

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
DECEMBER 14, 1960

IN THE MATTER OF: :

CASE 2143 Application of Southern Union Gas Company for an :
amendment of Order No. R-1670-C to provide for :
640-acre proration units in the Basin-Dakota Pool: :
on a temporary basis and for permission to trans-: :
fer allowables. Applicant, in the above-styled :
cause, seeks an amendment of the special rules :
and regulations governing the Basin-Dakota Pool, :
San Juan and Rio Arriba Counties, New Mexico, to :
provide for 640-acre proration units on a one- :
year temporary basis and for permission to trans-: :
fer allowables in said pool for testing purposes.: :

BEFORE:

Murray Morgan
A. L. Porter

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

MR. PORTER: Take up next Case 2143.

MR. MORRIS: Case 2143. Application of Southern Union
Gas Company for an amendment of Order No. R-1670-C to provide for
640-acre proration units in the Basin-Dakota Pool on a temporary
basis and for permission to transfer allowables.

MR. PORTER: I would like to call for appearances before
we proceed with the testimony.

MR. VERITY: George Verity for Southern Union, and asso-

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ciated with me is Mr. William S. Sampson of the Texas Bar.

MR. BUELL: For Pan American Petroleum by L. I. Atwood, Atwood & Malone of Rosell, and my name is Guy Buell.

MR. KELLY: William Booker Kelly of Gilbert, White & Gilbert of Santa Fe. Sun Ray Mid-Continent.

MR. ALLEN: Roger K. Allen of Denver, Colorado, associated with William Kastner of Roswell, New Mexico, appearing for Gulf Oil Company.

MR. BRATTON: Howard Bratton of Roswell, appearing on behalf of Delhi Oil Corporation.

MR. PAYNE: One further appearance, Seth, Montgomery, Federeci for El Paso, and associated with them is Ben Howell and Garrett Whitworth.

MR. PORTER: Gentleman from Gulf, please state your name again.

MR. ALLEN: Roger K. Allen.

MR. PORTER: Thank you, sir. Mr. Verity, the Commission will recognize you at this time as counsel for the applicant.

MR. VERITY: If the Commission please, this application requests 640-acre or permission at the option of the producers to drill one well to 640 acres in the Basin-Dakota Gas Pool, and we believe that we can at this time conclusively show to the Commission that one well will adequately drain 640 acres in this Pool. However, as the notice indicated and the Commission is aware, in the application we have only asked for a temporary order for a period

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of one year because we are perfectly willing to bring forth further proof after the pool has been further developed. And at this time if there are no further statements, I would like to call Mr. Whitaker to the witness stand.

MR. PORTER: Other companies desiring to present testimony, let's have all the witnesses stand and be sworn.

(Witnesses sworn)

MR. VERITY: While the witness is placing those Exhibits on the witness stand, I would like to introduce into evidence Order R-1670-C in Case No. 2095, which prorated the entire Basin-Dakota Pool and declared it to be all one pool and common source of supply. I want to introduce that into evidence.

MR. PORTER: You want this Order placed in the record in this case. Let the record show that the Order R-1670-C has been made part of this record.

A. M. WIEDERKEHR,

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

DIRECT EXAMINATION

BY MR. VERITY:

Q Will you state your name, please?

A A. M. Wiederkehr.

Q Mr. Wiederkehr, are you a graduate petroleum engineer?

A Graduate analysis gas engineer.

Q You have testified before this Commission heretofore as an expert gas and petroleum engineer, have you not?

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A Yes, I have.

Q Have you made a particular study of the reservoir characteristics of the Basin-Dakota Gas Pool in San Juan and Rio Arriba Counties?

A Our company, of course, has been interested in the San Juan Basin for about thirty years, and in my capacity with the company, I have watched the development of the Dakota reservoir for the past eight years. Actually, it's only been the past two or three years that the appreciable Dakota production has been found in what is now known as Basin-Dakota Gas Field, and we have kept up with the development and maintained records of production pressures, and anything that was available to us.

Q In your opinion, is there presently enough information with regard to the reservoir to know what area can be drained with one well?

A From the information that is available and we would have to admit this is limited because actually there have been only a few tests run and the Dakota is only slightly developed, but from the information presently available there is no doubt in my mind that a Dakota well will drain well in excess of 640 acres.

MR. VERITY: Will you mark this as Exhibit 2, please?

(Whereupon, Applicant's Exhibit No. 2 was marked for identification.)

Q Directing your attention to Exhibit 2, which I believe is the same one that is on the left in the background, will you please

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tell us what it is?

A Exhibit 2 is a plat of the area in which Southern Union Gas Company has run an extensive interference test. The Exhibit on the board has colored in yellow Southern Union Gas Company or associated company-owned acreage. The well in the center of the circular patterns drawn there, being Angels Peak No. 21 Well, was completed in September of 1959, and was shut-in from the date it was completed. As a matter of fact, no -- not even a deliverability test or an IP test was run on the well. It was shut-in from the date it was completed.

Q What was the purpose of running this test?

A We were of the opinion that due to the cost of drilling Dakota wells and due to the nature of the Dakota reservoir that one Dakota well could be drilled and effectively drain 640 acres. It was our intent when we drilled this well initially to run an interference test to determine the feasibility and the range of drainage.

Q Now, I notice on the Exhibit that you have drawn various circles thereon. What do these circles indicate?

A Actually, the various circles somewhere on the perimeter intersect another well location. For instance, due south of the test well in Section 24, the northeast quarter of this section is Angels Peak only Angels Peak 20-B being 7620 feet from the test well in the southeast Aztec Oil & Gas, No. 7 Aztec which is 6,906 feet from the test well. In Section 25, to the northeast, the well

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being Tennessee Gas Company's Eaton No. 1 Well, and then in the southwest quarter of Section 36, Pubco Company's No. 26 State Well. There is -- this well is located 1,838 feet from the test well, and these are all of the wells that were drilled prior to September of 1960 which might have affected the shut-in pressure of the Angels Peak 21 or the test well.

Q Referring for the moment to the Pubco Well, when was it placed on production?

A Pubco Company's 26 State Well went on production the latter part of September, 1960.

Q And when was the Angels Peak Well -- when was your test on the Angels Peak 21 initiated?

A Actually, the test was initiated on 10/6/59, that was the date of the original shut-in pressure on the well.

Q So that it was -- you were testing it for almost a year prior to the production on the Pubco Well?

A Eight months.

MR. VERITY: Will you please mark this as Exhibit 3?

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

Q Directing your attention, now, to what the Reporter has marked Exhibit 3, and we have no copy of it on the blackboard, will you please tell us what it is?

A This is a tabulation of time of the shut-in pressure on the test well, and the accumulative production of all other wells



in the vicinity of the test well as well as the accumulative production from individual wells and the total from all wells.

Q Will you recount the data on that Exhibit for us, please?

A I think the most interesting thing is that on 10/6/59 the Angels Peak 21 had a shut-in pressure of 2,095 pounds. At that time the only well producing in the area was Angels Peak 20. It had 544,000,000 cubic feet of gas. On May the 16th, 1960 --

Q You say "Angels 20," that's Angels 20-B?

A 20-B, right. On 5/16/60 the shut-in pressure was 2,056 being some 39 pounds drop and the only well outside of the Angels 20 that had been on production was the Tennessee Eaton Well which was some 8,000 feet away. On 6/23/60 the Angels 21 had a shut-in pressure of 2,050 pounds at which time the Aztec No. 7 Aztec had produced 7 MCF or 7 MMCF, Tennessee had produced 65 MMCF, Angels Peak 20-B had produced 1493 MMCF, and at the instance 45 pounds of pressure had been lost even though it never produced a drop of gas since the date of completion.

Q Up to this time was there any well -- let me -- pardon me -- up to this time, what was the closest well that was producing that could have effected the pressure in the Angels Peak 21 Well?

A The closest well was Aztec 7, yet it had only produced seven million. I doubt if it would have affected it.

Q What was the affect created by the effect of the drop of the pressure in Angels 21?

A The only effect -- the only well that could have affected

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the Angels 21 was the Angels 20-B because it was the only well that had produced enough gas to have drawn down the pressure, and that well is located 7400 feet away, and a drainage area around that with a radius of 7412 feet well in excess of 640 acres.

Q Now, continuing with Exhibit 3, what do you show in August of 1960?

A Well, on the 22nd of August, the Peak 21 was drawn down to 2,032 pounds at that time. The Aztec Well had produced 254 MMCF, the Pubco Well, 41 MMCF, the Eaton 145, and the Angels 20-B, 1830. You will notice that the pressure dropped more rapidly with the advent of the production, of production from the Pubco 26 Well, that being the closest well, being located 1838 feet away. The last pressure taken was on October the 3rd, 1960. At that time, the Angels 21 was down to 1974 or some 121 pounds lower than its original pressure. And the accumulation of all offset wells was some 2.6 billion feet of gas.

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

Q Mr. Wiederkehr, now directing your attention to the Exhibit 4, which is on the right of the blackboard, will you please explain that to us?

A Actually, Exhibit 4 is simply a plot of the tabulation shown on Exhibit 3, plotting the shut-in pressure of the 21 Well, shut-in tubing pressure of the 21 versus accumulation of all offset wells. This shows the pressure drop in the 21 that has to be



attributed to the production from the offset wells and until the fourth point on the map being just about the center and just below the T in the tubing pressure, any pressure drop prior to that would have had to be because of wells other than the Pubco Well, all of which are well away from the test well and all of which would indicate the drainage area well in excess of 640.

Q If I understand you, then, the line from left to right on Exhibit 4 demonstrates the total production from the offset wells?

A Right.

Q The length of it?

A That's correct.

Q It dropped from top to bottom and indicates the drop in pressure of the Angels Peak 21 Well?

A That's correct. I would like to point out at this time we plotted shut-in tubing with the pressure tubing, and they would have been quite close together during this same period of time these tubing pressures were taken. For bottom hole pressure, to be sure, there was no fluid accumulation in the hole, and that definitely the pressure drop could not be attributed to anything outside of drainage. As a matter of fact, the bottom hole pressure test also indicated a substantial pressure drop. We do hope the well above was clean so there is no doubt as to where the pressure drop had to come. It couldn't be an accumulation of fluid in the hole because all four bottom pressuring indicate no fluid in the

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hole.

Q Mr. Wiederhekr, have you had occasion to examine the information reflected in other geological tests and surveys with regard to drainage in the Basin-Dakota Pool?

