BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

IN THE MATTER OF:

CASE NO. 1308

TRANSCRIPT OF HEARING

January 14, 1959

DEARNLEY - MEIER & ASSOCIATES
GENERAL LAW REPORTERS
ALBUQUERQUE, NEW MEXICO

I N D E X

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

IN THE MATTER OF: The hearing required to be held by Order R-1069-B to permit all interested parties to appear and show cause why the Special Rules and Regulations set forth in Order R-1069-B should be continued beyond February 28, 1959.	CASE NO. 1308

BEFORE:

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: Proceed next to Case 1308, and at this time I would like to ask for appearances in this case.

MR. PAYNE: Case 1308. In the matter of the hearing required to be held by Order R-1069-B to permit all interested parties to appear and show cause why the Special Rules and Regulations set forth in Order R-1069-B should be continued beyond February 28, 1959.

MR. WHITE: Charles White, of Gilbert, White, and Gilbert, Santa Fe, New Mexico, appearing as resident counsel for the following companies:

The Texas Company and Sinclair Oil and Gas Company, whose attorney, James H. McGowan of Tulsa, Oklahoma is associated in

the case; Skelly Oil Company, whose attorney, George Selinger, of Tulsa, is associated in the case; Sunray Mid-Continent, whose attorney, William R. Loar, of Tulsa, is associated in the case, and I also would like to enter the appearance of Jack M. Campbell of Campbell and Russell, Roswell, New Mexico, also appearing on behalf of Sunray.

MR. PORTER: Mr. White, The Texas Company, Sunray Mid-Continent, and what other company?

MR. WHITE: Sinclair.

MR. PORTER: Thank you.

MR. SPANN: Charles C. Spann, from Albuquerque, and Mr. Cecil Hamilton, from Oklahoma City, representing Phillips Petroleum Company.

MR. BRATTON: Howard Bratton, Hervey, Dow & Hinkle, Roswell, New Mexico, appearing for Humble Oil and Refining Company, appearing as resident counsel for Sun Oil Company. Associated with me for Sun Oil Company will be Mr. Granville Dutton, from Dallas, Texas.

MR. KELLAHIN: Jason Kellahin, of Kellahin and Fox from Santa Fe, New Mexico, appearing on behalf of Amerada Petroleum Corporation. I have associated with me Mr. H. D. Bushnell of the Oklahoma bar.

MR. NEWMAN: Kirk Newman, of Atwood & Malone, Roswell, New Mexico, appearing as resident counsel for Gulf Oil Corporation, and associated with me is Mr. Kellough of the Colorado bar.

MR. SPERLING: J. E. Sperling, appearing on behalf of British American Oil Producing Company.

MR. PORTER: Any other appearances in Case 1308?

MR. SETH: Oliver Seth, Santa Fe, and L. C. Kell, Los Angeles, appearing for Shell Oil Company.

If the Commission please, if I may ask a question. It is the understanding of Shell Oil Company that this hearing, the scope of the hearing is limited to the question as to whether or not the existing order will be continued in its present form, and we have proceeded on that assumption. Are we correct in our understanding?

MR. PORTER: Mr. Seth, you are correct, and the matter will be confined strictly to the advertisement. We will not get into relative merits of 80-acre proration units versus 80-acre spacing.

Mr. White, I believe you said that Sunray has testimony to present in this case?

MR. WHITE: Yes, we have.

MR. PORTER: I think we will proceed with the testimony for about twenty minutes, and the Commission will recess for lunch about 11:45.

MR. WHITE: If the Commission please, at this time I would like to make a brief opening statement.

The record in this case shows that in August of 1957, Sunray Mid-Continent filed this application requesting a temporary

order authorizing an 80-acre proration unit to be established in the Bisti Lower Gallup Oil Pool in San Juan County. The case was heard in September of 1957, and the Commission denied the application. Thereafter, a petition for re-hearing was filed, and the case was again heard, in December of 1957, at which time additional evidence of the pool characteristics was introduced. As a result of that hearing, the Commission issued its Order R-1069-B, and the order, among other things, made the following findings of fact, which I would like to quote. Namely, Finding No. 5:

> "That sufficient evidence was adduced by other Petitioners on re-hearing, in addition to the evidence adduced at the original hearing, to justify the establishment of 80-acre proration units in the Bisti Lower Gallup Oil Pool on a temporary basis."

Now, this order, by its expressed terms, is to become ineffective March 1st of this year. However, the Commission had an occasion to reaffirm Order R-1069-B as recently as last April, and in so doing, made the following finding of fact, and I quote:

> "That in deciding Case 1308, Order No. R-1069-B, the Commission determined that one well would efficiently and economically drain 80-acres in the Bisti Lower Gallup Oil Pool, and that such determination is inherent in Finding No. 5; and further, that in making such determination, the Commission took into consideration the economic loss caused by the drilling of unnecessary wells, the protection of correlative rights, including those of royalty owners, the prevention of waste, the avoidance of risk arising from the drilling of excessive number of wells, and prevention of reduced recovery which might result in the drilling of too few wells."

As I previously stated to the Commission, this pool was established in 1956. At the time of the hearing, original hearing, there were approximately 125 wells drilled in the pool upon which study could be made. Sunray Mid-Continent, and other operators in the pool then, as now, feel that the pool can be economically and efficiently drained by 80-acre proration units. However, because of the limited amount of factual information available, both geologically and field information, Sunray requested that the order be temporary in nature in order that additional studies could be made as to the pool characteristics, and that the matter could be later reconsidered by the Commission, and the Commission has called a hearing today to determine whether or not Order R-1069-B should continue to be in effect.

There now have been 304 wells drilled in the pool, and since the original hearing, Sunray Mid-Continent and the operators in the pool have been diligent and continued to carry on their extensive study of the characteristics of the pool.

