BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

IN THE MATTER OF:

CASE 1641

TRANSCRIPT OF HEARING

JULY 15, 1959

DEARNLEY - MEIER & ASSOCIATES
INCORPORATED
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ALBUQUERQUE, NEW MEXICO
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CASE 1641 (Hearing De Novo) Application of El Paso Natural Gas Company for a hearing de novo before the Oil Conservation Commission in Case No. 1641, Order R-1410, which was an application by W. R. Weaver for the promulgation of special rules and regulations governing the drilling, spacing, and production of wells in the Angels Peak-Gallup Oil Pool, San Juan County, New Mexico.

BEFORE:

Gov. John Burroughs
Murray Morgan
A. L. Porter

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

MR. PORTER: The hearing will come to order, please. Next case to be heard will be Case 1641.

MR. PAYNE: Case 1641. (Hearing De Novo) Application of El Paso Natural Gas Company for a hearing de novo before the Oil Conservation Commission in Case No. 1641, Order R-1410, which was an application by W. R. Weaver for the promulgation of special rules and regulations governing the drilling, spacing, and production of wells in the Angels Peak-Gallup Oil Pool, San Juan County, New Mexico.

I might mention at this point that when this case was advertised,

El Paso was the only one who, up to that point, had filed an application for hearing De Novo. Pan American subsequently filed one also.

MR. PORTER: Before we get into this case, I would like to announce that the next to be heard will be Case 1420, and then Case 1722, and then we will go back to Case 1637.

We will proceed now with Case 1641. I would like to have appearances in this case at this time.

MR. NEWMAN: Kirk Newman of Roswell, New Mexico, and Guy Buell of Fort Worth, Texas, a member of the Texas Bar, representing Pan American Petroleum Corporation.

MR. ERREBO: Burns Errebo and James E. Sperling, Modrall, Seymour, Sperling, Roehl & Harris of Albuquerque, representing W. R. Weaver.

MR. PAYNE: Is Pan American ready to proceed?

MR. BUELL: Yes, sir, we are ready.

MR. PORTER: Mr. Buell, will you proceed, please?

MR. BUELL: We are perfectly willing and able, Mr.Porter. I wonder if Weaver would rather go first since it is their application?

MR. ERREBO: The application is of El Paso, and I believe that Pan American, Weaver did not file any application for a Hearing De Novo.

MR. BUELL: I was being courteous. We are ready. We have one witness, Mr. Marshall, who has not been sworn.

(Witness sworn)

MR. ANDREWS: May it please the Commission, I came in just a little bit late. I hadn't realized you had called this case until just this moment. I appear for El Paso Natural Gas, and Mr. Howell thought you were going to take the other case up first, and he was to meet me here just shortly after one-thirty. He should be along most any moment; and I'm not familiar with it.

MR. MORGAN: Any objection to Pan American going ahead since they are also the applicant in the case?

MR. ANDREWS: I am not familiar with it.

MR. MORGAN: Do you have any objection?

MR. ANDREWS: I think that would be satisfactory.

MR. PORTER: I probably should have announced the order of the cases prior to the recess. However, I didn't think, and I see Mr. Howell is coming in.

MR. ANDREWS: I don't know if the record yet shows the appearance hereon of Seth, Montgomery, Federici & Andrews, and Ben R. Howell for El Paso Natural Gas Company.

CHARLES MARSHALL,

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

DIRECT EXAMINATION

BY MR. BUELL:

Q Mr. Marshall, will you state your full name, by whom you are employed, in what capacity and what location, please?

A Charles R. Marshall, with Pan American Petroleum Corporation. I am a petroleum engineer for -- in the Farmington office.

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

A Yes, sir.

Q Your qualifications as a petroleum engineer are a matter of public record?

A Yes, sir.

MR. BUELL: Any questions, Mr. Porter?

MR. PORTER: No, sir. His qualifications are acceptable.

Q Mr. Marshall, have you made a reservoir study and evaluation of the Angels Peak-Gallup Pool?

A Yes, sir, I have.

Q Based on that study, are you prepared at this time to make certain recommendations relative to regulating and prorating this pool?

A Yes, sir.

Q Briefly, right here at the outset, would you summarize your recommendations so that this Commission can follow and analyze your testimony in the light of your recommendations?

A Yes, sir. I would like to recommend that oil wells completed in the Angels Peak-Gallup Field be spaced and prorated on an 80-acre proration unit; that the allowable for these oil wells be assigned in accordance with statewide Rule 505; three, that the gas wells in this Field be allowed to have up to and in-

cluding 320 acres assigned to them; four, that a limiting gas-oil ratio of 2,000 to 1 be assigned; five, that gas wells be assigned an allowable equal to the gas limit for an 80-acre oil well, on an acreage basis, that is, a well which had, a gas well which had 320 acres assigned to it would have a gas allowable equal to four times the gas limit of an 80-acre oil well. And six, I would like to -- I would recommend that a gas well be classified as any well producing with a gas-oil ratio in excess of 25,000 cubic feet per barrel, an oil well classification be defined as any well producing with a gas-oil ratio of less than 25,000 cubic feet per barrel.

(Thereupon, Applicant's Exhibit No. 1-A was marked for identification.)

Q Mr. Marshall, I direct your attention now to what has been marked as Pan American's Exhibit No. 1-A. What does that exhibit reflect?

A Exhibit 1-A is a structure map of the Angels Peak-Gallup Field which is contoured on top of the Gallup pay sand in this Field. The contour interval is 25 feet.

Q Does that Exhibit reflect the boundary outline of El Paso's Huerfano unit?

A Yes, El Paso operated Huerfano unit is bounded by a dashed heavy blue line.

Q Does the area of that unit exceed the limits of your map to the South and to the East?

A Yes, sir, the Huerfano unit extends off of this map to the South and East.

Q All right, sir. Within the productive area of the Field and within the unit boundary, there are two tracts that are not committed to the unit. How have you designated those tracts?

A Of the tracts that are within the unit area, which are not committed to the unit, in which there is some development taking place in the Gallup, or is taking place, I have outlined in purple. These two tracts are Section 34, Township 27 North, Range 10 West, and the E/2 of Section 19, Township 27 North, Range 10 west.

Q Now, one of those non-committed tracts is Mr. Weaver's tract, and it has four wells on it, does it not?

A Yes, sir.

Q Now, the other tract, who operates it?

A Frontier Refining Company.

Q Does it have a well on it at this time?

A They are presently, I believe, in the process of completing a well on this structure.

Q All right, sir. What is the significance of these horizontal green lines? I notice one to the North and one to the South of your Exhibit.

A These green lines are the approximate limits of commercial production based on the information which is available to date on this Field.

Q And the one to the North being your approximate limit of the oil production, the one to the South the approximate limit of the gas production?

A Yes, sir.

Q What is the purpose of the orange band that's on Exhibit 1-A?

A This reservoir contains both gas and oil. As you can note from the contour map, it is dipping to the North, going down to the North. The area above this orange band is gas-saturated, and below, or to the North, is oil-saturated. The orange band itself represents the area of transition between gas and oil, or the area in which gas is immediately overlying the oil and in contact with it.

Q All right, sir. How do you depict the gas-oil contact on Exhibit 1-A?

A I've shown the vertical elevations of the gas-oil contact by a dashed red line. This gas-oil contact at the present time is at plus 430 feet.

Q Now, you say "at the present time." What was your picture of the gas-oil contact at the time of Case 1616?

A Plus 420 feet above sea level.

Q And you have since moved that contact up 10 feet?

A Yes, sir.

Q Why have you done that, Mr. Marshall?

A From information that was available, and the information

that was available at the time of the previous case, indicated that at that time the gas-oil contact was at plus 420 feet. We have since -- since that time information has become available that indicates that the gas-oil contact is presently at 400 and -- plus 430 feet, and has moved from plus 420 feet to plus 430 feet.

Q All right, sir. Going back to the Field limits for just a moment, how is this Field defined generally to the northwest and generally to the southeast, are the limits known?

A The development has not defined the limits of the Field either to the southeast or northwest. Consequently, since the limits are not known in either of these directions, in order to have an area to consider, I arbitrarily cut off the reservoir on each of these flanks. This limit is shown by the irregular solid blue line.

Q How have you distinguished oil wells and gas wells on Exhibit 1-A?

A Gas wells on this Exhibit are shown as a star with a circle around it colored in red. The oil wells are shown as a green circle with a solid dot in the middle. Also, wells which are presently in the process of completing or drilling are shown by two concentric white circles. One well appears on the map which is not a Gallup completion, but I used it for control on structure as well as pay development, and I have shown that well with a cross.

Q All right, sir. What is the significance of the numbers in red opposite each well?

A That is the latest available gas-oil ratio in each of the wells.

Q Now, you introduced an exhibit similar to this in Case 1616, did you not?

A Yes, sir.

Q When you compare this exhibit with that exhibit, is the oil area larger or smaller?

A The oil area is larger.

Q What caused that change, Mr. Marshall?

A One, the vertical rise in the gas-oil contact caused the oil area to become larger and also by virtue of structural control, which was obtained on the recent drilling of Pan American's "C A" McAdams "B" No. 2, located in the NW/4 of Section 28, Township 27 North, Range 10 West. Structure control and pay development control available from that well indicated a nosing of the structure to the north, which increased the oil area size.

(Thereupon, Pan American's Exhibit No. 2-A was marked for identification.)

Q All right, sir. I direct your attention now to what has been marked as Pan American's Exhibit No. 2-A. What is that exhibit?

A Exhibit 2-A is a cross section, the trace of which is shown on Exhibit 1-A as being AA Prime. This section runs from the southeast -- from the southwest to the northeast, starts with El Paso's Huerfano unit 104, goes on through Huerfano unit 103, W. R.

Weaver's McAdams No. 3, Pan American's C.A.McAdams "B" No. 1, and a stick log is shown on Pan American's J.C.Gordon "D" 1. This is the well that is not a Gallup completion and is shown as a cross in Exhibit 1-A. An electrical log was not available on this well to the proper scale, so I used the stick log. The electrical log is available for interpretation, and this log indicates that the main Gallup sand is not developed at that location.

Q Mr. Marshall, from the standpoint of the purpose of this hearing, what is the significance of Exhibit 2-A?

A Exhibit 2-A presents in cross section view the Angel Peak-Gallup reservoir through the area of the trace. As you can see, the pay development in the Angels Peak-Gallup Field is a rather generally dipping monocline, or it is more or less a sand lens that dips to the north. The fact that this reservoir contains both gas and oil is shown by the colors. The red represents the area that is saturated with gas, and the green area, that is saturated with oil. The gas-oil contact in cross section view naturally appears as a horizontal line at plus 430 feet.

Q All right, sir. Where on this cross section would we see the orange band that you have on your Exhibit 1-A? Where would that area be on this cross section?

A That would be the area where the gas or pink color immediately overlies and is in contact with the green or oil.

Q Where is that on that exhibit, immediately to the left of Weaver's McAdams No. 3?

A Yes, sir, to look at this area in a horizontal plane, you would see what is represented by the orange band on Exhibit 1-A.

Q Mr. Marshall, did you introduce an exhibit similar to this in Case 1616?

A Yes, sir.

Q What were the differences, if any?

A I have moved the gas-oil contact to plus 430 feet.

Q By the use of that cross section, Mr. Marshall, would you show me just what happened to move that gas-oil contact up? Did oil move up into the dry gas cap, is that --

A Yes, along this line of contact where the oil is in immediate contact with the gas, the oil moved up a vertical distance of 10 feet.

Q All right, sir. Upon what data do you base that conclusion, Mr. Marshall?

A The data available from the performance of W. R. Weaver's McAdams No. 3, as well as the information which has since become available by the drilling of Pan American's C.A.McAdams "B" No. 2.

