BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
March 16, 1960

REGULAR HEARING

IN THE MATTER OF:

Application of Redfern and Herd for the creation of a new gas pool for Gallup production, consisting of portions of Sections 17, 18, and 19, Township 24 North, Range 6 West, and consisting of portions of Sections 13 and 24, Township 24 North, Range 7 West, all in Rio Arriba County, New Mexico.) Case 1915

BEFORE:

Mr. A. L. Porter, Jr.
Mr. Murray Morgan
Governor John Burroughs

TRANSCRIPT OF HEARING

MR. PORTER: We will take up Case 1915.

MR. PAYNE: Case 1915: Application of Redfern and Herd for the creation of a new gas pool for Gallup production.

MR. BRATTON: Howard Bratton, Roswell, New Mexico, appearing on behalf of the Applicants. If we could have one moment to get organized, please.

MR. PORTER: Yes.

MR. SETH: We would like to enter an appearance, Garnett Whitworth and Oliver Seth, for El Paso Natural Gas Company.

MR. COOTER: Mr. Commissioner, Paul Cooter of Atwood and Malone, Roswell, appearing for Pan American, associated with Guy Buell.

I N D E X

MR. PORTER: Does anyone else want to take this opportunity to make an appearance in this case?

MR. ERREBO: If it please the Commission, Burns Errebo of Albuquerque appearing on behalf of Val R. Reese and Associates.

MR. KELLAHIN: Jason Kellahin, Kellahin and Fox, Santa Fe, appearing on behalf of the Standard Oil Company of Texas.

MR. BRATTON: If the Commission please, we have one witness. I'll ask that he be sworn, and then I would like to make a brief opening statement.

MR. PORTER: Will the witness stand and be sworn?

(Witness sworn.)

MR. BRATTON: If I could, I would like to take one word to explain briefly why we're here and what we are asking. This case might properly or normally appear on the nomenclature docket, but it is in the area of the present Escrito-Gallup Oil Pool, and it was requested that it be heard more or less as a companion case with the case of Val R. Reese which was just dismissed.

It appeared that it might be advisable to have both of those cases heard by the full Commission so that all of the parties requested that both cases be heard by the Commission. As has just happened here, Val R. Reese and Associates have dismissed their application, and I believe I can state that we're all in agreement, at least, I know of no disagreement at the moment, as to the application of Redfern and Herd.

Basically our application is for the creation of a gas

pool. We do not ask any special pool rules or regulations. We just ask that an area which we believe is a separate common source of supply producing gas be designated as such.

JACK D. THORNTON

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

DIRECT EXAMINATION

BY MR. BRATTON:

Q Will you state your name?

A Jack D. Thornton.

Q By whom are you employed and what capacity and where?

A Redfern and Herd, as a Geologist, Midland, Texas.

Q Will you state briefly your educational and professional background?

A Graduated with a degree of Petroleum Geology from Texas Tech in 1949. Since that time continuously, I practiced Petroleum Geology, and the last two years continuously in the San Juan Basin.

Q Are you familiar with the area in question in this application?

A Yes.

Q Have you studied this pool and the surrounding area?

A Yes.

MR. BRATTON: Are the witness' qualifications acceptable?

MR. PORTER: They are.

Q (By Mr. Bratton) Mr. Thornton, will you explain briefly,

turning to what has been marked Exhibit A and Exhibit 1, explain briefly what our case is, what we intend to prove, what we are going to try to prove to this Commission today?

(Whereupon, Applicant's Exhibits A and 1 marked for identification.)

A If I may, I would like to pass out the plat that the Commission might use to follow me. The first plat, Exhibit A, is a diagramatic cross section or summary of what we wish to illustrate with the package of plats or the following plats. It shows that we have discovered a sand bar approximately 200 feet downdip from the main portion of the Escrito Pool. It is producing from a clean sand and from further data, we know that the Escrito Pool is producing from a shaly fasces.

The diagramatic plat here shows the 200 feet, the fasces change updip, and points out very significantly that we are 200 feet downdip from the Escrito Pool.

Q Now, Mr. Thornton, in essence your case is that,over on the right-hand side of that diagram is the area that we're talking about --

A Yes.

Q -- that is 200 feet downdip from the present Escrito-Gallup Oil Pool?

A That is correct.

Q It is producing oil over in the oil pool?

A Yes.

Q And we are producing gas in the gas pool?

A Yes.

Q Downdip from the oil?

A Yes.

Q Referring now to Exhibit 1, will you refer to it and explain our application in terms of area, what area we are asking for and where we say the gas pool is and the oil pool?

A All right. Exhibit 1, of course, first is a structure contour map on top of the Gallup formation, 50 foot contour intervals. It shows a continuous uniform dip to the northeast, going by the Escrito Oil Pool, continuing downdip 200 more feet until you arrive at the gas area.

The heavy blue dashed lines inside this red coloring is the area we're talking about and is the gas producing area from the sand bar just mentioned on the prior plat. This is the area we will be talking about.

Q That area consists -- there are five wells in there?

A There are five wells at total depth. I believe one is producing. The others are in various stages of being hooked up and completion.

Q I believe one of those wells, the one further southwest in our area, is in the present Escrito-Gallup Oil Pool?

A Yes. The most southwesterly well, and also the most southwesterly boundary that we propose cites the No. 1-24 Brown, which is presently in the Escrito Pool, but our studies have led us to believe that that well has a thin interval of the sand bar

producing here and should be taken out of the present oil pool and put in our new or our proposed outline of a new gas pool. Incidentally, the well has been completed approximately a year and a half and has never produced, never has been produced, due to its being a gas well and no outlet or no hookup and not capable of producing oil sufficient enough to be produced as an oil well. Our studies lead us to believe that the well should be put in the new pool.

Q Explain what else your Exhibit 1 shows with reference to this application.

A With reference to this application, it shows that we are, of course, downdip, as we pointed out. It also shows the trace of the cross sections which will be shown shortly. It shows the, about the margin of separation between the existing oil pool and the existing gas pool. It also shows there is no closed structure indicated at this time, just a continual dip with a stratigraphic type trap, evidently occurring in the vicinity of this red or our boundaries here.

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

Q Refer to your Exhibit No. 2.

A Exhibit No. 2 is also a structure contour map. It is an interval lower down in the section. It is the top of the main Gallup pay zone itself. It is contoured on 25 foot intervals going from southwest to northeast, and it's very doubtful if you can carry it much further than the present contoured area, due to

the zone isn't clear-cut or can't be followed much further outside the interval, due to the spacing down in the township, but it also illustrates that we are on the producing zone itself, the producing zone which is the primary producer in the Escrito; and definitely the producing zone in the gas pool. We are still 200 feet downdip from the average datum in the Escrito Pool.

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

Q Refer to your Exhibit 3 now.

A Exhibit 3 is posted on the large board here. This portion over here is not in it, it is this portion right here (indicating). If you'll look at your maps, the trace of cross section No. 1 from southwest to northeast, that is this cross section. The cross section has the wells in place, using Schlumber-J logs as the wells; it shows a clean developed sand bar here with a fasces --

Q Excuse me, when you say "here", say which well you are referring to for the benefit of the reporter.

A Oh, clean sand bar in the Redfern and Herd Largo Spur No. 1.

Q That is in the gas pool?

A That is in the gas pool.

Q The three wells on the right-hand side of that cross section are in the gas pool?

A Yes.

Q All right.

A Moving southwestward, updip from the Redfern and Herd No. 1 Largo Spur, you can see, which is evident on the electrologs, the fasces change from a clean sand to a silty shale beginning to occur as you move southwest, and permeability is decreasing in area of this well, the Brown No. 1-24; permeability has decreased and fasces change is rapidly occurring. As you move southwest from the Brown 1-24, the fasces change further occurs or has completed to change, you might say, and is now a silty shale with extremely low permeability; in fact, the permeability is so low, the fasces is so silty, that it creates an impermeable barrier between the gas downdip in the vicinity of the Redfern and Herd well in the Escrito Pool further to the southwest. The barrier mostly occurs between the Brown 1-24 and the Standard Oil No. 1 Federal 4-26. I've shown it in color, the sand is represented with yellow and the shaly fasces is represented with gray.