The pool history now shows, and the results of their study show, that the testimony which has previously been offered has been confirmed; namely, that there is communication and continuity of sand throughout the pool. The reservoir is of such porosity and permeability that the area can be drained economically and efficiently on 80-acre proration.

We hope to establish at this hearing, from the testimony that will be offered, that it will not only lend additional support to

Commission's findings that such a proration unit is justified in the area, but that Order R-1069-B, in its present terms, should be continued in effect.

Mr. Loar will proceed with the interrogation of the witness.

MR. VERITY: Your Honor, I would like to enter my appearance. George Verity, on behalf of Mr. Rex Moore, supporting this application for continuance of the order.

MR. PORTER: Thank you, Mr. Verity.

MR. VERNOR: I would like to put in an appearance for Atlantic Refining Company. Atlantic Refining Company is in support of this application.

MR. PORTER: Are there any other appearances to be made in this case?

Mr. Loar, would you have all of your witnesses stand up and be sworn, please.

MR. LOAR: We have two witnesses.

(Witnesses sworn.)

MR. LOAR: Mr. Finfrock, will you please take the stand.

MR. PORTER: Will you have Mr. Finfrock spell his name for the Reporter, please.

MR. FINFROCK: Initial L. J. F-I-N-F-R-O-C-K.

L. J. FINFROCK

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

DIRECT EXAMINATION

BY: MR. LOAR:

Q Mr. Finfrock, will you please, for the record, state your name and occupation?

A I am L. J. Finfrock, research geologist for Sunray Mid-Continent Oil Company, Tulsa, Oklahoma.

Q Will you very briefly--I believe you have testified here before--very briefly state your qualifications and familiarity with the Bisti Lower Gallup Oil Pool.

A I graduated from the University of Illinois in 1940 with a bachelor of science degree in geology, and in 1948 I received my master of science degree from, in geology, from the University of Illinois. I have been actively engaged in the study of the Bisti Field since June, 1956, and have been in attendance at numerous hearings, and worked on the Unit Committee of Geologists and Engineers.

Q Have you examined essentially all of the electric logs in this field?

A I believe I have.

Q I believe there are approximately three hundred.

A Approximately three hundred.

MR. LOAR: If his qualifications are acceptable, we will proceed.

MR. PORTER: They still are.

Q (By Mr. Loar) Will you please refer to what has been marked as Sunray's Exhibit No. 1 and discuss it briefly?

A Exhibit No. 1 is our area map of the Bisti Lower Gallup Oil Pool. The Bisti Pool is composed of portions of Township 24, 25, and 26 North, Range 9, 10, 11, 12, and 14 West. This pool is approximately thirty miles in width and averages from one and a half -- I mean, in length, and averages from one and a half to three miles in width.

We have shown hereon, by the appropriate symbols, the 289 oil wells and 13 gas wells in the lower Bisiti Gallup Oil Pool. This is an additional 115 wells since the hearing of last year.

We have also shown hereon, by the orange border, the pool limits as defined by the New Mexico Oil Conservation Commission in the December nomenclature hearing.

We have also shown hereon, the original LPG gas injection pilot area, forming a square of 160-acres around the common corner of Township 25 and 26 North, Range 12 and 13 West.

We have also shown here in yellow, the project area of the recently approved gas injection project, incorporating portions of our Federal C Lease in Township 25, 26 North, Range 12 West.

We also have indicated on this area map, by the red and green solid and dashed lines, the traces of various cross sections that have been made in preparation for this hearing.

Q Now, then, Mr. Finfrock, would you refer to Exhibits 2, 3, 4, and 5, and --

A Exhibit No. 2 is a copy of the portion of the electric log of the British American Oil Producing Company's Marye No. 1

located in the northeast northeast of Section 1, 25 North, Range 13 West. As can be seen from this Exhibit, we have depicted by the green color in the solid portion in the middle of the electric log, the lower Gallup formation, and have shown it by the appropriate name. The top of this formation is picked in this well at 4826 feet. At total depth of 5,003 feet, we are still in the lower Gallup formation.

Exhibit No. 3 is a copy of the portion of the Shell Oil Company's Carson No. 1 in Section 24, 25 North, 12 West, which likewise shows, by the green color, the lower Gallup formation in this well. The top of the lower Gallup is encountered at approximately 4860 feet, with the base at 5134 feet.

Exhibit No. 4 is a copy of a portion of the induction electrical log of Skelly Oil Company's Lockhart 1-A, located in Section 31, 25 North, 10 West. This location --

Q Mr. Finfrock, could I interrupt you at this point. I think the staff -- some of these Exhibits aren't numbered. Are you aware of the numbers on the exhibits?

MR. NUTTER: Yes.

Q (By Mr. Loar) Would you go through two, three, four and five, merely identify the wells so that they can mark on their exhibits the exhibit number.

A Exhibit No. 2 is a British American Well, No. 1 Marye.

Q Just a minute now, Mr. Finfrock. All right, Exhibit No. 3.

A Exhibit No. 3 is the Shell No. 1 Carson. Exhibit No. 4 is the Skelly No. 1-A Lockhart. Exhibit No. 5 is the L. E. Elliott C-1.

Q Now, then --

A Going back to Exhibit No. 4, which is the Skelly's Lockhart 1-A, the top of the lower Gallup is picked in this well at approximately 5146 feet, and at a total depth of 5295 feet approximately, we are still in the lower Gallup formation.

Exhibit No. 5 shows the portion of the induction electrical log of the L. E. Elliott Federal C-1, located in Section 34, 25 North, 10 West, and in this well, the top of the lower Gallup formation is picked at approximately 5345 feet, and in a total depth of 5450 feet, we are still in the lower Gallup formation.