Q What happened to Weaver's McAdams No. 3 that indicates movement of oil up into the gas cap?

A This well was originally drilled into the main Gallup pay and encountered gas, I believe reported approximately 5800 MCF of gas daily. Subsequent to that time, the well went to oil. We have pressure information, pressures taken approximately two months apart, which support the fact that at the time the first

pressure was made, it was evidently the column, the well bore was filled with nothing but gas. And at the time the second pressure was made, it was evident that there was oil in the well bore. This information, of course, was available at the prior hearing. However, it was the only information which was available that indicated any move in the contact, and as there had been considerable production in this area, this Section 34 was the first development, it was my opinion that it could very easily be a local condition in that the oil had migrated into the gas cap only in this area.

Q Excuse me for interrupting, Mr. Marshall, I want to be sure I understand. In other words, all these data were available to you at the time of Case 1616. It was your opinion at that time that that was simply a highly localized condition due to the production of gas in that area?

A It was my opinion that that could very well be what it was.

Q You felt that, generally speaking, the contact was still at plus 420?

A Yes, sir.

Q All right. What has happened to make you change your mind in that regard?

A The fact that since the -- since that time, we have -- Pan American has drilled the C.A.McAdams "B" No. 2. This well encountered the top of the main Gallup pay at plus 421 feet. Had the gas-oil contact been at plus 420 or thereabouts, we would have ex-

pected a very high gas-oil ratio on this well, due to the ratios of oil and gas. However, the ratio,measured ratio on completion of the McAdams "B" 2 was 4220. This ratio is exactly what would be predicted in view of the fact that the initial bottom hole pressure measured on the McAdams "B" 2 was 1300 pounds, and showing that the completion had taken place, and we can explain the fact, in fact, predict almost exactly that the ratio would have been in the neighborhood of 4,000. Therefore, that meant that there was evidently no free gas in the vicinity of the well, so that supported the further increase in the gas-oil contact or movement of the gas-oil contact up.

Q Roughly, Mr. Marshall, about how far is Pan American's McAdams "B" 2 from Weaver's McAdams 3?

A It's approximately two miles. That distance coupled with the fact that we had information on the movement of the contact here and here, which more or less centrally locates it with respect to this portion of the reservoir is -- proves that the contact had moved up generally throughout the reservoir.

Q Mr. Marshall, what happens when oil migrates into a dry gas cap?

A It goes -- migrates into the gas cap and establishes a residual oil saturation which is not ever recoverable. It --

Q To reduce that to layman's language, or lawyer's language, would you call that waste?

A Yes, sir.

Q In other words, it is your testimony here that waste has occurred?

A Yes, sir. Undoubtedly, by virtue -- no fault of anyone because the Field was developed in the way it was discovered, in the gas column first, that waste has taken place because of that fact.

Q All right, sir. One other thing I wish you would clear up for me, Mr. Marshall. You attributed the completion gas-oil ratio of 4200 to 1 on your McAdams "B" 2 as being caused by depletion. That well, that was a completion GOR, that well had never produced. How could that be caused by depletion?

A We know that the reservoir pressure prior to any development was approximately 1620 pounds. The fact that the McAdams "B" 2 had an initial pressure of 1300 pounds indicated that the area around that well was being depleted through production of other wells in the reservoir, not from production of it because it had not produced.

Q I see. What, in your opinion, Mr. Marshall, is the approximate solution gas-oil ratio in this pool?

A Between 500 and 600 cubic feet per barrel.

Q All right, sir. Assume along with me that communication in this pool was restricted and that production from other wells had not affected the area of the McAdams "B" 2, and that the well had been completed with a completion pressure approximating 1600 pounds. What, then, in your opinion, would have been the

gas-oil ratio?

A Somewhat less than the solution ratio, which would be somewhat less than somewhere between 500 and 600 cubic feet per barrel.

Q All right, sir. You are recommending a limiting ratio of 2,000 to 1, are you not?

A Yes, sir.

Q And you stated that, in your opinion, the solution ratio is 500 to 600 to 1?

A Yes, sir.

Q Why do you recommend a limiting ratio higher than the solution ratio?

A We have an example in the McAdams "B" 2 of the fact that the ratio increases with depletion. Although it is desirous to produce oil as efficiently as possible and from low ratio wells, there is a practical matter concerned in that the ratio continually increases from the time the well begins to produce, so that if you assigned, although it would be absolutely more efficient initially to assign a limit at the solution ratio, if you did that, it would be only a short matter of time until it would be necessary to increase it. It is my opinion that 2,000 is a reasonable value above the solution ratio to offer a practical gas-oil ratio limit to apply on this case.

Q All right, Mr. Marshall. As a result of the Examiner Hearing on this case, an order was issued adopting a 4,000 to 1

limiting ratio?

A Yes, sir.

Q In your opinion, as an engineer, which ratio would better serve conservation, a 4,000 to 1 limiting ratio or a 2,000 to 1 limiting ratio?

A There is no doubt that in the reservoir, being the type that it is, the 2,000 cubic feet per barrel gas-oil ratio would result in less waste than the 4,000.

(Thereupon, Pan American's Exhibit No. 3 was marked for identification.)

Q All right, sir, you want to return to your seat now. We are through with those exhibits. I direct your attention now, Mr. Marshall, to what has been marked as Pan American's Exhibit No. 3. What is that exhibit?

A Exhibit 3 is a tabulation of gas-oil ratios of various wells in the Angel Peak-Gallup Field showing the well, the date the gas-oil ratio was measured, the oil production, and the gas-oil ratio. These ratios are the same that I have put in red on Exhibit 1-A.

Q While we are speaking of ratios, Mr. Marshall, let me ask you this. In this pool, could you have any difficulty satisfying yourself as to whether a well is an oil well or a gas well?

A No, sir, the ratios are of such magnitudes that there is no difficulty in determining whether a well is a gas well or an oil well.

Q Projecting your thoughts on ahead a little, now, to a later stage of depletion, do you anticipate that you will ever have any trouble in this pool telling whether a well is an oil or gas well?

A As long as the reservoir is -- if the reservoir can be prorated in such a manner as to prevent any further movement of this gas-oil contact, or to prevent -- permit a stabilized gas-oil contact, which I think the various points of the recommendations I made will do, as long as we can maintain a contact stable, I don't see how there could be any difficulty in future classification of a well as to whether it is a gas well or an oil well.

Q All right, sir. Do you have any further comments on Exhibit 3-A before we go on?

A No, sir.

MR. BUELL: May I ask the Reporter. All of your Exhibits will have an "A" after them. If I forget it, will you add it for me?

(Thereupon, Pan American's Exhibit 4-A was marked for identification.)

Q Look at Exhibit 4, Mr. Marshall. What is that Exhibit?

A Exhibit 4 is a tabulation.--

Q 4-A, pardon me.

A Exhibit 4-A is a tabulation of the present data which is available in the -- from wells in the Angels Peak-Gallup Field.

The tabulation lists the shut-in surface pressure, the time that the well had been shut-in prior to measurement of the surface pressure, the date the pressure was measured, the date that the particular well first produced, the cumulative production to the time the test was made, the calculated bottom hole pressure datum of plus 450 feet, and where available, the bomb measured bottom hole pressure at a datum of plus 450 feet.

Q That Exhibit, or rather the data on that Exhibit seems to be more or less self-explanatory. Do you want to comment on it at all?

A One thing I would like to point out is that you'll note, next to the last column is headed "Calculated Bottom Hole Pressure." These pressures were calculated by knowing the shut-in surface pressures as well as certain characteristics of the gas. The accuracy of this method of calculating bottom hole pressures is rather vividly referred to by the Huerfano unit 103. A pressure conducted in March of 1959, the surface -- shut-in surface pressure was 1,066 pounds, using the method of calculating that was used to calculate the remainder of bottom hole pressure, a bottom hole pressure of 1,270 pounds was calculated; on the same date at the same time, a bottom hole pressure which was measured with a bottom hole pressure bomb was 1267 pounds. Also, on the Huerfano unit 107, the calculated pressure was 1412, and the measured 1425. This indicates the rather good accuracy of the method used to calculate the bottom hole pressures.

(Thereupon, Pan American's Exhibit 5-A was marked for identification.)

Q All right, sir. Look at Exhibit 5-A now, please, Mr. Marshall. What is that Exhibit?

A Exhibit 5-A is a graphical representation of the tabular information which was presented by Exhibit 4-A. The graph is a plot of bottom hole pressure versus time. The Exhibit is colored -- coded to show the pressures taken on individual wells. For example, all the yellow dots are pressures taken on Weaver McAdams No. 1.

Q Mr. Marshall, as a reservoir engineer, what is the significance of the data you see reflected on that graphical Exhibit?

A The significance is the fact that a trend is established. These pressures were measured throughout the reservoir at random points in the reservoir at various wells, and at random times; yet they line up in a trend. Now, this indicates that regardless of where you measure the reservoir pressure, or when you measure it, you are going to be on this trend, which means that each producing well is not only, the pressure is not only being influenced by it but is being influenced by other wells that are producing since the trend is established.

Q All right, sir. Do you have any further comments on that Exhibit?

A No, sir.

(Thereupon, Pan American's Exhibit No. 6-A was marked for identification.)

Q Look now at Exhibit 7-A, Mr. Marshall. I beg your pardon, Exhibit 6-A. What does that Exhibit reflect?

A Exhibit 6-A is a tabulation of initial bottom hole pressures of various wells in the Angels Peak-Gallup Field. It shows the date the pressure was measured, the shut-in time in days, the initial bottom hole pressure prior to any production from the various wells, the distance to the nearest producing well in feet, the pressure drawdown caused by interference in pounds per square inch, the minimum drainage area indicated by this pressure interference, the pressure drawdown expressed as a percent of the original reservoir pressure.

Q These data on that Exhibit, Mr. Marshall, seem to be pretty much self-explanatory. Do you have any comment on that Exhibit?

A Yes, sir. I would like to make this comment. In determining the amount of pressure interference or the area that a well will drain, there are two methods to ascertain the area that a well will drain. One is if you have a situation where you have a reservoir which has been discovered and wells subsequently completed, completed after the discovery, and have pressures measured on them prior to any production from them, will show interference from the wells that had previously been producing. Now, that is one way that you can show pressure interference and determine the drainage areas.

Another way is what has been known as, called a formal interference test. This method employs the idea that if you drill a well a considerable distance or a distance from another well, which is producing, or other wells in the reservoir which are producing, and then measure the initial pressure on that well, and then observe the pressure with it not producing, but observing the effect of other wells producing on the well that you have shut-in, if the pressure is drawn down from the shut-in well by virtue of production from other wells, you have established communication and pressure interference. Now, an example of this method is the first method, I'll say first, all of the pressures on this Exhibit, Exhibit 6-A, show the first method in that they are all subsequently completed wells which had pressures, initial pressures less than the initial reservoir pressure, thus indicating that they had been influenced by other producing wells. In regard to the second method or interference test, the Huerfano unit No. 103, in January of 1959, January the 17th, prior to any production from the well, had a bottom hole pressure of 1295 pounds. Now, this well was continued as -- in a shut-in status, it was not produced, and another pressure was measured forty-two days later. At this time the pressure had declined to 1270 pounds, which, of course, conclusively proves that pressure communication between this well and other producing wells existed.

Q All right, sir. Is that all, Mr. Marshall?

A Yes, sir.

(Thereupon, Pan American's Exhibit No. 7-A was marked for identification.)

Q Would you go on, now, to Exhibit 7-A, please? What is that Exhibit?