We also, in addition to the Schlumber-J electrologs, we have core analyses on these wells. We also have the perforated interval and the cored interval marked on the cross sections. The permeability decreases in this manner from a well near the Redfern and Herd well, the El Paso No. 89 Largo Canyon Unit, the permeability reaches something like 74 millidarcies for various feet, whereas permeability in the Standard Federal 4-26 decreases down to .01 and .02, and if you would like to, I have those tabulations that I could pass out, if you would like to look at them now or I could pass them out to you later.

Q You might pass them out at the end of your testimony.

A That is cross section No. 1, or Exhibit No. 3.

MR. PORTER: I have one question at this point. What's the distance between the Standard Federal 4-26 and the Val R. Reese there, the Brown No. 1?

A Let me refer to the map here. I don't have it in footage. It is approximately a mile and a quarter, I would say a mile and a third.

MR. PORTER: Thank you.

A For closer measurement I have the scale here, but it would take longer to take it off the scale than just to look at the map.

MR. PORTER: That is all right.

A This cross section does show structure and fasces change which separates the two pools.

Q (By Mr. Bratton) Tell me, Mr. Thornton, basically over in the gas pool you have a sand bar?

A Yes.

Q Over in the oil pool you have a fractured shale like the Sprayberry in West Texas?

A Yes. From studying the area, the Escrito Pool seems to be producing as much from a slightly fractured type of rock than it is any cleancut sand bar or sand lens or shoestring sand; some refer to and I referred to the gas sand as a sand bar because it is a common term, and the sand bar takes on that appearance when

you correlate the wells from well to well. It appears to be that.

Q Basically, what you are saying in all these exhibits is that the gas exists downdip, and if there was communication, that gas wouldn't be downdip?

A That's true. That is one thing I failed to bring out, which is one of the most significant things, that the gas under higher pressure existing here is downdip from the oil existing up here, updip, and if there was any communication through a common reservoir or a common rock reservoir or a rock with common composition, the gas probably would have been updip rather than downdip.

Q Not probably,gas just doesn't exist downdip from oil in the same reservoir, does it?

A That's right. Also, in addition to the permeability barrier that shows up on electrologs and shows up in core analyses, there is a big pressure difference between bottom hole pressures in this well and one of the wells we have pressure on in the Escrito Pool, it lacks just a little bit of being 400 pounds difference, bottom hole pressure, the difference being in the gas area and the 400 pounds less pressure being in the one well over in the Escrito Pool. Both wells, both bottom hole pressures were taken immediately upon completion of the two wells, and that pressure difference helps us with our separate reservoir.

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

Q Go on to your next cross section.

A Exhibit No. 4, which you are looking at a reduced scale

copy in your plats, is this cross section here, and the traces shown on the map itself from west to east across the Escrito Pool down into the gas area shown by the Redfern and Herd No. 1 Largo Spur, the gas area shown by the El Paso No. 89, and the Redfern and Herd No. 2 Largo Spur. This cross section also shows the wells in the gas area are downdip to the oil wells, and it also illustrates the fasces change occurring updip.

The core analyses and pressures, of course, are the same, and apply to this cross section as they do to the other. The well in the Escrito Pool we have the bottom hole pressure on is the Standard Oil No. 1 Federal 3-20, which exhibited approximately 400 pounds less bottom hole pressure than did the gas wells downdip.

Q Is there anything further that you wish to point out by this cross section here, Mr. Thornton?

A Of course, the color of the sand is represented by yellow, and you can see the main Gallup pay zone changing fasces from a clean sand to silty shale, and permeability decreasing rapidly to the west until you reach the Escrito Pool, which is a distance of almost three miles. On this cross section, the fasces or the main Gallup pay zone has turned practically to shale so these wells also appear to be producing from more of a fractured reservoir than they are a permeable reservoir.

Q Refer to your next cross section now.

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

A If you will turn the page, we come to cross section No. 5, this is Exhibit No. 5, which this one is the same cross section as No. 1, with one exception. This cross section does not show structure. The wells, as you read in the name plate, the wells are placed in juxtaposition and put on a flat marker for clear correlation and to show the fasces change more clearly. The Redfern and Herd No. 1 Largo Spur, which is a gas well, is on the right or the northeast;as you move to the left or to the southwest, you can see the fasces change start occurring in the Brown well, which seems to have maybe a few low permeable feet of that sand, and changes into a,practically a shale in the Standard No. 1 Federal 4-26. This cross section, I think, shows that relation fairly clearly.

Q That's the same cross section you have shown before?

A That's the same cross section as I rolled up here, the one with the wells in place and showing 200 feet downdip.

Q Going from southwest to northeast only, you have hung them on the same marker so that the kicks on the log are right in line?

A Right. Shows the main pay zone to be correlated so we can show easily and clearly the fasces change and the impermeable barrier existing between gas sand downdip and the Escrito Pool updip.

Q Go on to your next cross section.

(Whereupon, Applicant's Exhibit No. 6 marked for identification.)

A Exhibit No. 6 is also a cross section with the wells placed side by side and placed on a flat datum marker to show clear correlation and show the fasces change developing. It does not show structure. It is the same cross section as this one right here with the wells placed side by side.

The three wells again on the right are gas wells. The four wells on the left are oil wells. They are producing oil now and this well over here, the Redfern and Herd No. 1, is producing gas. It also clearly illustrates the fasces change or the change in rock composition occurring.

Q Refer now to your isopaques, Mr. Thornton.

(Whereupon, Applicant's Exhibits Nos. 7 and 8 marked for identification.)

A We leave the cross sections and go to Exhibit No. 7, which is an isopaque map in the Escrito area. It is a net sand thickness of the Largo Spur sand bar, as I called it a while ago, the sand is producing in the gas well. The map, as indicated in the name plate, is taken from the E. S. induction log curve.

As you move from northeast in the gas area to southwest, the sand rapidly thins until the Brown 1-24 appears to have about five feet of sand there left. The logs, if you would like to refer to the logs on the cross section No. 3, I believe would be Exhibit No. 3, would show that induction kick and S. P. kick in the main Gallup pay zone.

Q Now, Mr. Thornton, you got a zero line on there. That

means that's where the sand bar ends?

A That is what appears. That zero line appears to be the spot where that sand bar or sand would disappear.

Q The sand in which the gas is accumulated, as to which we are asking for the gas pool, is north and east of there?

A Right.

Q And based on that line, we have asked that the area north and east of there, including the five wells and intervening 160, be classified as a separate gas pool?

A Yes, that's right. Map No. 8 or Exhibit No. 8 is kind of a companion map to Exhibit No. 7. It is also a net sand thickness in the Largo Spur sand bar, taken from the Schlumber-J microlog, the microlog, being the log that is used to detect and show porosity, and as you can see, the zero line probably shifts slightly eastward, but it is still in the proximity of the first zero line you saw taken from the induction, which is a resistivity curve.

This map was taken from the microlog and the zero line occurs between the Brown well in the Escrito Pool, and northeast of that zero line also is gas, and that is the area we propose as a new pool area.

Q Is there anything further you have in connection with your isopaques?

A I have nothing further on the isopaques. I might answer further questions from you at this time. I have a couple more exhibits that they have to bring in.

MR. BRATTON: If the Commission will wait one minute, we have two exhibits which they're bringing in now, which prove to me or show to me what this case is all about.

I think there will be an engineering witness presented by the Commission shortly.

(Whereupon, Applicant's Exhibits Nos. 9 and 10 marked for identification.)

Q (By Mr. Bratton) Refer to your Exhibit No. 9 now.

A Exhibit No. 9 is the same -- I have forgotten the number of the exhibit, but it's the same as the first cross section there with the wells placed side by side from southwest here on my left to northeast on my right. In addition to repeating the fasces change, the pinching out of the sand bar, we have placed the type of production from the wells at the top of well logs to show the difference.

The heavy crude being produced over on the left is from the Escrito Pool, the light-colored liquid on the right, the condensate being produced from the Redfern-Herd No. 1 Largo Spur. The sample on the left from the Pan American No. 1 Zanotti is 40.40 gravity. Standard No. 1 Federal 1-27, 42.1 gravity; the Standard 4-26 is 38.9 gravity; the two wells here, the Brown No. 1-24 and Lybrook 1-19 have no sample in that the Brown has never produced, the Reese well hasn't cleaned up yet. It is making connection and it was fracked with water and hasn't cleaned up yet, whereas the well on the right has been on the line and is now

producing, it has a little color still in it, due to still cleaning up. That sample was taken last week. Two weeks ago this sample was taken, and it still has a little tinge of the frack oil left but it has increased up to 70.7 gravity.