As can be seen from these type logs which have been picked from various portions of the reservoir, one can see that the lower Gallup formation is present in each and every log, which are representative of the general area from which they have been picked.

MR. PORTER: Mr. Loar.

MR. LOAR: Yes, sir.

MR. PORTER: At this point it is 11:45, and the hearing will be recessed until 1:15.

(Recess)

MR. PORTER: The hearing will come to order, please. Mr. Loar.

Q (By Mr. Loar) Mr. Finfrock, had you finished your

discussion of Exhibit No. 2, 3, 4, and 5, which are the logs for the Bisti Lower Gallup Oil Pool?

A Yes, sir, I have.

Q I believe you testified that these logs are representative of the logs in the field, is that correct?

A That is correct.

Q Now, then, will you please refer to Exhibit No. 6 and discuss that briefly?

A Exhibit No. 6 is an electrical log cross section extending from the British American No. 1 Navajo, the northwest, northwest, 15, 26 North, 14 West, following the solid green line to the Lion No. 1 Atlas, Section 24, Township 25 North, Range 10 West. This exhibit is hung from a datum of plus 1750 feet, and shows the division of the upper and lower Gallup formation.

We have covered here in green the designation of the lower Gallup formation as approved in committee work for unitization in which we have shown the first section and third benches in the lower Gallup formation, as can be seen from this exhibit. The lower Gallup sands are present through out this longitudinal axis as shown here on this exhibit.

Q Is this essentially the same cross section that you presented in previous hearings?

A That is correct.

Q Now then, will you please refer to Exhibit No. 7?

A Exhibit No. 7 is cross section A prime, double A prime,

which starts on Lion's No. 1 Atlas, which was the last well in the previous section, continues on to a southeast direction to Gulf No. 1 Federal Well in Section 29 of 24 North, Range 9 West. This is the portion of the field that had not been developed at the time of the previous hearing, and we've continued this section on in a southeasterly direction to show that we have the same upper and lower Gallup formation present in these sands, present and continuing in an elongated direction through this bar-type deposit.

Q Does the additional drilling in this area and the cross sections that you prepared from the information obtained from these wells, confirm your previous testimony?

A They do.

Q Now, then, will you refer to Exhibit No. 8?

A Exhibit No. 8 is Cross Section CC Prime, which is shown here in the dashed green line, extending from the Sunray's G-1 Federal in Section 32 in a northeasterly direction, to the Benson-Montin-Greer No. 1 Foster in Section 21 of 26 North, 13 West. The previous two cross sections and this one are drawn from the same rate of plane, and as can be seen from this cross section, we show the attitude, or the dip, or bed of the lower Gallup formation to the northeast.

I would like to call you attention to the fact that as we produce, as we move down dip basinward, we will find that the shalely sand stone, represented as the uncolored sand between

the upper and the second bench, tends to thin as we go basinward, and that the second sand thins also. We have no evidence in it, in the last well, the Benson-Montin-Greer No. 1 Foster. We also show the same thinning characteristics as we move off the bar deposit in these other sands.

Q Now, will you likewise refer to Exhibit No. 10?

A Exhibit No. 10 is cross section DD prime, which is shown represented here by the dashed green line, extending from the El Paso Natural Gas Pilot No. 8 Kelly State in a northeasterly direction, on cross section 9, and terminating with Pan American's No. 2 In-ni-da-pah.

Q Excuse me, I referred to that as Exhibit No. 10, is that No. 9

A That is 9.

MR. PORTER: It corresponds with the one I have.

A And terminated with the Pan American No. 2 In-ni-da-pah in Section 4 of 25 North, Range 12 West. This, as in the previous exibit, is drawn from the same data plane, and you can see the characteristics of the dip best in a northeasterly basin direction. I would also like to point out that this shale separating the upper two benches, as the previous section, continues to move as we move off the bar deposit. Likewise the shale, the interval between the second and third benches, as we approach the northern or up dip portion, tend to dip to where it is possibly less than one half to two feet in thickness.

Q I believe you are ready for Exhibit No. 10?

A I am ready for Exhibit no. 10.

Q Will you discuss that, please?

A Exhibit No. 10 is cross section EE prime, which is a north-south section essentially extending from the Carson -- I mean, from the Shell Carson No. 5 in Section 27, terminating in the National Drilling Company's No. 1 Federal in Section 15 of 25 North, 11 West. This previous section is drawn from the same datum point, indicating the northeasterly dip into the basin, and the fact that this shalely sand stone, between the upper two benches, still shows this characteristic of thinning basinward, and we feel that between the Shell 21-22 Ah-nus-Bah, and the Sunray Platero, this goes into one sand, which in turns shales completely out north over to the Platero, between the Platero well and National Drilling Company's No. 1 Federal. In this instance we show very little thinning of the shale zone between the second and third interval. However, we do show an overall thinning in the lower Gallup section as we moved eastward off the bar.

Q Now then, I believe we are ready for FF prime, which is, I believe, No. 11.

A That is correct. Exhibit No. 11, FF prime, is the last of our transverse cross sections. This cross section is in the southeasterly portion of the field, and due to the lack of complete development in this portion of the field, we are not in the same position as the other sections that we have, in that

we have not been able to complete it across the bar. However, you see, though, they are hung from the same datum point, and we show the same northeasterly dipping bed of the lower Gallup formation. We also show that the presence of the three previously mentioned sands are there, and in this instance, we do not see the evidence of thinning of the shalely sand interval between the sand benches.

Q At the previous hearing, microlog cross sections were introduced showing the more, representing the more porous and permeability portions of the lower Gallup formation. Have you prepared micorolog cross sections paralleling all of the SP cross sections that you've discussed here today?

A Yes, I have, and the microlog cross sections are indicated on this Exhibit No. 1 by the solid red or dashed red lines.

