BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

IN THE MATTER OF:

CASE NO. 1440

TRANSCRIPT OF HEARING

JULY 2, 1958

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BEFORE THE
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IN THE MATTER OF:

CASE NO. 1440 Application of Skelly Oil Company for an order promulgating temporary special rules and regulations for the Otero-Gallup Oil Pool in Rio Arriba County, New Mexico. Applicant, in the above-styled cause, seeks an order promulgating temporary special rules and regulations for the Otero-Gallup Oil Pool in Rio Arriba County, New Mexico, to provide for 80-acre proration units, well spacing, and such other provisions as the Commission may deem necessary and proper.

BEFORE:

Daniel S. Nutter, Examiner

T R A N S C R I P T O F P R O C E E D I N G S

MR. NUTTER: The hearing will come to order, please. The next case on the docket will be Case 1440.

MR. PAYNE: Application of Skelly Oil Company for an order promulgating temporary special rules and regulations for the Otero-Gallup Oil Pool in Rio Arriba County, New Mexico.

MR. SELINGER: For applicant, George W. Selinger. We have one witness, Mr. Lee King.

(Witness sworn)

LEE KING,

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

MR. SELINGER: We would like for the record to show that this hearing was originally called for May 14, 1958, then continued upon motion of the applicant to June 8th, 1958, and then continued upon motion of the applicant to July 2nd, 1958.

MR. NUTTER: The record will so show.

DIRECT EXAMINATION

BY MR. SELINGER:

Q State your name. A Lee King.

Q And you are associated with Skelly Oil Company?

A That's correct.

Q In what capacity?

A District engineer.

Q Where are you located, Mr. King?

A Farmington, New Mexico.

Q Are you familiar with the Skelly Oil Company's operations in the San Juan Basin and more particularly in Rio Arriba where our Jicarilla "B" and "C" wells are?

A Yes, I am.

Q Have you heretofore testified before the Commission as an expert engineer? A Yes, I have.

Q I hand you what has been marked as Exhibit 1 in this particular case, an enlarged copy which we have on the board, and ask

you to state what that is?

A This is a map showing the vicinity of the Otero Gallup Pool, and the proposed addition to the Otero Gallup Pool. The pool as it is now outlined by the Commission includes Section 5 and Section 6, 24 North, 5 West, Sections 31 and 32, Section 25 North, 5 West. We propose to ask for the N/2 of Section 33 and Section 34, Township 23 North and 5 West be included in this pool.

Q Is there now a well in the Gallup in the N/2 of 34?

A Yes. We have a well, the Jicarilla "C" 16, completed in the Gallup.

Q And has Skelly also authorized a well which is to be drilled in the N/2 of 33 which will lead to continuous acreage to the presently defined field?

A Yes. We propose a well in the NW, probably the NW/4 of Section 33, 25 North, 5 West.

Q How many completed producing wells are there now in the Gallup?

A We have nine completed wells, and we are drilling on the tenth one.

Q Will you point them out with your ruler so the Commission can determine which are the Gallup wells; differentiate it from the other producing zones?

A We will start by noticing-- in Section 6, 24 North, 5 West, we have a Pictured Cliff gas well which is Jicarilla "B" 1.

Q Just enumerate the Gallup oil wells, just point them out.

A No. 2 Jicarilla is in Section 31, 25 North, 5 West; No. 8 in Section 31; No. 9 is in Section 31; No. 4, No. 5, No. 6, 7 and 10 are in Section 32; and No. 3, a completed Gallup oil well, is in Section 5, 25 North, 5 West. We have No. 11 presently drilling in Section 5.

Q Are all of these wells on Skelly acreage at the present time?

A Yes, they are.

Q Now, I will hand you what has been marked as Skelly's Exhibit 2 and ask you to state what that is?

A Skelly's Exhibit 2 outlines considerable data and information that would be of value at present and later on this pool.

Q Is that the data on all the producing wells up to the time that that Exhibit was prepared?

A This data is up through May the 31st, 1958.

Q And what -- just generally what are the items indicated on that? The location, the well number, the perforations, whether or not the well has been sand fraced, the completion dates and pressures, gas-oil ratios, recovery of oil and gas production, is that correct?

A That is correct. We have a complete record of each well, the completion data, the quantity of sand and water or sand and oil that was used to frac the formation, the initial potential, pressures of casing and tubing, the initial GOR and all subsequent GOR's that have been taken, the bottom hole pressure on wells that have

had a bottom hole pressure taken, and the date of that pressure, and the datum. Some of these bottom hole pressures are -- were, of necessity, taken from drill stem tests.

Q That's the earlier wells?

A That is in the case of the earlier wells where Amerada bombs or other equipment was not available or was not utilized, and we took the build-up on a drill stem test and derived a true build-up by computation to the initial bottom hole pressure in this field.

Q What's the first completion or discovery date of the well in the field?

A The Jicarilla "B" 2.

Q That's a top well, and when was it completed?

A It was completed on 6/28/1957.

Q What do you estimate the original bottom hole pressure to be?

A Twenty-three hundred and twenty-one pounds initially.

Q What is the average bottom hole pressure now, approximately?

A Well, the average presently is approximately eighteen hundred pounds.

Q So that you've had approximately a five hundred pound drop in reservoir pressure since the date of the completion of the first well?

A That is correct. This eighteen hundred pounds that I call the average was the average -- close to the average of these figures shown here, but recently we have a new bottom hole pressure taken

in the Jicarilla 6 "B" that was fourteen hundred and forty-one pounds.

Q So that would be about, approximately a nine hundred pound drop from the initial to the latest and last well pressure taken?

A That is correct.

Q How much oil has been produced to May 31st, 1958?

A Total oil production from this pool, twenty-seven thousand, eight hundred and sixty-nine barrels.

Q Is that an unusual drop for the amount of production secured?

A I would say it is enormous.

Q It is an enormous drop? A Yes.

Q I hand you what has been designated as Exhibit 3, and ask you to state very briefly what that is?

A Exhibit 3 gives a brief description of the geology and trap nature of this reservoir. It --

Q Well, without going into the general geological description or the engineering problems and peculiarities of this pool, will you kindly go to the reservoir characteristics and very briefly read that part?

A We have very low permeability and porosity with relatively high connate water saturation in this pool. Actually, it is a Mickey Mouse type oil field, as the pools are normally classified.

Q By that, you mean that there is no other pool in the San

Juan Basin that can be definitely described as a Mickey Mouse pool as this, from the information you have available?

A I know of no pool that has had over a thousand pound pressure drop with only twenty-seven thousand barrels of oil produced from approximately nine, ten wells. Extensive fracing proved the only route for migration into the well bore; I say only possible route because of the low permeability and porosity,and sand oil fracing is necessary to create adequate permeability for commercial production. A solution gas drive reservoir is indicated in this area, and we have no water indicated to date.