Q That is the Redfern and Herd Largo Spur No. 1 well in the gas pool?

A That's right.

Q That's 70, and the three wells on the left have approximately 40 gravity?

A That is right. It clearly illustrates the density of the liquids and it clearly illustrates that the lighter density fluid should have moved updip unless a barrier existed.

Q In other words, if there was communication across that area, could you have that 70 gravity fluid existing 200 feet downdip from this 40 gravity crude?

A No. I would say due to its density that there would be more of an equalization of the gravities, and this surely wouldn't be that high, as high as 70.7.

Q Refer to your next exhibit.

A Exhibit No. 10 is a similar cross section going from west to east across this Escrito Pool into the gas producing area. It also illustrates the difference in fluid and the difference in type rock the fluid came from. On the left is Standard No. 1 Federal 3-19, 39.5 gravity; Standard No. 1 Federal 3-20, 14.4; a new well here, Compass Exploration State 1-16, 41.4; the Pan

American No. 1 Dashko, 41.3 gravity; the Redfern-Herd No. 2, 71 gravity; and the Redfern and Herd Largo Spur No. 1 has the 70.7 gravity. The El Paso well on the right is in the cross section, has the sand bar and is cored and it will probably be in the gas area also, but they haven't completed their well, I don't have a sample for it. This cross section east to west also illustrates the fact that due to the difference in density of fluid, with the much higher gravity being downdip in the gas area, is probably stopped or is stopped by a barrier to the west to keep it from migrating into the Escrito Oil Pool.

Q In your opinion could that 70 gravity fluid exist in that area if there were communication with the 40 gravity fluid to the west?

A Not very likely. Incidentally, while running these gravities, we ran into something else. The oil that is being produced in the Escrito Pool has a pour point of approximately 45 degrees. It begins to jell and paraffine begins to settle out of it, the hydrometer won't stick in it at approximately 45 degrees whereas this has been produced under 20 below zero without any malfunction or failure. It probably will go to 40 below zero, there's no way to tell. That is a very significant difference in the content of the oil.

Q Is there anything else, Mr. Thornton, you care to say in connection with the application?

A Nothing other than the core analyses I have tabulated,

and we might pass those out at this time.

Q Before you do that, referring back to your last exhibit there, there again your fluid in your Redfern and Herd Largo Spur No. 1 that is cleaning up, that's the same situation, it's on a drillstem test?

A Yes. I pointed that out on the first cross section, this from the No. 1 or this -- oh, the difference in those two. Incidentally, this lighter oil was caught on a drillstem test or recovered on a drillstem test. It was good and clean. This sample was caught after the well was fracked, which I failed to fully illustrate a while ago. It is still cleaning up. I brought the darker sample that was caught two weeks ago, and the sample which was caught last week. It is still cleaning up and will probably reach a color similar to this clean sample. It was uncontaminated, it came right out of the reservoir.

Q Both of them are in the nature of 70 gravity?

A Yes, 70.7, and this one on this three-tenths higher, so they are very similar.

Q Mr. Thornton, in your opinion, based upon the studies that you have made, is the area which is requested in this application to be classified as a gas pool, is that in communication with the Escrito-Gallup Oil Pool to the west?

A No, my studies have led me to believe it is definitely separate.

Q In your opinion, it is a separate accumulation, a separate

pool for a reservoir?

A Yes.

Q Did you prepare Exhibits 1 through 10?

A I did.

MR. BRATTON: We would offer Exhibits 1 through 10 in evidence, and also Exhibit A, our schematic diagram.

MR. PORTER: Without objection the Applicant's Exhibits will be admitted. Anyone have a question of the witness? Mr. Payne.

CROSS EXAMINATION

BY MR. PAYNE:

Q Is all the acreage in the proposed gas pool in the Canyon Largo Unit?

A No.

Q Part of it is?

A You asked if all of this acreage was inside the Canyon Largo Unit? No.

Q But part of it is?

A Part of it is.

Q What did the Canyon Largo Unit provide, if you know, as to the drilling of exploratory wells?

A I do not know any of the mechanism of their Unit agreements or anything.

Q Now, Mr. Thornton, I believe you testified that you find no evidence of a structural closure, at least in all directions

other than towards the Escrito-Gallup Oil Pool, is that right?

A Well, from Exhibit No. 1 and 2, especially No. 2, which was made on the producing zone and contoured on a very close interval of 25 feet, there appears to be no closed structure, or no closed structure can be put in there and controlled.

Q Now in view of that, what is the likelihood that this is actually a gas cap for another oil pool that hasn't been discovered yet?

A Well, that, of course, is in the future and will have to be reckoned with once it occurs, but it is in the future, definitely, now.

Q Do you think the Commission might be justified in entering a temporary order creating a gas pool, and take another look at it if a well was drilled downdip that might prove to be an oil well?

A Yes, yes. A question like that, for me to answer fully would take, you might say, a conference with management, but I would say yes.

Q Now, Mr. Thornton, I believe you testified that one of the wells doesn't have a gas connection at this time, in view of the fact that it's classified as an oil well, is that the situation?

A That is true. The well is classified as an oil well, but was potentialed as a gas well and made no fluid.

Q The point I'm trying to arrive at, Mr. Thornton, if the pool is, if this area is classified as a gas pool, do you have any

assurance that you'll be able to get a gas connection?

A Yes. Yes, our pressures, volume, and mechanical features are such that we definitely will. In fact, we have one on one well.

MR. PAYNE: Thank you.

MR. PORTER: That well is classified as an oil well only because it is in a defined oil pool?

A That appears to be the thing that happened. The well was drilled a mile from the Escrito Pool, they reached out,even though it was potentialed as a gas well, they reached out and put it in the Escrito Pool. Well, the Escrito Pool being such as it is, and the volume of gas being produced, it evidently was uneconomical for any gathering company to come over and gather any gas; so when that well was put in the pool a year and a half or so ago, no one ever connected up with it. The date of completion on it was 10-4-1958, and the well has been shut in since.

MR. PORTER: Mr. Arnold.

BY MR. ARNOLD:

Q Mr. Thornton, the producing formation in the Escrito Pool and in the new proposed gas pool are the same geologic age, wouldn't you say?

A You asked me?

Q Yes.

A Yes, they are the same geological age with very little difference, probably, in the age. One might be slightly younger

due to the slope. This area might be slightly younger than this area, but technically, it's the same geological age.

Q And the source rock on the oil, what would you say that was?

A The amount of production, rate of production, pressures, gas, everything about the source rock in the Escrito Pool appears that the source rock probably varied near the well. The wells are producing from right maybe in the source rock itself, or the source rock is close by.

Q How do you account for the fact of this sandstone being there at the same time, and I presume that you think the date of accumulation was about the same?

A That is a tough question, about time of accumulation, but the other part of your question, or how that sand bar got there or why it is there or why it is different from the Escrito is a typical example of the entire San Juan Basin, which is a sedimentary basin made up from top to bottom so far of sedimentary rock that was laid down in a sea. Here we are talking about a portion of the sea being the Gallup. As the seas regressed, evidently to the eastward, or the rocks appeared to have been laid down, maybe from west to east of shore currents or wave action, could have cleaned up that sand bar very similar to present day sand bars along the Gulf Coast. The Gulf Stream is producing sand bars now, for instance, Padre Island, not over 15 or 20 feet high, but runs for several hundred miles and evidently could be a similar situation of

sand cleaning, a cleaning action or wave action depositing a sand bar.

Q I was wondering how you accounted for the gas accumulated in one sand and the oil accumulated in the other sand at approximately the same time.

A That can be explained easily. Of course, you have to skip further to the east to answer that, the wells that are too far to put on this cross section. But the source rock we were talking about a minute ago appears to be a shaly type rock which occurs further downdip from the gas bar or sand bar, that source bed being further downdip, squeezing the gas, or the gas and condensate coming out of the source rock did migrate updip until they hit this barrier. This appears to be the Escrito Pool, I should say type rock appears to be possibly a source rock for stuff in its vicinity, or maybe slightly updip from it. But how this gas got here, it appears to have come from downdip, also, and accumulated in the clean sand bar until it hit that barrier.

