Section 16: SE/4
Section 21: E/2 NW/4, S/2 NE/4, and SE/4
Section 22: W/2 NW/4, W/2 SE/4, and SW/4

- (f) Extend the Allison-Pennsylvanina Pool, to include:

Township 8 South, Range 36 East, NMPM
Section 36: SE/4

- (g) Extend the South Bitter Lake-San Andres Pool, to include:

Township 10 South, Range 25 East, NMPM
Section 22: S/2 SW/4 and SW/4 SE/4

- (h) Extend the Caprock-Queen Pool, to include:

Township 12 South, Range 31 East, NMPM
Section 35: SE/4 SE/4

- (i) Extend the Caudill-Wolfcamp Pool, to include:

Township 15 South, Range 36 East, NMPM
Section 21: NW/4

- (j) Extend the Cedar Lake-Abo Pool, to include:

Township 17 South, Range 31 East, NMPM
Section 20: S/2 SE/4
Section 29: N/2 NE/4

- (k) Extend the Eagle Creek-San Andres Pool, to include:

Township 17 South, Range 25 East, NMPM
Section 14: SW/4

- (l) Extend the East E.K-Queen Pool, to include:

Township 18 South, Range 34 East, NMPM
Section 22: NW/4 SE/4

- (m) Extend the Southwest Gladiola-Devonian Pool, to include:

Township 12 South, Range 37 East, NMPM
Section 35: N/2 NW/4

- (n) Extend the Langlie Mattix Pool to include:

Township 22 South, Range 37 East, NMPM
Section 29: N/2 NW/4 and SW/4 NW/4

- (o) Extend the Lynch-Yates Pool to include:

Township 20 South, Range 34 East, NMPM
Section 22: S/2 S/2
Section 26: SE/4 and W/2 NE/4
Section 27: N/2
Section 28: E/2 SW/4

- (p) Extend the Mescalero-Devonian Pool to include:

Township 10 South, Range 32 East, NMPM
Section 27: NW/4

- (q) Extend the Pearl-Queen Pool to include:

Township 20 South, Range 35 East, NMPM

Section 3: W/2 W/2

Section 4: E/2 NE/4 and SE/4

- (r) Extend the North Square Lake-Grayburg Pool to include:

Township 16 South, Range 31 East, NMPM

Section 9: SE/4 NE/4

- (s) Extend the Tubb Gas Pool to include:

Township 22 South, Range 38 East, NMPM

Section 18: SE/4

CASE 2121:

Northwestern New Mexico nomenclature case calling for an order for the creation of a new pool and for extending existing pools in San Juan and Rio Arriba Counties, New Mexico.

- (a) Create a new pool classified as an oil pool for Gallup production, designated as the Kutz-Gallup Oil Pool and described as:

Township 27 North, Range 11 West, NMPM,

Section 2: N/2 & SW/4

Section 4: S/2 & NW/4

Section 5: All

Section 9: N/2 & SE/4

Section 10: N/2

Section 11: NW/4

Township 28 North, Range 11 West, NMPM,

Section 31: SE/4

Section 32: SW/4

- (b) Extend the South Blanco-Pictured Cliffs Pool, to include:

Township 25 North, Range 4 West, NMPM,

Section 13: N/2

Township 26 North, Range 5 West, NMPM,

Section 10: SW/4

Township 28 North, Range 6 West, NMPM,

Section 35: E/2

Docket No. 33-60

(c) Extend the Otero-Chacra Pool, to include:

Township 24 North, Range 5 West, NMPM,
Section 4: NW/4

Township 25 North, Range 5 West, NMPM,
Section 33: SW/4

(d) Extend the Cha Cha-Gallup Oil Pool, to include:

Township 28 North, Range 13 West, NMPM,
Section 7: E/2 (Partial)
Section 8: W/2 (Partial)

Township 29 North, Range 13 West, NMPM,
Section 31: SW/4

Township 29 North, Range 14 West, NMPM,
Section 20: NE/4
Section 21: S/2 & NW/4
Section 22: SW/4
Section 25: SW/4
Section 26: S/2 & NW/4
Section 27: All
Section 28: N/2
Section 36: N/2 & SE/4

(e) Extend the Devils Fork-Gallup Pool, to include:

Township 24 North, Range 7 West, NMPM,
Section 11: E/2 NE/4

(f) Extend the Verde-Gallup Oil Pool, to include:

Township 30 North, Range 15 West, NMPM,
Section 5: S/2 SW/4

Township 31 North, Range 14 West, NMPM,
Section 22: SW/4 NW/4

CASE 2089:

(De Novo)

Application of Val R. Reese & Associates, Pan American Petroleum Corporation, El Paso Natural Gas Company and Redfern and Herd for a hearing de novo in Case 2089 which was an application for special rules and regulations governing the drilling, spacing and production of oil and gas wells in the Escrito-Gallup Oil Pool, Rio Arriba County, New Mexico.

CLASS OF SERVICE
This is a fast message
unless its deferred char-
acter is indicated by the
proper symbol.

WESTERN UNION TELEGRAM

W. P. MARSHALL, PRESIDENT

SYMBOLS

DL = Day Letter
NL = Night Letter
LT = International
Letter Telegram

The filing time shown in the date line on domestic telegrams is STANDARD TIME at point of origin. Time of receipt is STANDARD TIME at point of destination.