Q What kind of drive do you have in the reservoir?

A It is a solution gas drive reservoir, as we know it now.

Q What are the average permeabilities and average porosities?

A Three hundredths of a milladarcey is the average,permeability average. Porosity is six point five percent. We have a residual oil saturation of forty-one percent, a total water saturation of fifty-one point five percent. We have original solution gas-oil ratio of three hundred eighty, original formation volume factor of one point three two,and we have an average API gravity of the oil, forty. And we had an original bottom hole pressure of twenty-three twenty-one. And at the time this report was made, May the 31st, 1958, the approximate bottom hole pressure was thirteen hundred pounds, average for the pool. Had a decline of a thousand twenty-one pounds, with a total oil accumulation being produced of twenty-seven thousand three hundred and sixty-nine

barrels. We had accumulated gas production of one hundred, forty-three thousand, two hundred eighty-two MCF, which resulted in a decline bottom hole pressure of point zero three seven pounds per stock tank of oil produced.

Q Is that rather unusually low as oil fields go?

A I think that bottom hole pressure drop per stock tank barrel is high, very high. We have an average net thickness of sixty-five feet, but there is considerable amount of silt stone, shale, that it is impossible almost to tell the exact productive interval except by fractures, which seems to be the criteria for a reservoir here.

Q Now, you have made some estimates of recoverable reserves, have you not, and that is indicated on your Exhibit 3?

A That's correct. We estimate the total oil in place for eighty acres at five hundred and seventy-seven thousand, one hundred twenty-nine barrels, and with a solution gas drive we expect to recover only ten point eight percent.

Q And in view of the bottom hole pressure decline that you've occasioned now since the computation of these figures, it may still be less?

A It is very possible and very probable that we will not even approach this ten percent.

Q Go ahead.

A The ten point eight percent will, if we do recover that, will give a recovery on eighty acres of sixty-two thousand, three

hundred thirty barrels, stock tank oil, which would render a hundred and eleven barrels of stock tank oil in place, per acre foot. We have expected recovery per acre foot of twelve barrels of oil.

Q Now, have you computed that on the basis of forty acres?

A Yes. The forty-acre figure, forty-acre oil in place is two hundred and eighty-eight thousand, five hundred and sixty-four barrels with an expected recovery of approximately ten point eight percent or thirty-one thousand, one hundred sixty-five barrels recovery on forty acres. And we have a total gas in place per eighty acres computed to be two hundred and ten million, and we expect possibly to recover eighty percent, which would be one hundred sixty-eight million, abandonment pressure of two hundred pounds.

Q Without going into detail on Exhibit 3, on Page 1 of that Exhibit, the engineering problems and peculiarities of this pool, you have indicated some of the problems involved on the surface inorder to get to and from locations, have you not?

A Yes. This Jicarilla reservation is rough country, as most people that have been in that area, found out. It's washed and rugged in summer and winter, and extensive road building and location leveling is necessary.

Q Now, aside from your surface problems, you also have underground problems in the building and producing and operating of these wells, do you not?

A Yes. We have to haul water from long distances for drilling these wells, for mixing the drilling mud. We have several lost

circulation zones before we reach the Gallup,and many times the Gallup fractures take mud and lost circulation material while drilling. And it entails quite a bit of completion and time and labor to clean this mud and lost circulation material from the fracture.

Q Do you have any paraffin problems?

A That's very critical in that area along with our other problems. Most of these wells that are flowing have to scrape the paraffin every six to ten days, and we try to do it every two weeks, but the well is plugged off with paraffin,and we had several cases where we went in with a swabbing unit and swabbed the wells after cutting the paraffin. We have a regular schedule of paraffin scraping of six to ten days, depending on the well.

Q Is this well in a remote location for market and facilities which require you to have unusual storage facilities?

A Yes, we have to have extra tankage -- storage facilities for the oil here because we are faced with a trucking problem. There is no pipeline outlets.

Q Now, supplementing your information on recoveries of Exhibit 3, you have prepared Exhibit 4, which I hand you and has been marked by the Reporter as such. Without going into great detail specifically as to items, will you give the total cost per well, including all salvageable material and translate that into expected recoveries for forty acres and eighty acres?

A We have a total cost,initial cost of one hundred twelve thousand, three hundred and one dollars, with a salvage value of

surface and subsurface equipment of twenty-four thousand, eight hundred and three dollars, which will render a final cost of eighty-seven thousand, four hundred ninety-eight dollars.

Q Now, have you determined the lifting costs on forty and eighty acres, and the exceptionally high cost of maintenance of both lease, roads and other --

A Yes, this lifting cost was computed using the trucking cost of thirty-eight cents per barrel as a starting figure, and then we have lease maintenance costs, road maintenance. And we had to furnish housing for the pumpers and roustabouts in that area. We have our own water wells for the water supply for the pumpers. We generate their own electricity and other incidental operations that --

Q Why is it that the lifting cost for forty acres is seventy-five cents a barrel and the lifting cost on eighty acres is fifty-eight cents a barrel?

A Well, the road maintenance and the housing and the water wells were necessitated regardless of whether you recovered any quantity of oil. The larger quantity of oil you recovered divided by the cost would lower those costs.

Q Would lower the per barrel cost?

A That's correct.

Q Now, you have indicated the computation for forty and eighty acres. Would you give the profit or loss for forty acres and profit and loss for the eighty acres?

A Well, with an expected oil recovery on forty acres of thirty-one thousand, one hundred sixty-five barrels, the value of that oil should be eighty-one thousand, six hundred and fifty-two dollars and thirty cents. Expected gas recovery on forty acres -- this is primary -- be eight thousand and four hundred dollars, for a total value, oil and gas on forty acres of ninety thousand fifty-two dollars and thirty cents.

Q This is including the anticipation of sealing your casing head gas, is that correct?

A That is correct.

Q At what rate?

A At three million.

Q At ten cents a thousand?

A Ten cents a thousand, and we expect possibly to have three million per day.

Q What are the figures, then, with respect to the eighty acres?

A Well, with the oil recovery of sixty-two thousand, three hundred thirty barrels for eighty acres, we have a total value of one hundred sixty-three thousand, three hundred and four dollars and sixty cents, at two dollars and sixty-two cents per barrel. That's the price of that oil in this area, and we have a primary gas recovery on eighty acres of one hundred sixty-eight thousand, which at ten cents per thousand would bring sixteen thousand, eight hundred dollars, or a total value for eighty acres of the hydrocarbon one hundred eighty thousand, one hundred four dollars and sixty cents.

Q Then, your forty acres, what is your total cost of depletion for a forty-acre well, and what is the value of your oil and gas on primary on forty acres?

A We have a total cost of depletion including lifting cost and initial investment of one hundred ten thousand, eight hundred seventy-one dollars and seventy-five cents. And we have a total value of oil and gas to be recovered of only ninety thousand, fifty-two dollars and thirty cents, or resulting loss of twenty thousand, eight hundred nineteen dollars and forty-five cents, if drilled on forty acres.