A Again I've taken the information in the tabular form and put it in a graphical form. Exhibit 7-A is a graphical representation of the tabular information which appeared in Exhibit 6-A. It is a plot of bottom hole pressures versus time, initial bottom hole pressure versus time for the various wells where initial bottom hole pressures were available.

Q What is the significance of that Exhibit, Mr. Marshall, from the standpoint of this hearing?

A This Exhibit vividly demonstrates the influence that wells other than the well on which the pressure was taken which was shut-in wells and were not producing, shows the influence of wells that were producing, the reservoir pressure measured at points where there was no production, as indicated by the curve, was declining at a rate, or rate of decline that would have been expected.

Q Have all the initial pressures of subsequently completed wells been below the virgin original reservoir pressure?

A Yes, sir.

Q Is that what Exhibit 7-A shows?

A Yes, sir.

Q All right, sir. You are going to have to go back to the

board now. Let me direct your attention to Exhibit 8-2. Just flip them all down.

(Thereupon, Pan American's Exhibit No. 8-A was marked for identification.)

Q What is that Exhibit, Mr. Marshall?

A As I've stated before, by taking the pressure information that's available from the various wells in the field and tabulating it in the manner in which Exhibit 6-A was tabulated, it is evident that communication, that the wells in this reservoir are capable of draining wide areas, and also by taking the information, the same information and putting it in a graphical form, it is very vivid, the conclusion is drawn that the wells in this reservoir are draining wide areas. Now, it helps me to see it on the surface, so what I've done with Exhibit 8-A is for each well for which we had an initial reservoir pressure is take a blowup of the area around that well from this map, from Exhibit 1-A, 8-A, is a blowup of the area around the W. R. Weaver McAdams No. 2 and the El Paso Huerfano unit No. 99. As you can see, the initial pressure taken on Huerfano unit 99 taken prior to any production from that well was 1512 pounds per square inch. This was 108 pounds less than the original reservoir pressure in that area, in the field. That conclusively shows that the pressure at this well -- the pressure at this well was being drawn down by production from other wells in the area. Now, the nearest producing well to the Huerfano unit 99 is the W. R. Weaver McAdams No. 2. It is located approximately 3100 feet from the Huerfano unit 99; this is the nearest well which had produced. The fact that the pressure had drawn down so

far out here indicates, in fact, conclusively proves that the No. 2, the Weaver No. 2 had to be draining an area, a minimum area of 693 acres. I've indicated this minimum area of 693 acres by the circle.

Q Why do you say minimum, Mr. Marshall?

A The magnitude of the pressure drawdown, which in this case was 108 pounds, proves that the well was undoubtedly draining more than 693 acres. Had the well been draining only 693 acres, you would have expected the pressure at this point of 99 to be very close to the original reservoir pressure.

Q I see.

A However, it was 108 pounds less.

Q This may seem like a foolish question to you, Mr. Marshall, but I am going to ask it anyway. The initial pressure on this unit No. 99 Well was below original virgin reservoir pressure. Now, is there any way that pressure could have been lowered by the shrinkage of the reservoir rock by anything you can think of? Is there any way that pressure could have been lowered except through production from other wells in the same reservoir?

A No, sir, there would have been no other way to decline the pressure. This well was not produced except by production of other wells producing from the same source.

(Thereupon, Pan American's Exhibit No. 9-A was marked for identification.)

Q I direct your attention, now, to Exhibit 9-A, Mr. Marshall. Is that an Exhibit similar to 8-A?

A Yes, sir. Exhibit 9-A is a blowup of the area on Exhibit 1-A around the Weaver McAdams No. 3 and McAdams No. 4. The

initial measured pressure on the No. 4, bottom hole pressure was 1209 pounds, or 330 pounds less than the original reservoir pressure. This undoubtedly conclusively proves that that well had been influenced or that interference and drainage had taken place by virtue of production of other wells. The nearest producing well at that time to the No. 4 was the Weaver No. 1. This well is located approximately 2450 feet away. The fact that the pressure had been drawn down at this point, 2450 feet from the nearest producing well, conclusively proves that the Weaver No. 1 was draining a minimum of 433 acres. Again, because of the magnitude of pressure drawdown, it was undoubtedly draining more than 433 acres.

(Thereupon, Pan American's Exhibit No. 10-A was marked for identification.)

Q All right, sir. Would you go to Exhibit 10-A, please? That is a similar Exhibit, Mr. Marshall, and I wish for purposes of brevity and time saving, would you just give the name of the wells involved, the pressure drawdown, and the indicated minimum drainage area?

A Yes, sir. This Exhibit is the area of the Weaver No. 1 and the Weaver No. 3. The initial pressure on the No. 3, which is an oil well now, was 450 pounds, or a drawdown of 170 pounds. This conclusively proves that the No. 1, the nearest producing well, was draining a minimum of 488 acres.

(Thereupon, Pan American's Exhibit No. 11-A was marked for identification.)

Q All right, sir. Go on, now, to Exhibit 11-A and briefly tell us what it shows.

A Exhibit 11-A again represents the pressure information, initial pressure information available from the El Paso Huerfano unit No. 103. This well had an initial pressure of 1295 pounds, or 325 pounds less than the initial reservoir pressure. The well evidently was interfered by other wells, the nearest of which is the Weaver McAdams No. 4, 1980 feet away, showing a minimum drainage area for the No. 4 of 283 acres.

Q All right. By that Exhibit, you don't purport to show that the furthest away that, largest area that well will drain was 283, do you, Mr. Marshall?

A 283, no, sir. The fact that is 283 is only because of the location of the well. It was located only 1980 feet from the Weaver No. 4. Now, the fact that this pressure had drawn down 325 pounds by virtue of production from the No. 4 showed that the well was probably draining an area considerably, but larger than the 283 acres, but the well is so located that that would be the minimum drainage.

(Thereupon, Pan American's Exhibit No. 12-A was marked for identification.)

Q All right, sir, would you go to Exhibit 12-A, please?

A Exhibit 12-A is a similar Exhibit showing the pressure information which was available from the Huerfano No. 106. Its initial pressure was 1320 pounds, or 300 pounds less than the initial reservoir pressure. The nearest well to the 106 is the Weaver McAdams No. 4, which is at a distance of 3550 feet. This proves that the No. 4 was draining a minimum of 909 acres.

(Thereupon, Pan American's Exhibit No. 13-A was marked for identification.)

Q All right. Will you go to Exhibit 13-A and tell us what it reflects?

A Exhibit 13-A shows the pressure information which was available from the Huerfano unit No. 107. It had an initial pressure of 1425 pounds, which is 195 pounds less than the original reservoir pressure. This means that the drawn down pressure was caused by production from other wells, the nearest of which is the Weaver No. 3 at 2175 feet, and showing the drainage area of 341 acres. Now, you'll note that both the Weaver No. 3 and the Huerfano unit 107 are oil wells. This Exhibit conclusively proves that not only a gas well but an oil well will drain in excess of 341 acres.

(Thereupon, Pan American's Exhibit No. 14-A was marked for identification.)

Q All right, sir, go on down to Exhibit 14-A.

A Exhibit 14-A shows the pressure information available from Pan American's McAdams "B" 2, a recently drilled well. The pressure -- bottom hole pressure was measured on this well prior to any production, and it had a pressure of 1300 pounds, or 320 pounds less than the original reservoir pressure. The nearest well was the Huerfano unit 105, which is an oil well, and it is located 3100 feet away. Also, the Pan American McAdams No. "B" 2 is an oil well. Now, the magnitude of the pressure interference between these two wells conclusively proves that an oil well can also drain in excess of 693 acres.

Q In other words, Mr. Marshall, based on Exhibits 13-A and 14-A, we see in this pool that oil wells are capable of draining extremely larger areas, do we not?

A Yes, sir, because of the excellent characteristics of the reservoir, and they can also drain relatively wide areas.

Q Do you have any other comments on those Exhibits?

A No, sir.

Q Let's briefly review your remommendations, Mr. Marshall. What size proration unit do you recommend for oil wells in this pool?

A I recommend an 80-acre proration unit for an oil well.

Q All right, sir. We previously discussed your recommended limiting GOR of 2,000 to 1. Unless you have any further comment in that regard, we will go on to another recommendation.

A No, sir, I have no further comment.

Q All right, sir. Let me back up a minute. You do certainly feel or are you a little redundant after your testimony? But you certainly feel that an oil well will efficiently drain in excess of 80 acres, do you not?

A Yes, sir.

Q All right, sir. What size proration unit are you recommending for gas wells in this pool? Let me back up, Mr. Marshall. Instead of saying proration unit, what size, what amount of acreage are you recommending to be assigned to a gas well?

A Up to and including 320 acres per well.

Q In your opinion, Mr. Marshall, will a gas well in this pool effectively drain in excess of 320 acres?

A Yes, I think the data indicates, supports and proves that a gas well will drain considerably more than 640 acres.

Q Do you feel that if the gas cap of this pool is developed to a density of 320 acres, it can be effectively depleted?

A Yes, sir, definitely.

Q You feel that way. Then, you must feel that any greater density than one gas well with 320 acres would result in the drilling of unnecessary wells?

A Yes, sir, I do.

Q All right, sir. Would you state again the allowable that you would assign to a gas well in this pool?

A I would assign an allowable to the gas well equal to the gas limit for the oil well, 80-acre oil well on the surface basis;if the gas well has 320-acres assigned to it, it would receive four times the gas requirement for an 80-acre oil well.

Q And you are recommending the normal unit allowable for an oil well under Rule 505?

A Yes, sir.

Q You have recommended as defining a gas well as any well producing with a ratio of 25,000 to 1?

A Yes, sir.

Q And an oil well is anything below that figure?

A Yes.

Q Do you think we will have any trouble in defining a gas well and an oil well?

A Not so long as the gas-oil contact remains stable.

Q All right, sir. You testified that the gas-oil contact has already moved up structure, up into the gas cap approximately ten feet, have you not?

A Yes, sir, by virtue of the fact,the way the field was developed it has moved up.

Q In view of that, let me ask you this question, Mr.

Marshall. Are you familiar with the order that was issued as a result of the Examiner Hearing in this case?

A Yes, sir, I am.

Q Do you recall that that order contained a provision that after or starting July the 15th no oil well whose casinghead gas was not gathered and saved could produce?

A Yes.

Q In other words, it prohibits the flaring of casinghead gas?

A Yes, sir.

Q Are Pan American's oil wells in this pool connected to a gathering system?

A No, sir.

Q Do you know of a formal casinghead gas gathering system, as such, in the field?

A No, sir.

Q What stage of development would you say this pool was in, initial stage of development?

A Yes, sir, it is still in the initial stages of development.

Q Pan American's oil wells are shut-in, are they?

A Yes, sir.

Q Let me ask you this, Mr. Marshall. Assume for me that the oil wells remain shut-in, the gas wells continue to produce, what will happen to our gas-oil contact?

A Well, as I stated, because the way the reservoir was developed, the gas area being developed first, a certain amount of waste is taking place by virtue of production from the gas cap and

no production from the oil area. Of course, if we shut-in the oil wells now,then the problem will only be compounded and we will further -- cause further waste of oil by virtue of its moving into the dry gas cap.

Q Mr. Marshall, no one likes to make a choice between one type of waste as opposed to another type, but I'm going to ask you to make a change -- choice. Which, in your opinion, would cause the greater amount of waste, the flaring on a temporary basis of the casinghead gas from the oil wells -- I say temporary, meaning until they can be connected, and the gas gathering saved. Would that cause more waste or will more waste result through shutting these oil wells in and allowing the oil to migrate into the dry gas cap?

A It is my opinion that far more waste would result by shutting in the oil wells now at this stage and allowing oil to migrate into the gas cap, oil which will not be recovered,than the small amount of casinghead gas that will be flared over the period until the wells are connected to a cashinghead gas gathering system.