LA130 DA433

D MDA163 PD=MIDLAND TEX 15 338P CST= PM 3 21
A L PORTER JR=
OIL CONSERVATION COMMISSION SANTA FE NMEX=

SINCLAIR OIL & GAS COMPANY DESIRES TO JOIN WITH OHIO
IN PROPOSING FLEXIBLE 80 ACRE PRORATION UNITS AND
80 ACRE ALLOWABLE FOR THE LEA-DEVONIAN AND LEA-BONE
SPRINGS POOLS, LEA COUNTY, NEW MEXICO. SINCLAIR OWNS
14.05980/0 INTEREST IN LEA UNIT AND IN THE DISCOVERY
WELL. THESE MATTERS SCHEDULED FOR HEARING NOVEMBER 16
1960 CASES 2118 AND 2119=
JOE MEFFORD=

=80 80 14.05980/0 16 1960 2118 2119.

ICERNING ITS SERVICE

GOVERNOR
JOHN BURROUGHS
CHAIRMAN

State of New Mexico
Oil Conservation Commission

LAND COMMISSIONER
MURRAY E. MORGAN
MEMBER

STATE GEOLOGIST
A. L. PORTER, JR.
SECRETARY DIRECTOR

P. O. BOX 871
SANTA FE

December 8, 1930

Mr. Ross Malone
Atwood & Malone
Box 867
Roswell, New Mexico

Re: Case No. 2118 & 2119
Order No. R-1826 & R-1827
Applicant:
The Ohio Oil Company

Dear Sir:

Enclosed herewith are two copies of the above-referenced
Commission order recently entered in the subject case.

Very truly yours,

A. L. PORTER, Jr.,
Secretary-Director

ir/

Carbon copy of order also sent to:

Hobbs OCC x
Artesia OCC
Aztec OCC

Other J. O. Terrell Couch
Sinclair Oil & Gas Company - c/o Mr. Mefford
Midland, Texas

LEA DEVONIAN POOL

PERTINENT DATA

1. Location of Field:

Approximately 14 miles west-southwest of Monument, New Mexico,
Section 12, T-20-S, R-34-E, Lea County

2. Completion Data Lea Unit Well No. 1:

a.	Formation	Devonian
b.	Total Depth	14,735
c.	Top of Devonian	✓ 14,285 (-10,611)
d.	Top of Devonian Pay	✓ 14,349 (-10,675)
e.	Completion Date	7-8-60
f.	Perforated Interval	14,347-375 14,393-489
g.	Treatment	500 gal MA 4,000 gal Acid
h.	Initial Potential Test	
	(1) Potential (BOPD)	516
	(2) Choke Size (in.)	8/64
	(3) GOR (CF/B)	321
	(4) Casing Pressure (psig)	pk.
	(5) Tubing Pressure (psig)	1570

3. Reservoir Fluid Characteristics:

a.	Saturation Pressure (bubble point)	567 psi @ 202°F
b.	Formation Volume Factor @ Original Pressure	1.185
c.	Solution Gas Oil Ratio (CF/B)	318
d.	Oil Viscosity @ Original Pressure (cp)	0.310
e.	Oil Gravity (°API @ 60°F)	58.2

4. Reservoir Characteristics:

neutron log -
from down log

a.	Porosity (%)	4.7
b.	Permeability (md)	9.6 and greater
c.	Water Saturation (%)	30.0 est.
d.	New Pay (ft.)	98
e.	Reservoir Temperature (°F)	202
f.	Original Reservoir Pressure (psig)	6046 @ -10,744
g.	Probable Reservoir Mechanism	Water Drive