Q Now, give the same figures with respect to eighty acres.

A Well, with eighty acres, we will have a total cost of depletion of one hundred, twenty-three thousand six hundred forty-nine dollars and forty cents; with a value placed on the oil and gas of one hundred eighty thousand, one hundred four dollars and sixty cents; with a net profit of fifty-six thousand, four hundred fifty-five dollars and twenty cents.

Q So that on forty-acre development, your loss would be a little over twenty thousand -- approximately twenty-one thousand for a forty-acre well loss, and for eighty-acres, it would be a profit of approximately fifty-six and a half thousand?

A That is correct.

Q Now, I notice you confined your figures to the primary. Are there any possibilities of secondary recovery in this area?

A There is good possibilities, I'd say, of possible permissible phase flooding for this pool, which might result in some

secondary pool.

Q Then, considering both the primary and secondary recovery, would you estimate that the recovery for a well on eighty acres would be the same as the recovery of two wells on eighty acres, considering both the primary and the secondary?

A Well, there could be more oil recovered if the wells were -- if this lease was developed on eighty-acre spacing, if secondary recovery is initiated.

Q Why is that?

A Well, the sweep of your flood would be much more efficient if you had your wells on eighty-acre spacing, your break through would not be as quick, and the resulting quantity of oil recovered secondary would be greater.

Q You have in answer -- in answering that question Exhibits which will be introduced, particularly Exhibits 7 and 8, --

A That is correct.

Q -- which is the interference test of the showing of fracing in the reservoir --

A That's true.

Q -- fracturing in the reservoir, excuse me.

A Yes.

Q Now, I'll hand you a series of Exhibits marked 5-A to 5-P, both inclusive, and I'll ask you to state whether or not it is electrical log and micrologging on seven or eight of the wells?

A We have electric logs on Jicarilla "B" 2 and micrologs on

the Jicarilla "B" 2. Exhibit 5-A is the electric log; Exhibit 5-B is the microlog.

Q Without mentioning each Exhibit, does it cover Jicarilla "B" 2, "B" 3; just enumerate the wells.

A Jicarilla "B" 2, Jicarilla "B" 3, Jicarilla "B" 4, Jicarilla "B" 5, Jicarilla "B" 6, Jicarilla "B" 7, and Jicarilla "B" 8, and the Jicarilla "C" 16, which is proposed to be included in this pool.

Q "C" 16 is a well that's on the extreme east end of the field, is that correct?

A That's correct.

Q Point that out on Exhibit 1.

A "C" 16 is now an undesignated well, but we propose it be included since it is a Gallup completion, and very probably this pool will extend northwest, southwest, our geologist thinks.

Q From Exhibit 5-A through 5-P, the electric log and the microlog, is it your opinion that, the Gallup throughout, all these wells are in the same reservoir?

A Yes, very -- it is very definite, I believe.

Q Now, I'll hand you what has been marked Exhibit 6, A through D, and ask you to state what that is?

A This is a core analysis performed on the Gallup section from the Jicarilla "B" 3. It gives some very startling information as far as oil reservoirs are concerned. The summarization of this information will be found at the bottom of the page; for your average porosity, it is five point eight percent, your permeability

average for this Gallup section is only one-hundredths of a millacarcey. Residual oil saturation is thirty-eight point two percent, and there is very high water saturation for an oil pool of fifty-seven point three percent.

Q Is this the information that led you to make the observation that this is a Mickey Mouse pool?

A Well, it says here,"the matrix is interpreted to be essentially nonproductive." We found that to be almost a fact.

Q What proof do you have of that,if you relied on the porosity and permeability solely as to whether or not you would be able to make a producing well?

A Well, we have another Gallup well, the Jicarilla "E" 1 completed about five miles Southwest of this Otero Gallup pool, and the cores on this well had no natural fractures, and after two subsequent frac jobs, sand oil treatments, we are presently producing only seven barrels per day.

Q So that the absence of fracing,and the porosity and permeability that you encountered in this reservoir would make it almost prohibitive of completing commercially producing well?

A That's true. Without natural fractures, this would be a definite noncommercial pool.

Q I hand you what has been marked Exhibits 8 and 9, which is a core analysis on Jicarilla 16. Noting that Exhibit A is on the board, where are the fractures that you have been testifying about as indicated on that core analysis?

A This core analysis of the Gallup formation begins at 6101 through 6110 for the first interval cored, and we note very low porosity, very high water saturation with the vertical fracture which, I might say, is called vertical fractures by core analysis. But these fractures run at a forty-five degree to sixty degree angle to the well bore. They are not vertical, they run across the well bore.

Q How are they indicated on that Exhibit?

A They are indicated by two horizontal parallel lines.

Q Point them out on that Exhibit as you go all the way down.

A They are in the area normally considered the well bore, and throughout this entire interval we note that sand and shale is indicated by the short dashes and the dots. This entire interval in the Jicarilla "C" 16 shows fracturing as does the cores taken on other wells on the Jicarilla "B" lease.

Q Is that common through not only the "C" lease in the Gallup, but also the "B" lease in the Gallup?

A All wells to date completed in the "B" lease that have been cored indicate fracing.

Q Now, I hand you what has been designated as Exhibit 8, which is on the board, and ask you to state what that is?

A Exhibit 8 is an interference pressure test curve taken in the Jicarilla "B" 4. These pressures were measured at a datum of plus seven hundred. The bomb was placed -- Amerada bomb was placed in the well and had a seventy-two hour clock which necessitated

pulling this bomb every three days to wind it and change the charts.

Q Will you point out Well No. "B" 4 on Exhibit 1 so that we can follow it?

A 4 is in the southwest, southwest of Section 32, 25 North, 5 West.

Q That's the well that had the bomb?

A That's the one that we had the pressure bomb in. We flowed Well No. 2 in Section 31, 25 North, 5 West, and we flowed Well No. 3 in Section 5, 24 North, 5 West for the first three days that this bomb was in Well No. 4, then we intended to start to flow No. 5 as well as 2 and 3, but it died from paraffin acceleration, and by the time we got it swabbed in, in three days the test had gone by. We swabbed in No. 5, cleaned out the paraffin and started flowing. On the third day is when Well No. 5 started flowing. On the fourth day, after we pulled the chart, at the end of four days,we noted at the end of four days that the pressure had stabilized, and on the fifth day the pressure had dropped to eleven hundred and seventy pounds. It had a two-pound drop there from the fourth to the fifth day. On the sixth day the pressure had dropped to eleven hundred and thirty-one pounds, or forty-three pound drop. And on the seventh day we had a bottom hole pressure in Well No. 4 of eleven hundred and twenty-nine pounds, or forty-five pound drop. Well, at that time Well No. 5 plugged up with paraffin again, and it died sometime during that night. I don't know. We came back the next morning, it was dead, so we continued

to flow Wells No. 2 and 3, and we noted a startling pressure rise when Well No. 5 died. In one day, the pressure climbed to twelve hundred and twelve pounds, approximately. Correctly, twelve hundred and thirteen pounds; in only one day. And it continued to rise until it reached a practically static pressure after fourteen days. On the fourteenth day, the pressure was twelve hundred and eighty-five pounds. And on the fifteenth day the pressure was twelve hundred and eighty-six pounds, so it had relatively stabilized. At this time we wanted to see if we had any pressure interference or could definitely find any interference from 2 and 3, so we shut down Wells 2 and 3, and No. 4 was also closed all this time. And we had a pressure build-up the last three days of this test from twelve hundred and eighty-six pounds to twelve hundred and ninety-nine pounds, or thirteen pound build-up, which showed that some interference was being effected by 2 and 3 offsetting No. 4.