Q What you are saying would seem to indicate that there was a real good possibility of oil down-structure in this new area, then?

A Yes, that is a possibility. Changes occur so rapidly I wouldn't want to estimate as to where and when, but it is a possibility with this type situation.

Q Do you think that more than likely this is an associated oil and gas reservoir, rather than a gas reservoir?

A Data right now doesn't indicate associated with any oil right now; the data we have, which is limited.

Q But from your theory of accumulation, you seem to indicate that was what you think?

A The theory could be carried that far, yes. The theory could be carried that far. The only thing that keeps you from, or keeps me from going into that too far is the occurrences of the sand bars in other places in the San Juan Basin, where they are very narrow, that is, going from east to west or perpendicular to striking those basins, the sand bars have been very narrow and if oil accumulation does occur, you know it has to be close by or will be found close by shortly; whereas strike-wise, moving along the strike of the Basin and strike of this pay zone, they are sometimes quite long, but very narrow, typical sand bar type deposition there.

MR. PORTER: Does anyone else have a question of Mr. Thornton? Mr. Nutter.

BY MR. NUTTER:

Q Mr. Thornton, do you have any opinion as to whether or not these light colored high gravity liquids exist in the reservoir as a liquid or vapor?

A From pressure and gas analyses, we have, all data supports the fact they exist as a gas -- bottom hole pressures and data of that nature.

Q Speaking of bottom hole pressures, do you have the virgin

pressures for these two areas?

A Yes.

Q How do they compare?

A As previously mentioned, approximately 400 pounds difference.

Q That's on the virgin pressures?

A Yes. This well here was completed in November, I believe, of 1957.

Q Is that the discovery well for the oil pool?

A I don't know if it was the discovery well or not. Well, wait a minute, it was undesignated at the time. It was approximately three miles from the discovery, but --

MR. PORTER: Would you identify the well by number, please?

A Standard Federal 3-20. When it was completed, it was undesignated due to being over a mile from the discovery, I think it was about three miles.

Q What was the discovery well in the pool, Mr. Thornton?

A We are talking about bottom hole pressures?

Q Yes.

A The discovery well in the pool.

Q Yes.

A I'm -- it was a series of undesignated wells, that it kind of grew. The Standard 2-26 was one of the undesignated discoveries, and the Standard 6-22 was another one, and this one being

two miles from the Standard 6-22 in Section 22, it being two miles from it, it was also undesignated.

Q Which was the first well that was drilled in the green area?

A The Standard 1-27 in Section 27.

Q What was the pressure on it when it was originally completed?

A We do not have the bottom hole pressure on it. The one we do have the bottom hole pressure in is three miles from it.

Q What was its initial pressure?

A Its initial pressure upon completion at plus 1100 datum point was 1724.

Q What well was that, please?

A The Standard of Texas 3-20 Federal No. 1.

Q What was the date on that pressure, please?

A December, 1957.

Q Now which was the first well that was drilled in the red area?

A The first well drilled in the red area, the Redfern and Herd No. 1 Largo Spur. Oh, excuse me, the first well was the Brown No. 1-24, that was the first well.

Q Do you have a bottom hole pressure on it?

A Don't have a bottom hole pressure on it. We have a pressure on Redfern - Herd No. 1 and No. 2 Largo Spur.

Q Do you know whether a bottom hole pressure was taken on

Brown No. 1-24?

A It was not.

Q Which was your first bottom hole pressure that was taken in the red area?

A Redfern and Herd No. 1 Largo Spur.

Q And the date on it?

A The date on it, January. Oh, excuse me, here, November the 16th, 1959.

Q And the bottom hole pressure was?

A At that datum point of plus 1100 was 2,000 pounds.

Q That's the same datum that you had your pressure on the other well?

A Yes, same datum, elevation datum as the other one.

Q Does this sand in the green area ever clean up as you progress southwesterly and become a clean sand?

A As you progress southwesterly, there are no wells existing within three and a half miles, and these do not appear to be too clean right here, but I haven't investigated it too far, but the nearest well is so far away and sand does change so rapidly that I couldn't give you a good answer to that, whether it cleans up or not as you move updip, which is southwest.

Q Those wells in that area you are talking about could well be another trend?

A Yes, very definitely.

Q Has any well ever been drilled in this area which en-

countered an impenetrable shale that had zero permeability?

A Well, not exactly zero permeability, but permeability so low that Core Laboratories say that it is incapable of producing unless the well is fractured, unless the rock is fractured or cracked and the oil is seeping in through those cracks. Now they have drilled that type of section, or cored that type of section where Core Laboratories say it is incapable of producing.

Q Where were those wells?

A They're in the Escrito Field. One of them is the Standard 4-26. Well, here the core analyses -- here, did we pass this out? Just pass those out. These tabulated core intervals that we're passing out now are cores of that main Gallup pay zone interval. There's two columns for each well, permeability and porosity, and as you can see there the permeabilities in the Pan American Standard wells are quite low, they are extremely low; whereas over in the sand bar, the El Paso No. 89, from its measured permeability it's very capable of production.

Q No well has yet been drilled, however, that would measure a permeability that would be low enough to isolate these two sections from each other and prevent communication between the gas section and the oil section, is that correct?

A One of the nearest wells to us here is the Standard 4-26 in the heart of the pay zone there. You can see the permeability is low as .07, .02, .04, .17, .13, never did get up to one millidarcy except for one foot up near the top. Now if that -- well,

Core Lab says that that is too low to produce unless porosity, corresponding porosity on the corresponding foot would reach as much as nine percent, and permeability reached as much as three-tenths percent. They whack it off there. The Lab tells us that people frack a lot of low permeability stuff, but they can show and do show, and I have verbal, or conversations with them, that they just flat knock off any commercial or economical production below three-tenths percent millidarcy and a corresponding nine percent porosity, so that well doesn't meet those requirements over enough feet or any feet, or one or two feet. It doesn't meet the requirements to let even something as high gravity as this, and gas, which will go where oil won't -- gas will go where oil won't, and definitely updip, due to the density and a higher pressure, evidently this type reservoir here is too impermeable to let it pass.

Q Even with all this low permeability this well is producing, isn't it?

A Well, very little, two barrels a day. It's not an oil well. Excuse me, it's an oil well, but two barrels a day production is not much. That's what it has been showing for some time.

Q Is that what it potentialed?

A No, it potentialed for seventeen, I believe.

MR. PAYNE: It has 40 acres dedicated to it?

A Yes, yes, the 40 acres are dedicated to it, yes.

Q (By Mr. Nutter) Is there correlation, Mr. Thornton,

between GOR's and structural position in this green area?

A No, I wouldn't say that GOR's have any relation to the structural position. I think the GOR's are related more in age of the well. GOR's, I would say, have a definite relation to the time the well has been producing, but not to its structural position.

Q Do any of the wells in the green area produce liquids of high gravity that are light colored?

A No. I have a sample from every one of them that had a fluid sample available, they are all very similar. In fact, they are practically alike.

Q All the wells in the green area are dark lower gravity fluids?

A Yes.

Q Now the red area, are there any wells in the red area that produce a dark low gravity fluid?

A No,here are the two producing wells, and as I showed you, this one is cleaning up or lightening up every day.

Q Now I think you stated that you didn't have a fluid sample on the Brown 1-24?

A No, it was completed in 1958 and has never been blown or cleaned up or hooked up, it has no outlet and therefore they haven't wasted time or money producing it. Well, they can't produce it.

Q In the event this well should turn up with a dark low gravity fluid, it perhaps should be in the Escrito rather than in

the proposed gas pool?

A Now we do have data along that line. We have an engineer here that completed the well and potentialed it, and it potentialed as a bona fide gas well and didn't make any of the dark heavy fluid. Independently of that data, I had already decided or begun to think that it should be put in the gas area, due to the little wedge of sand that appears to be left in that well.

MR. PAYNE: Mr. Thornton, is the gravity increasing on any of the wells completed in the green area?