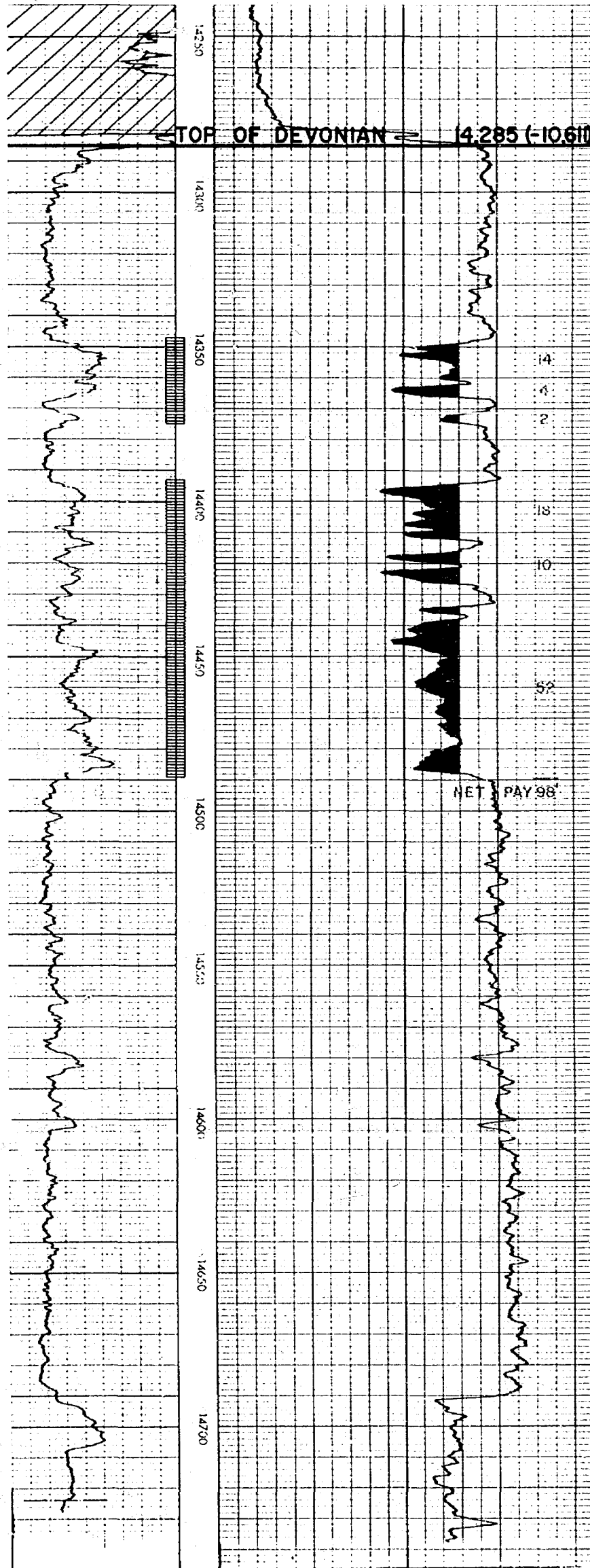
neutron log

NMOCC Case No. 2118

Ohio Exhibit No. 2

Date _____

RADIOACTIVITY LOG OF DEVONIAN SECTION



RECOVERABLE OIL RESERVES

LEA DEVONIAN POOL

Basic Data

Net Pay = 98 feet (Neutron Log)
Porosity = 4.7% (Neutron Log)
Water Saturation = 30% (estimated)
Formation Volume Factor = 1.185 (fluid analysis)
Recovery Factor = 50% (estimated)

Volumetric Calculation

7758 Bbl/acre-foot x Porosity x (1-Water Saturation) x Net Pay x Recovery Factor
Formation Volume Factor

$$\frac{(7758)(0.047)(0.70)(98)(0.50)}{1.185} = 10,554 \text{ bbls/acre}$$

NMOCC Case No. 2118

Ohio Exhibit No. 4

Date _____

*previous
calc*

\$ 700,000

COMPARATIVE ECONOMICS
FOR DEVELOPMENT OF
LEA DEVONIAN POOL

40-ACRE SPACING VS. 80-ACRE SPACING

Minimum Area Expected to be Productive	800 Acres
Wells Required with 40 Acre Spacing	20 Wells
Wells Required with 80 Acre Spacing	10 Wells
Investment @ \$471,000 per Well	
For 40 Acre Spacing (20 Wells)	\$ 9,420,000
For 80 Acre Spacing (10 Wells)	\$ 4,710,000
Ultimate Reserves	
Oil	8,443,200 bbls.
Gas @ 300 cu. ft. per bbl.	2,532,960 MCF
W.I. Net Operating Income Per Gross Bbl. of Oil Produced Including Income From Gas Produced with Oil	
Value	
Bbl. of oil	\$2.77
300 cu. ft. of gas	.06
Total Gross Value	\$2.83
Costs	
Severance & Advalorem Taxes	\$0.20
Royalty	0.35
Lifting Costs	0.25
	\$0.80
Net Operating Income per gross bbl.	\$2.03
W.I. Total Net Operating Income 8,443,200 x \$2.03/bbl.	\$17,139,696
Net Profit for 40-Acre Spacing	\$ 7,719,696
Net Profit per Well	0.82 to 1
Profit to Investment Ratio	
Net Profit for 80-Acre Spacing	\$12,429,696
Net Profit per Well	2.64 to 1
Profit to Investment Ratio	

This exhibit
looks only
at
single
completion
while
subj. well
is actually
dualled

NMOCC Case No. 2118
Ohio Exhibit No. 5
Date _____

11
386,000
20
\$ 7,720,000
10
1,243,000
10
\$ 12,430,000

The Ohio Oil Co.

DOCKET MAILED

Date _____

P. O. BOX 3128

HOUSTON 1, TEXAS

October 21, 1960

Re: Lea-Devonian Pool in Section 12,
Township 20 South, Range 34 East,
N.M.P.M., Lea County, New Mexico

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Case
2118

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A list of the interested parties now known to applicant is attached.