Q Were you through with that Exhibit?

A Yes.

Q Now, Mr. King, all of the wells in the field have been drilled on a density of one well to eighty acres, have they not?

A That is correct.

Q Now, with respect to the spacing, however, Well No. 4 is the only well that is as close as thirteen hundred and twenty feet from another well in the Gallup, is that correct?

A That is correct. 4 and 5 are thirteen hundred and twenty feet, approximately, apart.

Q And did you have a pressure interference test shown between Wells 4 and 5 greater than any other two wells?

A Yes. There is definite pressure interference between 4 and 5, which is pronounced and possibly that is because of the close nature of the wells.

Q That's because of the thirteen hundred twenty-foot distance between the wells? A That's correct.

Q Well No. 3 is approximately thirteen hundred feet from Well No. 4. Did you have the effect of interference from those two wells, Wells 3 and 4?

A I have no definite proof that 3 affected Well No. 4. I have proof that Wells 2 and 3 affected 4. I cannot say which ones or whether both were affected. One is over fifteen hundred feet, and the other is in excess of, well, eighteen hundred and sixty-seven feet.

Q So that you had an effect between Well No. 4, the test well, and Wells Nos. 2 and 3, one being in excess of fifteen hundred feet and the other in excess of eighteen hundred sixty-seven feet?

A That's correct. We had pressure interference.

Q So you had pressure interference between the three producing wells and the test well, Well No. 4, in proportion to the distance between the wells, did you not? Maybe not in direct proportion, but insofar as the effectiveness of the interference is concerned?

A There is a relation between distance and affected pressure decline. The further the wells were away from the Well No. 4, the less the pressure decline, but we did obtain a pressure drop over further distance than eighty-acre spacing, so we can drain eighty acres or in excess of eighty acres with one well.

Q You anticipated my question. Based on the test as indicated on Exhibit 8 and your 8-A and 8-B and your explanation, did you find an interference between wells on staggered forty acres?

A Yes. Yes, there is definite interference.

MR. SELINGER: We would like to offer in evidence Skelly's Exhibits 1 through 8-B inclusive.

MR. NUTTER: Without objection, Skelly's Exhibits 1 through 8-B will be admitted.

Q (By Mr. Selinger) Now, as Skelly's Exhibit 9, we would like to introduce a letter. As Exhibit 9 we have a letter from our gas contract division with respect to the sale of a market for casing head gas. Very briefly I would like to read it. "We are now negotiating for the sale of casing head gas from Skelly wells in the caption field Otero Gallup Pool. I am of the opinion that contract arrangements will be completed within the next four to six weeks. Unfortunately, however, the sale will be in interstate commerce, which means that the contract will be subject to approval by the Federal Power Commission. I use the word "unfortunately" solely because of the time lag which necessarily will be involved. If we are successful in securing expeditious handling

by the Commission, referring to this Commission. I am of the opinion we can be delivering within three to four months. If we're not, that is, if we do not secure an order requesting a gas-oil ratio limitation of six thousand cubic feet, which we will go into, then the date by which deliveries can be accomplished is solely one of conjecture.

All I can assure you -- and you, the Commission -- is that we shall exert every effort to be marketing the gas at the earliest possible date."

Indications are that in order to secure approval as quickly as possible from the Federal Power Commission, if we have an order from this Commission which will make available a volume of casing head gas, the Federal Power Commission having power of use and reserves will be more apt to give us a prompt approval for the marketing and handling of the gas.

Now, Mr. King, with respect to what Skelly Oil Company is proposing -- I might say to the Commission, without being too presumptuous, this being for the benefit of the Commission, we have drawn up a proposed order which will be of some benefit in allowing the Examiner to follow our proposed rules and regulations.

Now, in addition to the eighty-acre proration unit that is being requested, have you made recommendations with respect to the location of the wells?

A Yes. I feel that wells should not be located closer than six hundred sixty feet from outside lease lines, and not closer than three hundred thirty feet from any inside quarter quarter section

line, and that they should be drilled on diagonal quarters within one hundred sixty-acre tracts.

Q I might ask you in that regard, you are proposing to the Commission that they require one well to each eighty-acre unit, the units to follow governmental subdivisions running east and west, that is, the N/2 and S/2, based on the facts that there are no tracts containing -- there are no leases containing acreage less than the proposed standard basic unit of eighty acres, is that correct?

A That is correct. Eighty acres can be readily assigned to any well now completed or drilling in this pool.

Q And there are no tracts in their entirety containing less than eighty acres in this area, at least in the area depicted in Exhibit 1, is that correct?

A That's correct.

Q Now, referring to your Exhibit 2, which is information and data on all existing producing wells, what is the limiting gas-oil ratio in existence in the Otero Gallup Field at the present time?

A The limiting gas-oil ratio is two thousand to one.

Q Now, I will ask you, are there any wells now producing in this field that can produce with a gas-oil ratio of less than two thousand cubic feet?

A No. All wells now completed have gas-oil ratios greater than two thousand to one.

Q Do you anticipate that as production is had in the future that the gas-oil ratios will continue to rise on these wells?

A I believe that the gas-oil ratio will rise and rapidly. As the reservoir reaches bubble point pressure, I believe our gas-oil ratios will be up possibly double what they are now.

Q At the present time all of the wells in the Gallup Pool are oil wells, are they not?

A That is correct.

Q And with the increasing gas-oil ratios, there might be a possibility of a well or two being classified as a gas well?

A That's very possible.

Q Do you think, then, that the request for a limiting ratio of six thousand cubic feet is an unreasonable request in view of the reservoir's condition as you find it now in the field?

A No. I believe this is a reasonable request from several points. The reservoir is not very sensitive, and secondly, a quantity of gas in excess of what would be produced, if the wells were cut back to one, is needed to afford installation of compressors and pipe lines to market this gas. And without marketing the casing head gas, why, I think we're definitely going to have a loss on wells drilled on this pool.