A No, for the number of wells that the field has been producing since 1957, I followed it, the gravity in the production books has remained right around 40, 39 and 40. Sometimes it hits 41, but it will average 40.

MR. PAYNE: Thank you.

Q (By Mr. Nutter) Mr. Thornton, this well up here in Section 10 of 24,6 shows a top for the Gallup. Did it produce from the Gallup?

A Section 10?

Q Yes.

A That well is a Skelly well, and it is producing, I believe, from various intervals in the Gallup.

Q Is it an oil well or is it a gas well?

A It is a small oil well right now on a pump, was the last report I had. A friend of mine happens to be working with Skelly and I see him regularly, and it's a low volume pumping oil well

now. Some of its perforations -- now this is speaking from him, the geologist -- it's kind of related to Otero type area.

Q What state of completion is the Canyon Largo No. 89 well in at the present time?

A Total depth has been reached, casing has been set, and they're waiting, they are moving out the big rig, going to move in a smaller economical workover rig to complete with. The casing is set.

Q There has been no potential taken?

A No.

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

BY MR. PAYNE:

Q Mr. Thornton, if the Commission grants your application, creates a gas pool for the red area, is it your opinion that it would be in the interest of protection of correlative rights to prorate this gas pool, and if not, why not?

A When you speak of proration to me, I have to go into what type deliverability or acreage, or proration takes in that, doesn't it?

Q Yes, sir, it does.

A But correlative rights --

Q Do you feel that the gas production should be limited to the market demand from the area?

A Yes, yes, I would say that, yes.

MR. PAYNE: Thank you.

MR. PORTER: It will be. Mr. Errebo.

BY MR. ERREBO:

Q Mr. Thornton, with regard to the 1-24 well, I believe you show that as the Val R. Reese Brown well, is that correct?

A That's right. That's the way it was drilled, and I just stuck to that nomenclature.

Q Actually, are you aware of the fact that that well has since been assigned to the Killarney Oil Company?

A Yes.

Q And actually it is a Killarney well and not a Val R. Reese?

A Yes, I should have made that correction. The property is Killarney. I don't know how they carry their name, but I do know that.

Q Now that well has been shut in and has not produced for sale since its completion, is that correct?

A Not that I know of, no, it hasn't produced, no outlet.

Q Actually the 1-19 well, Val R. Reese, hasn't produced either?

A No, it's a new well and it hasn't been hooked up yet, but should be hooked up soon.

Q Your two wells lying in the north are presently producing, are they not?

A One of them is presently producing. The other one is in about the same stage as the Val Reese 1-19, it's in the process of completing surface hookups.

Q Actually you are selling your gas, are you not,to the Southern Union?

A Yes.

Q Are you or are you not familiar with any plans of the Southern Union to send its line south to the Val R. Reese well and the Killarney well?

A Do I know of any of their plans to do that?

Q Yes.

A I believe I just haven't gone into that at all.

MR. WIEDEKER: I can make a statement when you get through, I'll answer that question.

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

BY MR. UTZ:

Q Mr. Thornton, I believe you stated that there was no dark oil produced on drill stem test, I presume from the Reese 1-24. Was there any oil of any type?

A I would have to ask the engineer that completed it.

Q Will he be a witness after you?

A He hadn't planned to be; could be, but hadn't planned to.

Q If it did produce any oil, well, I think possibly we should know.

MR. PORTER: He will put on the witness to give you that answer.

Q (By Mr. Utz) Are there any other pressures other than

the two that you gave Mr. Nutter that you have, bottom hole pressure?

A One other. There are two in the gas area and one in the oil area.

Q What is the well and the pressure on it?

A In the oil?

Q Well, you said you had two in the gas area --

A Yes, the Redfern and Herd No. 1 Largo Spur and the Redfern and Herd No. 2 Largo Spur. The No. 1, at a depth of 5449 or plus 1100, the pressure was 2,000 pounds. The No. 2 at a plus 1100, the pressure was 1993; and the Standard of Texas No. 1 Federal 3-20 at that depth, a plus 1100, was 1724. The bottom hole pressure on the Standard well at the total depth was actually 1687, but adjusted to a common datum, why, we adjusted to 1724, or take 1724 from the bottom hole pressure chart.

Q Mr. Thornton, the pressure differential between the highest pressure you gave me in the red area and the 3-20 in Section 20 is only 276 pounds. Where did you get your 400 pounds?

A Where did I get my 400 pounds, was at the bottom of the well hole at a depth of 6135, the Standard well was 1687.

Q 6135?

A Yes.

Q What was that pressure again?

A 1687 at 6135. Now in the Redfern and Herd No. 1 at 5506 feet up the hole, the pressure there was 2,015. The No. 2 Redfern

and Herd at 5500, which is 600 feet less hole than the Standard well, the pressure was 1993. I might add, the curve I saw on the Standard well, it was a hundred hours to reach that, whereas in this well, well, I think it was four hours, I believe, the No. 1.

MR. NUTTER: Were both of them stabilized pressure?

A Not exactly stabilized but approaching it. You know, the curve seemed to be curving more towards stabilization.

MR. NUTTER: Which one lacked more coming to stabilization, I imagine the Standard well?

A No, the Standard well, after a hundred hours, was pretty well stable. It was the more stable one, I would say from the curve.

Q (By Mr. Utz) Where is the Southern Union No. 1 Ernest well?

A It's on the map approximately in the middle of the green area, Section 27, northwest corner.

MR. PAYNE: Is it possible, Mr. Thornton, from a standpoint of geology and engineering, to have an oil pool with the drive being furnished by a gas cap which is downdip?

A Not physically possible.

MR. PAYNE: Your answer is that it's not physically possible?

A Not physically possible.

MR. PORTER: I think the question is in order in this case.

Q (By Mr. Utz) Do you have any knowledge how long it would be before the El Paso Canyon Largo 89 would be completed?

A No, I do not.

MR. UTZ: That's all I have.

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

MR. BRATTON: I would like to ask one concluding question if I could.

REDIRECT EXAMINATION

BY MR. BRATTON:

Q There has been a number of questions about whether this red area, the gas area we are talking about, whether that's associated with oil production or not. One thing is for sure, whether it is or isn't, it isn't associated with oil production in the Escrito-Gallup Oil Pool?

A No, it is not.

MR. PORTER: Any further questions? The witness may be excused.

(Witness excused.)

MR. PORTER: We'll take a short break.

(Whereupon, a short recess was taken.)

MR. PORTER: The hearing will come to order, please. Mr. Bratton, will you call your next witness?

MR. BRATTON: We'll call one more witness to answer a question which was raised. Will you be sworn, please?

(Witness sworn.)

THOMAS A. DUGAN

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

DIRECT EXAMINATION

BY MR. BRATTON:

Q Will you state your name, address and occupation?

A Thomas A. Dugan, 1007 North Dustin, Farmington, New Mexico. I'm a Consulting Petroleum Engineer.

Q You have previously testified before this Commission as an expert witness?

A Yes.

Q Mr. Dugan, did you complete or were you present at the completion of the well in question that Mr. Utz was asking about, I think it was the Brown well?

A The Val R. Reese Brown No. 1-24.

Q Yes.

A Yes, sir.

Q Will you tell the Commission anything you can pertaining to such liquids as may have been recovered?

A The well was fracked around 1500 barrels of 40 gravity crude oil, and we produced back approximately half of the load oil, around 750 barrels, and the well was making so much gas that we felt,Mr. Reese felt it was a waste of gas to be flaring that much gas with such a small amount of oil, but the oil that was being produced back was between 50 and 55 gravity oil, whereas we fracked

with 40 gravity oil.

Q And you never did fully recover your frack oil?

A No. At the present time, I believe they still lack around 700 barrels of recovering the load oil.

MR. BRATTON: I have no further questions.

MR. PORTER: Do you have any questions, Mr. Utz?

MR. UTZ: No.

MR. PORTER: You may be excused.

(Witness excused.)

MR. PORTER: Anyone else have any testimony to present in this case?

MR. BUELL: Guy Buell from Pan American Petroleum Corporation. We have brief testimony to present. We will make every attempt to avoid needless repetition.

(Witness sworn.)