Very truly yours,

THE OHIO OIL COMPANY

By


J. O. Terrell Couch

TC:MK

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Lea County, New Mexico

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Harvey E Roelofs
Trustee for Olen F. Featherstone, II
c/o Olen F. Featherstone
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P. O. Box 1720
Fort Worth, Texas

Pan American Petroleum Corporation
P. O. Box 68
Hobbs, New Mexico

Herbert Aid Estate
c/o J. T. Sivley
212 Booker Building
Artesia, New Mexico

EDWIN B. COX & EDWIN L. COX
OIL PRODUCERS
2100 ADOLPHUS TOWER
DALLAS, TEXAS

December 9, 1961

Mr. J. O. Terrell Couch
LaFonda Hotel
Santa Fe, New Mexico

Re: Case No. 2459

Dear Sir:

Edwin L. Cox, as a Working Interest Owner in the Lea-Devonian Pool, believes that the type of production found in the Lea-Devonian and Lea-Bone Springs Pool is such that would justify 160-acre units, provided that the allowable for a 160-acre proaction unit is raised in an amount appropriate for excess acreage over the present 80-acre spacing. It is our belief that if domestic production is to compete with foreign oil, we need wider spacing in the United States.

Very truly yours,

Edwin L. Cox
by Harvey Jordan

DAJ/ph

BEFORE THE
OIL COMMISSION
CASE NO. 2118 + 2459
14

DOCKET MAILED

Date _____

DRILLING AND EXPLORATION COMPANY, INC.

EXCHANGE BANK BUILDING

DALLAS 35, TEXAS

MAILING ADDRESS
P. O. BOX 35366
AIRLAWN STATION

December 8, 1961

Mr. J. O. Terrell Couch
The Ohio Oil Company
c/o La Fonda Hotel
Santa Fe, New Mexico

Dear Mr. Couch:

We have received a copy of The Ohio Oil Company's Application for 160-acre proration units, along with appropriate allowable for the Lea-Devonian Pool, Lea County, New Mexico. This application has been docketed as Case No. 2459 by New Mexico Oil Conservation Commission and is set for hearing December 13, 1961, in Santa Fe, New Mexico. We further understand that on the same docket, the original pool rule cases for the Lea-Devonian and Lea-Bone Springs Pools are re-opened and set for hearing.

This letter is to advise you that we are in full agreement with the facts set forth in your applications concerning these matters and that we are in complete agreement with respect to your Application for 160-acre proration units along with the appropriate allowable for the Lea-Devonian pool.

Yours very truly,

DRILLING AND EXPLORATION COMPANY, INC.



E. A. Roberts, Jr.
Vice President and Production Manager

EAR/rl

cc: The Ohio Oil Company
Legal Department
Texas Eastern Building
P. O. Box 3128
Houston 1, Texas

DOCKET MAILED

Date _____



THE PURE OIL COMPANY

SOUTHERN PRODUCING DIVISION

P. O. BOX 239 • HOUSTON 1, TEXAS • FAIRfax 3-9351

December 8, 1961

The Ohio Oil Company
Texas Eastern Building
Houston 1, Texas

Attention: Mr. J. O. Terrell Couch

Gentlemen:

The Pure Oil Company is in favor of 160 acre pro-ration units in the Lea Devonian Pool with provision for appropriate oil allowable factor in excess of the present 80 acre allowable factor, and this is to advise that we concur in your application dated November 22, 1961 to the New Mexico Oil Conservation Commission for pool rules on such basis.

Yours very truly,

THE PURE OIL COMPANY

J. W. Collier
J. W. Collier
Joint Operations Coordinator

JWC:be

DOCKET MAILED

Date _____

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASE No. 2118
Order No. R-1826

APPLICATION OF THE OHIO OIL COMPANY
FOR AN ORDER ESTABLISHING TEMPORARY
SPECIAL RULES AND REGULATIONS FOR
THE LEA-DEVONIAN POOL, LEA COUNTY,
NEW MEXICO, TO PROVIDE FOR 80-ACRE
PRORATION UNITS.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on November 16, 1960, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission."

NOW, on this 8th day of December, 1960, the Commission, a quorum being present, having considered the testimony presented and the exhibits received at said hearing, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.

(2) That the applicant, The Ohio Oil Company, seeks the promulgation of temporary special rules and regulations for the Lea-Devonian Pool in Lea County, New Mexico, to provide for 80-acre proration units.

(3) That the evidence presented concerning the reservoir characteristics of the Lea-Devonian Pool, including permeability and porosity data, justifies the establishment of 80-acre proration units in said pool for a temporary one-year period.

(4) That the information presently available and presented as evidence indicates that the Lea-Devonian Pool can be efficiently and economically drained on 80-acre proration units.

(5) That during the one-year period in which this order will be in effect, the applicant should gather all available information relative to drainage and recoverable reserves in the subject pool, including core data and interference tests.

-2-

CASE No. 2118
Order No. R-1826

(6) That this case should be heard again by the Commission at the regular monthly hearing in December, 1961, at which time the applicant should be prepared to prove by a preponderance of the evidence the proration unit size on which the subject pool can be most efficiently drained and developed.

IT IS THEREFORE ORDERED:

That temporary special rules and regulations for the Lea-Devonian Pool in Lea County, New Mexico, be and the same are hereby promulgated as follows, effective January 1, 1961.

SPECIAL RULES AND REGULATIONS FOR THE
LEA-DEVONIAN POOL

RULE 1. Each well completed or recompleted in the Lea-Devonian Pool or in the Devonian formation within one mile of said pool, and not nearer to nor within the limits of another designated Devonian pool, shall be spaced, drilled, operated and prorated in accordance with the Special Rules and Regulations hereinafter set forth.