Q Now, as a matter of fact, without your gas income, it will be questionable whether or not you make a profit even on eighty acres?

A It is very probable that we could lose money on eighty

acres since our reserves are still sketchy, the figures are not definite.

Q Of the nine producing wells -- at the present time there are nine producing wells, are there not?

A That's correct.

Q Nine producing wells with total allowable of five hundred eighty-nine barrels, the effect of a two thousand-foot limitation would result in a penalty of approximately two hundred fifty-seven barrels or forty-six percent from the present daily allowable, is that correct?

A That's correct.

Q And under a six thousand-foot ratio, there will still be some well penalized for high ratio, and in view of our anticipating increasing gas-oil ratio as months go on, there will be an increasing number of gas wells continued to be penalized even under the six thousand gas-oil ratio?

A That's correct. We have two wells producing in excess of six thousand to one, and many that are increasing in gas-oil ratio.

Q Now, with respect to the allowable under the existing general state-wide Rule 505, the Commission has already set up a means of a standard for determining the allowables for eighty-acre wells under the proportional factors based on depth, is that correct?

A That's correct. It is two point thirty-three times your unit allowable.

Q Your basic unit allowable?

A That's correct for this depth of production.

Q Now, you are not so much concerned with the allowable -- whether it be forty-acre or the proportional factor, as long as the field is developed on a uniform program of eighty acres with a gas-oil ratio limitation of six thousand instead of two thousand, is that correct?

A I think the allowable is very unimportant in this situation actually. Possibly a lower allowable would not hurt us.

Q You wouldn't be adverse to either Rule 505, which the Commission has already established or to any other allowable figure that the Commission may establish, whether it be on the basis of forty acres or some other proportional factor?

A That is correct. I think it would be fair to establish possibly a unit allowable based on depth for this pool, not the eighty-acre allowable.

Q That is based on the fact that all wells would be required to be located on eighty acres so that you would not have the danger of disproportionate take between wells on smaller units?

A That is correct. If this is developed orderly and uniformly on eighty-acre spacing, we will not only determine the boundaries of this field sooner so that some secondary recovery may be instigated, but I think that any secondary recovery would be enhanced by eighty-acre spacing.

Q You would be in a position to determine the limits of the field with the same number of wells with a less period of time?

A That is correct.

MR. SELINGER: That's all we have of this witness.

MR. NUTTER: Does anyone have any questions of the witness? Mr. Porter.

CROSS EXAMINATION

BY MR. PORTER:

Q Mr. King, I believe, according to the gas-oil ratio schedule for San Juan Basin, that the new tests or the tests for this pool are either June 15 or July 15?

A July 15.

Q July 15?

A Yes, sir. We have those in at Aztec. I believe they were completed. They are in the hands of the Commission down here.

MR. NUTTER: I believe, Mr. King, if you will check, this pool was set up to be made in May.

MR. SELINGER: And to be filed by June 15, and made effective July 1st, but new ratios will go into effect August 1st.

Q (By Mr. Porter) I was wondering if you have a tabulation. Is that it, on your Exhibit No. 2?

A Yes. 5th and 3rd, '58, the gas-oil ratio in Jicarilla "B" 2 was 4122 and so on down the list.

MR. SELINGER: They are on Exhibit 2, and they are dated, Mr. Porter.

A They were submitted the last part of May, I believe. They ran 4122; 3786; 5482; 6327; 3448; 2667; 2772 and 2133.

Q (By Mr. Porter) What I was wondering about was the amount of oil produced on these tests.

A Yes, sir, I have those too.

MR.SELINGER: Starting on Exhibit 2, on Exhibit 2 he'll go right down the line and give you the tests on those wells enumerated in that order on Exhibit 2.

A On the Jicarilla 2 "B", 84 barrels of oil per day; Jicarilla 3 "B", 69 barrels of oil per day. Twenty-four hour test these were on. Let me give you the choke on the first one. It was on a half inch choke, and on the 3 "B", it is on a 24/64 choke. And Jicarilla 4 "B", on a 24/64 choke, produced 71 barrels of oil per day. On Jicarilla 5 "B", on half inch choke produced 75 barrels of oil per day. On the Jicarilla 6 "B", on a three-quarter inch choke, we produced 77 barrels of oil per day. On the Jicarilla 7 "B", on half inch choke, we produced 218 barrels of oil per day, but at this time this 7 "B" was a very new well. We only had a total production of 774 barrels of oil produced, so I doubt that this 218 would apply at present; it would be closer to 175. To follow down, Jicarilla 8 "B", on a 34/64 choke, produced 288 barrels of oil per day; Jicarilla 9 "B" on a 24/64 choke produced 221 barrels of oil per day. And we are now, well, we just almost obtained our load oil back on the Jicarilla 10 "B" and the production is going to be 100 barrels per day initially on 10 "B".

Q (By Mr. Porter) I believe, according to the Rules of the Commission, that your test on 7, 8 and 9 would have to be re-run

because they were produced on the June test in excess of 125 --

A Sir, these wells were not produced for twenty-four hours. I have converted this figure to a daily twenty-four hour figure to give a representative figure to these above; they were produced according to Regulations.

MR. SELINGER: We obeyed the law.

MR. PORTER: That's all I have.

QUESTIONS BY MR. NUTTER: How about your 16 "C", what was it on that?

A 16 "C" was flowed through open two-inch, and it produced only 41 barrels of oil per day. We flowed that well one hour with an intermeter and closed it in for four hours because of the excessive gas-oil ratio. After one hour the gas breaks through and it produces approximately twenty-five thousand to one GOR. So we produce it only one hour out of four.

MR. PORTER: I notice on some of these wells that the producing capacity of the wells varies a great deal, and there is not much production history.

A There is quite a decline. You will note over here after the completion date, the initial potential of the Jicarilla 2 "B" was 100 barrels per day, and it is now 84 barrels per day. Jicarilla 3 "B" initially 157 barrels per day, and it is now approximately 69 with only 4,796 barrels of oil being produced. That's quite a drop. And 128 barrels for No. 4, now only 71, which is a half, and so on down the list. No. 5 here has stood up --

Q (Mr. Porter) Same thing?

A Yes, sir, so there is a marked decline in production along with bottom hole pressure.

Q You actually had an increase on No. 7?

A No, 7 we -- yes, we obtained a better test on the gas-oil ratio by 8 barrels than we did on the initial test.

Q Four barrel decline on No. 9?

A That is correct, sir. Yes, sir.

MR. PORTER: That's all I have.

MR. SELINGER: I might add for the record that we recognize the lack of production history and complete information on the reservoir as pointed out by Mr. Porter. That is why we ask for a temporary one-year order. We would like the Commission to continue to have jurisdiction over this field because we think that it will be something which the Commission can remember as well as the industry as a shining example of how a field can be somewhat like the Sprayberry in Texas, when there will be oil in the ground and there will be an economic problem of trying to recover that oil. And since it is such a unique field, we ask for a temporary one-year order. We want the Commission to continue to have jurisdiction. We would like an opportunity of coming back twelve months from now and presenting complete information about this reservoir. I might state that at present there is adequate proof for all we are asking. We ask for a one-year order, but I think there is proof that eighty acres is definitely adequate.