A Yes. I spent some time week before last with the firm of H. Gruen Associates and Petroleum Consultants in Dallas. They had recently conducted a test on the well operated by Caulkins Oil Company and International Oil Company, and Mr. E. E. Fogleson. They made that information available to me. This particular test was run on the well known as Caulkins M D 244 located in Section 14, 19, 26, Range 6 in Rio Arriba County, sixty miles away. And the analysis of the data collected on that test indicates a drainage area of well in excess of 640 acres.

Q How far away is that from the Angels Peak 21 Well?

A That's sixty miles.

Q From this information and other information that you have with regard to the Basin-Dakota Gas Pool, do you have any conclusions with regard to drainage patterns and the ability of one well to drain an area in the pool?

A From the information available, and again admitting we still could use more information, everything we have indicates that a Dakota well will drain in excess of 640 acres. We ask for a temporary order of a year because this pool is going to encompass maybe a million acres, it's maybe 10 or 15 developed at the present time. So there are a lot of things we don't know, but we

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could, in that period of time, we could accumulate a lot more information to tell us whether all areas would be affected in the same way. Right now we have tested two areas, and they have shown the same thing. When we test four or five more, they may show something different.

Q If one well would drain 640 acres, what is the effect of drilling two wells in the 640-acre tract?

A Well, the effect of Southern Union is a loss of about 100,000 for cost of drilling the well, plus another twenty-five or thirty thousand for connection charge on the well, and for each additional well. We don't need to get the gas out of the ground. It costs us 125 to 130 thousand dollars. It's straight economic loss, but if you are not going to gain anything, why do it?

Q In your opinion, it is unnecessary waste?

A It most assuredly is.

Q Do you have a recommendation to the Commission with regard to permitting one well to be drilled to 640 acres?

A Yes. I would suggest that the Commission allow one well be drilled to 640 acres at the discretion of the operator.

Q Do you have a recommendation with regard to any limitations as to where the well could be drilled with regard to the 640 acres which is being drilled?

A I would suggest that the well be drilled in any quarter section but no further than 99 feet from the interboundary of the quarter section on which it is located, thereby placing the well in

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close proximity of the center of the 640 acre unit. I would go further and suggest -- we have a problem of small sections running along the tip of Township 28 North -- that those drilling units be left alone just as they are because if we try to attribute 640 acres to those, we are going to have a long narrow unit, and your drainage certainly would not fit the size of the unit you had. If formed, I would suggest those be left alone as they are as under the Commission's present rules. Where we have a full section, I think one well in the 640 would effectively drain it, not adversely effect the offset. I would recommend where wells are previously drilled, where 640 would be attributed to them, they be granted an exception to the spacing of the well location.

Q In other words, if there are wells already drilled where 640 acres could be attributed to them, they should be granted an exception to the limitation that they be drilled within one of the interior 40 acres?

A That's correct.

Q Do you have a further recommendation with regard to allowables to be granted to one well which is drilled on a 640-acre tract?

A I would suggest that in the acreage portion of the alleged formula, that the acreage attributed to the well whether it be 320 or 640 be inserted in the present alleged formula and the formula not be changed.

MR. VERITY: We offer Exhibits 1 through 4 in evidence.



MR. PORTER: Without objection, the Exhibits will be entered as offered.

(Whereupon, Applicant's Exhibits Nos. 1 through 4 were received in evidence.)

MR. VERITY: No further questions of this witness at this time.

MR. PORTER: Any questions of the witness?

CROSS-EXAMINATION

BY MR. PAYNE:

Q Mr. Wiederkehr, even though your information here in this area of the Angels Peak Oil Company Well does show pressure drawdown, does that establish the effectiveness of the drainage?

A Yes, when you can lose 50 pounds or 4 percent of the gas under a tract in less than a year with the well shut in, I think it's pretty effective.

Q Do you have any rule of thumb how much pressure drawdown is necessary to indicate how much acreage is being efficiently drained?

A No. All you can go by is the fact that at the present rate of drawdown on this well it can be left shut-in and in less than twenty years, we normally think that in less than twenty years it would be dry. That, to me, then, is the effect.

Q Do you think the pressure drawdown would remain porous through the life of the well?

A There will be another Exhibit put on later that it would

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indicate it would be worse than that.

Q Do you think the two areas that have been studied are typical of the entire Basin-Dakota Pool?

A Yes, they are typical although you might find some differences in different areas, and that is the exact reason we have requested we be given some additional time to study other areas that are being developed and have been developed. The Commission has already found this is one common source of supply.

Q You do have a wide range of deliverabilities in the pool, do you not?

A You have a wide range of deliverabilities just like you do in any of the other reservoirs in the San Juan Basin. It's lenticular sand with varying permeabilities and porosities and fracs, but the two areas that we have studied definitely can be drained as efficiently as any area can be drained.

Q Well, in view of the wide range in deliverability, presumably the recoverable gas under the tracts also varies?

A That's definitely true. The recoverable gas would vary under the tract. You will have a different reservoir under each tract.

Q Do you believe that a pool should be spaced on the basis of the best wells the poorest wells or the average wells in the pool?

A I think the pool should be spaced in such an order as to permit the effective recovery of the maximum amount of gas with the



minimum expenditure.

Q How do you do that?

A By giving -- by giving a man an ultimate of driving the well on the spacing, he might desire as long as it's not too small so that his spacing would be so small he couldn't possibly have enough gas under it.

Q I take it from your testimony you do intend to keep gathering additional data as to drainage and such other data as might be useful to you?

A That's right, I am. Two other companies we represent are I know of, and have already agreed on some additional tests we will run.

Q Of course, they could be run even if the Commission desired to remain on 320 prorationing units, can they not?

A Certainly, they could be run. The longer we stay to 320 the more aggravated the present problem is going to be. Right now they are drilling approximately twenty or thirty Dakota wells a month or more in the San Juan Basin and because of offset obligations and lease requirements all operators are going to be forced to drill wells they don't want to drill and don't need to drill.

Q There are additional areas in the Basin-Dakota Pool where Dakota gas wells have been drilled back to back, so to speak, on 320-acre units, are there not?

A Yes.

Q In other words, where there is not 640-acreage to be

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dedicated to one well?

A A lot of the wells were drilled that way, yes.

Q If the operator -- assuming the Commission granted your application here, then the operator dedicates both wells to the 640-acre unit rather than having two non-standard 320 units, what deliverability would you propose be used?

A I would propose, if he drills two wells, that each well would stand on its own merits, although his was the well that acreage was attributed to, and then the deliverability of the well, then each well will stand on its own.

Q You wouldn't propose that the two wells be attributed to one unit with allowables being produced from it in any proportion?

A I don't think that would be the way to handle it. I think just like to do in Lea County, if 640 is attributed to that particular acreage, and put it in the formula.

Q You are aware that in Lea County and Jalmat we do have units with more than one well on them and the allowable can be produced from the two or three or four wells in any proportion?

A You also have spacing of 40 and 8 on a 61 P 640 and a few other things.

Q But you prefer the non-standard unit method?

A I prefer to have each individual well stand on its own merits and fit into your present formula.

Q Inasmuch as you recommend the well be located in the

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interior 40-acre tract of the 640-acre unit in order to get it as close to the center of the 640 as possible, what happens if a temporary order is entered, the wells are drilled this way, and subsequent information indicates that the pool should have been developed on 320-acre unit?

A If you have 320 within the unit, you move out 99 feet from outer boundary, you still have as much between the two wells whereas to not to create any major problem.

Q Now, Mr. Wiederkehr, further, the application also asks for permission to transfer allowables in order to take interference tests. Do you have any more data on that as to what wells you propose to shut-in, and what wells you propose to transfer the allowable of those wells?

A No. What I mean, I have nothing definite on that. I think that we would need -- what I had in mind in the application was that the Secretary of the Commission be granted the authority to grant those hearings for testing purposes. If the Commission granted definitely to do it, we would drill the well in Section 13, on your Exhibit, and shut it in and put 20 and 21 back on production.

Q You are in favor of administrative procedure wherein you set out the wells you propose to shut in, the wells wherein you transfer their allowable, notifying offset operators of your administrative application?

A You can't say they can in order to simplify, because if

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we are going to ask for a temporary order for a year to get enough information, and if we are going to have to have a number of hearings to get approval of a transfer of allowable, you'd be using up your year before you got anything started.

MR. PAYNE: Thank you, I believe that's all.

MR. PORTER: At this time the Commission will recess the hearing till one-thirty.

(Recess)

AFTERNOON SESSION

MR. PORTER: The hearing will come to order, please. Mr. Wiederkehr, will you take the stand again, please, sir?

CROSS-EXAMINATION (Continued)

BY MR. PAYNE:

Q Mr. Wiederkehr, referring to your Exhibit No. 3, your interference test data, is there any particular reason why you use the shut-in reference on the Angels Peak 21 rather than bottom hole pressure?

A Only because we had more top hole shut-in and this gives you a better view of it. Exhibit 6 or 7 will have some whatever the next present to the next witness of points and data on the bottom hole pressure. Since we did not have enough of those, we did more, we ran the bottom hole to be sure.

Q Unless you abandoned each time, how can there be liquid build-up shut-in?

A If it wasn't there to start with and none there at the



finish, there was no place for it to go.

Q Well, sir --

A The well was never blown, it wasn't cleaned neither at the start of it nor at the conclusion. Should it have any liquid, there is no way for it to ever have had any liquid in it.

Q You consider it abnormal for a Dakota well --

A What?

Q -- to never have had liquid build-up?

A No, not necessarily.

Q You are aware, are you not, of situations where on dual completions, you shut-in the Dakota side and then you get liquid build-up so you think you have a pressure decline; as you have a packer leak, then you take a bottom hole pressure test and that shows any leak. You are aware of situations like that?

A Where there is liquid build-up in the well bore.

Q You don't know what the cause is, you think you have a packer leak and the bottom hole pressure shows you did not have a packer leak, that must have been due to liquid build-up, the decline in pressure?

A Well, I know of declines in pressure that was caused by liquid build-ups, yes.

Q So you are willing to admit, at least you can take bed liquid and shut-in Dakota Gas wells?

A That's correct. Definitely, there is not one here, that is the reason we ran the bottom hole pressure.

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Q You didn't run bottom hole pressures, you ran the shut-in pressure?

A Not every time, no.

MR. PORTER: Mr. Nutter.

BY MR. NUTTER:

Q Mr. Wiederhekr, these pressures that you have here are pressures that are taken with a gauge?

A Dead weight.

Q Dead weight? Dead weight gauge, and represent the surface pressure of this shut-in Dakota well?

A That's correct.

Q To what do you attribute the failure of this curve on Exhibit No. 3, I guess, is this No. 3?

MR. VERITY: Exhibit 4.