Q In preparing these, did you take into consideration the hundred and fifteen new wells that had been completed in the lower Gallup since the last hearing?

A Yes, I did.

Q Do they confirm your testimony here today and your previous testimony?

A They do.

Q Now then, Mr. Finfrock, I believe you prepared a sand distribution map of the upper portion of the lower Gallup formation, have you not?

A Yes, I have.

Q Will you please discuss that? I believe it has been marked Exhibit No. 12.

A Exhibit No. 12 is a distribution map of this upper sand member of the lower Gallup formation. This yellow, as shown here on this map, is not to represent quality of sand, it merely represents presence of sand by study of the electrical log characteristics, and as you can see, this sand is in the form of a barrier in the north, west, south, and easterly direction, extending at least thirty miles in length.

Q Would you proceed.

A I have since then made a study of the micrologs of the approximate three hundred wells in the Bisti Lower Gallup Oil Pool, and contoured an isopach map of this lower Gallup formation, and which we have superimposed over the distribution map. This shows the occurrence in that sand zone of the better developed portion of the upper bench of the lower Gallup, and as can be seen from this exhibit, we find that the fairway, as we mentioned before, is on the outer edge of this bar, which is the seaward side, where we would expect to get sorting in a better manner than we would back from the seaward side.

Q Now then, have you prepared a similar exhibit for the second sand of the lower Gallup formation?

A I have.

Q This has been marked Exhibit No. 13, has it not?

A Exhibit No. 13 is the distribution map of the second member of the lower Gallup formation, and the yellow, as indicated hereon, has been put there as a result of a study of electircal logs showing that the sand is present in these wells, as shown hereon, and the study of the microlog logs of these wells indicates the presence of that portion of this deposit, which is better sorted and shows more porosity and permeability, and as can be seen from this exhibit, this portion of the bar lies in approximately the same position in relation to the total sand body as did that in Exhibit No. 12.

Q Now then, do the sand distribution map and the isopach for both portions of the lower Gallup reflect a study of all of the wells in the Bisti Oil Pool?

A All of the wells that I was able to obtain, and that is practically every well that has been completed.

Q Do the hundred and fifteen wells drilled in the past thirteen months, and used in these exhibits, confirm your testimony in the last hearing?

A Yes, they do.

Q Do all of these exhibits that you have prepared today reflect that the sand is continuous and connected throughout the Bisti Lower Gallup Reservoir?

A That is my opinion.

Q Were Exhibits 1 through 13 prepared under your direction and supervision?

A They were.

MR. LOAR: We move at this time that these exhibits be admitted in evidence.

MR. PORTER: Is there any objection to the admission of Sunray Mid-Continent's Exhibits 1 through 13? They will be admitted into the record.

MR. LOAR: That's all the direct we have of this witness.

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

CROSS EXAMINATION

BY: MR. NUTTER:

Mr. Finfrock, in this additional study that you have made of the Bisti Lower Gallup Oil Pool, with the some one hundred and fifteen additional wells to study, has anything come to your attention that would indicate to you that the spacing of the pool, as it presently exists, is in error?

A No.

Q You still feel that it should be spaced or prorated--

A Prorated.

Q --on the basis of 80-acres per well?

A I feel that is adequate.

MR. NUTTER: Thank you.

MR. PORTER: Anyone else?

MR. UTZ: Yes, sir.

MR. PORTER: Mr. Utz.

QUESTIONS BY MR. UTZ:

Q Mr. Finfrock, referring to Exhibit No. 12, specifically to the Merchant 2 and 3 wells in Section -- at point 512, are those wells completed in the Gallup formation?

A Those are two wells that I have not been able to receive electrical logs on, so I did not attempt to show the presence of sand. However, due to the fact that they apparently are productive wells, there must be sand present, but I did not have those logs to study, and they are not represented in as belonging to anyone group or the other. I haven't been able to defind them because I didn't have the logs.

Q We would assume then that your isopach map is in error, particuarly in that area?

A The isopach map would probably have to be corrected when those came in. If they do not evidence any microlog separation, I mean, if they did evidence microlog separation.

Q In your opinion, would your study in regard to the micrologs show that we have now some dry acreage in the boundaries of this pool?

A You mean based upon the study of the micrologs?

Q Based upon your study of the pool, if you want to cover the entire area.

A Well, there are several wells that have been drilled within the confinds of this pool that do not have been drilled

and have been completed that do not show evidence of microlog separation. That is not the only criteria, the positive microlog separation.

Q We do have quite a bit of pool outside of your zero microlog permeability?

A The orange boundary is outside of the zero line of the isopach in some instances, that is correct, sir.

MR. UTZ: That's all I have.

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

QUESTIONS BY MR. FISCHER:

Q Mr. Finfrock, in Section 15 of Township 24 North, 9 West, --

A 24, 9?

Q Yes, sir.

A 15. Yes, sir.

Q That No. 8 Federal Gulf, that is dry in the lower Gallup, in any of the Gallup?

A Apparently it is. They did not complete it as an oil well.

Q And the No. 4 in Section 21 South, east quater, that's a Gulf well?

A Section 4, you say?

Q No, sir, Section 21, is that well No. 1?

A Yes, in the northeast, northeast, the Gulf Kenny

Beto, I guess. We show that as a completed well.

Q Is that completed in all three benches?

A In the lower Gallup.

Q All three?

A I do not have the perforations.

MR. FISCHER: Thank you, that's all.

MR. PORTER: Any further questions?

MR. LOAR: I have one additional question, Mr. Porter.

REDIRECT EXAMINATION

BY: MR. LOAR:

Q Mr. Finfrock, are there some wells, at least in the Bisti Lower Gallup Oil Pool, which are producing and do not show any microlog, positive microlog separation?