Q Do you have any other comments you would like to make, Mr. Marshall?

A No, sir, I believe not.

MR. BUELL: May it please the Commission, I would like to make a brief explanatory statement. Our testimony has shown that waste has occurred in the field. We said it had because it has, but we do not want that testimony in any way to be taken as critical of either the Commission or of Mr. Weaver. It was one of those things that unfortunately none of us could control. Also, I

would like for the record to be crystal clear in this regard, and that is that Pan American is in complete sympathy with the Commission's efforts to eliminate the flaring of casinghead gas where it is economical and practical to do so. We think our past actions in this regard bare that out, but we have so many unusual factors in this pool. We have the unusual factor that has just been discussed, of having oil in intimate communication with gas. We have the additional practical factors of this field being in the initial stage of development. Actually, I don't believe anyone at this time has sufficient data available to him to adequately plan a gathering system. Data obtained from our McAdams "B" 2, for instance, which has just recently been completed, indicates that the oil area is going to be larger than we had ever anticipated. In view of the unusual factors, I would like to move at this time that in order to prevent waste, the Commission authorize us to return our oil wells to production.

MR. PORTER: Mr. Buell, your motion will be considered along with the entire consideration of the case and in any subsequent order that may be issued. Does anyone have a question of Mr. Marshall?

MR.PAYNE: Yes, sir.

CROSS EXAMINATION

BY MR. PAYNE:

Q Mr. Marshall, wouldn't it be in the interest of conservation to reinject this gas back into the gas cap?

A Which gas are you referring to?

Q The casinghead gas that you are not allowed to flare

at the present time and which you say you cannot gather economically.

A Under ideal conditions, it would be. However, we would be injecting gas from one property into the property of another person, which I don't imagine would be too desirable.

Q Aren't you a big owner in the Huerfano unit?

A Pan American?

Q Yes.

A I believe somewhere in the order of a third.

Q Don't you think also the Commission should look at this thing, the pool as a whole, rather than on the basis of individual properties?

A I think that the Commission should look at it with the idea in mind, of course, to prevent the avoidable waste that could occur as well as to protect the correlative rights of all the people involved in the reservoir.

Q Now, couldn't you prevent waste by reinjecting this gas rather than getting an exception to the no-flare provision?

A Providing I could get permission to do so, yes.

Q Now, referring to your earlier testimony, Mr. Marshall, I believe you said that waste has been caused in this pool ever since the entry of the most recent order, is that correct?

A No, sir.

Q When has this waste that has occurred -- when has it taken place?

A The chief amount of waste that has taken place took place prior to the reclassification of the field from a gas field

to an oil field.

Q Has any waste taken place subsequently?

A By virtue of the history of the field it is rather -- I believe, if I am not mistaken, that for some period after the initial order, the field was produced with a ratio of 2,000 to 1, and subsequent to that an order was issued which produced the field at a ratio of 4,000 to 1. During the period the field was producing at 2,000 to 1, there could have been some. I doubt that any significant waste has taken place. I believe that some waste was taking place during the period that the reservoir was being produced at a ratio of 4,000 to 1.

Q All right, sir. That is due to the oil migrating up structure into the dry sands, is that correct?

A Yes, sir.

Q So what you are saying is that the gas withdrawal rates have been too high?

A Yes, sir, in general.

Q Now, isn't it true that under your proposal, a gas well will be allowed to produce twice what it is now allowed to produce?

A Well, the well itself, but the acreage voidage, or the relative voidage between the gas well and the oil well will be essentially equal. In fact, it will be in favor of the oil well. The oil wells will be voiding more than the gas well. The small amount of the voidage created by the oil as far as the relative voidage, it being equal, the gas well will not be voiding more than twice the oil wells.

Q Aren't they essentially equal, the voidage of the gas-oil, as opposed to the oil well?

A At 4,000 to 1?

Q Yes, sir.

A No, sir. At 4,000 to 1, the wells -- let's see now, the wells which are drilled on 160-acre spacing now have an allowable of around 600 MCF per day. The oil wells under the present rule have an allowable of 150 barrels a day with a limiting ratio of 4,000. The voidage is, of course, in favor a little bit of the oil well. It is approximately equal, that's correct. You are right. At the present time it is approximately equal.

Q Now, doesn't your theory of waste by the migration of oil into the dry sand, isn't that contingent upon the possibility that the entire gas cap will be drilled up on 80 acres?

A No, sir, I don't believe it is. If the entire gas cap were drilled on 80 acres, that would mean that the voidage from the gas well would be 1200 MCF per day for 160 acres. Now, that is twice the voidage that my recommendation proposes, so that if the gas wells are drilled on 80 acres and developed on 80 acres, the voidage would be twice as much. If they are not developed on 80 acres, which I don't see how we can avoid in various areas, the waste would only occur by virtue of the fact that we would allow inefficient oil wells to produce oil because of the high limiting ratio. As far as the voidages, they would be equal. If we assume that all of the oil wells can produce at a ratio of 4,000 to 1, I doubt seriously, as this field is developed, in fact, I know Pan American "B" 1 had a gas-oil ratio so small we couldn't

measure it. If they can produce at 4,000 to 1, we will be all right, but I don't believe they have been able to.

Q What is the smallest proration size that you can economically drill a gas well under?

A In this particular reservoir?

Q Yes, sir.

Q I would say that a reasonable -- to obtain a reasonable return, it would require 320 acres.

Q Now, isn't a gas well under your proposal going to get 1,200,000 cubic feet of gas per day?

A That gas well that is drilled on 320 acres, yes, sir.

Q Now, a gas well only gets 600,000 cubic feet?

A Yes.

Q So there would be twice as much oil migrating into the dry sand under your proposal as there is now?

A Well, it depends; not if -- it depends on what you are assuming. the development is going to be, the development density.

Q That's what I am trying to pin down. You assume that the gas cap is going to be drilled out on 80 acres, do you not?

A Yes, sir. I believe that's the order.

MR. PAYNE: I believe that's all.

QUESTIONS BY MR. PORTER:

Q Mr. Marshall, I believe you recommended a 25,000 to 1 dividing line between an oil well and a gas well; that is gas-oil ratio.. And I believe you also testified that the gas-oil ratios would increase in this pool --

A Yes, sir.

Q -- as it nears depletion?

A Yes, sir.

Q You also said that you didn't have any difficulty distinguishing between an oil and gas well. I can't reconcile all those statements.

A Well, sir, the oil portions, the crude characteristics and the rock characteristics are such that we would expect an increase in ratio as the reservoir is depleted. Now, based on those characteristics, the peak and ratio, or the ratio should peak and start down a little bit at a gas-oil ratio for the oil well of somewhere around 10,000 to 12,000 cubic feet per barrel. Now, by that time, under this proposal, the gas reservoir is going to be depleted. In other words, at the instant of depletion, we have all the oil out that we are going to get out, and the gas there may be still -- we have all the gas we are going to get out. If they were separated and we had the oil area with the characteristics it has, and the gas area with the characteristics it has, the ratio on an oil well would never get over 12,000 to 1; it would start down during the latter stages of depletion. Now, if we put them together, what the ideal conditions are, to try to cause that to exist simultaneously or simultaneous depletion, and by the time the field is so far depleted, the pressure in the gas cap will be so low that there wouldn't be -- it wouldn't be economical to recover any more, and the ratio of the oil well would not have gotten over 12,000 cubic feet per barrel.

Q But that's pretty much of an assumption, you think?

A No, sir. I think from what we know about the reservoir that if we prorate it in a manner as to bring it down together, which I believe we can do --

Q In other words, according to your recommendation?

A Yes, sir. In accordance with my recommendation.

MR. PORTER: Anyone else have a question of Mr. Marshall?

MR. HOWELL: Ben Howell, representing El Paso Natural Gas.

QUESTIONS BY MR.HOWELL:

Q Mr. Marshall, I believe the testimony has previously shown that on Pan American's Exhibit No. 1-A the Weaver Brown wells are located on Section No. 34, which is outlined in purple on the Exhibit, is it not?

A Yes, sir.

Q Now, there is one well in each quarter section which is completed in the Gallup formation on that Section, is there not?

A Yes, sir.

Q And looking at the surrounding sections, it appears that there is no well completed in the SW/4 of Section 35, which adjoins to the East, is that correct?

A Yes, sir.

Q And that there is no well completed in the NE/4 of Section 3, lying directly to the South, is that correct?

A Yes, sir.

Q And that there is no well completed in the NE/4 of

Section 33, which lies directly to the West, is that correct?

A Yes, sir.

Q Now then, if a well is required on each of these offsetting quarter sections, what would be the effect of the completion of those additional three wells in the gas cap with reference to waste? Would it increase or decrease the waste?

A Now, what rate do we --

Q Assuming that the present rule that we are now complaining about is to remain in effect, and that each of these wells would be permitted to produce on the basis of that rule?

A There would be waste occurring by virtue of the fact that we have got the oil wells back here producing at a limit of 4,000 to 1, and they can't make 4,000 to 1 or probably can't, and we will have more migration into the gas cap which will cause waste.

Q The drilling of three wells in those locations will increase the withdrawals from the gas cap under the present rules, would it not?

A Yes, sir.

Q Based upon your testimony as to the area which one well will drain in this pool, would you consider the drilling of each of these three locations to be an unnecessary well?

A Yes, sir, I definitely would.

MR. HOWELL: Thank you.

MR. PORTER: Mr. Errebo.

QUESTIONS BY MR. ERREBO:

Q Mr. Marshall, referring to your Exhibit No. 1, the

northernmost, is that a blue or a green line there? I guess it is a green line.

A Yes.

Q That represents the limits of commercial production, is that what you identify that as?

A Represents my limits of commercial production.

Q You mean by that, that any well drilled inside of that line would be a commercial well?

A Yes, sir.

Q Would you recommend that your management drill a well anywhere inside that line at this time?

A Yes, sir. I'm in the process of recommending some wells back here, a well back up here in Section 20.

Q How is the Jack Frost No. 1 doing now, Mr. Marshall?

A Well, sir, I'm not sure. We, at the present time, have just completed a restimulation of the well.

Q Does it have its load oil back?

A No, sir, not from the restimulation.

Q And it still doesn't have its load oil back after it was fraced the second time, is that it?

A That's correct.

Q Do you think at the present time you have enough information that you would recommend that an offset to that well be drilled, say, to the northwest?

A Well, sir, we have a very excellent offset to that well. The Huerfano unit 107, I believe, flows with a small choke around 150 to 160 barrels a day, so that the payout in that area

certainly indicates further development.

Q I am talking about a northwestern offset to that well. That is still within the green line, isn't it?

A You mean in the same quarter section?

Q Yes, sir, that's what I mean.

A I would naturally want to wait until we -- await the result of Jack Frost. However, by virtue of the fact that we thought enough to have the pay section -- to restimulate that well, I believe that -- it is my opinion that evidence will become available from that well that will support additional development.

Q Actually, as poorly as that well performed, it would be rather foolish to move off and not try to do -- salvage something out of that deal, isn't it?

A Well, yes, sir, it would have been foolish to move off. I would like to make my point clear about the -- what was the question now?

Q Well, I think you have answered my question that I previously asked you. Now, with regard to the performance of Weaver No. 3, that's the oil well, I would like for you to state for me, please, what it is that led you to believe that that well shows a movement of the oil column toward the gas cap?

A Well, the well was initially drilled in -- I believe the well was drilled in with gas, and it was reported that on penetration of the top of the pay sand, the well produced 5800 MCF of gas per day, and in accordance with the report, I see there was no liquid. At the present time this well produces 104 barrels of oil per day, or according to the test conducted March 28,1959,

produces 104 barrels per day with a gas-oil ration of 5,221. I cannot believe that it is possible that the same saturation existed in the section cut by that well at the time it was drilled and at the time this test was taken.