CHARLES R. MARSHALL

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

DIRECT EXAMINATION

BY MR. BUELL:

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

A Charles R. Marshall. I'm employed by Pan American Petroleum Corporation in their Fort Worth, Texas, office, as a Petroleum Engineer.

Q Have you recently moved from Pan American's Farmington office to the Fort Worth office?

A Yes, sir.

Q You have testified at prior Commission hearings, have you not?

A Yes, sir.

Q And your qualifications as a Petroleum Engineer are a matter of public record?

A Yes, sir.

MR. BUELL: Any questions?

MR. PORTER: His qualifications are acceptable.

Q (By Mr. Buell) Mr. Marshall, have you made a study of the area around the Escrito-Gallup Pool, with particular emphasis on whether or not the gas wells to the northeast of that pool are separate from the Escrito-Gallup Pool?

A Yes, sir, I have.

Q What is your conclusion as to separation?

A That the Escrito-Gallup Oil Field is definitely a separate accumulation of hydrocarbons from the gas wells producing from the Gallup to the northeast.

Q Do you find that to be true -- of course you do, from a geological standpoint, do you not?

A Yes, sir.

Q Is that also true from the engineering data which are available to you and which you have evaluated?

A Yes, sir.

(Whereupon, Pan American's Exhibits Nos. 1 and 2 marked for identification.)

Q In connection with geology, Mr. Marshall, let me direct your attention to what has been marked as Pan American Exhibit No. 1. What does that exhibit reflect?

A Exhibit 1 is a map of the area under consideration. On the map I have contoured the top of the Gallup, or a marker near the top of the main Gallup pay. It is contoured on a 25-foot interval, and as you can see, the structure dips, this regional dip to the northeast, there's no closure in here. Also I have indicated the gas wells by a red dot, and the oil wells in the Escrito-Gallup Field by a green dot.

Q Would you say generally, Mr. Marshall, that your interpretation of structure agrees with that presented by Mr. Thornton?

A Yes, sir.

Q Now from a geological standpoint, Mr. Marshall, upon what data do you base your conclusion as to the separateness of these gas wells from the oil wells?

A As you can see from the structure map, the dip of the Gallup is to the northeast, I mean that this area is higher than this area. Now the mere fact that that situation exists, that the oil wells are completed in the Gallup higher than these gas wells in this case is conclusive evidence that the two sets of wells are producing from separate reservoirs: the gas wells from a gas

reservoir, and the oil wells from the Escrito-Gallup oil reservoir.

Q If the gas wells were in effective communication with the oil wells, we would find that the gas would migrate upstructure, would it not?

A Yes, we have approximately -- it was mentioned by Mr. Thornton -- 200 feet of change on the average between the oil and gas; in the geologic time that has existed, the gas would undoubtedly have migrated had it not been trapped in a separate trap from the Escrito-Gallup Oil Pool.

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

A Exhibit 2 is a cross section, the trace of which I believe is shown on some of them, it doesn't seem to be shown on this but is shown on the rest of the exhibits that I've passed out. It runs generally from south-southwest to northeast and approximately perpendicular to the strike across the Gallup oil reservoir and the gas reservoir to the northeast.

Q Referring to the electrolog portion of the cross section, does it generally show the same conditions that Mr. Thornton depicted on his several cross sectional exhibits?

A Yes, sir.

Q What do you have on the bottom of Exhibit 2?

A The bottom of Exhibit 2 is a bar graph or plot, potential profile. It shows the potential of all the wells, which are the

logs on the cross section. You can see by starting here with the first well, which is Pan American Zanotti, and proceedings towards the barrier or impermeable barrier between the two reservoirs, you get a decrease in potential of the oil wells. This one is the furthest from the barrier, as we get closer and closer, this being the closest oil well to the barrier, the potentials also go down. Conversely, on the other end with a gas well or one of the better gas wells, as you proceed to the southwest towards this barrier, which evidently exists between the two reservoirs, the gas well open flows, they also decrease in the direction of this barrier, so that we know the thing is divided somewhere in here. This further illustrates and confirms that point. This area here would correspond to the brown lines or brown band, this would be the view in cross section of the brown band here.

Q Mr. Marshall, direct your attention to the brown band on Exhibit 1. Do we find any dry holes in that area?

A No, sir.

Q Between the two?

A No, there's no wells been drilled in that area.

Q Based on your knowledge of the area that we're discussing here, would you recommend to Pan American that if they owned acreage in that area they drill a well?

A No.

Q As a matter of fact, would you recommend drilling a well in the Escrito-Gallup Oil Pool?

A No, sir.

Q Would you briefly state for the record the potentials that we observed, starting with the highest potential oil well and going toward your area of separation?

A The Pan American Zanotti, which is the first well on cross section, had a potential of 86 barrels of oil per day. The next well, Standard of Texas Federal No. 1-27, had a potential of 70 barrels. The third well, which is the well closest to the barrier of these depicted of the oil wells, had a potential of 17 barrels of oil per day. The first gas well was the, what is known as the Killarney well, located in Section 24, nearest the barrier from the gas side, had an open flow of 1867 MCF gas daily. The next well, the Reese Lybrock No. 1-19, had an open flow of 3456 MCF, and the next one, or the last, Redfern and Herd Largo Spur 1, 10,466 MCF per day.

Q Before we leave the Exhibit No. 2, let me ask you this question. You as an engineer don't feel that you could look at potentials alone and no other data, and come to a conclusion as to separation or communication, is that correct?

A That's correct, from strictly an engineering standpoint, you couldn't take the potentials by themselves and say they show separation of reservoirs. However, in this case, where the first thing that you see is so conclusive, you would interpret these as being confirmation of the fact that the areas are separated.

Q Mr. Marshall, another engineering tool that you would

probably use to ascertain separation or communication would be analyses of bottom hole pressure data, would it not?

A Yes, sir.

Q You have heard the bottom hole pressure data that has been discussed by Mr. Thornton?

A Yes, sir.

Q Are you in agreement with him that such data indicate conclusively the separate nature of these two accumulations of hydrocarbons?

A Yes, sir, I am.

Q In addition to those data, do you have any other bottom hole pressure data available to you?

A Yes, Pan American ran a sonolog pressure test on March the 15th of this year on the John S. Dashko No. 1 located in Section 15 of Township 24 North, Range 7 West. This is an oil well in the Gallup Oil reservoir.

Q That pressure was called in to you by phone after you arrived here in Santa Fe, was it not?

A That is correct.

Q You would call it recent data, then, wouldn't you?

A Yes, sir.

Q Mr. Marshall, would you give the circumstances surrounding the taking of that pressure and the result of the pressure that was observed?

A The well was shut in for a period of nine days, and the

fluid buildup in the well was measured by means of a sonic tool, and the casinghead or the casing pressure measured, and a pressure calculated, a bottom hole pressure at the datum which was used by Mr. Thornton, plus 1100 feet, and the pressure was indicated to be 640 pounds at the Dashko No. 1.

Q Would you compare that pressure with the recent pressures on the gas wells in the Escrito area?

A The two gas wells which we have bottom hole pressures available on, the Largo Spur 1, a pressure at the same datum of 2,000 pounds; and the No. 2 a pressure of 1993 pounds at the same datum. So we're talking about a difference in pressure there of somewhere in the neighborhood of thirteen to fourteen hundred pounds.

Q Mr. Marshall, do you feel that a shut-in period of nine days would be sufficient for the oil well to build up?

A I feel that a nine day shut-in period allows the well to obtain easily buildup. It is possible that after nine days, in some of these tight sands or tight pays, which this one certainly is, it could take longer than that. However, I feel sure that this is considerable bit more than, say, half built up. Even if it were only half built up, which I can't conceive, it would be in nine days, we would still have 1200 pounds or a differential of 800 pounds between the two areas.

Q Do you feel that these data conclusively show that the gas wells to the northeast are separate and apart from the Escrito-Gallup oil pool wells to the southwest?

A Yes, sir. The positive geological data available indicates this, by virtue of the existence of the deposition and the pressure data is more or less a positive tool from an engineering standpoint which confirms this.

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

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

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

MR. PORTER: Any questions of the witness?

MR. PAYNE: Yes.

MR. PORTER: Mr. Payne.