A I feel there are, yes. There would be the edge wells on either plane.

MR. LOAR: That's all.

MR. PORTER: Anyone else?

MR. FISCHER: Yes, Mr. Porter.

MR. PORTER: Mr. Fischer.

RECROSS EXAMINATION

BY: MR. FISCHER:

Q Your yellow section that you say shows that this sand is present, have you found any other evidence outside the limits of this Bisti Pool that there is any uniform permeability in this

sand where it is encountered that might show another bar type development outside the pool limits?

A No, sir, I have not.

MR. FISCHER: Thank you.

MR. PORTER: No further questions, the witness may be excused.

(Witness excused.)

T. W. BRINKLEY

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

DIRECT EXAMINATION

BY: MR. LOAR:

Q Mr. Brinkley, will you please state your name and occupation?

A My name is T. W. Brinkley, I am chief reservoir engineer for Sunray Mid-Continent located in Tulsa.

Q Will you please give a brief resume of your professional background?

A In 1940 I graduated from the University of Tulsa, Tulsa, Oklahoma, with a bachelor of science degree in petroleum engineering. Since then I have been practicing as a reservoir engineer, as a petroleum engineer the last thirteen years specializing in reservoir engineering.

Q Have you been associated with the Bisti Field since

the earliest states of development?

A Yes, I have. I might state that since Sunray is chairman of the Engineering Committee, I have been associated with that group, also since Sunray is chairman of the Operators' Committee, I have been associated also with that group. In addition to that, I have made several independent studies of the Bisti Lower Gallup reservoir. I have in the past appeared as a witness and offered testimony in this spacing matter.

MR. LOAR: If his qualifications are acceptable, we will proceed.

MR. PORTER: Yes, sir.

Q (By Mr. Loar) Will you please briefly discuss the reservoir characteristics or history of the lower Gallup formation, Bisti Pool, San Juan County, New Mexico?

A To date, we have drilled approximately three hundred two oil wells in the Bisti Lower Gallup reservoir. This drilling has defined a pool approximately thirty miles in length, and width varying from one and a half miles to three miles. Out of these three hundred two wells that have been drilled, thirteen of them are gas wells, and these gas wells are located in the southeastern portion of the Bisti Field. The most easterly gas well, and I will circle the well here for your convenience, is the Humble State No. 2, located in Section 32, 25 North, 10 West. It is located in the southeast of the southeast.

The westerly most gas well is the Shell Carson Unit No.

32-20 located in Section 20, 25 North, 11 West. As you can see, this gets the eastern and the western boundary of the thirteen gas wells.

The New Mexico Oil Conservation Commission's boundary of this pool was identified earlier by Exhibit 1 as the orange boundary. That boundary contains thirty-three thousand eight hundred acres.

As described earlier by Mr. Finfrock, the drilling of these three hundred and two wells has defined the Bisti Lower Gallup sand as a long narrow deposit of sand. Further, we find that the drilling of these wells has characterized the reservoir as being thinner in the center. Also we find that the wells drilled on the northeast flank and the southwest flank up and down this trend, the sands are thinner.

Further, the electric log interpretation reveals that the thicker sands are of better quality, and the thinner sands on the flanks are of inferior quality. This characteristic is further substantiated by core analysis.

Q I believe you prepared exhibits reflecting the core analysis for three typical wells. These have been marked Exhibits 14, 15, and 16. Would you please refer to these, briefly?

A Exhibits 14, 15, and 16 represent, are exhibits showing the electric logs and laboratory analysis of cores taken from these three wells. The three wells are identified as follows:

Exhibit 14 is the Phillips Benally No. 2, located in the northeast, southwest of Section 5, 25 North, 12 West. This well represents a well in the fairway.

Exhibit 15 is the British American Salge B-5, and it is located in the northeast, northeast, Section 33, 26 North, 13 West. As you can see, it is an edge location.

Exhibit 16 is the El Paso Natural Gas Kelly State No. 1 located in the northeast, northeast of Section 16, 25 North, and 12 West. Again, this exhibit represents an edge well.

Since these three exhibits illustrate the same significant characteristics, I would like to concentrate my testimony on Exhibit 14. That is the Phillip's Benally No. 2, the fairway well. You will notice in the center of the exhibit that we have the electric log. We have identified the upper and second sand. You will notice also the electric log reflects better sand development in the upper sand, compared to the second or lower sand. On the right hand side we indicate the results of the laboratory determined permeability from cores taken through the entire vertical section.

As you notice, the better permeability occurs opposite the upper sand. Maximum permeabilities are detected at approximately two hundred milladarcies. You will notice too, that permeability is identified by the bar graph throughout the entire veritcal section.

On the left hand side you will notice the laboratory

determined porosity values for the entire cored interval. Again, you will notice better porosity development opposite the upper sand, compared to the second and lower sand. Again, I direct your attention to porosity development throughout the entire vertical section. The foregoing characteristics are reflected on Exhibit 15 and 16.

Q Mr. Brinkley, I believe there are some blank spaces on Exhibit 15 on your porosity scale and permeability scale.

A Exhibit 15. Yes, we have blank spaces circled in red. On Exhibit 16 there are several blank spaces. Those blank spaces represent sections that were not cored.

Q Now then, what is the significance of these three exhibits?

A These exhibits illustrate that permeability exists throughout the vertical sections, and also refect the better sand character in the fairway wells in the reservoir.

Q Mr. Brinkley, is pressure interference information one of the tools of the petroleum engineer or the reservoir engineer to defind drainage, or the area that one well will drain?

A Yes.

Q Have you seen evidence of pressure interference in the Bisti Field?

A Yes, sir, I have.

Q Would you please discuss some of these instances of pressure interference?