Q (By Mr. Nutter) Doesn't seem as though the pressure is declining in a relatively smooth curve. There just seems to be a marked seep around 1,200,000, 1,300,000 though it is that jog in that curve?

A I don't know. That could have been an error in reading, it could be of the effect of other wells that are farther away. Actually, at that point only one of the wells in this immediate vicinity were on production. And, actually, if you will notice, the draftsman, on there, didn't quite hit the center of his circle, and that sort of makes that lineal job. I feel if he would have hit the center of the circle -- it was a poor drafting job.



Q If he established the center of the circle?

A A seep in there yes, that could have been caused by a number of things. Actually, the 20-B well was not produced wide open into the line all of the time. There were periods of time when it was shut-in. And when it was, production was restricted. In a case like that, you would expect a variation in your pressure decline. If you had a constant flow of gas away from the well, then your decline would have been constant, but with fluctuation in the volume of gas moving from the offset wells, then you would expect a jagged decline curve.

Q Do you think this decline which is from 2095 from the initial pressure to 1974 to the final pressure indicated, which is decline of some 121 pounds and approximately 5 percent of the total initial pressure, do you think it represents a 5 percent loss of the gas that was in place here at this 21 Well?

A I sure do. All you have to do is to check it for is a deviation due to compressibility and it's a definite loss.

Q I see. I may be jumping the gun. You stated another witness was going to testify as to actual bottom hole pressure that was taken?

A Yes.

Q Can you tell me the types that were taken so we can see where, on this arrangement of interference on Exhibit 3, they fall?

A April the 26th, 1960. Bottom hole pressure 2512 at 6269.



Datum, October 3rd, bottom hole pressure 2431. The same datum, November 5, the bottom hole pressure 24 at the same datum.

Q November 5, 1960?

A Yes.

Q You don't have a core surface pressure?

A Not on this chart I didn't have production -- all the production in, Mr. Nutter, in time to get it on that chart. We did run another bottom hole pressure November the 5th.

Q What was the fourth bottom hole pressure that you had?

A Late November. I couldn't give you the date.

Q Three recent and one that was taken in April?

A Yes, sir. We have copies of those if you would like to look at them. We didn't get copies for everybody. We do have copies so you can see there was no fluid build-up in the well bore, if you are interested in those.

Q Mr. Wiederkehr, have you seen evidence of a similar situation to this anywhere else in the Dakota or in the San Juan Basin?

A This is the only test actually run.

Q Have you heard of any place where pressures were encountered two miles or three miles away from producing wells which were typical of virgin reservoir pressure?

A Where there weren't typical virgin reservoir wells, I think the San Juan Basin, insofar as the top hole shut-in pressure as initial pressure, that you will find fluctuation in all of the

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basin due to the difference in depth, fluid, the well bore and other conditions that might affect your top hole pressure.

Q You haven't seen any other instances where the --

A Pressure just dropped for no reason at all.

Q -- pressure seep may be drainage by another well three or four miles away?

A There is no other explanation for it as an engineer, just there. No concepts, no conceivable reason to cause the pressure to be dropped except to be drained.

Q You would have to drop in pressure if you had a leak through your cement job, wouldn't you?

A If you had gas flowing out of that well bore into charging another sand, you might have.

Q Can you say that categorically this is not happening in this case?

A Well, I will say this, there is no indication either from the casing pressure, if it were leaking that would be shown in your casing pressure as well, and the casing tubing pressure cored, so that wouldn't tell you anything.

Q I was wondering about that. I don't see any real correlation over here in the left, correlation and comparing here meant that the comparative production from the other well has increased with the exception of when you have a large increase in the cumulative production, over at the left side you have a small decrease in the pressure?

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A It's going to take some time, it must be regularly taken by drainage, an area of 3300 acres. It's going to take some time lag, when the time you open the well 8,000 feet away and it effects the shut-in well.

Q That's the very point I was thinking of, Mr. Wiederkehr; the fact it is a long ways away, and the drainage that was occurring, if it's occurring, is spread out over such a wide area at that distance, it should be, the pressure decline should be a rather uniform thing. And here, for instance, from April the 4th, 1960 to April the 18th of 1960 there was a decrease of only one pound there, whereas a considerable increase in the cumulative production.

A From when?

Q April 4th of '60 to April 18th?

A There was very little production.

Q Their increase of this cumulative production of 28 million feet --

A 28 million feet scattered over 3300 acres are very minor.

Q How about one pound decrease of 28 million feet? The next period represents a decrease in pressure of 9 pounds, you had only 24 million feet to produce, how could you explain the variation at which the rate of it is declining the actual increase?

A As I say, two or three things could, other wells farther that are effecting it, that is one of the possibilities. And there very definitely, and we always have to remember that all pressures



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are taken by human beings, and it will always be human error in taking the pressure. We applied the pressures that were made available to us. I am not going to swear every one of these pressures are accurate, although there is definitely a pressure decline on the shut-in well and that the pressure decline has been in excess of 50 to over 100 during this period of time you would admit you might miss a pound or two or three. If you work with dead weight you know sometimes they are cantankerous and might miss a pressure of two or three pounds, you don't miss one of fifty pounds.

Q As a matter of fact, I think we agreed about 5 percent of the total initial pressure --

A If you take any two points, it could conceivably be there had been a mistake in the readings. If you take too many of them in succession, I think you would have to admittedly hold that all of them were read wrong.

Q I think that it doesn't go down smoothly like all of the seeps in it?

A That's right.

Q Do you think this information is typical of and represents conditions throughout the San Juan Basin as far as the Dakota is concerned?

A It is only this and one other piece of information that I have, period. Both of those indicate good drainage. Now, in answer to a previous question, I stated that some areas I don't



know about. The Dakota varies throughout the San Juan Basin in characteristics and permeability, porosity and so forth. There very definitely could be areas where you may not be able to drain 50 acres, I don't know yet. But we are willing and able to conduct additional tests in additional areas to see just what is taking place.

Q What would be your recommendation, Mr. Wiederhekr, in the assignment of allowables in the Basin Dakota Pool, if 640-acre spacing were adopted; if an operator had already drilled two wells on 640-acres?

A You assign 320 for each well and apply that to your pro-ration formula and the deliverability of each individual well, the deliverability in each well stands on its own.

Q The acreage factor on 320, half of the acreage factor on the well on 640?

A That's correct.

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

MR. PORTER: Any further questions?

BY MR. KENDRICK:

Q Mr. Wiederhekr, did your company take an initial potential on this Angels Peak 21?

A No, no initial potential was run on that. It was shut-in immediately after completion.

Q Was the well cored?

A No.



Q Are any of the offset wells that are shown on the Exhibit on the board encountered as Exhibit 2, are those abnormally large initial potential wells?

A I am familiar with only two of the wells, the Aztec had a high potential, and so did the Angels Peak 20.

Q Would they be considered in the top 5 or 10 percent of the open flow range for Dakota completion?

A I would hate to answer that. There are 200 Dakota wells, I am only familiar with about 20. I would hate to say. I do know in several completions a number of wells that have had much higher potential up in the 18 and 20 million, where the Angels Peak 20 has 6.9 and the Aztec about 11. They are higher than the average, yes.

Q Then, the permeability in this area could necessarily be higher than the average potential? The open flow potential would show it was higher than average, would it not?

A Either permeability or sand conditions, are two things that affect your deliverability, your millidarcy feet. So sand conditions or permeability or both are better. Admittedly, this is a good area, one of the best in the Basin, one of the best. There are two or three others that are good too.

Q If the drainage is occurring in this area, it might not necessarily occur in other areas where the sand conditions are not so good?

A Not as effectively here. When you take drainage in excess

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of 3,000 acres, I dare say in any area, I would say it would drain at least 640. I don't think it would be five times worse.

MR. KENDRICK: I believe that's all. We have an emergency call for Mr. Robert Boon or Broom.

MR. PORTER: Anyone else have a question?

BY MR. KELLAHIN:

Q Mr. Wiederhekr, would you mind restating your recommendations as to the well locations?

A I would suggest that the well locations since we don't have a standard northeast-southeast or southeast unit, the well locations be in it no more than 990 feet from the interboundary of the quarter section on which it's located.

Q That would not mean the radius of 990 from the center of the section. You are talking about the boundary line in either direction?

A Right. In other words, I will say no more than 990 from the east-west or north-south line measured; starting from the center of your section so that you can be, it would actually be the square, 990 squared plus 990 squared with the square root of that about 1100 feet from the center of your section. I hadn't figured it out.

Q A great many wells are not so located?

A That's correct. A number of wells have been drilled previously. As a matter of fact, on our Exhibits here, none of them were drilled in that manner.



Q You are recommending exceptions be included in that?

A For wells previously drilled.

Q Now, in response to a question from Mr. Nutter, I believe you recommended where there are two wells on a section, each one stands on its own merits?

A Yes.

Q Do you mean by that, then, you would not permit or not advocate permitting to dedicate 640 to such a well?

A I had not considered crossing section lines, I keep thinking of a unit of 640 as being a section; although if the wells are far enough apart, I see no reason, if two wells had been drilled, oh, in one section, and you can pick up the half section on either side, if the wells are far enough apart, I see no reason why that could not be done.

Q You are not making that recommendation?

A I wasn't making that.

Q You do not recommend against it?

A Depending on the position of the wells, if there is an infinite distance between the two wells so your drainage is going to effect your two section units, you will have when you get through.

Q What, then, do you mean by infinite distance?

A I think you can be talking about 2500 or something like that, I am speaking of the curve. I really haven't looked at the thing, just thinking they ought to be 2,000 feet apart.

Q There are a great many sections in the Dakota Pool that

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have been drilled with two wells, are there not?

A Yes, too many.

Q In that event, would you have any serious objection to the establishment of unorthodox for the dedication of acreage to those Pools?

A As long as the acreage would appear to be productive, no, I think we are going to have productive limits concerned. As long as the operator would prove within a reasonable doubt, I don't see any reason why not, if the acreage was productive.

BY MR. UTZ:

Q Mr. Wiederkehr, to clarify what you are actually proposing, is a 1980 target area in the center of the 640-acre tract?

A Yes, sir.

Q Twice 990?

A Yes.

Q In regard to the small sections at the top of Township 28 North, I believe you stated you would recommend just leaving them alone. What do you mean?

A We've already spaced -- the Commission has already spaced those along that center of sections, the short sections along the north part of Township 28, they have already been spaced. As a matter of fact, I believe that was done at a hearing a month ago. For this particular section, I would suggest we not try to allow 640 acres to be allocated to them because then you would get out of your boundary of your unit an awful long way from your well no



matter where you put it.

Q What you really meant was to go ahead and drill them in accordance with the units that are already established?