Q Mr. Marshall, would the method of producing that well have any effect upon the apparent gas-oil ratio?

A The method of producing it?

Q Yes.

A Very negligible effect, in my opinion.

Q Do those wells tend to load up with oil when they are shut-in?

A No, sir.

Q They don't?

A No. In fact, you'll notice on one of the previous pressure Exhibits we had, we had a surface pressure measured on the Huerfano unit 107, which is undoubtedly an oil well. It produces with a ratio of 2,573 and flows 140 to 150 barrels of oil per day. A bottom hole pressure was run on that well after a seven-day shut-in. Some gradient steps were taken every several feet, and the well was indicated to have absolutely no fluid in it at the time the pressure was measured.

Q Let's go back to this McAdams No. 3 again, Mr. Marshall. Now, do you know whether that well loads up or not, with oil?

A I have an indication that it does at some time. In fact, one of the reasons for my conclusion that the oil cap has moved into that well is two pressures that were taken which showed -- that one taken in -- I forget the date, but two months

prior to the second pressure, there was no oil in the well bore, and on the second pressure, the pressure indicated that there was oil in the well bore.

Q You know how much oil there was in there?

A No, sir. I can make an estimate.

Q Well, let me ask you this, then, Mr. Marshall. Excuse me, were you through on that?

A Yes, go ahead.

Q Do you know what the producing practices of W. R. Weaver have been in producing this well? By that, I mean do you know whether it has been produced continuously or do you know whether it has been produced for a period and then shut-in for a period and then produced for a period and so on?

A No, sir.

Q Now, if that well did load up, and you've indicated by your testimony that it would have oil in the bore, then, if it were produced continuously over a period of a month, and, say, shut-in only twice, then, you would have a certain amount of oil production which would result from the opening up of the well, wouldn't you, that would be in excess of its normal producing?

A Yes, sir. Of course, that oil had to come from somewhere that was loading the well bore, which, in my opinion, was coming because the contact was moving up.

Q Now then, if that -- would you say, then, that you get an additional amount of oil when you first open the well up and it slugs out?

A Well, I would say this. A ratio measured on a well

immediately after opening it for a short period of time probably wouldn't be representative. You would want to have some production to stabilize the well; the fact that this well evidently stabilized at 104 barrels of oil per day.--

Q Well then, Mr. Marshall, wouldn't it be true that the more times you shut that well in, and then open it again, during the month, as the number of times increased, that you opened and shut it, you would have an increase in amount of oil produced during that month as compared, for instance, to a month when you open and shut the well a fewer number of times, isn't that correct?

MR. BUELL: May it please the Commission, I feel that Mr. Errebo is trying to get Mr. Marshall to criticize Weaver and Brown's operations, which Mr. Marshall is not going to do. We assume Mr. Weaver and Mr. Brown are prudent operators, we assume the data they submit to the Commission is representative, and we so use it.

MR. ERREBO: If it please the Commission, what I'm trying to develop here is that I think the method of operating this well, that I have just been through on this line of questioning has a very definite relationship to the gas-oil ratio that will be indicated. Therefore, the change in gas-oil ratio that Mr. Marshall says has occurred, I think it very well varies with the change in operating conditions. Now, that's the point I'm trying to develop with it.

MR. BUELL: Mr. Errebo, are you admitting that the data your client submitted is not representative? Surely not.

MR. PORTER: Objection overruled.

A I would like to state, Mr. Errebo, to clarify, as far as --

MR. BUELL: Do you recall the question?

A Yes. -- as far as my opinion is concerned, over a period of a month, I do not believe that you could vary the gas-oil ratio. If you had a man out there that was ready to turn the valve off and on every five minutes, if you take the average of a five month period, I don't think the ratio would vary.

Q (By Mr. Errebo) Are you talking about the apparent producing rate as determined from the total amount of oil and gas produced at the end of the month?

A Either that or a twenty-four hour test.

Q Actually, the information that you have on it is based on production information rather than test information?

A I don't believe so. A ratio, 15,000 ratio, which I reported, was a gas-oil ratio filed with the Commission dated March 28, 1959, which was, I believe, a twenty-four hour test. The ratio that I had available, it wasn't exactly a ratio. I believe the report filed with the Commission stated that the well potentialed for 5800 MCF of gas per day and reported no liquid.

Q Well, how about the ratio that you show on your Exhibit 1 for that well? Is that a test ratio also?

A Yes, sir. I believe that is the formal gas-oil ratio filed with the Commission.

Q Now, with further regard to movement of this oil rim or the gas-oil contact, was it your testimony earlier today here, Mr. Marshall, that that movement occurred during a time when there

were no rules in effect other than statewide rules?

A The majority of it, yes, sir.

Q Is it your testimony that no movement has occurred since then?

A I think some movement has occurred since then.

Q Now, since then, since that time, we've had rules in effect which provide for 2,000 to 1 ratio, haven't we?

A For a short period.

Q Is it your testimony that movement occurred during that period of time?

A There was some minor amount of movement. I would say it was negligible during that time.

Q Then, we've had a period of time that the limiting ratio was 4,000 to 1, haven't we?

A Yes.

Q And movement occurred then?

A Yes, sir, I think some of the movement occurred during that period.

Q Now, do you think movement causes waste?

A Yes, sir.

Q Have you made an estimate of how much gas was drawn out of the gas cap during that period of time?

A During the period of time --

Q That the 4,000 to 1 rule was --

A 4,000 to 1?

Q Say, per day.

A Yes, sir. Just a second.

Q Perhaps rather than delaying the hearing, your finding a definite figure on that, Mr. Marshall, let me ask you this question. You have determined what the total amount has been, is that right?

A I have a tabulation showing --

Q Per day?

A The monthly withdrawal.

Q The monthly withdrawal?

A The monthly withdrawal.

Q Is it your opinion that there would be more or less monthly withdrawals under the rules you propose from the gas cap under present conditions?

A Under present development conditions more or less than which now, or than the present withdrawals?

Q Under the rules which you propose, would there be less total gas withdrawn from the gas cap than under the rules that are now in effect?

A No, sir, but there would be less voidage of the oil. The waste caused by decreasing the oil withdrawal is the same as the waste caused by the increase in the gas withdrawal, and the reason it would be less oil withdrawal is that in 4,000 limit an oil well that is not capable of producing 4,000 can't withdraw 4,000, so that you are cutting the -- you are, in effect, reducing the withdrawal from the oil area.

Q Can you tell me whether the total amount of gas withdrawn from a gas cap would be smaller or larger than is now being withdrawn on a daily basis --

A On a 4,000 limit

Q -- under which you are proposing, as compared to now?

A I am proposing that the allowable for 160-acre gas well be set at 600. The result of my proposal, 600 MCF per day under the present rule, I believe, is also 600 MCF per 160 developed acres. The withdrawal of the gas cap, from the gas cap would be identical.

Q I would like to repeat my question, Mr. Marshall. Will you please tell me, Mr. Marshall, under the rules you propose --

A There will be neither more nor less on a per well based --

Q That wasn't my question, Mr. Marshall. My question was this, whether or not the total amount of gas withdrawn from this field through the wells as they now exist, would be more or less under your rules as compared to the present situation?

A It would neither be more nor less, it would be the same.

Q The total amount?

A The total amount, yes, sir. With the existing wells we have the same resulting allowables, providing no wells are drilled on less than 160 acres or no additional wells are drilled.

Q You have qualified that, Mr. Marshall, haven't you? You say "providing." I want to know on the basis --

MR. PORTER: Mr. Errebo, does your question assume that there will be no more wells drilled? You said "through the present wells drilled."

MR. ERREBO: Yes, sir, the situation as we now have it.

MR. PORTER: And the question was -- will you repeat it again, please?

MR. ERREBO: Yes, sir, on the basis --

MR. PORTER: On the basis of the present rule, what you propose?

MR. ERREBO: Yes, sir. Will the total amount of gas be more or less withdrawn from the gas cap under the rules which you propose with the present wells as compared to now?

MR. BUELL: Let's be sure, now, that we've got everything in this question, Mr. Errebo. Do you mean on a surface volume basis, on an acreage basis, on a per well basis, on a total MCF basis, or what?

MR. PAYNE: He means total.

MR. ERREBO: I was making it just as clear as I possibly could, Mr. Buell, and that is the total amount of MCF.

MR. BUELL: Not on any comparative basis?

MR. ERREBO: On any total amount of gas withdrawn under that gas cap, under the rules he proposes, if it was to be put into effect, with the wells we have now, would it be more or less.

A If I am wrong, stop me. You want me to assume that there will be no further production, that we are going to go under what is there now?

Q (By Mr. Errebo) I didn't ask about further development.

MR. PAYNE: The question requires no assumption. He is talking about right now.

A The volume would be the same. It would be not more, not less, it would be the same under the present rules and under my recommendation.

Q Your testimony is there will be no more gas withdrawn from the present wells under your rules as you propose than there is right now under the present rule, is that your testimony?

A That was my testimony. No, sir, excuse me. There will be more gas withdrawn from the gas cap under my recommendation than is being withdrawn at the present time.

Q What will that cause, Mr. Marshall? Will that cause more migration of the oil rim? Will it cause it to migrate further into the gas cap;if it is migrated at all, will it aggrevate the situation which you say is now occurring?

A To answer that question we will take the number of gas wells and the number of oil wells. I have based my recommendation on full development of the field. Now, I've said that under the full development of the field, which we can't tell whether it will be next week or two years from now, the voidage would be equal, and there would be no waste. Right now, as we have one,two,three, four,five,six gas wells, and one,two, three, four, five, six oil wells, two of those wells are drilling. When these wells are producing, since the number of wells will be equal, I can't see that there will be any waste occurring.

Q Do you think there is any waste occurring now?

A Definitely, right now, because Pan American's wells are shut-in, and I believe the only wells producing are the gas wells.

Q Well, let's assume that the wells were being produced, then do you think that waste would occur under producing conditions that would result from the rules which are now in effect?

A Yes, sir.

Q Other than the shut-in?

A Yes, sir, because the wells -- there are several wells, two that I know of, and possibly there will be more that can's produce a ratio of 4,000.

Q You say that they can't produce a ratio of 4,000?

A Yes, sir.

Q How many of those wells are there?

A Right now, well, there is two right now. Well, actually, the Frost is not producing at the present time either.

Q Well, actually, how many wells are there on your Exhibit No. 1 that show a gas-oil ratio in excess of -- let me strike that, if you will, please. How many are there, wells that show a gas-oil ratio less than 4,000 to 1 as appear on your Exhibit No. 1?

A Two.

Q And which are those two?

A The Frost, when it was producing, and the Huerfano unit No. 107.

Q Actually, the Frost shows TSTM, doesn't it, doesn't show any ratio?

A Yes, sir.

Q How many wells are there as compared to those one or two, however you want to look at it, that produce in excess of 4,000 to 1?

A You mean of the wells I am calling oil wells?

Q The wells shown on your map?

A Well, all the rest of them.

Q How many are there, do you know?

A Six gas wells, and one, two, three, four oil wells.

MR. ERREBO: That will be all.

MR. PORTER: Take a ten-minute recess.

(Short recess)

MR. PORTER: The hearing will come to order. Mr. Payne.

QUESTIONS BY MR. PAYNE:

Q Mr. Marshall, I believe you testified that in order to have an economic gas well in this pool, you have to be able to dedicate 320 acres to it, is that right?

A I testified that to have a reasonable return on investment you would have to, yes, sir, dedicate 320 acres to it.

Q Is there a distinction or is it distinction without a difference?