A We have several instances of positive well interference in the Bisti Lower Gallup reservoir. One instance occurs in the El Paso Natural Gas Kelly State No. 2, located in the southeast, northwest, Section 16, 25 North, 12 West. That well is located right here, which I have circled in red. In that well, on January 31, 1956, the bottom hole pressure was measured to be fourteen hundred and three pounds at the elevation, on datum of plus thirteen hundred feet. This pressure is two hundred and nine pounds less than the original reservoir pressure. Another instance --

Q Now, Mr. Brinkley, are there wells, were there wells offsetting this well which were producing prior to its completion?

A Yes, the nearest well that was producing at the time, or before the time that this well pressure was measured, was the discovery well, El Paso Natural Gas Kelly State No. 1, which was previously circled in black. The discovery well is located twenty-four hundred and twenty feet distance from the Kelly State 2. The well that we detected interference on. Using this information and constructing an arc around the producing well, with a radius of twenty-four hundred and twenty feet representing the interference that we have measured and detected, would encompass an area of four hundred twenty-five acres.

Q Mr. Brinkley, what was the pressure on this Kelly State No. 2 that you testified to?

A The bottom hole pressure on the Kelly State No. 2

measured on January 31, 1956, was fourteen hundred and three pounds per square inch.

Q That was completion pressure?

A That is completion pressure, before any production was taken from that well.

Q Now then, will you please discuss some of the other examples?

A Another example is the El Paso Natural Gas Kelly State No. 3. That well is located on the northeast, southeast, Section 6, 25 North, 12 West. Again, I will circle that well in red. On February 29th, 1956, this well measured a bottom hole pressure of thirteen hundred ninety-four pounds at the elevation of thirteen hundred feet. This pressure represents two hundred eighteen pounds less than the original reservoir pressure. Again, the nearest well producing, at this time, was the discovery well, El Paso Natural Gas Kelly State No. 1, and it is located twenty-three hundred feet north, twenty-three hundred and ten feet north of the subject well. Again, by circumscribing an arc around the discovery well with that radius, the well encompassed an area of three hundred and eighty-four acres.

Q Now, was this also a completion pressure on this Kelly State, which well was it, No. 7?

A No. 3. Yes, it is also a completion pressure, measured before any oil had been produced.

Q All right.

Another example is Shell-Phillips No. 23-10, located in the northeast, southwest of Section 10, 25 North, 12 West. Again, I have circled the well in red. On August 31, 1957, the bottom hole pressure was measured in this well, and the value was fifteen hundred and twelve pounds at an elevation of thirteen hundred feet.

Q Was that also a completion pressure, Mr. Brinkley?

A That also was a completion pressure. This completion pressure represents a hundred pounds per square inch, less than the original reservoir pressure. The nearest producing well is Southern Union's Ka-gee-tah. It is located in the southeast, northwest, Section 10, 25 North, 12 West. Again, I have circled that well. The nearest well that was producing is fourteen hundred feet from the Shell-Phillips No. 23-10. Similarily, by constructing an arc around the producing well with a radius of fourteen hundred feet, we circumscribed an area of fourteen hundred feet. We circumscribed an area of one hundred forty-one acres.

Q Now, then, do these examples reflect pressure interference and drainage of wide areas even in the portion of the field which has been described as perhaps inferior or with less peremeability?

A Yes.

Q As well as the more premeable portions.

A Yes, they do.

Q These pressure interference tests reflect migration of oil in the reservoir, do they not?

A Pressure interference tests reflect the movement of oil away from the newly completed well used in this example, and that oil flows from that area to the nearest producing well.

Q Now then, have you seen other instances of pressure interference in this pool?

A Yes. One example, the latter part of '56, continuously through the fall of '57, in the project area marked on Exhibit 1, colored in yellow, representing the Sunray Federal C Lease, we had four wells shut in for approximately one year, and measured the reservoir pressure from time to time. During that year we observed a pressure decrease in each of those four wells, and the range in value of this pressure decrease was between eighty-two pounds and one hundred and five pounds.

Bear in mind two of these four wells are located at the edge of the field where the inferior sand characteristics are, and two of the wells were located in the fairway. Again, using the distance between these shut in wells and the nearest producer to the well, and circumscribing an arc or circle around the producing well with that radius, and calculating the area within that circle, we find that we can calculate the radius of drainages for areas varying from a minimum of one hundred twenty-six acres to a maximum of nine hundred and ninety acres. There is another instance of interference and that instance is in the pilot area, as Mr. Finfrock mentioned

this morning. The pilot area is located on Exhibit 1, colored in green. The pilot area is located at the intersection of Township 25, 26 North, Range 13 West. This interference test was identified as a pressure build up in outlying wells, observed for a distance of little less than one mile from the injection well. This pressure build up was due to the injection of LPG and gas in our injection well. In other words, we identified the pressure build up in the wells within that circle, almost a circle. Using that radius and constructing a circle around the injection well, we can circumscribe an area in excess of a thousand acres.

Q Mr. Brinkley, have you made a study of the reservoir pressure the Bisti Lower Gallup Oil Pool?

A Yes.

Q Will you please refer to Exhibit No. 17, which is a pressure contour map reflecting a recent bottom hole pressure survey for this pool?

A Exhibit 17 represents an isobaric map of the lower Gallup reservoir.

Q Mr. Brinkley, will you please explain what an isobaric map is?

A It can be stated quite simply. An Isobaric map is a pressure contour map, that means that a contour represents lines of equal pressure in the reservoir.

Q Is an isobaric map, or pressure contour map, one of the recognized tools of the petroleum or reservoir engineer?

A Yes.

Q All right, sir, will you proceed with the discussion of Exhibit 17.