A Right, they are freakish, necessary of that particular township, and I think we are just going to have to admit it's there, we are going to have to live with the 320-acre wells that are already drilled.

MR. PORTER: Anyone else?

BY MR. ALLEN:

Q You referred to the 320-acre wells that already exist. As I understand your proposal, will it permit or conclude the drilling of two wells? Will you continue the drilling of two wells on 640?

A I propose to let the operator do as he pleases for those. I feel like if we can drain it and save a few dollars by drilling 640, let us do it.

Q As I understand your well location rule, it would permit two wells in the north half of the section, is that correct?

A I would not advocate that, although I believe the present rules do not prohibit it. I would think that any wells drilled hereafter, regardless of whether we have 640 or 320, that the two wells should be in diametric proposed diagonal wells. We may have a few that are already drilled that way. I don't believe it's good to have two wells and dedicate a full section to two wells drilled in one-half of it.



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Q It certainly would not be in the interest of correlative rights, would it?

A No, it would not.

BY MR. NUTTER:

Q Mr. Wiederkehr, in this application or at this hearing, are you planning to specify which wells you would take these interference tests on?

A No.

Q That is a matter of another hearing?

A I ask that it be in response to a question earlier that the order that's issued, in the event this application is granted that the Secretary of the Commission be granted the authority to administratively approve these interference tests. I think we must go ahead and get started.

Q You seek an administrative order for approval of interference test wells?

A Right.

Q Would you specify in the administrative procedure that the offsetting operators should be notified of the wells that are going to be shut-in and also that would be producing in excess of allowables?

A I think offset operators should be notified and given a right to object.

Q How about royalty owners, variation in royalty operation?

A You are asking for trouble there.



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Q Well, I was thinking if you are going to transfer a 640-acre allowable to one well, that well would be producing a lot of gas and particularly if the drainage isn't as effective as you say it is, it might injure someone's correlative rights?

A You and I differ there. I think the allowable is so low that even on 640, the allowables, it won't make a lot of gas. It appears to me that, based on the testimony of Mr. Utz this morning, that the allowables are getting poorer, poorer, and, of course, I don't know what the objections are going to be for a Dakota 320 or 640 acre. I don't think it excessive.

Q I do think Mr. Utz has presented the nominations for the Dakota --

A On the basis, I know, as a whole and New Mexico, as a whole.

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

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

(Witness excused)

ORAN HASELTINE,

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

DIRECT EXAMINATION

BY MR. VERITY:

Q Will you state your name, please?

A Oran Haseltine.



Q Mr. Haseltine, you were sworn this morning, I believe?

A Yes.

Q Mr. Haseltine, are you a graduate engineer?

A Yes, sir.

Q Have you testified before this Commission heretofore as an expert engineer?

A I have.

Q What is your present occupation?

A Production superintendent for Southern Union.

Q As production superintendent for Southern Union, did you supervise the testing of the Angels Peak 21 Well and 20-B and other wells in that vicinity of Southern Union?

A Yes, I did.

(Whereupon, Applicant's Exhibit No. 5 was marked for identification.)

Q Mr. Haseltine, I direct your attention to Exhibit 5, which appears on this board. Will you please tell us what it is?

A This is a graph that shows the change in pressure at Angels Peak 21, with the time.

Q I believe that Exhibit 4 showed decrease in pressure in the 21 Well with regard to cumulative production of offset wells?

A That's correct.

Q The time on this chart moves from left to right, does it?

A That's right. Begins on the left in October of '59 and brings us up to the present time, November and December of 1960.



The vertical scale is pressure at the wellhead of Angels Peak 21.

Q And you have noted in here, have you, the dates and places on the chart at which the bottom hole pressure tests were taken?

A That's right. The bottom hole pressures are marked below the dead weight pressure at the casinghead at that particular date, and the notes there indicate the day on which that particular bottom hole pressure was taken.

Q Now, I notice extended vertically along the bottom of the Exhibit, in addition to bottom hole pressure, there is another date entered on the Exhibit. Will you tell us what that is?

A It shows the time at which these offset wells came on production. That first note shows that the Angels Peak 20-B was already on production when the 21 was completed, and then farther along we find Tennessee Gas, Eaton came on production in May of '59, and then Aztec 7 -- May of '60, and Aztec 7 came on production June of '60, and Pubco 26 State came on in August of '60, and then there is a note farther on there showing Pubco 26 State was shut-in early in October. I believe the actual date was the 6th or 7th of October of this year.

Q Now, up until the middle of August of 1960, when the Pubco Well was put on production, what was the nearest producing well to the Angels Peak 21?

A The first part of that curve, up until May of 1960, the only well producing was Angels Peak 20-B which is 7412 feet away, and then in May of '60, the Tennessee Well came on, which was even



farther away, 8351, and then in June, Aztec 7 came on, which is 6956 feet away, and those were the only wells on production in the area until August, when Pubco 20 State was put on.

Q The distance from Pubco 26 State to the 21 -- to the Angels Peak 21, is how much?

A 1838 feet.

Q What would the drainage area be under the nearest well prior to the Pubco Well?

A The drainage area, based on a radial drainage area with radius equal to distance from well to well, the smallest drainage area would be 3492 acres, which would be that represented by Aztec No. 7.

Q Now, I notice in the chart in the diagram there is a definite break in the decline curve of the pressure on the Angels Peak 21 Well in August of 1960. Is there a proper explanation for that?

A Yes. Pubco 26 State, which is located only 1838 feet, came on production at that time and the rate of pressure decline increased very markedly.

Q Then, at the start of October, 1960, the curve makes another turn and goes horizontal. Is there an explanation of that?

A Pubco 26 State was shut-in about the 6th or 7th of October and is still shut-in, as far as my information goes.

Q There is one other anomaly in the chart which is indicated by a pressure increase on the 21 Well in May of 1960. Do

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you have an explanation for that?

A The only production prior to May had been from the Angels Peak 20-B, and substantially all of the production wells prior to May, all the production from the area had been from the Angels Peak 20-B. On the 25th of April through the 23rd of May, Angels 20-B was curtailed and very definitely, I think, that increase in pressure there in the last half of May is a reflection with time lag involved, of the fact that Angels 20-B was curtailed through those approximately four weeks.

Q Do these two anomalies coming abruptly, following shut-in of adjacent wells, give you a conclusion with regard to effective drainage of the area of the 21 Well -- Angels Peak 21 Well?

A I would say the drainage in an area there is extremely effective from wells much farther away from 640 spacing, extremely effective.

MR. VERITY: That's all.

MR. PORTER: Anyone have any questions?

CROSS-EXAMINATION

BY MR. NUTTER:

Q Mr. Haseltine, these pressures which are depicted on this Exhibit are the same ones that are on the interference test data sheet?

A I think I may have more points on this curve, essentially, it's the same data.

Q I was plotting these on this Exhibit, and there appears



to be no correlation whatsoever. I wondered if they are the same pressure or what the score actually is. If we take March the 12th, for instance, Mr. Wiederkehr -- March the 11th, I beg your pardon, of 1960, Mr. Wiederkehr shows a pressure of 2076, and your gravity here shows a pressure of about 2061.

A He's plotted tubing pressure, then plotted casing pressure on that well.

Q They are not the equivalent pressure, then?

A If you are talking about different lengths of your tubes, that is the difference.

Q Sometimes when the tubing pressure seems to be going down rather drastically, the casing pressure is holding. Can you tell me whether or not you attribute that to the fact there is a packer on the tubing?

A No packer. Can you give me a specific time there? I have this information tabulated here, casing and tubing pressures together, and generally they came down together.

Q I was thinking there from April the 18th to April the 26th you had decline of 9 pounds on tubing pressure.

A Right.

Q However, there is decline of one or two pounds on casing pressure?

A Two-pound decline on casing pressure, right.

Q From August the 12th to August the 22nd you have a decline of five pounds on the tubing pressure?

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A Right.

Q But you have a decline of fifteen or twenty pounds on the casing pressure?

A No, sir. The correct decline there would be 5 pound casing pressure, and if it shows more than that on the graph, it is an error in plotting.

Q I may have an error in my plotting. Yes, sir, I do. This plotted ten pounds too long on one point. I'm sorry. Why wouldn't you have a comparable decline in pressure in the casing as well as the tubing in this well?

A Well, I think we do. In the mass of data that is presented, you're bound to have some error in reading and taking this much of points. There were actually, oh, probably 16 or 18 dead weight tests made on this with casing and tubing and being taken simultaneously; we were talking about the range of pressure of 2,000 pounds, and a 2-pound error would be only a tenth of a percent. And, so, if you happen to be a tenth of a percent high and a tenth of a percent low on the others, that would account for four pounds right there.

Q Which is within acceptable realm with that type of gauge?

A Yes.

Q If you had a bad cement job and you were losing some pressure, would you lose pressure on the casing and not on the tubing, do you think?

A No.

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Q Would they both be effected equally the same?

A If we had 5, 6, 7, 8 loss of reserves around this well, we wouldn't be able to notice any particular difference in casing and tubing pressure, and we would see it also on our tubing traverses and temperature traverses we made. One or two temperature traverses in conjunction with these bottom hole pressure measurements, and there was no anomaly on the temperature rating that existed. If there had been a casing leak of this magnitude, this would have to be a big casing leak.

Q A casing leak. How about the leak in the cement shoe?

A I think, I feel we would have seen it on the temperature traverse.

Q It would show on the temperature traverse, wouldn't it?

A The thing wouldn't have been normal. We traversed this thing to 6269 perforations or close enough there, if we had been moving this amount of gas out of those perforations into the well bore on down to some lower horizon, the shoe leak would have to be to a lower horizon.

Q How about the perforated interval, what is that in this well?

A On the 21?

Q Yes, sir.

A 6271 to 6446 and 6463.

Q 6463, yes. Then, did you mean for all those bottom hole pressures and also the point you traverse is 6269?

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A Right.

Q Was the bottom hole pressure taken on the well on original completion?

A No, the first bottom hole pressure was in April of 1960.

Q Was any drill stem test taken to get a shut-in pressure on the drill stem?

A No, just well shut-in pressure. Wellhead shut-in pressure.

MR. NUTTER: That's all. Thank you.

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

MR. VERITY: That's all we have, Your Honor. We offer Exhibit No. 5 in evidence.

MR. PORTER: Without objection, the Exhibit will be admitted.

(Whereupon, Applicant's Exhibit No. 5 was received in evidence.)

MR. BUELL: If it please the Commission, Pan American has one witness, Mr. Eaton, who has previously been sworn.

G. W. EATON, JR.,

called as a witness, having been previously sworn, testified as follows:

DIRECT EXAMINATION

BY MR. BUELL:

Q Mr. Eaton, just go ahead and turn down Exhibit No. 1, would you, please?