RULE 2. Each well completed or recompleted in the Lea-Devonian Pool shall be located on a unit containing 80 acres, more or less, which consists of the N/2, S/2, E/2 or W/2 of a single governmental quarter section; provided, however, that nothing contained herein shall be construed as prohibiting the drilling of a well on each of the quarter-quarter sections in the unit.

RULE 3. The initial well on any 80-acre unit in said pool shall be located within 150 feet of the center of either the NW/4 or the SE/4 of the quarter section on which the well is located. Any well which was completed in the Lea-Devonian Pool or which was drilling to the Devonian formation within one mile of said pool prior to January 1, 1961, is granted an exception to the well location requirements of this rule.

RULE 4. For good cause shown, the Secretary-Director of the Commission may grant exception to the requirements of Rule 2 without notice and hearing when the application is for a non-standard unit comprising a single quarter-quarter section or lot. All operators offsetting the proposed non-standard unit shall be notified of the application by registered mail, and the application shall state that such notice has been furnished. The Secretary-Director of the Commission may approve the application if, after a period of 30 days, no offset operator has entered an objection to the formation of such non-standard unit.

The allowable assigned to any such non-standard unit shall bear the same ratio to a standard allowable in the Lea-Devonian Pool as the acreage in such non-standard unit bears to 80 acres.

-3-

CASE No. 2118

Order No. R-1826

RULE 5. An 80-acre proration unit (79 through 81 acres) in the Lea-Devonian Pool shall be assigned an 80-acre proportional factor of 10.33 for allowable purposes, and in the event there is more than one well on an 80-acre proration unit, the operator may produce the allowable assigned to the unit from the wells on the unit in any proportion.

IT IS FURTHER ORDERED:

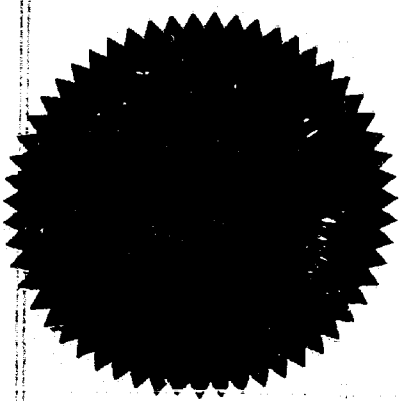
That operators who propose to dedicate 80 acres to a well in the Lea-Devonian Pool must file an amended Commission Form C-128 with the Hobbs District Office of the Commission by December 16, 1960, in order that the well may be assigned an 80-acre allowable on the January proration schedule.

IT IS FURTHER ORDERED:

That this case be reopened at the regular monthly hearing of the Commission in December, 1961, at which time operators in the subject pool shall appear and show cause why the Lea-Devonian Pool should not be developed on 40-acre proration units.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION


John Burroughs
JOHN BURROUGHS, Chairman

Murray E. Morgan
MURRAY E. MORGAN, Member

A. L. Porter, Jr.
A. L. PORTER, Jr., Member & Secretary

esr/

DRAFT

RSM/esr
November 28

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

RSM
11/28
OK
11/28
OK
12/2
OK
12-2-60
OK
12/28

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASE No. 2118
Order No. R- 1826

APPLICATION OF THE OHIO OIL COMPANY
FOR AN ORDER ESTABLISHING TEMPORARY
SPECIAL RULES AND REGULATIONS FOR
THE LEA-DEVONIAN POOL, LEA COUNTY,
NEW MEXICO, TO PROVIDE FOR 80-ACRE
PRORATION UNITS.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on
November 16, 1960, at Santa Fe, New Mexico, before the Oil Conser-
vation Commission of New Mexico, hereinafter referred to as the
"Commission."

NOW, on this _____ day of Dec, 1960, the Commission,
a quorum being present, having considered the testimony presented
and the exhibits received at said hearing, and being fully advised
in the premises,

FINDS:

(1) That due public notice having been given as required by
law, the Commission has jurisdiction of this cause and the subject
matter thereof.

(2) That the applicant, The Ohio Oil Company, seeks the
promulgation of temporary special rules and regulations for the
Lea-Devonian Pool in Lea County, New Mexico, to provide for 80-
acre proration units.

(3) That the evidence presented concerning the reservoir
characteristics of the Lea-Devonian Pool, including permeability
and porosity data, justifies the establishment of 80-acre proration
units in said pool for a temporary one-year period.

(4) That the information presently available and presented
as evidence indicates that the Lea-Devonian Pool ~~can~~ be efficiently
and economically drained on 80-acre proration units.

(5) That during the one-year period in which this order will be in effect, the applicant should gather all available information relative to drainage and recoverable reserves in the subject pool, including core data and ~~bonafide~~ interference tests.

(6) That this case should be heard again by the Commission at the regular monthly hearing in December, 1961, at which time the applicant should be prepared to prove by a preponderance of the evidence the ~~size of~~ proration unit ^{size} on which the subject pool can be most efficiently drained and developed.

IT IS THEREFORE ORDERED:

That temporary special rules and regulations for the Lea-Devonian Pool in Lea County, New Mexico, be and the same are hereby promulgated as follows, effective January 1, 1961.