A It depends on your definition of economical. If you say can we make any profit down to a dollar, I believe we could

make some profit on a hundred and sixty acres. However, I don't think the return would be realistic.

Q I see. You think it would have to be 320 to have a reasonable return on your money?

A Yes, sir.

Q Now, what you are worried about here in wanting to change the ratio from 4,000 to 1 to 2,000 to 1 is actually total gas produced out of the gas cap, is it not? You want to hold withdrawals down in the gas cap so that the oil doesn't migrate up structure?

A Yes, sir. I want to provide essentially equal withdrawal so that the contact won't move either way.

Q And you are not so concerned about the gas withdrawal rates at present, are you?

A No, sir.

Q What you are worried about is additional wells being drilled in the gas cap?

A Yes, sir, I'm assuming the development of the field.

Q All right, sir. If you can't get a reasonable return on your money unless you drill on 320, then how can you assume that this pool will be drilled up on either 80 or 160?

A Well, sir, we don't operate -- I'm giving that as Pan American's opinion. We don't operate all the wells. In fact, Mr. Weaver has already drilled to a hundred sixty acre density. Evidently he believes that he can show a return on 160 acres. We are

of the opinion that we cannot.

Q Let me ask you this, Mr. Marshall. Does the United States Geological Survey require an offset well if you can establish it is uneconomical to drill a well?

A I don't -- I'm not sure of the regulation. I don't believe so.

Q So that --

MR. BUELL: Excuse me, Mr. Marshall. Unless he knows of his own knowledge, Mr. Porter, he shouldn't answer that question because he is not an expert on their policies. I couldn't answer it myself.

MR. PAYNE: The Commission will take administrative notice of that fact.

MR. HOWELL: If the Commission please, we expect to put on a little testimony about what the United States Geological Survey requested, and they have a representative here, and I suggest that --

MR. PAYNE: Are you controverting the point, Mr. Howell, that they do not require an offset well, and if you establish it, it would be uncommercial?

MR. HOWELL: I am prepared to put on testimony that the United States Geological Survey has required the drilling of three offset wells in this section.

MR. PAYNE: That does not conflict with the point that I am asking the Commission to take administrative notice of.

MR. HOWELL: We certainly would not stipulate that that is a fact; that we have a representative of the Survey here that I suspect can meet with the Commission, if necessary, that could establish the surveys position.

MR. PAYNE: Do you intend to call him as a witness?

MR. HOWELL: No, I do not, because he is here, available; we expect to put on testimony as to what the survey has requested of us as a unit operator.

MR. PAYNE: Pending such time until we find definitely what the U.S.G.S.'s position is, we withdraw the request that the Commission take administrative notice of it with the proviso, if I am correct in my understanding, that the Commission takes administrative notice of it at such time as it is determined.

MR. PORTER: Perhaps it may be developed through a later witness -- subsequent witness.

MR. HOWELL: If the Commission please, if we could employ Mr. Payne to get the Survey, to keep the Survey from drilling those wells, we will be delighted to have him.

MR. PAYNE: I am talking about when they require an offset well and when they do not only.

MR. HOWELL: I am talking about something specific.

MR. PAYNE: So am I.

Q (By Mr. Payne) Mr. Marshall, are you aware that the pool rules for this pool went into effect on June the 1st?

A Yes, sir.

Q Are you also aware that the no-flare provision didn't go into effect until July the 15th?

A Yes, sir.

Q Did your company make any bonafide effort to get a market for this gas or to make plans to reinject this gas during the forty-five day period?

MR. BUELL: May it please the Commission, I might be able to answer that better than Mr. Marshall. We have entered into preliminary negotiations with El Paso, who is the most logical purchaser; a very preliminary negotiation.

MR. PORTER: Anyone else have a question of Mr. Marshall? Mr. Utz.

QUESTIONS BY MR. UTZ:

Q Mr. Marshall, do gas wells in this pool produce a certain amount of liquids?

A Yes, sir.

Q Referring to your Exhibits 8-A through 14-A, where you purport to show interference, how were these bottom hole pressures taken?

A I believe I can go by this tabulation here. The pressures were calculated from surface pressures except on Exhibit 6-A. There are three initial bottom hole pressures by which there is an asterisk. These pressures were bombed measured pressures.

Q Is that on the 107 and the 103?

A The 103, 107, and Pan American's McAdams "B" 2, yes, sir.

Q Well, a number of these Exhibits, then, were calculated, those wells shown on the Exhibit?

A The bottom hole pressure was calculated, yes, sir.

Q Do you know whether or not there is any liquid in the well bore?

A It is my opinion that based on the places that we did have measured bottom hole pressures, except for the McAdams "B" 2, of course, which had liquid in the hole, but the Huerfano 103 did not have any liquid in the hole at thetime that bottom hole pressure was measured, and in fact, the Huerfano unit 107, which produces quite a bit of oil, it did not have any liquid in the bore when the bottom hole pressure was measured, and in line with the values and examination of the values that resulted, together with those two facts, it is my opinion that there was no liquid in the bore of these gas wells which I calculated the bottom hole pressure for.

Q You base that on the ones that you did take bottom hole pressure on?

A Yes, sir.

Q And how many of those were oil wells?

A Two.

MR. UTZ: That's all.

MR. PORTER: Anyone else have a question of Mr. Marshall?

MR. BUELL: May I formally offer at this time, may it please the Commission, Pan American's Exhibits 1-A through 14-A?

MR. PORTER: Without objection, Pan American's Exhibits 1-A through 14-A will be admitted into the record.

REDIRECT EXAMINATION

BY MR. BUELL:

Q Mr. Marshall, I want you to assume for me that under the present rules of 80-acre units for both oil and gas wells, a 4,000 to 1 limiting ratio, which we now have, Assume further, that the field is completely developed under these rules. I want you to compare that with your recommended rule and assume complete development. Under those two assumptions, which would result in the greater gas withdrawal?

A The rules which are now in effect governing production.

Q And your recommendations would result in less total gas withdrawals?

A Yes, sir.

Q All right, sir. You earlier answered a question that conservation would be served by reinjecting the produced casinghead gas into the gas cap, is that right?

A Yes, sir.

Q Were you answering that question as a true scientist, looking only at the ultimate end and increased oil recovery?

A Yes, sir.

Q Let's go, as a scientist, a little further, Mr. Marshall, and I want you to tell me from a scientific viewpoint alone which would be the more efficient way, ignoring correlative rights,

which would be the most efficient way to produce this field to get the maximum amount of oil?

A To shut-in the gas wells, possibly, in addition, reinject casinghead gas into the gas cap. Of course, that would be a form of secondary recovery. As far as primary recovery is concerned, the greatest primary recovery would result from shutting in the gas wells and producing the entire reservoir through the oil wells, if you are not going to worry about correlative rights.

Q But as you say, when you do that, you close your eyes to correlative rights?

A Yes, sir.

Q And production in that manner would result in damage to correlative rights?

A Yes.

Q Pan American is an interest owner in the Huerfano unit, is that right?

A Yes, sir.

Q Are there other owners?

A Yes, sir.

Q Also there are some developed tracts in the unit area in the gas cap which are not even committed to the unit, is that right?

A Yes, sir.

Q Mr. Marshall, I thought we were going to let the Jack Frost thaw out a while, but apparently we are not, so let me direct

your attention to what will be marked as Pan American's Exhibit 15-A. What is on that Exhibit, Mr. Marshall?

A This Exhibit shows the electrical log sections on Pan American's Jack Frost "B" No. 1, and El Paso's Huerfano 107.

Q All right, sir, what kind of a well is the Huerfano 107?

A It is a flowing oil well. On the latest gas-oil ratio test measured, taken the 29th of March, the well flowed 290 barrels of oil per day with a gas-oil ratio of 2573. On the latest production test only the well flowed 154 barrels of oil per day through a 20/64 inch choke.

Q Is the Huerfano unit 107 an offset to the Jack Frost "B" 1?

A Yes, sir, it is a diagonal offset.

Q And it is an excellent oil well in this pool?

A The 107.

Q One of the better ones?

A Yes, sir.

Q All right. Would you compare the log on the Huerfano unit 107 with the log on Pan American's Frost "B" 1?

A In my opinion, the electrical log is indicating that the pay section in these wells is for all practical purposes identical.

Q All right, sir. What other information do you have on this Exhibit with reference to the Frost "B" 1?

A We have a core analysis -- results of a core analysis taken on the pay zone.

Q What does it reflect?

A It shows that over the approximate 8 feet of pay, main pay, that the porosity is around 8 or 9 percent, and that the permeability varies between a very small amount to up to 6, 7 milladarcies.

Q What is your opinion of the potentialities of the Frost "B" 1 from the standpoint of an oil producing well?

A From the information here, it is my opinion that it should be a comparable well to the Huerfano unit 107.

Q You have enough confidence in it to recommend an expensive work-over job, do you not, --

A Yes, sir.

Q -- which Pan American is in the process of executing at this time?

A Yes, sir.

Q And you feel the chances are good that the Frost "B" 1 will make a commercial oil well in this pool?

A Yes, sir.

MR. BUELL: May I formally offer Pan American's Exhibit 15-A?

MR. PORTER: Is there objection to the admission of this Exhibit?

MR. BUELL: That's all I have at this time.

MR. PORTER: It will be admitted.

(Thereupon, Pan American's Exhibit No. 15-A was received in evidence.)

MR. ERREBO: I have some questions.

MR. PORTER: Mr. Errebo.

QUESTIONS BY MR. ERREBO:

Q Mr. Marshall, is the Huerfano unit No. 107 producing oil through the perforations above the line that you have identified as top main sand?

A The well is producing from all the perforations. It is my opinion that a minor amount of oil is coming from above that line that you referred to.

Q You intend to perforate the Jack Frost "B" 1 to a comparable depth?

A No, sir.

Q You don't? Why not?

A Because we have perforated our McAdams "B" No. 1, which is not shown on this section at comparable depths and tested it, and it is our opinion that the intervals above the top of the main sand are producing essentially gas with very little oil.

Q Mr. Marshall, you don't mean to tell this Commission that you expect the Jack Frost "B" 1 to be as good a well as the Huerfano unit 107, do you?

A Well, sir, I would expect it to be a comparable well, yes, sir.

Q You mean as good a well?

A Yes, sir.

Q Now, do you feel that these sands get poorer in porosity and permeability as you go toward the edge of the field, northeast?

A I don't -- evidently -- yes, yes, I do feel that there is a decrease in thickness, certainly. And evidently there is also a decrease in the pay quality.

Q Then, you wouldn't expect the Jack Frost "B" 1 to be as good a well, would you?

A Well, we have a log on both wells. The information that we can take from the electric log indicates that the development is essentially the same.

Q Even though it's lower on structure, is that right, and further toward the -- what you defined as commercial limit of production?

A It is in the same trend, but it is a little bit down structure, 25 feet, 24 feet.

Q Did you drill the Huerfano unit No. 107, Pan American?

A No, sir.

Q Was that information available to them when they drilled the Jack Frost "B" 1?

A The information -- let's see, --

Q The logs?

A Let's see,if the well was completed, I am sure. --

Q I was just wondering, Mr. Marshall, if you expect a

comparable well, why you didn't get that comparable well the first time around on this then?

A Well, we wish we could have, but we feel that through certain things that happened in drilling this well -- for instance, while coring the well, it was unavoidable, but we lost 300 barrels of mud to the formation. We believe that the damage which resulted to the pay section was not repaired by the first stimulation, and we feel that by restimulating the well, we have a good chance to repair that damage.

MR. ERREBO: Thank you. That's all I have.

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

(Witness excused)

MR. PORTER: Does this conclude your testimony, Mr. Buell?