A (Witness complies)

Q Mr. Eaton, would you state your name, by whom you are employed and in what capacity and what location, please, sir?

A George Eaton, Jr. I am Senior Petroleum Engineer for Pan American Petroleum Corporation in Farmington, New Mexico.

Q Mr. Eaton, you've testified at prior Commission hearings, have you not?

A Yes.

Q Your qualifications as petroleum engineer are a matter of public record, is that correct?

A That's correct.

MR. BUELL: Any corrections?

MR. PORTER: The witness' qualifications are acceptable.

Q In the course of your employment with Pan American, have you had the opportunity to make a study to ascertain the drainage area of a well completed in the Basin-Dakota Gas Pool?

A Yes, sir. During Pan American's development of the Dakota formation in the San Juan Basin we collected data and that data has been analyzed. On the basis of that analysis, we have made a study to determine what I believe to be the drainage radius of wells completed in the Dakota formation.

Q Are you of the engineering opinion, Mr. Eaton, that one well completed in the pool will effectively and efficiently drain in excess of 640 acres?

A Yes, sir, I believe it will.

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

Q I direct your attention, Mr. Eaton, to what has been marked Pan American's Exhibit No. 1. What is that Exhibit?

A Exhibit No. 1 is a map of a portion of the Basin-Dakota Pool.

Q Mr. Eaton, let me interrupt you. Would you slide that down a little so the Commissioners will not have to turn all the way around to see it? Would you go ahead, please?

A Exhibit No. 1 is a map of the portion of the Basin-Dakota Pool showing the location thereon of two separate areas in which Pan American has collected interference test data.

Q You said a portion of the Basin-Dakota Pool. What productive areas of that are not reflected on this Exhibit 1?

A Primarily the productive areas which are not shown on this map is approximately one range to the west of the map and approximately one township in New Mexico along the north edge of the map.

Q You say one township in New Mexico to the north. Is the Dakota formation productive on north of the New Mexico-Colorado State line?

A Yes, sir, the Dakota is productive on into the State of Colorado.

Q Do you happen to know what size proration units have been adopted for Dakota in Colorado?

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A Yes, sir. The proration units are 640 acres in Colorado.

Q All right, sir. Would you go to the two areas you have outlined in red and state again for the record what those areas are?

A The two areas outlined in red have been labeled the Angels Peak area and the Jicarilla area. These two areas represent areas in which Pan American has collected interference test data.

Q It appears from here, Mr. Eaton, that some of the wells within that red outlined area are colored with the red dot, is that correct?

A Yes, sir. You will notice that three of the wells in the Angels Peak area are so colored, and two in the Jicarilla area are so colored.

Q What is the significance of that?

A These dots -- these wells depicted by the red dots are the control wells or shut-in wells for the interference tests.

Q Mr. Eaton, I have heard you engineers often refer to interference tests -- I heard Mr. Wiederkehr, in his testimony, talking about control wells, shut-in wells, interference tests. Just what do you, as a reservoir engineer man, mean by interference tests?

A As Mr. Wiederkehr previously stated, a shut-in well is observed for pressure performance, although the well is not produced. Then, the distance between that shut-in well, if a pressure

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decline occurs on that well, and the closest producing well to determine it an arc is struck between the shut-in well and the nearest producing well; and the area of a circle whose radius is equal to that distance between the shut-in and producing well is the minimum area being drained by that nearest producing well.

Q What do you mean by minimum drainage area?

A Well, if the interference had been established into the shut-in well, it doesn't stop at that point, it reaches on beyond that shut-in well. Furthermore, that pressure performance of the shut-in well is being flooded to a certain extent by wells further removed than the nearest producing well.

Q So, Mr. Eaton, if you have a shut-in or control well, you observe pressure on it, the pressure declines although that well is not producing from the standpoint of production, prevention of waste, only that would indicate to you, would it not, that your shut-in well is an unnecessary well as far as draining the reservoir is concerned?

A Yes, sir, that is true.

Q You might need that well for protection of correlative rights assuming that it's a different ownership than the wells that are producing and draining that area?

A You definitely would, under those circumstances.

Q From the standpoint of prevention of waste, it's an unnecessary well?

A Right.

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(Whereupon, Applicant's Exhibit No. 2 was marked for identification.)

Q I direct your attention to what has been marked Pan American's Exhibit No. 2. What does that Exhibit reflect, Mr. Eaton?

A Exhibit No. 2 shows pictorially the procedure which I have just outlined for depicting detection of interference tests and the drainage area for wells in which interference is occurring.

Q All right, sir. Which one of your shut-in and control wells is that Exhibit based on?

A This Exhibit No. 2 shows the pressure performance of the shut-in well the Pan American's J. F. Day "E" No. 1. This well is located in the Angels Peak area.

Q All right. Go ahead and briefly discuss in detail the data shown on Exhibit No. 2.

A Actually, Exhibit No. 2 consists of two parts. The left-hand portion of Exhibit No. 2 is a plot of the observed pressure data on the shut-in well. The right-hand portion of Exhibit No. 2 shows an insert map of the area in the vicinity of the shut-in well showing the location of the well which was shut in as well as the nearest producing well.

Q What color code have you used on that particular Exhibit, Mr. Eaton?

A The shut-in well, the J. F. Day "E" No. 1 is shown in red. The nearest producing well is shown in green. In this par-

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ticular case, that is the Sunset International Kutz Federal #1-E.

Q Shut-in well controlling in the nearest producing in green?

A Yes, sir.

Q Do you throughout your remaining three Exhibits --

A The remaining have that same color code.

Q Go on with your explanation.

Q You will notice from left-hand side of Exhibit No. 2 shortly after completion a pressure of approximately 2,020 pounds was measured on J. F. Day "E" No. 1. Subsequently, a build-up occurred to about 2,030 PSIG after which a decline occurred and which apparently would be consistent although the test was terminated before too severe a decline did occur. The right-hand portion of Exhibit No. 2 shows that the J. F. Day "E" No. 1 located about 3,000 feet from the nearest producing well, the Sunset International Kutz Federal 1-E. Now, the area of the circle whose radius is 3,000 feet is 650 acres. In other words, Exhibit No. 2 shows that the Sunset International Kutz Federal No. 1-E was draining in excess of 650 acres at the time these data were collected.

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

Q All right, sir. I direct your attention to what has been marked as Pan American's Exhibit No. 3. What does that Exhibit reflect, Mr. Eaton?

A Exhibit No. 3 is very similar to Exhibit No. 2 in that it,

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too, shows interference test data which were collected on wells in the Angels Peak area. Again, the left-hand side of Exhibit No. 3 shows the observed pressure on the J. F. Day No. 1 this time whereas the right-hand side shows the insert map of the area in the vicinity of the J. F. Day No. 1 showing the location of that well and the nearest producing well.

Q All right, sir. Based on data obtained from this shut-in or control well that is shown on Exhibit No. 3, what drainage area do you see reflected by this data?

A In this case the J. F. Day No. 1 is located 4200 feet from the nearest producing well. Now, the area of circle whose radius is 4200 feet is 1275 acres. So this Exhibit shows that during the time in which these data were collected, the Sunset Kutz Federal No. 1-E was draining an area of 1275 acres.

Q Why do you qualify your statement that the test data were collected, Mr. Eaton, you in referring that other producing wells have since come into production and interfere with the drainage area of this well?

A These information maps only show the wells that were completed at the time these pressure measurements were made. Subsequently, there have been other wells drilled in this vicinity.

Q Another thing, before we leave Exhibit 3 wherein we compare the left portion of Exhibits 2 and 3, the pressure decline curve, I notice a more sharper or rapid decline in Exhibit 2 than I see on Exhibit 3. Why is that?

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A Yes, sir, you will notice in both cases the producing well is Sunset International Kutz Federal No. 1-E. In the case of J. F. Day "E" No. 1, the distance between the two wells is about 3,000 feet, which shows that effective drainage area of 650 acres; whereas in the case of J. F. Day No. 1 the area of that circle is approximately twice the 650 acres in Exhibit No. 2. Now, then, just appears that the pressure decline in Exhibit No. 1 is approximately twice that exhibited by the pressure decline in Exhibit No. 3, which is a perfectly normal and typical example of what you would expect of a reservoir in pressure communication.

Q What do engineers call that, pressure gradient or pressure transit or something like that?

A Pressure gradient.

Q Your pressure is usually lower in the area of the withdrawals from the reservoir?

A Yes, sir. The only way that the pressure can be is lower in the vicinity of the well which is producing. Therefore, the pressure of the J. F. Day No. 1 should be higher than it is at the J. F. Day No. 1-E since that well is farther away from the pressure zone around the producing well. That is exactly what we find. The pressure in the J. F. Day No. 1 is some 20 pounds higher than the maximum pressure recorded in the J. F. Day "E" No. 1 during approximately the same period.

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

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Q All right, sir, I direct your attention now to what has been marked as Pan American's Exhibit No. 4. What does that Exhibit reflect, please?

A Exhibit No. 4 is similar, again, to the Exhibits 2 and 3 in that it shows interference data collected on the Pan American J. C. Davidson "F" No. 1. It also is a well located in the Angels Peak area. Again, the left-hand portion of Exhibit No. 4 shows the observed pressures on the shut-in well. The right-hand side of the Exhibit shows insert map of the area surrounding the shut-in well and the distance between it and the nearest producing well.

Q What does it reflect, Mr. Eaton, from the standpoint of drainage area of that producing well?

A As shown on Exhibit No. 4, the J. C. Davidson "F" No. 1 is located 3100 feet from the nearest producing well which in this case is Pan American Federal's L No. 1. Now, the area of whose radius is 3100 feet is 691 acres. This shows that the Federal's L No. 1 was draining a minimum of 691 acres.

Q Now, Mr. Eaton, with respect to Exhibits 2, 3 and 4, how were -- the pressure data reflected on those, how were these data obtained?

A These are dead weight pressure measurements.

Q What has been your experience, Mr. Eaton, with dead weight? Did you use a dead weight tester?

A Yes, sir.

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Q What has been your experience with respect to the accuracy of ascertaining pressure in this manner?

A We have very good luck and think your dead weight measurements are very accurate.

Q If you had to put a degree of accuracy or, say, a degree of inaccuracy, whichever would be the correct way to express it, what type of degree would you put on it?

A These dead weight gauges can be read to accuracy of a tenth of a pound, which would be very small percentage error in the range of 2,000 pounds.

Q All right, sir, in your opinion, Mr. Eaton, do you feel that any of the pressure decline reflected on Exhibits 2, 3 and 4 could be attributed to build-up of liquids in the well bore?