SPECIAL RULES AND REGULATIONS FOR THE
LEA-DEVONIAN POOL

RULE 1. Each well completed or recompleted in the Lea-Devonian Pool or in the Devonian formation within one mile of said pool, and not nearer to nor within the limits of another designated Devonian pool, shall be spaced, drilled, operated and prorated in accordance with the Special Rules and Regulations hereinafter set forth.

RULE 2. Each well completed or recompleted in the Lea-Devonian Pool shall be located on a unit containing 80 acres, more or less, which consists of the N/2, S/2, E/2 or W/2 of a single governmental quarter section; provided, however, that nothing contained herein shall be construed as prohibiting the drilling of a well on each of the quarter-quarter sections in the unit.

RULE 3. The initial well on any 80-acre unit in said pool shall be located within 150 feet of the center of either the NW/4 or the SE/4 of the quarter section on which the well is located. Any well which was ~~drilling to or~~ completed in the Lea-Devonian Pool *or which was drilling to the Devonian formation within one mile of said pool* prior to January 1, 1961, is granted an exception to the well location requirements of this rule.

RULE 4. For good cause shown, the Secretary-Director of the Commission may grant exception to the requirements of Rule 2 without

notice and hearing when the application is for a non-standard unit comprising a single quarter-quarter section or lot. All operators offsetting the proposed non-standard unit shall be notified of the application by registered mail, and the application shall state that such notice has been furnished. The Secretary-Director of the Commission may approve the application if, after a period of 30 days, no offset operator has entered an objection to the formation of such non-standard unit.

The allowable assigned to any such non-standard unit shall bear the same ratio to a standard allowable in the Lea-Devonian Pool as the acreage in such non-standard unit bears to 80 acres.

RULE 5. An 80-acre proration unit (79 through 81 acres) in the Lea-Devonian Pool shall be assigned an 80-acre proportional factor of 10.33 for allowable purposes, and in the event there is more than one well on an 80-acre proration unit, the operator may produce the allowable assigned to the unit from the wells on the unit in any proportion.

IT IS FURTHER ORDERED:

That operators who propose to dedicate 80 acres to a well in the Lea-Devonian Pool must file an amended Commission Form C-128 with the Hobbs District Office of the Commission by December 16, 1960, in order that the well may be assigned an 80-acre allowable on the January proration schedule.

IT IS FURTHER ORDERED:

That this case be reopened at the regular monthly hearing of the Commission in December, 1961, at which time operators in the subject pool shall appear and show cause why the Lea-Devonian Pool should not be developed on 40-acre proration units.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

Don.

12/18

12/19

12-18-61

12-19

DRAFT

RSM/esr
December 18, 1961

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASE No. 2118
CASE No. 2459
Consolidated
Order No. R-1826-A

APPLICATION OF THE OHIO OIL COMPANY
FOR 160-ACRE PRORATION UNITS IN THE
LEA-DEVONIAN POOL, LEA COUNTY, NEW
MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on
December 13, 1961, at Santa Fe, New Mexico, before the Oil Conser-
vation Commission of New Mexico, hereinafter referred to as the
"Commission."

NOW, on this _____ day of December, 1961, the Commission,
a quorum being present, having considered the testimony presented
and the exhibits received at said hearing, and being fully advised
in the premises,

FINDS:

(1) That due public notice having been given as required by
law, the Commission has jurisdiction of this cause and the subject
matter thereof.

(2) That the Lea-Devonian Pool was established by Order
No. R-1772, dated December 16, 1960, and, as presently defined,
consists of the NE/4 of Section 11 and the W/2 and the SE/4 of
Section 12, all in Township 20 South, Range 34 East, NMPM, Lea
County, New Mexico.

ant (3) That the Ohio Oil Company is the operator of the Lea
Unit which includes the acreage contained in the Lea-Devonian
Pool, as presently defined, that a participating area for the
Devonian formation within the Lea Unit has been proposed to the
United States Geologic Survey consisting of 2280 acres including
the acreage within the Lea-Devonian Pool.

(3) (4) That by Order No. R-1826 entered in Case No. 2118
effective January 1, 1961, the Commission, upon the application

CASE No. 2118
CASE No. 2459
Consolidated
Order No. R-1826-A

of The Ohio Oil Company, established 80-acre proration units in the Lea-Devonian Pool on a temporary, one-year basis; that temporary special rules and regulations for said pool were also promulgated which included a provision requiring the initial well on the 80-acre unit to be located within 150 feet of the center of either the NW/4 or the SE/4 of the quarter section; that said order prescribed an 80-acre proportional factor of 10.33 for allowable purposes.

(4) That the present application by The Ohio Oil Company seeks the establishment of 160-acre proration units in the Lea-Devonian Pool and the promulgation of special rules and regulations for said pool including a provision ~~requiring future wells to be drilled within 150 feet of the center of the quarter section comprising the proration unit, and a provision~~ granting 150 percent of the 80-acre allowable as the 160-acre allowable for the pool.

(5) That the application for 160-acre proration units was consolidated with the case in which operators in the subject pool were to appear and show cause why the pool should not be developed on 40-acre proration units.

(6) That the evidence presented at the hearing of this matter indicates the presence of an ^{active} ~~excellent~~ water drive in the subject pool; that the data derived from interference tests between wells in the pool is inconclusive to establish drainage over great distances, but that the results of such tests may have been affected detrimentally by the water drive.