A Exhibit 17, being the pressure contour map, reflects basically the pressure distribution in the reservoir. This exhibit was constructed from a poolwide voluntary survey conducted by the operators in the pool. This survey was conducted in August 1958. At that time, representative wells, key wells, were picked throughout the length of this reservoir, and were measured for pressure so that we could use that data in constructing a pressure contour map that would reflect representative reservoir pressures. The result of all of this field work was then put on this map, which we now call Exhibit 17. You will notice that the highest pressures are detected on Exhibit 17 along the fairway for the entire length of the reservoir, and these higher pressures are detected where the thicker sand exists. You will notice also that the lower reservoir pressures are identified along the northeast flank and along the southwest flank of the reservoir where the thinner sand sections are. You will notice further, the smooth and continuous nature of the contour lines reflecting continuity of our sand up and down the longitudinal axis of our reservoir.

Q Does this map then reflect that we have widespread pressure or fluid communication over a broad area?

A In my opinion, Exhibit 17 is significant mainly

because of the continuous nature of the isobars in that they reflect fluid movment has occurred over large areas, otherwise the contour lines would displace a discontinuous character such as erratic type contouring and the erratic type contouring would include numerous isolated low pressure areas.

Q At the previous hearing on this field, did you testify that one well would efficiently and economically drain 80-acres?

A Yes, I did.

Q I believe that both you and Mr. Finfrock have testified that approximately one hundred fifteen wells have been drilled since the last hearing?

A That is correct.

Q Has the drilling of these one hundred fifteen wells changed your opinion of this reservoir or changed your testimony?

A No, sir, it has not.

Q Does the pressure interference information and this isobaric map support your testimony that one well will drain in excess of 80-acres?

A Yes, it does.

Q Does all of the evidence available confirm your testimony that one well will efficiently and effectively drain in excess of 80-acres?

A Yes, it does.

Q Were exhibits 14, 15, 16, and 17 prepared under your

direction and supervision?

A They were either prepared by myself or under my supervision.

MR. LOAR: We move that these exhibits be admitted into evidence.

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

MR. LOAR: That's all the direct testimony we have from this witness.

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

CROSS EXAMINATION

BY: MR. NUTTER:

Q For how many wells did you have available bottom hole pressures in making this isobaric map, Mr. Brinkley?

A I didn't count them, but there are approximately a hundred.

Q And they are scattered throughout the length and breadth of the pool, I presume?

A Oh, yes, when we scheduled this bottom hole pressure survey, we requested that we get representative coverage, or each section or quarter section from each reservoir, so that we could be reasonably assured that the results we would gain would be representative of the reservoir pressure.

Q The little numbers opposite some of the well numbers

on the map indicate the well pressure that you had available on that well?

A I am very glad you brought that up. I forgot to mention that. Yes, we have shown, I think the draftman has been consistent, but immediately above the well and in fact, immediately above the well number, you'll find another number, and that number would be the pressure in that well. As a matter of fact, this isobaric map represents pressures corrected to the center of the completion interval.

Q These are not necessarily taken at a common datum?

A No, we feel that, since we are interested in reservoir pressure, that the pressure expressed at the center of perforations more nearly reflect what we want to know.

MR. NUTTER: Thank you.

MR. PORTER: Does that conclude your questioning?

MR. NUTTER: Yes.

MR. PORTER: Mr. Utz.

QUESTIONS BY MR. UTZ:

Q Mr. Brinkley, did you have more core data to study other than Exhibit 14, 15, and 16?

A Oh, yes, yes.

Q You made a study --

A Yes.

Q --of that core data?

A Yes, I made up Exhibits 14, 15, and 16, since they

were typical of the wells that would be included in all the wells cored.

Q Then there was other core data?

A Yes.

Q In your opinion, does this show communication between the sand in the Bisti Pool?

A It shows that permeability exists throughout the vertical section. However, the degree of communication vertically will not be as great as horizontally.

Q But you feel there is in the vertical limits?

A Yes, I do.

Q You have only shown two sands here. It is my understanding, or three, it is my understanding there are three sands. Did you show the three of them?

A I am not sure I understand you, but on Exhibit 14 we identified the upper and second sand.

Q Yes, sir.

A Are you referring to the lower sand?

Q Yes, is that shown on this exhibit?

A The lower sands are on Exhibit 14, 15, and 16, but they are not identified as such. They are identified upper sand, second sand, consistent with the isopach map that was presented earlier by Mr. Finfrock.

Q Well then, all three sands are shown on this exhibit?

A Yes.

Q But they are not identified?

A The lower sand is not identified, that is correct.

MR. UTZ: That's all I have.

MR. PORTER: Anyone else have a question? The witness may be excused. Does this conclude Sunray's testimony?

MR. LOAR: Yes, sir.

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

MR. CAMPBELL: Mr. Commissioner, I would like to make a brief statement on behalf of Sunray Mid-Continent, since they are the principal proponents for the continuation of this order.

I think it is apparent from the testimony that has been presented here, that all of the conclusions of these witnesses, who have appeared in prior hearings, have been confirmed, in their opinion, by the additional drilling that has taken place, and by the additional studies that have been made. I do not know whether the request was made to include the testimony and exhibits in the prior hearing in this hearing or whether they will automatically be included, but if it is necessary, I would like to request that all of the prior testimony involving the establishment of proration units in this pool be included as a part of the record in this case.

MR. PORTER: It is our understanding that the previous record is a part of the case.

MR. CAMPBELL: Then, as I say, with the previous record and the testimony here, based upon the most recent findings of the Commission, and their most recent order, it appears to us that there is a basis for a continuation of the present order, or for a new order at the time this one expires, upon the same terms as the present order.

Sunray Mid-Continent is requesting that the present arrangement of proration units in this pool be extended or continued, or that a new order be written with the same provisions, and that proration units of 80-acres be continued with the right of any party to drill more than one well on 80-acre proration units, should they so desire, with the proper adjustment in allowable.