A No, sir. I'm convinced it is not due to liquid build-up in the well bore. We ran a number of sonolog shots on wells in the Angels Peak area, and we never found liquid build-up above the base of the tubing setting depth.

Q Do you know whether or not those sonic sound shots, any of them were made on these particular control, these three particular control wells?

A I don't know whether these three wells were sonologs or not.

Q They could have been?

A Yes.

Q But there is little, if any, build-up of liquids in the

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shut-in well?

A Yes, we never found any above the tubing depth.

(Whereupon, Applicant's Exhibit No. 5 was marked for identification.)

Q All right, sir. Let's go on now to Pan American's Exhibit No. 5, Mr. Eaton. Now, the three other Exhibits cover wells in the Angels Peak area, is that correct?

A Yes, sir.

Q Where are we going now on Exhibit 5?

A Exhibit No. 5 is taken from a data obtained in the Jicarilla area.

Q Would you take the time, Mr. Eaton, to raise Exhibit 5 on the board there? Now, Mr. Eaton, state for the record what is reflected by Exhibit 5.

A Exhibit 5 is somewhat similar to the Exhibits 2, 3 and 4 in that it shows interference test data which was collected during the time that the two Pan American's wells were shut-in and not produced while other wells in that vicinity were being produced. The principal difference between Exhibit 5 and the Exhibits 2, 3 and 4 is that Exhibit 5 has a pressure performance of two wells and also has bottom hole pressure instead of dead weight pressure, and it is, the data was obtained in the Jicarilla whereas the previous data were up in the Angels Peak area.

Q Briefly, state what it reflects with respect to the shut-in bottom hole pressure performance to these two control wells.

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A Exhibit 5 on the left-hand side shows -- the dashed line shows the bottom hole pressure performance of the Pan American Jicarilla C T 148 No. 9. The solid line shows the bottom hole pressure opening of the Pan American Jicarilla C T 146 No. 9. In the case of the Jicarilla C T 148 No. 9, that is the one with the dashed line, that well is located 2200 feet from the nearest producing well. In the case of the Jicarilla C T 146 No. 9, that is the solid line, that well is located 7500 feet from the nearest producing well.

Q Let's talk about the 148 No. 9 that is true about Exhibit No. 5, we did observe a pressure decline in that shut-in well, but you also indicated it was 2200 feet from the nearest producing well?

A Yes, sir.

Q That 2200 feet the radius of the circle with 2200 feet radius would include less than 640 wouldn't it?

A 360.

Q Why did you include that Exhibit since it doesn't show 640 from that particular well?

A These dates were included for two reasons, really. One is to show that the data obtained on the other well fits in with the data obtained on another well in the same area, so that it is meant to support the reliability of the data of 146 No. 9; at the same time it's almost a textbook example of the pressure relationship that you would expect to exist in continuous reservoir in which there



is pressure communication. When you're talking about edge of the reservoir; it's a long way from production as compared to a point in that same reservoir closer to production. These two curves declining naturally show that both wells were being flooded by production within that same reservoir in which there is pressure communication. The fact that one of them is a higher pressure than the other simply indicates that it is farther removed from that area of production.

Q All right. Let's see 146 No. 9. That's farther away from the producing well?

A Yes, it's 7500 feet.

Q Why don't you draw a circle using that 7500 feet as a radius?

A The circle wasn't drawn. I believe such a circle would be extended off of any exhibit. I think it's obvious that the area contained in such a circle is in excess of 640 acres.

Q Mr. Eaton, before we leave Exhibits 2, 3 and 4 and 5, by looking at those here, I notice that most of these decline data were obtained over a relatively short period of time, three or four or five months. As it looks from here, why didn't Pan American leave these wells shut-in, and gather data of this type over a longer period of time?

A None of these tests were actually set up to be real interference test wells. They were merely conducted as part of our routine operations. We were convinced that what was happening was



part of our gas was being produced throughout wells in the vicinity, and in order to get our fair share we had to put these wells on production immediately, so that was what was done. The tests determined --

Q If we left those wells shut-in, the opportunity for violation of correlative rights would have existed?

A It certainly would.

Q Mr. Eaton, let's go back to Exhibit 1 for a moment. You were here in the hearing room during Mr. Wiederkehr's testimony?

A Yes, sir.

Q And completely aside from that you had the opportunity to review and analyze and study and evaluate the interference test data which he submitted?

A Yes, sir.

Q Do you feel, Mr. Eaton, these data are strategically enough located so that they are representative of drainage conditions that we will encounter in the Basin-Dakota Pool?

A I'm convinced that other interference tests conducted elsewhere within the basin pool will show the same thing, that is, one well will drain in excess of 640 acres.

Q Do you have anything else you would like to add, Mr. Eaton?

A I believe not.

MR. BUELL: May it please the Commission, that is all we have at this time. I would like to formally offer Pan American's

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Exhibits 1 through 5 inclusive.

MR. PORTER: Without objection, the Exhibits will be admitted.

(Whereupon, Applicant's Exhibits Nos. 1 through 5 received in evidence.)

MR. PORTER: Does anyone have any questions?

CROSS-EXAMINATION

BY MR. NUTTER:

Q Mr. Eaton, I notice in your direct testimony you mention the words "pressure gradient." As I understand it, pressure gradient is the change in the pressure in the reservoir from the well that's been producing out, into the change from that well out into the reservoir?

A Yes, sir.

Q When you reach the point that it's no longer profitable to produce the well, you reach the economic limit of the production there, or the abandonment pressure, so to speak, is there pressure gradient in the reservoir at that point?

A Yes, sir.

Q The further you go from the well bore, the higher the pressure is out in the well reservoir?

A Yes, sir.

Q So even though an interference test may show that a well is effecting another well -- as a matter of fact, I think a couple of these Exhibits show wells on 320 spacing two wells within the



section?

A Yes, sir.

Q You show the one well has affected the pressure in another well?

A Yes, sir.

Q It shows wells are drilled on 320 spacing, but if the spacing were doubled, then the wells with 640-acre spacing the amount of gas that would be present in the well bore when you reach the abandonment pressure would increase with it?

A You don't mean --

Q The amount of gas that is left in the reservoir, I'm sorry. It would increase with the radius of drainage at which that well was developed?

A Yes, that's true. There would be more gas remaining unrecovered on wider spacing, that close spacing that amount would be insignificant, on the order of, generally, 1 percent on difference of recovery in that range.

Q I don't have these Exhibits numbered, the one that shows the shut-in, the J. F. Day No. 1. What is the high pressure shown on that Exhibit?

A Are you speaking of the J. F. Day "D" No. 1?

Q "D" No. 1, yes, sir.

MR. BUELL: Do you have that tabulated so we can offer that as an Exhibit 2-A?

Q The low pressure?



A The low pressure is 2145.

Q Two and a half from out of total of how much, about 2,000 pounds, roughly?

A 2,050 pounds, approximately.

Q Percentagewise, what does that amount to?

A About 1 percent.

Q Percent at total that the decline is?

A Approximately 1 percent, I think.

Q 1 percent?

A One-tenth of 1 percent, excuse me.

Q Now, with the J. F. "E" No. 1, the high pressure and low pressure on that decline?

A The highest pressure recorded on the J. F. Day "E" No. 1 is 2,030 PSIG.

Q And the low pressure?

A Low is 2,024.

Q A variation of six pounds?

A Six pounds.

Q Total pressure?

A 2,025.

Q Percentagewise, what does that amount to for the decline?

A That would be approximately six-tenths of one percent.

Q How about the Davidson "F" No. 1, the high and low pressure there, please?

A The high pressure on the Davidson "D" No. 1 is 2,006 PSIG.



The low pressure is 2,001 PSIG.

Q So that is a variation of six pounds or five pounds?

A Five pounds out of 2,000, .25 percent.

BY MR. PAYNE:

Q Mr. Eaton, at the outset of your testimony, I believe you stated that one well in the Basin-Dakota will efficiently drain in excess of 640 acres. Which one well?

A It's my opinion that at least these four wells on which we collected the data will drain in excess of 640 acres.

Q Do you have any reason to believe that any other areas of this Basin-Dakota Pool, that any one well would drain in excess of 640?

A Let me answer that question this way, Mr. Payne. In the two cases where Pan American has data, we have this data on Exhibits 2, 3 and 4, were collected in Angels Peak approximately thirty-five miles away. We have data which was collected in Jicarilla. The data in the Angels Peak was collected in 1959, and the date the Jicarilla was collected was 1958. Now, both distancewise and timewise, we've got quite a spread. I believe that similar data collected elsewhere in the Basin would show the same relationship.

Q I agree you do have quite a spread in that area. Would you please tell me what percentage of the total proven area the Basin-Dakota Pool has depicted in the area outlined in red in your Exhibit No. 1?



A A very small percentage.

Q Also the interference tests were conducted by Southern Union in the Angels Peak area, were they not?

A Very close to the same area where Pan American data were collected.

Q In this general area in the Angels Peak, I note that your tests show that well can drain anywhere from 650 acres to 1275 acres. Isn't it entirely conceivable in other areas in the Basin-Dakota Pool you might have such a range, but it would range the other way, say, from 640 down to 160 acres efficient drainage?

A I suppose it would be possible although I wouldn't anticipate such a thing.

Q I take it, Mr. Eaton, you're rather impressed with interference tests and determining efficient drainage, is that right?

A Yes, sir.

Q Do you think the Commission should always require interference tests in spacing a pool or at least in increasing the size of the proration units from what they have been?

A I think that would be a very definite and conclusive method to be sure that pressure communication existed over the area to be included in the spacing unit.

Q Mr. Eaton, you have undoubtedly testified in and heard numerous spacing cases, not only in this case, but other interests. Is it true to say about many reservoir engineers, that the value you place on interference tests ranges from something they say,



whereas others think they are no good at all in determining drainage?

A I don't believe I ever heard reservoir engineers say that they were no good at all. I don't doubt that different reservoir engineers place different relative values on interference tests.

Q You probably have heard some testify they didn't think it of any great value to take interference tests in determining drainage, haven't you?

A I can't recall of it, Mr. Payne.

Q Mr. Eaton, you testified that the gas proration units in Colorado in the Dakota were 640 acres. Do they prorate gas in Colorado?

A No.

Q You meant 640 spacing?

A Yes, sir. Thank you for correcting that.

Q Mr. Eaton, throughout your testimony and particularly in regard to your interference test data, you stated they indicated that the well was draining an area of such and such.

A Yes.

Q Do you mean by that it is efficiently draining that area?