(7) That in the limited area in which data was available on this Devonian reservoir, it will not cause waste to allow development on 160-acre proration units, and development on 80-acre proration units might cause the drilling of unnecessary wells.

(8) That the evidence presented at the hearing of this matter failed to justify the establishment of 160-acre proration units on a permanent basis; however, 160-acre proration units

-3-
CASE No. 2118
CASE No. 2459
Consolidated
Order No. R-1826-A

should be established in said pool on a temporary, one-year basis.

⁹ *during the one-year period this*
(10) That ~~due to the possibility of the Lea-Devonian Pool~~
temporary order will be in effect,
~~reverting to 80-acre proration units at the termination of the~~
~~one-year period,~~ the well location requirements for said pool
should remain the same as those prescribed under the previous
80-acre order, and the allowable production from each 160-acre
proration unit should be retained at ~~the same~~ ^{a normal} 80-acre allow-
able figure.

(11) That during the one-year period in which this order
will be in effect, the applicant should gather all available
information relative to drainage and recoverable reserves in the
subject pool.

(12) That this case should be heard again by the Commission
at its regular monthly hearing in December, 1962, at which time
the applicant and other interested parties should be prepared
to prove the size of proration unit on which the subject pool
can be most efficiently developed.

~~IT IS THEREFORE ORDERED, ITS CINO BEI TO NOTADJUSIA~~

(1) That temporary special rules and regulations for the Lea-
Devonian Pool in Lea County, New Mexico, ~~be and the same~~ are
hereby promulgated as follows, effective January 1, 1962.

SPECIAL RULES AND REGULATIONS FOR THE
LEA-DEVONIAN POOL

RULE 1. Each well completed or recompleted in the Lea-Devonian
Pool or in the Devonian formation within one mile of said pool,
and not nearer to nor within the limits of another designated
Devonian pool, shall be spaced, drilled, operated and prorated
in accordance with the Special Rules and Regulations hereinafter
set forth.

RULE 2. Each well completed or recompleted in the Lea-Devonian
Pool shall be located on a unit containing 160 acres, more or less,
which consists ~~of the N/2, S/2, E/2 or W/2~~ of a single govern-
mental quarter section; provided, however, that nothing contained
herein shall be construed as prohibiting the drilling of a well
on each of the quarter-quarter sections in the unit.

RULE 3. The initial well on any 160-acre unit in said pool shall
be located within 150 feet of the center of either the NW/4 or the
SE/4 of the quarter section on which the well is located. Any
well which was completed in the Lea-Devonian Pool or which was
drilling to the Devonian formation within one mile of said pool
prior to January 1, 1961, is granted an exception to the well
location requirements of this rule. ~~and no longer removed-s-i~~

CASE No. 2118
CASE No. 2459
Consolidated
Order No. R-1826-A

129 160 201
RULE 4. For good cause shown, the Secretary-Director of the Commission shall order a hearing to be held on the application for a non-standard unit comprising ~~a single quarter quarter section or lot~~. All operators offsetting the proposed non-standard unit shall be notified of the application by registered mail, and the application shall state that such notice has been furnished. The Secretary-Director of the Commission may approve the application if, after a period of 30 days, no offset operator has entered an objection to the formation of such non-standard unit.

The allowable assigned to any such non-standard unit shall bear the same ratio to a standard allowable in the Lea-Devonian Pool as the acreage in such non-standard unit bears to 160 acres.

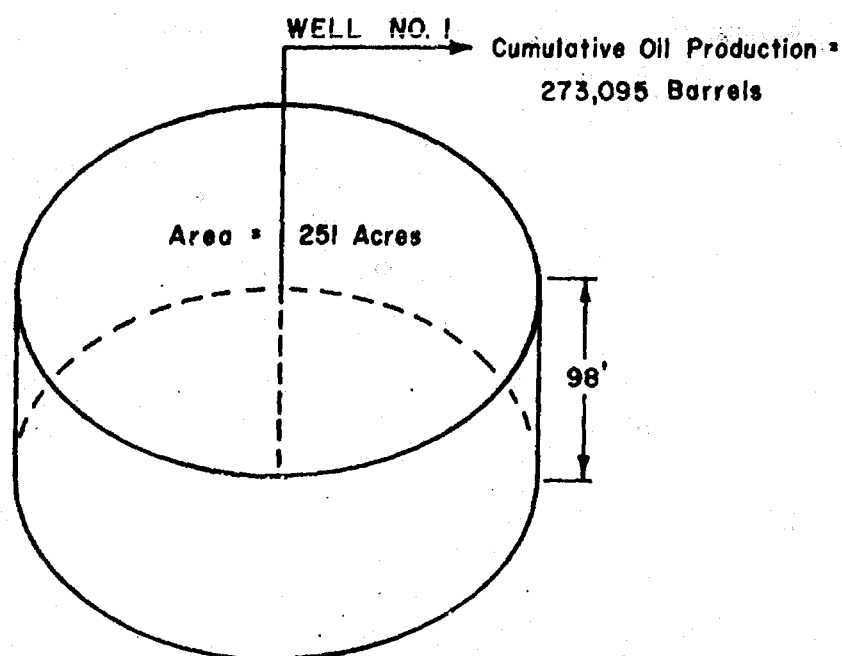
151 162
RULE 5. An ~~160~~-acre proration unit (~~160~~ through ~~160~~ acres) in the Lea-Devonian Pool shall be assigned a ~~proportional~~ factor of 10.33 for allowable purposes, and in the event there is more than one well on an ~~160~~-acre proration unit, the operator may produce the allowable assigned to the unit from the wells on the unit in any proportion.