QUESTIONS BY MR. PAYNE:

Q In your opinion, Mr. King, can wells in this field drain an eighty-acre pattern?

A Yes, I think one well can efficiently drain eighty acres.

Q Even in view of the low permeability?

A Yes, on the assumption that we are obtaining fairly good drainage from the natural fracturing and fractures initiated by sand-oil treatments, and I draw my conclusions from these pressure interference tests. If the interference tests are noted, I believe drainage will be effected.

MR. PAYNE: That's all.

MR. NUTTER: Any further questions of the witness? Mr. Utz.

QUESTIONS BY MR. UTZ:

Q Mr. King, how did you calculate the reserves which you referred to in this case?

A I used the standard formula. The data in Exhibit No. 3, the electric logs and the micrologs were all analyzed and each well was computed, you might say separately.

Q Did you use volumetric method there?

A Yes.

Q Do you think the volumetric method in this pool gives you an accurate reserve data in view of the fractures?

A At this time that is the only method that I have of computing reserves. We would only be estimating what might be or what might not be in these fractures, and I think I am very optomistic with my reserves, possibly too much so, could be quite out of

line. I am not saying that these are exact, but the data I had, those are the figures I arrived at.

Q The porosity that you used does not include the porosity in the reservoir?

A No, it does not.

Q So there would be a volume of oil in the fractures?

A That is true.

Q And is there any way that you know of of determining what that volume would be?

A Only through production history. I believe possibly pressure decline, which has been started in this field, would indicate the quantity of oil in place, and volumetric computations I don't feel would show you how much oil was in the fractures.

Q Have you done any studying at all on the pressure decline method?

A Just recently I started. I haven't completed my study on that. I might say it would be in the nature of one-third less so far than what I have computed volumetrically. I mean, as far as I have gone; I have not studied it completely.

Q As far as the pressure decline method, do you feel there is a possibility of there being less decline than you calculated volumetrically?

A I believe there will be quite a bit less when calculated by the pressure decline method.

QUESTIONS BY MR: PAYNE:

Q Mr. King, does that yellow square on the right, other than the N/2 of 33 and the N/2 of 34 have any significance?

A This entire colored area is Skelly property, and this development up here is in the Pictured Cliffs Gas zone.

QUESTIONS BY MR. NUTTER:

Q Now, Mr. King, as I understand it, at the present time the horizontal limits of this pool include the original and colored Jicarilla "P" leases?

A These four sections, Sections 56, 31, 32 --

Q And you have proposed the N/2 of 33 and the N/2 of 34 in Township 25, be included in the limits of the pool?

A That is correct. We have a Gallup well now undesignated as to pool in Section 34.

Q And that is your No. 16 Well, the most recently completed --

A No, it is not. It is an older well. It was completed in '57.

QUESTIONS BY MR. PORTER:

Q That, as yet, has not been included in the pool?

A No, sir.

Q It is about a mile and a quarter from the pool?

MR. SELINGER: We are locating a well to the section immediately west, which lies in between the two areas. We'll probably have a well down within two or three weeks so it will be productive in the Gallup, and therefore, it will be continuous straight across.

Q (By Mr. Porter) Do you have knowledge whether this Amerada Well over in 25 is a Gallup Well?

A I believe that is a Dakota-Greneros, I am not positive.

MR. SELINGER: That's right, Dakota-Greneros.

Q (By Mr. Porter) Mr. King, approximately how far is this development from the presently defined boundaries of the Bisti?

A Approximately seventy miles, sir.

Q Seventy?

A Yes, sir, southeast.

Q And there is at least one designated pool in between this development and the present boundaries?

MR. SELINGER: That's Gallegos.

A No, Gallegos is not a designated pool.

Q The Escrito Pool?

A Yes, sir. It is slightly, I believe, south and slightly east of this pool.

Q Of this pool?

A Yes, sir. I believe. I am not sure about that, sir.

Q But it is approximately seventy miles?

A From Bisti.

Q From Bisti?

A Yes, sir.

MR. SELINGER: There was one other provision which I would like to bring up which I failed to do originally that is in the proposed rules, and that is requesting permission to transfer allowables from

higher ratio wells to lower ratio wells on the same basic lease where all interests are identical. We feel that is a step in the direction of conservation to produce oil from lower ratio wells where it is possible to do so, and prevent the unitization of producing the higher volume gas. So we put that in as one of our recommendations.

MR. NUTTER: Are there any further questions of Mr. King? Mr. Utz.

MR. UTZ: Yes, sir, I've got one question.

QUESTIONS BY MR. UTZ:

Q Mr. King, do you feel that the means of production in this pool, the flow of oil from the well bore as shown in your Exhibit here, and core data is through the fractures?

A I would estimate, not having any proof one way or the other, that the major flow is coming through the natural fractures, that possibly the fracture system acts as a gathering artery for any drainage out of the formation which would be greatly assisted, I would say, by these natural fractures because of their being highly permeable; porosity.

Q Would you expect initial potential of the magnitude that you got with the --

A Not with natural fractures, I would not.

Q Do you have any idea what the permeabilities of those fractures would be?

A They possibly would be unlimited, I would say.

MR. UTZ: That's all.

QUESTIONS BY MR. PORTER:

Q Mr. King, one more question. You probably testified as to the average depth.

A No, sir, I did not give the average depth.

Q Well, approximately?

A There is approximately sixty-two hundred feet.

Q And your discovery well was below six thousand?

A No, sir. We flubbed up, that's another boner. Our discovery well was perforated, top of perforations from a 5,980 to 6,007 feet, so we have a depth factor of only 5,000 and 6,000 feet.

Q You don't consider that too important in this pool?

A No, sir, I don't think so. The allowable is the proper angle to look at this. We should look at it conservatively. I don't think that the allowable should be considered too heavily. I think there will be gas waste and possibly waste in the future of reservoir energy if this gas is not sold and utilized efficiently, like we can if gas is transferred from high ratio wells to low gas ratio wells. I think that's the proper way to handle these pools.

MR. SELINGER: Plus the capital investment for drilling is the only other important factor in the field.

QUESTIONS BY MR. NUTTER:

Q Mr. King, if allowables are not important here, why is it necessary to have a GOR of six thousand to one, especially when you don't have a market for your gas?

A We anticipate having a market for this gas, and we don't intend to flare it. In other words, we don't intend to flare six thousand --

Q Do you propose to curtail the production of this pool until such time as you have a market?

A We have in our cost analysis a price there for compressors figured in the entire cost which would have to be installed because these wells would not buck the two hundred fifty pound line pressure of the Pictured Cliffs gathering system in that area.

