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

TRANSCRIPT OF PROCEEDINGS

MR. PORTER: We will take the next case, 2119 -- 2118, I'm sorry.

MR. MORRIS: 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.

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,

Mr. Couch, involve a dually completed well.

MR. COUCH: That's correct.

MR. PORTER: One in Bore 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.

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

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

from reflection 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 seismograph 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.

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

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

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,

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 if 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?

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?

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 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?

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 300 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.

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

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.

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.

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 day per psi 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

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.

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.

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, 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

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 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-

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 perosity 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-

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?

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 stem 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

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[illegible] 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?

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.

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

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?

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?

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.

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 300 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?

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 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.

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-

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

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?

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

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

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-

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

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 assump-

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 waterflood 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.

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.

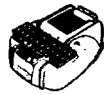
Q Mr. Young, was your No. 1 Well cored, this discovery well?

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.



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 infield 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

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.

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.

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

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.

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

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. Nutter, 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

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

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

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

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

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.

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.

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

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.

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?

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 40 he had to drill it in?

A Let me answer that this way, Mr. Payne. Upon the edge

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

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 --

[illegible]:

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.

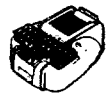
Q Well, as a matter of fact, Mr. Young, you are recommending these rules be adopted as temporary rules only, are you not?

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?



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

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,

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

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.

RECROSS-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

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?

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-

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,

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 payhas 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?

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

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 quarter/section, or perhaps they were referring to the fact any other contiguous forties / 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

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.

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