CROSS EXAMINATION

BY MR. PAYNE:

Q Mr. Marshall, is there any possibility that if the Commission classifies the area asked for as a gas pool, and a gas purchaser comes into the area to purchase the gas, is there any possibility that the casinghead gas from the Escrito-Gallup wells can also be marketed then, rather than flared?

MR. BUELL: In connection with that question, if I may state in preparing for this hearing, it was the practical thing to do so we again re-evaluated the economics of connection. We can simply give you our conclusion, or if you would like, we can present testimony in that regard.

MR. PAYNE: Well, your conclusion is fine. Just have the witness give it.

MR. BUELL: Yes, sir.

A As Mr. Buell said, we completely re-evaluated the economics of gathering and compressing casinghead gas from this field, with the new information which has become available in mind. The line, gas line which you refer to, the new one going into the gas area, is a little bit closer than a line we had previously going in there. However, to get away from the idea that we didn't know exactly where the lines were or what future lines might be planned in here, the cost to lay a line from a compressor to a line to sell it to was not considered. In other words, I based my economics on what it would take to gather casinghead at low pressure, take it into the compressor and compress it. The results of these economics resulted in a total loss on a field-wide basis of approximately $34,000.00, or in other words, we would not ever begin to pay out the necessary investment to install gathering and compression facilities.

I might point out that the new wells, some new wells have been drilled. This reservoir is sort of peculiar in that although you may have some good potential wells, they go down pretty drastically. A good example is the well in Section 21, the Reese Killarney was potentialed for 352 in July, and I believe at the present time that well is making about 33 barrels a day, or less than half of its allowable. That's typical in here, it's a fast drop, so that actually our economic picture hasn't changed to any degree.

MR. PAYNE: Thank you.

MR. BUELL: We have reduced the economic data to exhibit form if the Commission would like to have it.

MR. PAYNE: I think it's relevant, Mr. Buell.

MR. BUELL: We will mark this exhibit as Pan American's Exhibit No. 3.

(Whereupon, Pan American Exhibit No. 3 marked for identification.)

REDIRECT EXAMINATION

BY MR. BUELL:

Q Let me direct your attention to that exhibit, Mr. Marshall, and you can briefly summarize it for the record.

A This exhibit shows the comparison of the necessary investment and operating expenses that would be necessary to install a casinghead gas gathering system to install a compressor and to operate a compressor over the life of the field. That is the blue bar on the left-hand side. It shows a total of $100,685.00. The yellow bar is the total income which would be received from gas sales from the entire Escrito-Gallup Field. This figure was $66,000.00, or in other words, a loss of $34,685.00 would be suffered if it were necessary to compress this gas. This would be a loss in addition to the loss that would be experienced by virtue of the fact that it's my opinion that none of the wells drilled in the field will pay out if no more expenses are added to them.

Q In other words, Mr. Marshall, the oil wells that are currently producing from the Escrito-Gallup in your opinion will

not pay out the cost of drilling without spending another nickle, and any additional money spent is just that much more lost?

A That's exactly correct, yes, sir.

Q Actually, Mr. Marshall, is a lot of gas produced in the Escrito-Gallup Oil Pool?

A No, sir. At the present time it amounts to approximately 531 MCF a day, of which about 41 of this is used for pumping units to run lease equipment, or less than 500 MCF per day is produced from the entire field.

Q Do any wells contribute largely to that volume of produced gas?

A Yes, sir. There are two wells, the Standard of Texas 2-26 No. 1 and 4-26 No. 1, both located in 26 of Township 24 North, Range 7. The ratio of GOR's on these wells are 71,400 for the 22-6-1, and 73,600 for the 4-26-1. I might point out that these GOR's of that magnitude are a little misleading in that the fluid volume of these wells is so low that a small amount or relatively small amount of gas production results in a high ratio, because when you divide it by a very small oil number, the resultant ratio is very high.

Q Actually those wells are not making a lot of gas, they are just not making any oil?

A That's right. They make approximately, I believe it's less or in the neighborhood of 200 MCF per day total aggregate.

Q Do you know whether or not the operator of those wells

is contemplating any remedial work or --

A Yes, it is my understanding that the Standard of Texas contemplates either reworking these two wells to reduce the gas-oil ratio, or if that's not possible, they contemplate re-completing the wells; in their present state, they're not worth too much.

Q Mr. Marshall, assuming those wells are re-completed in another formation, then what would the total amount of casinghead gas produced in the field be?

A It would then be reduced to 210 MCF gas daily. That's for the entire field.

Q Excuse me, I didn't mean to interrupt you.

A I say that's all the wells in the field.

Q A little over 200,000 cubic feet?

A Cubic feet, yes.

Q When you are looking at the volumes of gas, that's not much gas?

A No, not for a total of eleven or twelve wells, which there are in this field.

Q It's your engineering conclusion that it's not only economically unattractive, but it economically results in a loss to gather and compress the casinghead gas?

A Yes.

Q You feel that the basis you used for your study for a field-wide system and a central compressor, do you feel that would be the least costly way to handle casinghead gas?

A Yes, I feel that throughout, the study looks at the problem in the most optimistic view in disposing of the gas. There's such a little gas available that you can look at it in the most unoptimistic view and still see a large loss for disposing of the gas.

Q Are you familiar with the administrative exception that the Commission has granted in the Bisti and Gallegos for those wells that were uneconomical to connect to the gathering system there?

A Yes.

Q You are somewhat familiar with the requirements that the Commission desired or wanted before they would grant such an exception?

A Yes, sir.

Q In your opinion, could each and every oil well in the Gallup Pool fit those requirements for administrative exception?

A Yes, sir.

MR. BUELL: That's all we have.

MR. PORTER: Anyone else have a question? Mr. Nutter.

RECROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Marshall, are you acquainted with the Angel's Peak-Gallup Oil Pool?

A Yes, sir.

Q What was the discovery well in that pool, is that well

an oil well or a gas well?

A I don't know the well. I believe it was a gas well, though.

Q Are you acquainted with the discovery well in the Gallegos-Gallup Oil Pool?

A No, sir, I'm not.

Q You don't know that that well was a gas well?

A No, sir.

Q Is there a possibility, if the Commission should classify this pool as proposed today to be a gas pool, that subsequent development could reveal this is a gas cap on an oil pool?

A That possibility exists, of course. However, based on the information and all the data available and the width of the existing gas sand, using that in conjunction with what we know about the Gallup throughout the Basin and how it occurs in rather narrow bands, I would say that from what we know now, that that would not be the case. Now that is, of course, possible, because future development could prove different.

Q If the Commission should find that there was an oil pool to the northeast of this proposed gas pool, do you think that the Commission should re-evaluate this entire situation?

A If it is found that this in the future proves to be an associated reservoir, which as I say, I don't believe it's going to --

Q It could be?

A Yes, sir, I think it should be studied and field rules for the field should be considered, yes, sir.

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

MR. PORTER: Mr. Utz.

BY MR. UTZ:

Q Mr. Marshall, would the injection of gas back into the reservoir in this pool add any additional oil recovery?

A The injection would not add any economical oil recovery. If you are going to go straight on a barrel basis, there might be some more, but the cost to compress and inject gas, as compared with the additional oil recovery, would not be an economical project. There could be some, this reservoir doesn't lend itself too well to gas injection; because of the economics, it doesn't lend itself at all to gas injection.

MR. PAYNE: You would be throwing good money after bad?

A Yes, sir.

MR. UTZ: That's all.

MR. PORTER: Any further questions of this witness? Did you offer your exhibits?

MR. BUELL: No, sir. May I at this time, Mr. Commissioner, offer Pan American's Exhibits 1 through 3, inclusive?

MR. PORTER: Without objection, the exhibits will be admitted and the witness will be excused.

(Witness excused.)

MR. PORTER: Does that conclude Pan American's case?

MR. BUELL: That's all we have.

MR. PORTER: Anyone else want to present testimony?

MR. WHITWORTH: Mr. Whitworth, El Paso Natural Gas Company. We have one witness we would like to present.

MR. PORTER: Have your witness stand and be sworn.

(Witness sworn.)

MR. WHITWORTH: May it please the Commission, El Paso has made an independent study of this area, and we feel that our exhibits should be presented to the Commission. However, we plan to be briefest of all. We do not wish to leave the impression that El Paso desires to limit or curtail cross examination; on the contrary, we welcome it.