Q So, prior to the time that the sales of gas is approved by the Federal Power Commission, the wells will not be produce?

A No, two thousand to one, that would be the limiting gas-oil ratio until some sale.

Q I missed that point in your testimony.

MR. SELINGER: I might add, Mr. Nutter, we would not be adverse to continuing the sixty-five barrel top in existence.

Q Until such time as you have a market?

MR. SELINGER: At any time. We are not adverse to either following the standard set down by the Commission on Rule 505 or the sixty-five barrels, or any other proportional factor. We don't think the allowable angle is of any importance -- as of great importance as the capital investment outlay for over drilling and for the volume of gas which could be sold when the market is secured.

Q (By Mr. Nutter) Mr. King, do you have the initial GOR's on the well?

MR. SELINGER: They are on the Exhibit.

A On Exhibit 2, I have the initial GOR's that were taken. On some of the wells we did not have a GOR.

Q Well now, for instance, your 2 "B" was completed in June, '57, and the first GOR is December of '57. Was that the first time you ever took a GOR there?

A That is correct.

Q Now, how do you explain the fact that your Jicarilla 5 "B" in December of '57 flowed seventy-five barrels through half inch choke with a GOR of 8,111 and in May of 1957 flowed seventy-five barrels through half inch choke with a GOR of 6327?

A I have no explanation. I did not personally make this test, but I assume it is accurate. I personally made the last one, but I have no explanation why it is lower.

MR. PORTER: You said you did take the second test?

A Yes, sir.

Q (By Mr. Nutter) Mr. King, have you prepared any cross sections of this pool --

A No, I have not.

Q -- in which you would correlate the various logs of the wells or the zones of permeability, the porosity which you have perforated?

A They are very definitely indicated on our electric log.

We did not draw cross sections, but --

Q I wonder what evidence you have. I note that each well has a number of different intervals that you have perforated. What evidence do you have that the various intervals of perforation are continuous from one well to the other?

A We have definite SP indications on electric logs in those identical places. You might note here, as an example, on Jicarilla 2 "B", we have resistivity indicated here with perforations opposite that resistivity, and we have a shale break and silt stone, and below we have another resistivity kick, corresponding SP, and that is indicated on all the logs. We have approximately five to six intervals there that are definite markers that can be correlated.

Q Are these same intervals apparent on the microlog of the well?

A Yes, the intervals are apparent, but the micrologs fail almost exclusively to render any microlog separation throughout the entire pool. There are very minute indications of any permeability on the microlog, but the corresponding formations are indicated on the microlog. You can readily pick the zones that are perforated in each well bore from the microlog as well as the electric log, and they do correspond continuously with a dip of approximately one hundred feet per mile in that area. We have a dip of that magnitude.

Q Do you encounter this dip of the top of the Gallup formation as you drill into it?

A Yes, that's correct. The Gallup formation dips to the

northeast, generally,at a magnitude of a hundred to one hundred twenty feet per minute.

Q It dips up or down to the northeast?

A Down towards the mountain; that would be towards the mountain. See, No. 2, the surface terrain is possibly misleading on some of these depths and perforations. One well may be up on a -- practically a mountain and the next one down two hundred feet lower.

Q Which well in this pool that you have drilled today is the furthest northeast of any?

A No. 6 "J."

Q What about 16?

A 16. "C" 16.

Q How do you explain the fact that the GOR is higher -- initial GOR is higher than any of the other GOR's reported here on the wells, that would be the lowest structurally?

A I do not know.

Q Could this be an indication of lack of communication among the various wells?

A Well, it could be that. We don't know the nature of this formation, whether it may curve around; we don't know the shape, the outline of the pool yet, and it is low structurally, but there could be a permeable barrier established between it and the pool to effect this high GOR.

Q I note that the geological description of the Otero-Gallup Pool states that the formation is an interbedded shale and siltstone,

highly fractured. Do these fractures extend throughout the shale as well as the siltstone?

A Yes, they do.

Q Is there production from the siltstone?

A That's where we perforated the siltstone and sandstone. There is some sand.

Q Is there evidence of vertical fractures through the shale?

A Yes. It is continuous. I don't believe that any of these formation indications here, with resistivity, are separate from one another. I believe they are connected by fracturing. I don't believe this zone here has a barrier because this has a shale break here, because we definitely experienced cores having fracturing cross shale breaks.

Q Have any tests been made to see if there is any vertical communication between the separate producing horizons?

A We haven't completed -- we ran drill stem tests with packer sets at various positions, but I don't believe that is reliable for vertical fractures as they are.

Q Mr. King, I note that in your calculations of reserves and economic estimates that you have used a figure of exactly twice as much for the recovery from eighty acres as you would obtain from forty acres. Do you believe that the permeability in this reservoir is such as to justify a calculation like that?

A Yes, I do. I think the natural fracturing will render the same quantity of oil on eighty-acre spacing as on forty-acre spacing

by greater utilization of reservoir engineering, solution gas, and I think it will move the oil over an eighty-acre area efficiently.

Q You have used ten point eight percent --

A Yes.

Q -- as the recovery factor for either case?

A Yes.

Q But you expect more efficiency from the eighty-acre than you do the forty?

A On secondary recovery only.

Q How about primary recovery? Are these primary recoveries estimated?

A I think they will be approximately equal in efficiency.

Q Do you think that the fracture system is uniform throughout the reservoir?

A I don't feel that it is uniform. I think it's presently -- I don't feel it is uniform.

Q You think there is a possibility that there is more communication between your Well No. 5 and your Well No. 4 than there is between Well No. 4 and 3, and 4 and 2?

A I definitely do.

Q So this would indicate that the permeability or the fractures,whichever the case may be, would not be uniform throughout the pool?

A That is correct. That is my assumption also.

Q Is there not a possibility that if the fracturing or the

permeability is not uniform throughout the pool, that some of the oil might be left in the ground by not drilling this second well on eighty-acres and, therefore, render these figures of twice as much oil per eighty as on a forty invalid?

A I believe the drainage will be adequate. Even though the drainage system is not uniform, I think it will be adequate. There is definitely more fracturing in some areas than in others, but I think overall that drainage will be effected.

Q Equally as well?

A Equally as well over a period of time. Now, if you wanted to deplete this reservoir in two years, possibly drainage would not be effected as well in some areas as in others, but over a period of time, which possibly five years or just an estimated five years, I think drainage will be effected by these fracturing regardless of this uniformity.

Q In other words, the element of time has not been used in making these calculations?

A No.

Q Well, wouldn't the operating costs be extended by the extention of time --

A Yes.

Q -- to deplete the reservoir?

A That's correct.

Q Then, perhaps, rather than the eighty-acre location having a smaller operating cost, the forty-acre location might have a

smaller cost, would they not?