A Let me answer that question this way. One of the reasons that Pan American collected these data were to get some confirmation of what our reserve estimates were which we have previously computed by the volumetric of porosity volume estimated in a new gas reservoir as well as in a new oil reservoir, for that matter.

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It's always very difficult for reservoir engineers to make a first good estimate of what reserves are, so we take every opportunity to try to confirm that good estimate or first estimate. In this particular case, our attempts were to observe the pressure decline on these selected shut-in wells while comparing that with the production data from the general area in which these wells were located, and by so doing, we felt like we got a fair comparison from the volumetric withdrawal computation with the porosity volume calculation of what gas we shut-in should be in place. With that respect, then, we know it's a good and fair comparison with those two estimates you're pretty sure that you are contacting a large percentage, at least, of the gas in the reservoir, and, therefore, it will have an opportunity to be around through the existing wells.

Q Now, is Pan American's case here based on drainage primarily, and completion secondarily?

A Yes.

Q In other words, most Dakota wells or a good portion of them will pay out in 320-acres, will they not?

A We think they will.

Q I believe you testified that there was -- you encountered no liquid build-up in the shut-in wells in the Angels Peak area?

A That's correct.

Q Now, it is entirely conceivable, is it not, that in other areas of the Basin-Dakota Pool you might encounter a future liquid



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A That's correct.

Q Now, it is entirely conceivable, is it not, that in other areas of the Basin-Dakota Pool you might encounter a future liquid



build-up?

A That's true.

Q And since the applicant is only asking for temporary order, in order to gather additional data in interference tests taken in the meantime in the area where liquid problems were encountered, they should in all probability use bottom hole pressures, should they not?

A Taking the bottom hole pressure together with dead weight pressure should give you the best evidence. You know what is taking place at the top of the hole, you know what is taking place at the bottom of the hole. To have them both would be better than either one by themselves.

BY MR. NUTTER:

Q Mr. Eaton, in drawing these pressure decline curves, I note that you use your shut-in casing pressure off of this sheet that was handed out.

A Yes, sir, the reason for that is that is only casing side that we were able to get our sonolog equipment to shoot the fluid level.

Q Well, level. These tubing pressures as indicated on this equipment are lower than casing pressure in almost every instance. To what do you attribute that?

A I have no explanation.

Q You don't think there is any fluid factor that would enter into this?



A No, I don't think so.

MR. PORTER: Anyone else?

BY MR. UTZ:

Q Do you have any information regarding the bottom hole flowing pressure or the equivalent top hole pressure of the producing well on any of these, looking, in particular, at the Exhibit which shows the Pan American J. F. Day "E" 1?

A No, sir, I don't. I do understand this, that Sunset Internation was generally producing their wells in Angels Peak area against a 500 PSIG back pressure. I don't know specifically about any one well.

Q That would include purchase and loss at the surface of that well, would it not?

A Yes, sir.

Q What I'm getting at is do you have any idea what the pressure gradient where the purchasing well to the radius would be?

A We will just have to make you an educated guess at it, which, I would say, is approximately 1,000 pounds.

Q Approximately a thousand pounds?

A Yes.

Q Now, that completion of the producing well, say, at 200 pounds, 300 pounds, whatever your band of pressure might be, would you say, then, that where the depleted pressure is where the radius would be 1,000 pounds?



A No, sir.

Q How much more would it be?

A It would depend a lot on the ability of each individual well to produce. The reason that I'm certain that it would be less than the same differential, as it's observed now, is because at the economic limit the producing rate would be on the order of maybe 75 MCF a day where the producing rate at the present time is up to five times that with the attended larger drawdown in bottom hole pressure.

Q As your reservoir depleted, your gradient would decrease?

A Yes, sir.

Q Whatever that gradient would decrease, that gas would be lost?

A Yes, sir.

BY MR. ALLEN:

Q What was the range of the open flow potential of Pan American wells involved in your Exhibits 1 through 5?

A I'm sorry, I don't have that information.

Q Would you say they corresponded favorably to Southern Union, which, I believe, were placed in the higher brackets in the completed wells in the field?

A I believe they would be lower than that. Consequently, they are in that bracket, yes, sir.

BY MR. ARNOLD:

Q Do you agree with Mr. Wiederkehr where he said that if

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the 640-acre units were approved that operator still should be allowed to drill two wells on a unit? Do you agree that an operator should have that right?

A I don't recall that he exactly said that, Mr. Arnold. I believe that he inferred that an operator should have an opportunity to drill either one or two wells in a section.

Q Well, that's what I meant to say.

A Yes.

Q Do you believe that he should be required to drill those in diagonal quarter sections?

A No, sir, I wouldn't at this time advocate any change from -- insofar as the two wells within the section is concerned, any change from the present regulations.

Q You don't agree with him, then, that correlative rights would be involved if two wells were located on the north end or south end of the section?

A I think the main thing we need to watch for is to make sure that all the acreage that is attributed to a well, whether it be on 640-acre unit or 320-acre unit, is to be sure that all of that acreage is productive.

Q Well, wouldn't you agree there isn't, so far as correlative rights is concerned, isn't very much difference between having two wells in the north end of the section than having one well which have been assigned two allowables?

A That's approximately correct, yes, sir.

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MR. ARNOLD: I believe that's all.

MR. PORTER: Any further questions?

BY MR. PAYNE:

Q Mr. Eaton, how do you determine whether the entire acreage, which is dedicated to the well, is productive?

A It's not very east all the time, Mr. Payne.

Q In your opinion, is there any dedicated dry acreage in this pool now?

A No, sir. I don't know of any, let's put it that way.

MR. PAYNE: Thank you.

MR. PORTER: Anyone else have a question? Was 2-A prepared by you or under your supervision?

A Yes, sir.

MR. PORTER: Let the record show that 2-A will be admitted into evidence. The witness may be excused.

(Whereupon, Applicant's Exhibit No. 2-A was received in evidence.)

(Witness excused)

MR. PORTER: Does that conclude the testimony?

MR. BRATTON: On behalf of Delhi Taylor Oil Corporation, we had contemplated merely making a statement of our position in this, but first we would like to refer to one Exhibit which would be just a map of the Basin-Dakota Pool. I believe it would be more proper and we would offer one witness for a very brief statement of our position. I believe it would be proper to put him under

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oath and it be considered testimony. We will take no more than five minutes.

MR. PORTER: Hearing is in order.

(Witness sworn)

MILLARD F. CARR,

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

DIRECT EXAMINATION

BY MR. BRATTON:

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

A Millard F. Carr, Dallas, Texas, with Delhi-Taylor Oil Corporation. I'm a member of the Land Department.

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

Q Mr. Carr, with reference to what has been marked as Delhi-Taylor's Exhibit No. 1, will you state the position of Delhi-Taylor Oil Corporation with respect to the pending application in this case?

A First, I would like to state very clearly at the outset it's a firm policy of Delhi-Taylor to support the widest position spacing wherever feasible. We would like to go on the record in support of the transfer of allowables for the companies who wish to run interference tests. We think it is certainly fair they should not suffer any loss of revenue for shut-in wells during a

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testing period. To illustrate the concern we do feel, however, about the temporary 640-acre spacing order, I would like to very briefly show you this map. It is just a rough outline of Delhi's leasehold ownership in the San Juan Basin. It extends from this corner to this corner over a period of, or distance of about ninety miles, and includes about, around 180,000 acres. Now, in this amount of acreage you can see we have a substantial number of full sections locations. And, in fact, we have completed about 23 Dakota wells on a full section location. At the present time we have about 25 Dakota wells completed on our acreage on a partial interest in several more. What I wanted to point out with this map is the fact that even with this substantial amount of sub-range we can -- you can see from the central portion we have a large amount which is actually in 320 checkerboards. We have no interest whatever in the other 320 acres in that particular section.

In trying to determine our drilling program for 1961 we don't feel, of course, we can afford to ignore our acreage simply because we don't have a lease that blocks off an entire section. We also feel that in order to take advantage of increased allowable which would be granted under the temporary 640-acre order it would behoove us as prudent operator to try to make nominations of the owner of this offsetting acreage in each one of these sections. In trying to do that, based on past experience, we can anticipate a whole realm of problems and we don't consider them minor. In the



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first place, we are going to have to work up some method of a temporary pooling or unitization to accomplish the 640-acre proration unit. Then, we are going to have to work with the offset owner to work up our contractual arrangement for whether he joins us initially in the drilling or whether one of the other partner bears all or part of the risk. We have also got to anticipate at the end of the one year test we may go back to the 320 test spacing. We could very easily be spaced with a partner in two wells in a section. And it's not our company's policy, as I think it would be of most any operator, to try to avoid bringing partners in your oil and gas production wherever you can. We also feel this, that this, in addition to placing a burden on us in making these arrangements on a temporary for 640 prorationing, there is going to be adverse effects on the present owners in here that have existing wells on 320 acres. If the 640 order becomes permanent, the people that have got two wells per section are not going to be damaged if we are going back to 320-acre order at the end of a year. We have had an irrevocable loss of income; for all the people have suffered a smaller proportionate amount of the total Dakota production than they would have gotten otherwise. For those are simply our reasons in view of that we would like to have actively. Southern Union requests for the right to conduct interference tests and transfer of allowables, but we do wish to go on record in opposition to the temporary 640 order. We have nothing further we would offer.

MR. BRATTON: Have you prepared Delhi's Exhibit No. 1?



A Yes.

MR. BRATTON: We would offer Delhi-Taylor's Exhibit No. 1 in evidence.

MR. PORTER: Without objection, the Exhibit will be admitted.

(Whereupon, Applicant's Exhibit No. 1 was received in evidence.)

MR. PORTER: Does anyone have a question?

CROSS-EXAMINATION

BY MR. PAYNE:

Q Mr. Carr, do you believe that the size of the prorationing unit in a pool ordinarily should be determined by the need for executing communitization agreements?

A No. We are just pointing out the fact that we will have a substantial number of problems brought on by a temporary order, which admittedly is temporary. We don't have enough evidence to substantiate making it permanent.

Q So what you're saying is your company's position, after additional data is obtained, then, an applicant should come in, if the evidence warrants, for permanent order?

A If the evidence warrants 640-acre spacing, then the Commission makes it permanent, yes. We don't have any of the problems I outlined, we are only objecting to the one-year test period.

Q Do you feel that the information presently available and presented here is sufficient engineerwise and geologically to jus-



tify the establishment of 640 proration units?

A I am certainly not qualified to answer that question.

MR. PAYNE: Thank you.

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

(Witness excused)

MR. PORTER: Does anyone else desire to present testimony? Any statements?

MR. SEVIER: J. Sevier with Pubco Petroleum Corporation. I would like to read a statement into the record, if the Commission please.