ROY L. PRITCHARD

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

DIRECT EXAMINATION

BY MR. WHITWORTH:

Q Would you please state your name, occupation, by whom and in what capacity you are employed?

A Roy L. Pritchard, Division Geologist for El Paso Natural Gas, Farmington.

Q Mr. Pritchard, you haven't been previously qualified as an expert witness before this Commission, have you?

A No.

Q Would you briefly relate to the Commission your educa-

tional background and experience as a geologist?

A Graduate of the Texas College of Mines, 1949, B. S. in Geology. Since that time I have worked for El Paso Natural Gas as a geologist.

Q How long have you been employed as a geologist by El Paso Natural Gas Company?

A Since June, 1949.

MR. WHITWORTH: Are the witness's qualifications accepted?

MR. PORTER: Yes, sir, they are.

Q (By Mr. Whitworth) Have you had occasion to make an independent study of the area in question here in this case?

A Yes, I have.

Q Generally speaking, from a geological standpoint does your opinion with regard to this area coincide with the opinions that have been presented by previous witnesses in this case?

A Yes, sir.

Q What have you used to make these studies?

A Electrolog cross sections.

(Whereupon, El Paso's Exhibits Nos. 1, 2, 3 marked for identification.)

Q You have three cross sections as exhibits today, as El Paso's Exhibits 1, 2, and 3?

A That's correct.

Q Do you have a trace of these exhibits, or map?

A No, but they are the same as the one we have here on the Redfern-Herd Exhibit 1 in two cases, Cross Section A is the

same as Cross Section 1 across the strike. The B is the same as Cross Section 2, and C I guess is the two center wells here, and the third well is the El Paso Natural Gas Canyon Largo No. 89.

Q What two wells were you referring to when you said the two central wells?

A The Standard of Texas 4-26, the Val R. Reese No. 1-24.

Q Now, your examination of this area has been quite extensive, hasn't it, Mr. Pritchard?

A Yes, sir.

Q From your examination do you agree that there is a gas area and an oil area here, as has previously been testified?

A That's right.

Q What is your opinion with respect to the permeability barrier that has previously been mentioned, is the location of that barrier in your opinion the same as --

A I would say that, of course, as this trace here shows, it shows a wide band somewhere in that area, there is a barrier which limits the gas from going up into the oil pool.

Q Without going any further into direct examination, from all the data and the studies that you have made, is it your opinion that there is a gas area separate from an oil area here?

A Yes.

Q And that the application of Redfern and Herd as to the gas area should be granted, that that should be a gas pool?

A I do believe that, yes.

Q In order that the exhibits may be admitted, would you please identify them to the Commission?

A Exhibit 1 is the Cross Section across the strike, which has the Redfern and Herd Largo Spur to the Standard of Texas No. 1-27. It shows, the red shows the gas sand as could be identified from electrolog, disappearing before it gets to the Standard of Texas No. 24-26. Well, the orange color here indicates a siltstone or a sandy silty shale.

Exhibit No. 2 which you have a copy of, I believe, was made to show the clean sand which is found in the Compass Exploration well, and it's attempted to correlate it into the gas area; and found that the gas then is higher in the Gallup section than the oil sand over here.

Exhibit 3, well, this one does not indicate structure, although these two do. It was made using core analyses, as well as electrolog information, and it shows the information on here, shows going this way that your permeability gets very, very low as you go updip.

Q Were these exhibits prepared by you?

A Yes.

MR. WHITWORTH: We ask that El Paso's Exhibits 1, 2, and 3 be admitted.

MR. PORTER: If no objection to the exhibits, they will be admitted.

Q (By Mr. Whitworth) Do you have anything further that

you wish to add to your direct testimony?

A I don't believe so.

MR. WHITWORTH: That's all.

MR. PORTER: Any questions of the witness?

MR. PAYNE: Yes, sir.

MR. PORTER: Mr. Payne.

CROSS EXAMINATION

BY MR. PAYNE:

Q Do you agree, Mr. Pritchard, with the Applicant as to the area that should be covered by this new gas pool?

A On the basis of the information we have at the present time, I do agree.

MR. PAYNE: Thank you.

MR. PORTER: Mr. Nutter.

BY MR. NUTTER:

Q Do you know what the status, the present status of that El Paso well that's being completed at the present time is?

A Well, it's in a sea of mud at the present time, we can't get a rig in.

Q Do you know whether you have an oil or gas well there?

A Pardon me?

Q Do you know if you have an oil or gas well yet?

A I would say a gas well, but I do not know, it has not been perforated.

Q How long will it be before you'll know what you have got?

Do you have any ideas?

A I don't have any idea, it depends on field conditions.

MR. PORTER: Any further questions? The witness may be excused.

(Witness excused.)

MR. PORTER: I would like to ask Pan American if they concur in the area requested.

MR. BUELL: Yes, we do. We feel now that it is the reasonable horizontal limits for the gas pool.

MR. PAYNE: I would like to ask Mr. Bratton how the Applicant determined the area that should be covered in the new gas pool.

MR. BRATTON: I believe there we took the five existing wells from the permeability barrier going northwest, those and the intervening 160 acre units.

MR. PAYNE: So actually the pool proposed by the Applicant will not be in the shape that the red is in on your exhibit?

MR. BRATTON: No, sir, I believe it's outlined in there, we believe that it would be extended there, but we limited it to the existing wells and the intervening location.

MR. PAYNE: Thank you.

MR. PORTER: Mr. Nutter.

MR. NUTTER: I have another question of Mr. Bratton, also. In the event the Commission should classify and create this pool as a gas pool, does your client have a suggested name for the pool,

Escrito Gas Pool?

MR. BRATTON: If that would be satisfactory to the Commission, it would be satisfactory to us.

MR. NUTTER: You don't care what it's named?

MR. BRATTON: Just so gas is in there.

MR. PORTER: Anything further?

MR. BUELL: I have been authorized and requested by Southern Union to make a closing statement for them. Mr. Weidekehr had to leave to catch a plane. Southern Union agrees with the separation theories advanced by the Applicants and others here today. I'm informed that they made an independent investigation as to that separateness prior to going into those gas wells with their pipe line, and they feel that they are definitely separate from the oil.

They have also authorized me to state that they have independently examined the economics of connecting the Escrito casinghead gas and they, like we, find it uneconomical.

MR. PORTER: Mr. Errebo.

MR. ERREBO: If it please the Commission, Val R. Reese and Associates, on the basis of the information and testimony presented here today, concur with the application and recommends that it be granted.

MR. PORTER: Mr. Kellahin.

MR. KELLAHIN: Standard Oil Company of Texas, the operator of six wells in the Escrito-Gallup Oil Pool, none of which are top

allowable wells, two of the wells with GOR's of over 70,000 to 1 have been mentioned here, and those two wells produce seventy, eighty percent of Standard's gas, but they are now approaching their economic limit, as was testified by one of the witnesses here today, Standard is presently investigating the possibility of remedial work or re-completion of these two wells in another horizon. Standard wants to concur with the statements and testimony which was offered by Pan American in regard to the economics of connecting the casinghead gas for production and sale. Standard has found that the Escrito-Gallup Pool is in an advanced stage of depletion and that gathering of casinghead gas would be uneconomical, in view of the small gas reserves and the rugged terrain involved in this area.

Standard has no objection to the application of Redfern and Herd for the proposed new Gallup Gas Pool.

MR. PORTER: Does anyone else have anything to offer in this case?

MR. BRATTON: On behalf of the Applicant, we wish to thank the Commission for their patience. This has been a long case and we appreciate the consideration of the Commission.

I just want to stress the reason it is long is it is a matter of more than passing concern to Messrs. Redfern and Herd. It is a very serious matter, that is why we have imposed upon the time of the Commission. We appreciate your consideration.

MR. PORTER: Anyone else have a statement? We will take

the case under advisement.

***

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Hearing was reported by me in Stenotype, and that the same was reduced to typewritten transcript under my personal supervision and contains a true and correct record of said proceedings, to the best of my knowledge, skill and ability.

DATED this 24th day of March, 1960, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Ada Dearnley
NOTARY PUBLIC

My Commission Expires:

June 19, 1963.