A No. I have considered the handling of that oil, and I think that that would be your main -- your lifting cost has been considered, and that would be your main cost in recovery.

Q How long do you think it will take to deplete this reservoir on eighty-acre spacing depth allowables?

A Primarily?

Q Yes, sir.

A Possibly two and a half years.

Q How long do you think it would take on forty-acre spacing, if it were drilled on forty-acre spacing?

A It could possibly be completed within a year or less at present allowable, because your waste of energy on forty-acre spacing is going to be much greater than it would on eighty-acre spacing.

Q Mr. King, what evidence does Exhibit No. 8 have that there is communication between the wells?

A No. 5 Jicarilla, No. "B" 5 was swabbed in on the third day after the bomb was placed in Jicarilla "B" 4. It took it approximately just one day flowing at the rate of 75 barrels a day only to stabilize the pressure in No. 4, and on the fifth day it lowered the pressure in No. 4 or Well No. 2 or 3. I haven't any proof which well affected it other than by concluding that when Well No. 5 died from paraffin acceleration, the pressure rapidly increased, and the No. 2 and 3 were still flowing. So they were not affecting

this Well No. 4 nearly so much as 5.

Q As a matter of fact, the evidence is that they weren't affecting the well between the 4th day, and the 6th or 7th possibly?

A They could have been affecting it to a small degree or to a degree, by say, lowering the build-up time. In other words, this pressure from the first day, first twenty-four hours -- we had a bottom hole pressure of eleven hundred forty-one possibly in twenty-four hours, and if Wells 2 and 3 had not been flowing, we could have had a more rapid build-up, and the pressure could have been as high as twelve hundred and some pounds. In other words, they could have been affecting the well but not noticeably like 5 "D." They do -- definitely do affect it because it has been proven. At the end of the test, we closed 2 and 3 in, and 5 had been kept closed in after it died here on the seventh day, and we had a stabilized pressure in No. 4 of twelve hundred and eighty-six pounds at the end of fifteen days. Then, Well No. 2 and Well No. 3 were shut in and we had immediate build-up in pressure on No. 4 which showed that some offset drainage or pressure interference was coming from 2, 3 or both.

Q And the change in pressure on the fifteenth day is what, a deviation from what, the expected --

A The stabilized pressure was expected to be twelve hundred eighty-seven pounds.

Q On the fifteenth day?

A It was one hundred eighty-six, but it was still climbing very slightly, and I figured possibly that with one more pound it

would have stabilized. Twelve eighty-six.

Q Was the bomb moved in Well No. 4 at any time during this test?

A It was moved every three days, but it was lowered back exactly as near as we could measure it, I would say within a foot. We were very accurate, and tried to get it in the same position each time it was removed.

Q What were the days that it was removed?

A It was removed on the third day, on the sixth day, on the ninth day, on the twelfth day, on the fifteenth day, and on the eighteenth day.

Q Is there any likelihood that the movement of the bomb on the fifteenth day is what caused that small change in pressure from there on?

A I don't believe so. If it would have, it might have jumped straight up here, if you moved from a different position, say from 1286 to 1290, or some figure like that, and started off in a straight line again. In other words, you would not have a gradual build-up in pressure if you had changed the position of the bomb. It would have been a straight line regardless of where you put the bomb.

Q What kind of bomb was this?

A Amerada bomb.

Q What is the accepted tolerance on pressures in percentage as far as this bomb is concerned?

A I believe it is one-tenth of one percent possibly.

Q And your deviation is far in excess of the accepted tolerance?

A It could be as much as two pounds, I believe, deviation. We had a thirteen-pound build-up these last three days.

Q Was the bomb tested at any time?

A It was a new bomb each time.

Q Each time it was a new one?

A No, when we started it had been calibrated. We have had it calibrated since then and it was all right.

Q Mr. King, in lab analysis, or the cores taken on the No. 16 Well where they show oil saturation being in the neighborhood of 40 percent, or I should way, in the uppermost interval there is an average of approximately 40 percent. Now, are they including oil saturation in the fractures or is that in the matrix only?

A Matrix only.

Q And their measurement of permeability is of matrix only?

A That is correct. I feel that if we did not have some greater permeability than exhibited by the core analysis, we would not drain this reservoir at all. It just would not give up any oil regardless of stimulation from sand-oil treatments.

Q How have these wells performed on drill stem tests, Mr. King?

A We have fairly good results on drill stem tests. I'd say an average of possibly two to five hundred feet of natural oil with oil and gas muc recovery.

Q None of them have flowed on drill stem tests?

A They have not. It does take considerable keepong up of these fractures and also possibly propping open the fractures with sand, I assume mainly just to clean the mud out of them to effect good permeable porous flow.

Q Have any of the wells been completed without fracture?

A No, none. They could have been, but they would be low producers, I would say. If we tried to effect a permeable type completion initially, some of these wells probably would have made their allowable naturally, but we had the casing -- I mean tubing out of the casing and everything to do the job with.

Q What is the ten point eight that you expect as your recovery factor based on?

A That is based on solution gas recoveries in other fields that could possibly be comparable to this, and from computations from all engineering principals that I know, I come up with a ten point eight percent figure which is too high possibly, but it is what I got.

MR. NUTTER: Anyone have any questions of this man? If not, Mr. King may be excused.

(Witness excused)

MR. SELINGER: That's all we have.

MR. NUTTER: Does anyone have anything they wish to offer in Case 1440?

MR. CURRENS: I am Don Currens representing Pan American

Petroleum Corporation. Pan American concurs with Skelly in this application in that we believe this field should be developed on eighty-acre spacing pattern. We don't actually have acreage within the field itself or within a mile of the field. However, we do have large blocks of acreage which may well turn out to be part of this same Gallup trend. Looking at this interference test data, I think I can see a good case for eighty-acre spacing, and certainly we would support a temporary order for one year for eighty-acre spacing.

MR. SELINGER: We would like to file a letter from Southern Union as Exhibit 10, and as Exhibit 11, a letter from Superior to the companies having acreage offsetting the Skelly acreage.

MR. NUTTER: Without objection, Skelly's Exhibits 10 and 11 will be introduced in evidence.

MR. SELINGER: And I also wish the record to show that I am authorized by Mr. H. H. Bell, division manager of Gulf Oil Corporation and Mr. Botkelog, their division attorney, to indicate to the Commission that they have no objections to our proposals.

MR. NUTTER: Does anyone have anything further they wish to offer in 1440? If not, we will take the case under advisement and the hearing is adjourned.

C E R T I F I C A T E

STATE OF NEW MEXICO)
: ss
COUNTY OF BERNALILLO)

I, J. A. TRUJILLO, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Proceedings before the New Mexico Oil Conservation Commission was reported by me in Stenotype and reduced to typewritten transcript by me and/or 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 25th day of July, 1958, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Joseph A. Trujillo
Notary Public

My Commission Expires:

October 5, 1960.