MR. BUELL: Yes, sir, that's all at this time.

MR. PORTER: Mr. Howell, do you desire to present testimony?

MR. HOWELL: We have two witnesses we would like to call, Mr. Rainey and Mr. Lemon.

MR. PORTER: Will the witnesses stand and be sworn, please?

(Witnesses sworn)

MR. HOWELL: If it please the Commission, at this time we would like to introduce the record of the testimony offered by

El Paso at the Examiner Hearing, the hearing, beginning at the middle of Page 165 and continuing through Page 201 of the record of the Examiner Hearing, and the two Exhibits which were introduced by El Paso in that hearing. I think in the interest of time that it might save quite a little bit of testimony here.

MR. PORTER: Is there objection to Mr. Howell's motion? That portion of the record will be made part of the record in this case.

DAVE H. RAINEY,

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

DIRECT EXAMINATION

BY MR. HOWELL:

Q Will you state your name, please, to the Reporter?

A Dave H. Rainey.

Q Are you the same David H. Rainey who testified in the Examiner Hearing.--

A Yes, sir.

Q -- in this case?

A Yes, sir.

Q Now, have you prepared, Mr. Rainey, a plat graphically showing the relationship between Section 34 and the surrounding portions of the Huerfano unit?

A This was prepared by our Land Department based on the information available to them, and they furnished it to me.

Q Will you please mark this as El Paso's Exhibit 1-A?

A Yes, sir.

(Thereupon, El Paso's Exhibit No. 1-A was marked for identification.)

Q Now referring to El Paso's Exhibit 1-A, is the north line, boundary line of the Huerfano unit shown running just to the north of Section 34 in Township 26 North, Range 10 West?

A Yes, sir, it is, by the heavy dashed line in the north edge of that section.

Q And is the acreage which has been committed to the Huerfano unit immediately surrounding Section 34 shown in red?

A Yes, sir.

Q And is Section 34, which is the Weaver Brown section, committed to the Huerfano unit?

A No, sir.

Q Now, do you know of the request made by the United States Geological Survey for the drilling of offset wells to protect the boundaries of the Huerfano unit?

A Yes, sir. The United States Geological Survey has advised us that they intend to ask -- I don't know whether the formal request has actually been made or not, but they intend to ask for an offset in the SW/4 of Section 35, the NE/4 of Section 3, and the NE/4 of Section 33, all surrounding the so-called Weaver and Brown lease in Section 34.

Q By another witness we will expect to introduce testi-

mony regarding the company's attitude toward the drilling of those additional offset wells. Now, passing to another phase of the testimony, Mr. Rainey, have you had occasion to examine pool rules issued by this Commission covering all that you were able to find in the State?

A Yes, sir.

Q I'll ask you to state whether or not you have found any pools in which the rules permit different spacing for oil wells and for gas wells?

A Yes, sir. There are ten gas pools in the State of New Mexico that I can find in the currently existing rules which provide for different spacing for gas wells and oil wells.

Q And I believe that at the Examiner Hearing you testified with reference to the Blinebry Pool, that although there are two pools designated, one is the Blinebry Oil Pool and one is the Blinebry Gas Pool; the vertical and horizontal limits are identical for the two pools?

A Yes, sir, that is correct.

Q And in that Blinebry situation, is there different spacing for oil wells and gas wells?

A Yes, sir. There is 160-acre spacing on gas wells and 40-acre spacing on oil wells. I might --

Q Go ahead.

A I might point out that there are a number of these rules. One, two, about four of these rules have been written in

the last two years which provide for different spacing for gas wells and for oil wells in the same pool.

Q I believe that at the Examiner Hearing you submitted as El Paso's Exhibit 2, proposed rules for the Angels Peak oil pool?

A Yes, sir.

Q Are there any changes or suggestions that subsequent study has led you to offer at this hearing?

A Yes, sir. We had a provision in the proposed rules that we submitted at that time, that no gas either dry or casing-head gas produced in the Angels Peak oil pool shall be flared or vented. And at this time, in the light of testimony of Pan American's witness, I think we would like to amend that one rule which was Rule 9 to provide that no dry gas produced from the Angels Peak-Gallup Pool shall be flared or vented.

Q Do you have any further testimony, any other matters that you wish to testify to before the Commission?

A I might point out one thing. With respect to our Exhibit 1-A, there was considerable testimony a moment ago, and I do not pretend to be an expert on U.S.G.S. rules and regulations, but I do know that the U.S.G.S. has advised us that as far as they are concerned, the question of economics does not enter into this particular case. Where there is drainage offsetting the unit and under the provisions of unit agreement, they are going to request we drill those three offset.

MR. HOWELL: I think that's all.

CROSS EXAMINATION

BY MR. PORTER:

Q Mr. Rainey, how would you define dry gas here?

A In our previously submitted suggested pool rules, we made the definition of a gas well as a well that produces with a gas-oil ratio of 30,000 to 1 or more; 30,000 cubic feet of gas per barrel of oil or more, and I think in that case the definition of dry gas would be gas produced from a gas well under that definition of a gas well.

MR. PORTER: Anyone have any questions of Mr. Rainey? Mr. Nutter.

QUESTIONS BY MR. NUTTER:

Q Mr. Rainey, --

A Yes, sir.

Q -- what are you proposing today, that there be an increase in the amount of acreage that be dedicated to a gas well?

A We are proposing exactly the same thing as we proposed in the Examiner Hearing, which is 320 acres, up to 320 acres to a gas well, as defined by the definition I just mentioned.

Q Well, now, we have heard mention of three wells that the U.S.G.S. has indicated to you that they would request?

A Yes, sir.

Q Now, one of those wells is in Section 3, correct?

A Yes, sir.

Q Now, how would you avoid having to drill that well if you had this 320-acre spacing?

A We would dedicate the E/2 of Section 33 to the well that is in the SE/4 at the present time.

Q Now, another requested well is going to be in the NE/4 of Section 3?

A Yes, sir.

Q How would you avoid having to drill that one?

A Dedicate the N/2 of Section 3 to the existing well in the NW/4.

Q Now, the other well is in the SW/4 of Section 35?

A Yes, sir.

Q How would you avoid having to drill that well?

A That well we would probably have to drill because of the fact that our Huerfano 107, which is in the NE/4 of that section, is classified, or would be classified under the terms of our definition as an oil well.

Q So actually, --

A Consequently, we would not have a gas well offsetting the Weaver McAdams No. 2.

Q We are talking about two wells --

A We are saving two wells at a cost of between two hundred and -- two hundred fifty thousand dollars.

Q We are talking about two wells rather than three?

A Yes, sir.

MR. NUTTER: Thank you.

QUESTIONS BY MR. PORTER:

Q Mr. Rainey, considering the pool as a whole, gas, oil and everything, do you think more or less waste would occur under your proposed pool rules than would under the rules established by the recent order?

A It is my opinion that there would be less waste in that there would be considerably fewer wells drilled in the so-called gas cap area, and there would consequently be total less gas production over the life of the field from the gas cap area than under the existing rules.

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

(Witness excused)

MR.HOWELL: Mr. Lemon, will you take the stand, please?

RICHARD F. LEMON,

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

MR. HOWELL: We would like to offer El Paso's Exhibit 1-A in evidence at this time.

MR. PORTER: Was this prepared by the witness?

MR. HOWELL: It was prepared and delivered to the witness. It was not prepared by the witness, it came out of the Land Department. It is a correct representation of the location of the area.

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

DIRECT EXAMINATION

BY MR. HOWELL:

Q Will you state your name for the record, please?

A Richard F. Lemon.

Q Are you the same Richard F. Lemon who testified in the Examiner Hearing of this same case?

A Yes, sir.

Q Now, without going over again the testimony which you gave in the previous case, will you please tell the Commission what additional information has come to you since that testimony, what additional data you have, what additional study you have done, and what conclusions you have reached as a result of any additional data and study?

A Well, I restudied the information with the emphasis placed on spacing, drainage, and since the previous hearing Pan American has completed their Forst 2 "B" or McAdams 2 "B", and from that measured pressure, it confirms what I had previously concluded prior, that one oil or gas well would drain in excess of 320 acres. The fact that the McAdams Well 2 "B" registered a pressure of approximately 300 pounds less than the initial pressure is sufficient evidence that that area has been drained by offsetting wells, and that, therefore, one oil well in that case will drain in excess of 320 acres.

Q Now, also during the period of time under study, was one of the Huerfano unit wells shut-in over a period of time -- was not produced over a period of time? I believe Mr. Marshall --

A Mr. Marshall mentioned that, yes, sir.

Q Are you familiar with that situation?

A Yes, sir.

Q And was there a loss in pressure from the time this well was not producing for a period of time?

A That is correct. There was a lapse of time there of forty-two days during which time there was approximately a 20 to 30 pound drop in pressure.

Q And what is the closest well to that particular well that was producing?

A The closest well is the Weaver and Brown McAdams 4, and that is located approximately, about 2,000 feet from the 103.

Q And over the period of forty-two days when the Huerfano unit well was not produced, there was a substantial drop in pressure?

A There was a noticeable amount of pressure which would be caused by offset production from McAdams No. 4.

Q Have you prepared any exhibits or schedules which you desire to introduce to summarize what your studies have been since the other testimony?

A Yes, sir.

Q Will you please state to the Commission what they are?

Will you please mark one as El Paso's Exhibit 2-A?

(Thereupon, El Paso's Exhibit 2-A was marked for identification.)

Q Now, will you state to the Commission what El Paso's Exhibit 2-A represents?

A El Paso's Exhibit 2-A is a diagram, a theoretical diagram showing the reservoir pressure profile under existing conditions that would exist in the Huerfano unit area, summarizing what one would find here. We arbitrarily selected the area and wells shown there, which are the Huerfano No. 107, Weaver and Brown McAdams 2, Weaver and Brown McAdams No. 4, Huerfano unit No. 6, and Huerfano No. 105. Line A indicates the original conditions that existed before any production occurred. The area, curve B, shows the type profile that one would find after a small amount of production from the Weaver-Brown 2 and 4 wells. The curve C would show the pressure profile at a later time with more production withdrawn from the area.

Q To be sure, there is no misunderstanding of this Exhibit, El Paso's Exhibit 2-A, am I correct in understanding that this is a theoretical condition which will exist in any reservoir in which there is communication between wells?

A That is correct.

Q And represents the experience that has occurred in a good many reservoirs?

A That is true.

Q Now then, in examining this particular area and particular reservoir, did you find the pressures to correspond with the theoretical communication?

A That is right. For instance, in the Huerfano unit 107, although this diagram is not to scale, it does show that assuming a drop had occurred there, had it occurred, the pressure front caused by production from the Weaver-Brown acreage would have moved past that location. That is, any time you find a drop in pressure at a location before that particular well is produced, there must be communication which is caused by the offsetting well's production, and likewise, on the unit No. 106, Huerfano, you have a similar type drop. The main purpose of this Exhibit is simply to show visually what would occur in a reservoir; the idea being that we are mainly concerned here with whether a well will drain 320 acres or whether it won't.

Q Well, I'll ask you as to whether you have prepared an exhibit which we have marked El Paso's Exhibit 3-A?

A Yes. Exhibit 3.

(Thereupon, El Paso's Exhibit 3-A was marked for identification.)

Q And state to the Commission what that exhibit represents.

A Exhibit 3-A is a plat of a portion of the Angels Peak Field showing the various well distances. The distances represented here are surface distances; that the bottom hole distances

would not vary appreciably from these numbers; these are approximate figures. I might point out that,assuming 320-acre spacing, the diagonal distance between wells would be something in the order of 3750 feet. The mid-distance between the wells would be 1875 feet. Therefore, the distances shown between wells here are all in excess of 1875 feet, so that if one can show that a drop of pressure occurred due to the offsetting well's production, then communication must exist to that point. Hence, 320 acres or in excess would be established.