Pubco strongly opposes the application of Southern Union Gas Company for a temporary 640-acre spacing order and permission to transfer allowables in the Dakota formation of the Dakota, Basin-Dakota Pool. We believe experience has shown a prevalence of low porosities and permeability and nearly all Dakota wells have required large stimulation in order to obtain economic producing rates. It is our belief that one Dakota well will not adequately drain 640 acres, thereby causing subsurface waste. It's our further belief that if this order is granted, it will serve no useful purpose and would, in effect, split prorations in the Basin-Dakota Pool and would not be in the best interest of operators, royalty owners or the State of New Mexico.

MR. WHITWORTH: Representing El Paso Natural Gas Company. El Paso is interested in this case in that it is an owner and

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operator of numerous Dakota wells throughout the whole San Juan Basin. I would like to read the following statement into the record on behalf of El Paso Natural Gas Company.

El Paso is in favor of the widest possible spacing for drilling and prorationing units in any case where such spacing is substantiated and warranted by the facts in the instant case, that pending a final determination of the facts, the application of Southern Union Gas Company, in granting that application, will not be injurious nor prejudicial to anyone, and could prevent the drilling of unnecessary wells. Accordingly, El Paso Natural Gas Company concurs in the application of Southern Union Gas Company, and urges that said application be granted. El Paso Natural Gas Company does not concur in statements that have been made that there is no relationship between deliverability and reserves, but that is not an issue in the case.

MR. BUELL: If it please the Commission, in the interest of brevity, let me simply state that Pan American generally concurs with the application of Southern Union, and we strongly urge and recommend that the Commission adopt optional 640-acre proration units for the Basin-Dakota Gas Pool. We think the evidence presented here, frankly, in my opinion, of course, the evidence warrants a permanent order. And certainly all the evidence that has been presented is to this effect, that a well in this pool will drain effectively and efficiently 640 acres.

MR. BRATTON: Howard Bratton. If the Commission please,

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I would like to state Humble Oil & Refinery has no producing Dakota wells as yet. However, Humble has potential Dakota acreage and approves of every certificate to gather data directed toward approval of the feasibility of wide spacing, and to that extent supports the application of Southern Union.

MR. ROBINSON: J. E. Robinson, representing Texaco, Incorporated. Texaco concurs with the evidence as submitted by Southern Union and Pan American, that a well of 640-acres will effectively drain a reservoir. We request that the Commission adopt one-year temporary ruling for 640-acre spacing until other information can be obtained from the formation, that would support 640-acre spacing for the entire Dakota, the Basin-Dakota. Texaco is in opposition to the proposed 990 feet spacing from the inter-boundary line of a section. This, in effect, would permit an operator to drill a well 1650 feet from the outer boundary of a section and with the 200 feet tolerance, then the operator could drill a well 1450 feet from the outer boundary of a 640-acre proration unit. Therefore, Texaco would recommend that a spacing be adopted where an operator would not be allowed to drill closer than 1980 feet from the outer boundary of his property, that would, in effect, allow an operator to drill in the center of the inter 40-acre units on his tract and also would give him a 1320 feet target area to locate his well on.

MR. VERITY: Southern Union would have no objection to the recommendation of Texaco as to location of a well within the

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640-acres to be dedicated. Very briefly, I feel that just a word with regard to a summary of the evidence that's been presented is called for, I think that it's most significant that no one has presented a word of testimony or a scintilla of evidence that has defended 640-acre spacing. We have had two, I believe, that have what I would say arbitrarily objected to it because it creates some problems in their Land Department. I would like to point out to this Commission if their Land Department doesn't have continuing problems of this nature, it's the first one I ever heard tell of, and, further, this does not complicate those problems.

We are not diminishing their rights by the request of this order. Delhi-Taylor and any other operator can still go ahead and drill one well to the 320-acres, and they can do it on a permanent basis, and this order does not diminish that right. We think, for them to come and say, because we request the Commission to give us the opportunity to develop the acreage on 640-acres, that does not mean that they have a right to deny it merely because they have some 320-acre tracts. Many of the operators in the pool are going to have this, and if the Commission denies this order, they're still going to have to drill those 320-acre tracts. They can drill them just the same if the Commission grants it. We feel that this Commission should be cognizant of the fact that the overall oil and gas industry has a big stake, the biggest stake, if you will, in the way that this Commission sets its orders for prevention of waste, protection of correlative rights. We think that when evi-



dence is presented to the Commission that is undenied with regard to drainage, that there is effective drainage, as this evidence has showed, not just over 640 but over a much larger area, that then it would be improper to require operators who voluntarily desire to drill on only one well to 640-acre to go ahead and expand the large sum of money that is required of them to drill two wells in place of one if one well will get the gas. We think that the objections that have been made are arbitrary, that they are not based upon any evidence, and we feel that the Commission should grant this application.

MR. PORTER: Mr. Redfern.

MR. REDFERN: John Redfern, Jr. I'm owner of interest in eleven Dakota wells that have been drilled upon 320-acre units, in conformity with rules and regulations of the State of New Mexico. I'm owner of additional undrilled acreage that appears will be productive in Dakota horizon. I would like to enter the following statement.

I have no engineering information upon which to either concur or disagree with Southern Union's application. I do concur with Southern Unions suggestion that the wells be spaced a minimum of 1650 feet from the boundary lines of the lease. I do not agree with the suggestion that wells that have already been drilled and which may be located as low as 790 to the exterior lease line, I do not agree to that, at least I would like to suggest to the Commission that they not permit such wells to be given a 640-acre

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allowable. Let me repeat, I don't mean wells in the inside of a large block which could in no way control the offsetting. I do think, whether or not listed 790 from other leases owned by other people, with other royalty owners, there may be impairment of correlative rights.

MR. KELLY: Booker Kelly, appearing on behalf of Sun Ray Mid-Continent. Sun Ray Mid-Continent feels all the affirmative evidence clearly shows that the most economic development of the Basin-Dakota Pool would be achieved by increasing the proration units to 640-acres for a period of one year, and to that extent Sun Ray Mid-Continent joins Southern Union in asking that the application be granted.

MR. KELLAHIN: Jason Kellahin, Caulkins Oil Company. The proposal, as outlined before the Commission, will create some problems to Caulkins. In that connection, we do urge that exceptions be granted for locations of wells presently drilled in the area, as has been the practice of the Commission to other pools and other areas. Also, due to the fact, as the evidence shows here, a number of tracts have been developed on the basis of 320-acres and for the record, in the future, we urgently press upon the Commission a request that they view with considerable amount of tolerance the formation of unorthodox units to take care of those situations where present development exists, in order to enable those opera-

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tors who developed on 320-acres, to protect their competitive position in the pool.

MR. JAMISON: William Jamison. I have been authorized by International Oil Corporation to make this statement, that it's our desire to obtain the 640-acre proration unit for the Dakota formation, and we wish to support the application of Southern Union Gas Company in every way.

MR. BUELL: Guy Buell, if it please the Commission, I wondered if it would be proper for me to ask the Commission their interpretation of Delhi-Taylor's position? It was my understanding they would have problems in spite of that. I wonder if my interpretation is the same as the position.

MR. BRATTON: My recommendation in this matter: We support the application insofar as it requests the right to conduct interference tests, to have administrative procedure to conduct those interference tests. We do not support the application insofar as it requests temporary 640-acre proration unit. We do not believe that is essential to the conducting of interference tests. In fact, in a pool in Lea County, New Mexico, the Commission did exactly that, granted the right to conduct the interference tests. It did not grant the larger proration unit on the temporary basis. It is the position of Delhi-Taylor that a temporary wide spacing order is not or should not be applied to a pool of this magnitude and this complexity and with the development which has gone on, that to impose a temporary 640-acre proration unit rule on that

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pool would cause not only problems in the Land Department, but problems in drilling programs and development, and it would cause problems which we think outweigh the advantages of a temporary 640.

MR. SPIELES: E. L. Spieles, Ohio Oil Company. The Ohio Oil Company has 1600 acres of land in Township 28 North, Range 11 West, San Juan County, New Mexico on which it has eventually drilled or participated in seven Dakota wells. In addition, we have interest in five other wells in the Basin-Dakota Pool. All of these wells which The Ohio Oil Company has an interest in are drilled on 320 spacing pattern. The Ohio Oil Company drilled the wells on spacing pattern allowed by the New Mexico Conservation Commission. We have a considerable amount of money invested in wells drilled on 320 spacing. We feel we should not be penalized for drilling these wells. We feel we should have the same opportunity to recover our investment on the wells we have drilled, and as an operator, who only drills one well for 640. The Ohio, therefore, opposes the establishment of temporary 640 proration unit for the Basin-Dakota Pool.

MR. ANDERSON: Jan Anderson, Geological Survey, Roswell. We have not as yet formed any definite opinion as to whether Dakota spacing in these San Juan Basin areas should be 640-acres. However, we are pretty definitely of the opinion that if we are to have 640-acre spacing, we shouldn't back into it through the side door by a 640-acre alleged unit and attempt to maintain spacing units of 320-unit acres. If we have 640-acre units, as far as the

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Federal lands are concerned, we are going to have to communitize those tracts, and under the Federal Leasing Act there is some question in our minds as to whether we can communitize 640-acres and allege production to it and at the same time keep the spacing unit as 320.

In the testimony today we did have some information on interference over distances, possibly from a mile and a half, and statements that one would effectively drain 640 up to two or more times that. No mention was made of any time limit, and we have a lot of information on deliverability on wells, although we do have some that was given to us by unit operators in connection with Dakota wells in the San Juan Basin. One of them that I think of right offhand was a Dakota well which the operator estimated that at the present deliverability of the well, if it remains constant, it would take 44 wells years to drain all the gas under 320-acres. I don't know about under 640. We might be looking at fifty or sixty years to recover the available gas in other parts of it. I think undoubtedly it would be recovered within a reasonable period of time, perhaps twenty percent. Of course, we in the Survey, recognize that the operators in the San Juan Basin are faced with an economic problem of having to drill expensive Dakota wells, where every well that has been completed, why, that causes one or more offset of the allowable production and the payout on long allowable production is not very high. Perhaps some consideration should be given to 640-acres on the spacing, on the basis that we

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would be able to move up additional reserve and perhaps get some additional market and at a lesser cost than we can do on 320-acres.

MR. PAYNE: Mr. Commissioner, at this time I would like to ask that the well record of Angels Peak Well No. 21, Angels Peak No. 20-B, as shown on Southern Union's Exhibits 2 and 3, be given administrative notice by this Commission.

MR. PORTER: The Commission will take administrative notice to well records. Does anyone else have anything else to offer? The Commission will take the case under advisement.

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