(2) That this case shall be reopened and heard again by the Commission at its regular monthly hearing in December, 1962, at which time the applicant and other interested parties shall appear and be prepared to prove the size of proration unit on which the subject pool can be most efficiently developed.

(3) That jurisdiction of this cause is retained for the entry of such further orders as the Commission may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

PRESSURE DECLINE CALCULATED FOR LEA UNIT NO. 1
FROM
JULY, 1960 TO NOVEMBER, 1962
BASED ON MAXIMUM RADIAL DRAINAGE OF 251 ACRES



$$\text{Pressure Decline} = \frac{N_p}{c_e N} \times \frac{B_o}{B_{oi}}$$

$$\text{Pressure Decline} = \frac{273,095}{(23.2 \times 10^{-6})(5.04 \times 10^6)} \times \frac{1.241}{1.185}$$

$$\text{Pressure Decline} = \frac{338,911}{139}$$

$$\text{Pressure Decline} = 2438 \text{ psi}$$

Measured Pressure Decline from July, 1960
to November, 1962 = 27 psi

NMOCC Case No. 2118 52459
Marathon Exhibit No. 6
Date 12-19-62

The Material Balance for an oil reservoir producing when the reservoir pressure is above the bubble point pressure of the reservoir fluid is given by the following equation:

$$NB_{oi} c_e \Delta p = N_p B_o - W_e + B_w W_p$$

where:

N = original oil in place

N_p = cumulative oil production

B_o = oil formation volume factor

W_e = cumulative water influx

B_w = water formation volume factor

W_p = cumulative water production

Δp = reservoir pressure decline

B_{oi} = initial oil formation volume factor

c_e = effective fluid compressibility

$$c_e = \frac{S_o c_o + S_w c_w + c_f}{S_o}$$

S_o = oil saturation

c_o = oil compressibility

S_w = water saturation

c_w = water compressibility

c_f = formation or rock compressibility

For a volumetric reservoir $W_e = 0$ and $W_p = 0$ and the above equation reduces to:

$$NB_{oi} c_e \Delta p = N_p B_o$$

The reservoir pressure decline at any time is thus given by the following expression:

$$\Delta p = \frac{N_p}{c_e N} \times \frac{B_o}{B_{oi}}$$

Basic Data for Lea Unit No. 1:

Porosity (ϕ)	= 5.49%
Water Saturation (S_w)	= 43%
Net Pay (h)	= 98 feet
Area (A)	= 251 acres
Initial Formation Volume Factor (B_{oi})	= 1.185
Oil Compressibility (c_o)	= 9.99×10^{-6} vol/vol/psi
Water Compressibility (c_w)	= 3.00×10^{-6} vol/vol/psi
Rock Compressibility (c_f)	= 6.25×10^{-6} vol/vol/psi

Original Oil in Place in 251 Acres Surrounding Lea Unit No. 1

$$N = \frac{7758 Ah \phi (1 - S_w)}{B_{oi}}$$

$$N = \frac{(7758)(251)(98)(0.0549)(0.57)}{1.185}$$

$$N = 5,040,000 \text{ bbls. of stock tank oil}$$

Effective Fluid Compressibility

$$c_e = \frac{S_o c_o + S_w c_w + c_f}{S_o}$$

$$c_e = \frac{[(0.57)(9.99) + (0.43)(3.0) + (6.25)] 10^{-6}}{(0.57)}$$

$$c_e = 23.2 \times 10^{-6} \text{ vol/vol/psi}$$

LEA DEVONIAN POOL

WELL COST DATA

	DRILLING COST \$	COMPLETION COST \$	DRILLING AND COMPLETION COST \$	SURFACE EQUIPMENT COST \$	GRAND TOTAL \$
Well No. 1	396,096	261,315	657,411	39,740	697,151
Well No. 2	354,201	187,371	541,572	22,840	564,412
Well No. 4	366,761	148,545	515,306	5,981	521,287
Well No. 5	368,523	190,931	559,454	5,948	565,403
Well No. 6	<u>305,286</u>	<u>185,667</u>	<u>490,953</u>	<u>12,113</u>	<u>503,066</u>
TOTAL	1,790,867	973,829	2,764,696	86,622	2,851,319
Average Per Well	358,173	194,766	552,939	17,324	570,264
Average Per Well Excluding #1	348,693	178,129	526,821	11,721	538,542
Estimated Cost to Dual			<u>25,000</u>		
Estimated Cost Per Devonian Well			\$ 501,821		
Number of Devonian Wells to Date			<u>7</u>		
Approximate Total Devonian Well Costs to Date			\$3,512,747		

NMOCC Case No. 2118 & 2459
Marathon Exhibit No. 7
Date 12-19-62