Q Now, would you state to the Commission what your Exhibit No. 4-A represents?

(Thereupon, El Paso's Exhibit 4-A was marked for identification.)

A Exhibit 4-A is a plat showing the initial pressures on the surrounding wells to the Weaver acreage versus time, in addition to cumulative gas production plotted versus time, the idea here being simply to show graphically if any drop in pressure has occurred from the -- in the surrounding wells. They were drilled at a later date from the Weaver acreage, and assuming communication existed, a drop in pressure should be obtained upon initial completion of the offsetting wells. The first well I have marked on the diagram, the upper portion there, is the E. P. and G. Huerfano No. 99. In that particular well I used the well head surface pressure, and computed the bottom hole pressure from that; an estimated value, assuming that you wouldn't have any oil column

in the well. The drop in pressure obtained in that well is approximately 115 pounds. The numbers at the top there apply to the plat here, as far as the well's location, the footage underneath that indicates the footage between the nearest producing well, so that the McAdams 2 production and probably the well, other wells on the lease, cause approximately a 115 pound drop in that well.

Moving across the diagram, the next well that I have noted on that is E. P. and G. Huerfano unit No. 105. At the time that well was completed, the nearest producing well to that well was the McAdams No. 1, and the distance across there is 8250, so that getting back to the idea of the half distance between wells of 1875, you would have way in excess of 320-acre drainage.

The Column marked 3 is the Huerfano unit No. 103. It's nearest offset well is the McAdams No. 4, and in that particular well there we did have a measured bottom hole pressure, and the value obtained at the datum I selected, which was plus 420, was 1270 pounds. So in that particular well there is a 370 pound drop from the initial conditions, so indicating a substantial amount of drop there. The distance between wells is 2,000, which is very near 320-acre spacing.

Column 4 applies to the Huerfano unit No. 6. The nearest producing well is the McAdams No. 4, at a distance of 3500 feet there, with the bottom hole pressure from the surface pressure with an indicated drop of 290 pounds.

The Column marked 5 applies to Huerfano unit No. 107, the

nearest producing well being the McAdams No. 3, at a distance of 2,000 feet. In that particular well we had a measured bottom hole pressure corrected to datum of 1428, which was 212 pounds below the initial pressure.

Column 6 applies to Pan American's McAdams 2 "B" which is an oil well, according to Mr. Marshall's testimony, and the nearest producing well to that well, or the -- let's see, I have several wells indicated there. The Huerfano unit 105 was the nearest producing well. And in addition to that, there is also the Huerfano unit 106 at a distance of 7800 feet, and also the McAdams No. 1 at a distance of 8400 feet; also shown on there is the distance between the McAdams No. "B" 1. When the pressure was measured on the McAdams No. 2, very little production had been taken from "B" 1, so that the main drawdown in that particular well would be attributed to the Weaver-Brown area, plus the Huerfano unit No. 105. The measured bottom hole pressure correct to the datum was 1310 pounds, indicating a drop of 320 pounds; a very substantial drop.

Q And what does the graph at the bottom reflect?

A That reflects the cumulative production at the various times the wells were completed, that is, the initial pressures were measured.

Q Now, Mr. Lemon, from your studies, have you changed the conclusions to which you testified before, that a well, whether it be a gas well or oil well in this area, is capable of draining

at least 320 acres?

A That is correct. There is evidence by the McAdams "B" No. 2 and also the Huerfano unit 107, which are oil wells, that is supported by similar data on wells that would be designated as gas wells under our rules.

Q Now, referring to El Paso's Exhibit No. 1-A, which is on the board behind you, I would ask what would be your recommendations, or your conclusions and recommendations to management about the economic feasibility of drilling additional wells on those three locations surrounding Section 34, that have been mentioned, as requested by the U.S.G.S.?

A I believe that I testified previously that on a 160-acre spacing for a gas well, you would just reach a more or less break even proposition. Therefore, there wouldn't be any additional economic advantage to drilling wells on 160-acre spacing.

Q Well, with the wells that are located there along the unit boundary, do you regard the drilling of wells on 160 as necessary to prevent draining, if the rules which we have requested were adopted?

A No, sir. Any additional wells, those wells that are presently completed would be more than adequate to drain that area.

Q And would you regard the drilling of wells on those three locations as being the drilling of unnecessary wells?

A Yes, sir.

MR. HOWELL: I think that's all.

We would like to offer the Exhibits in evidence. I'll ask a qualifying question.

Q (By Mr. Howell) Mr. Lemon, were these Exhibits prepared by you or under your supervision?

A Yes, sir.

Q Do they correctly reflect the matters to which they refer?

A Yes, sir.

MR. HOWELL: We offer them.

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

(Whereupon, El Paso's Exhibits 1-A through 4-A were received in evidence.)

CROSS EXAMINATION

BY MR. ERREBO:

Q Mr. Lemon, you were carrying me a little fast as you went over your Exhibit here showing a bar graph on the initial --

A That's A.

Q Yes, that's not numbered.

A Yes, that's 4-A.

Q Now, with regard to Well no. 1, that shows that the initial pressure was estimated at 1525?

A That is correct.

Q And that was based on a bottom hole pressure?

A No, sir. That was based on surface pressure converted

to bottom hole conditions.

Q Did you know how much fluid was in the well when that calculation was made?

A Based on my experience with other wells there, I assumed that there was no liquid in there.

Q Assumed that there wasn't?

A That's right.

Q Were you here when Mr. Marshall testified here yesterday -- this afternoon?

A Yes, sir.

Q Mr. Marshall, for Pan American?

A Yes, sir.

Q I believe he testified, did he not, that some wells did have fluid in the bore?

A I think that is correct.

Q Now, then, how about the subsequent pressure, the 1265, was that also estimated?

A No, sir, the 1265 was the well head pressure.

Q That was well head pressure?

A And also I would like to point out that that well is located in an area which would be in the gas cap area, and the conclusion reached because of its location would be such that you would expect the fluid in that well.

Q Were you able to take bottom hole pressures of any of these other wells? I believe you did testify on some of them,

didn't you?

A Yes, sir. We had one on the Huerfano unit 107, and also the Huerfano unit 103.

Q Now, were those both of the pressures which you are comparing, the initial and the later pressure?

A Yes, sir. Also I would like to point out that Pan American ran a bottom hole pressure on their McAdams 2 "B"; that is also a measured bottom hole pressure.

Q But you have no information on those wells as to whether the fluid was in the --

A I have no information on the Pan American well except that there was fluid in the hole.

Q Do you know how many pounds per square inch difference would be made by one foot of fluid in the bottom of the well?

A Well, it depends on the composition of the liquid. If it happened to be oil, I would say maybe three-tenths pound per foot.

MR. ERREBO: That's all I have.

MR. PORTER: Anyone else have a question of Mr. Lemon?

QUESTIONS BY MR. PAYNE:

Q Mr. Lemon, in your opinion, is drainage from the Huerfano unit taking place now?

A Drain --

Q Drainage from --

A In what way?

Q Well, are Mr. Weaver's wells draining acreage in the Huerfano unit?

A Under the current rules, I would say that the three gas wells are producing their limit compared with low ratio oil wells which 107 is actually below 4,000 based on my latest information. The fact that you have an unequaled balance like that, it is possible that some movement of the oil into the gas could occur.

Q But you are not certain whether it is occurring or not, is that right?

A Well, I would presume so.

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

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

(Witness excused)

MR. HOWELL: That's all our testimony.

MR. PORTER: Does anyone desire to present testimony in this case?

MR. ERREBO: If the Commission please, at this point we would like to ask for a five-minute recess to fully determine the extent of the testimony that we should put on.

MR. PORTER: Take a five-minute recess.

(Short recess)

MR. PORTER: The hearing will come to order, please. We will recognize Mr. Errebo.

MR. ERREBO: If the Commission please, W. R. Weaver has no further testimony to offer in this hearing at this time. At the previous Examiner Hearing, Mr. J. Harris testified, gave a geological testimony. Mr. Thomas M. Dugan gave the engineering testimony. We would like to ask that that testimony by both witnesses be incorporated by reference into this hearing record, and that the Exhibits offered at that time also be incorporated into the record of this hearing.

MR. PAYNE: With your permission, Mr. Errebo, I would like to amend your motion, and move that the entire record in that case be incorporated in this case.

MR. ERREBO: That will be satisfactory with us.

MR. PORTER: Is there objection to Mr. Payne's motion?

MR. BUELL: May it please the Commission, may I speak briefly, and only briefly, on this. I ask that Pan American's silence in not objecting to these motions not be construed to indicate complete concurrence in Pan America's legal thinking with the interpretation of De Novo hearing that has been handled here today.

MR. PORTER: The record of the previous hearing will be made a part of the record in this case. Anyone have any statements to make in this case?

MR. HOWELL: If it please the Commission, I would like about three minutes; as an argument to summarize, three to five minutes, and then I will be through.

MR. PORTER: Mr. Thomasson.

MR. THOMMASON: My name is Edwin Thomasson. I am deputy supervisor of the U.S.G.S. in Roswell. I would like to make two brief statements which were asked by your counsel. First of all, it is not the policy of the U.S.G.S. to call on any operator to drill an offset obligation when it can be shown to our satisfaction and to the satisfaction of our engineers and geologists that such location is not economical. Secondly, I would like to point out that in our opinion, under the present rules as they exist in the Angels Peak Field, there is drainage from the Huerfano unit to the Weaver and Brown tracts, and it is for this reason that we have called on the unit operator informally to offset these wells and probably will in the near future call on them formally to do so in the absence of some other arrangement whereby the withdrawals would be equal. Thank you.

MR. PORTER: Anyone else have a statement to make? Mr. Howell, will you proceed?

MR. HOWELL: I would just like to have about three minutes, and look at this Exhibit, El Paso's Exhibit 1-A, and summarize the problem in this respect. That you've got here a question of four wells on 640 acres, that under the Commission's rule, are being permitted to produce the same volumes of gas as four wells on 1280 acres, and that obviously is drainage from the 1280 to the 640 acres, and if the Commission will allocate the acreage as requested, so that the four wells will withdraw ratably

from the 1280 acres with the 640 acres, there is no need for drilling offset wells. The U.S.G.S. would not require them under those circumstances, and there wouldn't be additional unnecessary and expensive drilling into this gas cap. Now, that is the meat in the cocoanut.

MR. BUELL: May it please the Commission, on behalf of Pan American, may I again respectively urge that the Commission give serious consideration to our request to return our oil wells to production.

MR. ERREBO: May it please the Commission, on behalf of W. R. Weaver, we have no objection to the rules as they are now in effect, which were ordered by this Commission as a result of the Examiner Hearing. Certainly, there may be drainage to the Weaver tracts, but if El Paso does not desire to drill their wells to 160-acre density, to protect themselves from it, well, then, that is nobody's fault but their own. We think that the rules in effect now are satisfactory, and in the event the Commission should desire to reexamine them in a year's time, to have time to obtain more data and to more carefully evaluate the situation which we have here, we would certainly be agreeable to that.

MR. PORTER: Anyone else have a statement? Nothing further, we will take the case under advisement.

STATE OF NEW MEXICO )
) ss
COUNTY OF BERNALILLO )

I, J. A. Trujillo, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Proceedings before the New Mexico Oil Conservation Commission was reported by me in Stenotype and reduced to typewritten transcript by me, and that the same is a true and correct record to the best of my knowledge, skill and ability.

WITNESS my Hand and Seal this, the 30th day of July, 1959, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Joseph A. Trujillo
NOTARY PUBLIC

My Commission Expires:

October 5, 1960