With regard to the terms of any such order, it is our recommendation and our request to the Commission, that if it sees fit to write another order, that that order remain in effect for a period of one year from the expiration date of the present order, and that it include a provision that it shall continue in effect thereafter until any interested party or the Commission requests that it be brought up again for hearing.

I do not think that there is any question about the right of the Commission to bring it up again for hearing, but there has been some conversation recently that a party might be precluded from doing it at a later time. The reason for that request is that it will avoid the necessity, unless the Commission or an interested party request it, for another preparation of this type,

commencing ten or eleven months from now, and it will leave open, on the other hand, as the present order has, the full right of the Commission, at the expiration of the one year, or any other party at the expiration of that time, or at any later date, to request that the Commission bring the matter up again for hearing.

It is our understanding that the Commission has been advised by the company which originally appeared in this hearing in opposition to 80-acre spacing units, as distinguished from proration units, that they do not object to the continuation on the present basis, even though they have, I presume, been fully advised. They are not objecting to the continuation, so long as it is on a proration unit basis, and Sunray Mid-Continent is requesting that this order be extended upon the same terms as the present order.

MR. McGOWAN: James McGowan, Sinclair Oil and Gas Company. Our people have made a similar study, but not nearly as detailed as that shown here today by the Sunray people, and they arrive at essentially the same conclusion. If they testified today, their testimony would support and substantiate the testimony that has been given at the previous hearing by Sinclair's witnesses. We, therefore, recommend that the Commission make the present order permanent, or extend the order for such a period as they desire to, or write a new order consisting of the same terms.

MR. VERNOR: Russ Vernor, enginer for Atlantic

Refining Company.

Atlantic only has one well in the field. We haven't made a detailed study other operators have made, but I have reviewed the data and testimony of the other operators, and as a reservoir engineer, I agree with their conclusions, and I would like to recommend to the Commission that the Sunray application be adopted.

MR. BRATTON: Howard Bratton, appearing on behalf of Humble Oil and Refining Company and also on behalf of Manzano Chemical Company. I would like to make a statement for both companies, who concur in the recommendations of Sunray Mid-Continent. On the basis of the evidence previously presented, the Commission's findings, and the further evidence presented here today to substantiate those findings, it appears to us that the present order must be continued.

MR. VERITY: George Verity, for Rex Moore. I would like to urge the adoption of the proposal, and state to the Commission whereas Mr. Moore only had two wells at the time this was previously considered, he has since then drilled five more because it was 80-acre spacing, and all of his findings with regard to that has confirmed his opinion that it should be continued on that basis.

MR. BUSHNELL: H. D. Bushnell, appearing on behalf of Amerada. Amerada concurs in the recommendations made by Mr. Campbell, and feels that the evidence presented here today would

support that recommendation.

MR. SPERLING: J. E. Sperling, on behalf of British American Oil Producing Company. Independent studies made by British American with reference to this reservoir, leads to the same conclusions that may be deduced from the evidence presented today and at the previous hearing. Thereby, Amerada concurs in Mr. Campbell's recommendations to the Commission and recommends the order or a new order as suggested by Mr. Campbell.

MR. DUTTON: If it please the Commission, Sun Oil Company is in complete accord and actively supports the New Mexico Statutory mandate that the orders of the Commission shall so far as practicable afford each property owner in a pool the opportunity to produce his just share of the hydrocarbons to the extent such can be obtained without waste.

In our opinion, Order R-1069-B meets the statutory requirements in an admirable manner by providing for an optional 80-acre proration unit and acreage allocation. The order provides the best current practicable method of providing each owner in the Bisti Field the opportunity to recover economically the hydrocarbons under his property by permitting 40-acre drilling units. The order prohibits no operator from drilling additional wells if he deems it economically feasible to insure his opportunity to recover or to increase his own hydrocarbons. Most important, particularly in view of the domestic oil industry's attempt to maintain a competitive position. The order offers

no incentive to any operator to drill wells which will not substantially increase ultimate recovery merely for the purpose of securing an allowable advantage. Such advantage, which will permit an operator to drain his neighbor's property, inevitably leads to drilling unnecessary wells, which greatly increase the cost of domestic production.

A final point in favor of the rule is that the market demand for oil from this field is being met under the order.

For these reasons, we believe the Order R-1069-B ideally meets the dual proration goals of preventing waste and protecting correlative rights.

Sun Oil Company therefore respectfully requests that Order R-1069-B be continued in effect in the Bisti Field without a stated time limitation.

MR. KELLOUGH: Gulf Oil Corporation has no objection to the continuation of the present order for an additional period of time. We would like to concur in the recommendation made by Mr. Campbell that the order as now written be extended in all of its particulars for a period of one year and so long thereafter until upon application of any interested party or by the Commission on its own motion in the matter is brought up again. In that way, the ultimate proper spacing for the pool can be determined after additional producing history and at the proper time and without prejudice to any party with respect to any technical issues on the burden of proof.

MR. SETH: I would like to make a statement on behalf of Shell. Shell participated actively in the previous hearing as we all recall, and we advised the Commission by letter in December that we would not object to a continuation of this order, nor would we object to a termination. We have no objection, and we do not now object. We don't want anyone to misunderstand our inaction. We have not changed the position that we originally expressed in the very first hearing. We still feel that the development should be on the basis that we advocated at that time, and during the coming year Shell plans to proceed within the flexibility provided in the existent order and develop it in accordance with its beliefs, and we will struggle along for another year.

MR. WHITE: The Texas Company is one of the operators in the pool, and they concur in the recommendations by Sunray.

MR. SELINGER: If the Commission please, my name is George Selinger, and I represent Skelly Oil Company. We operate twenty-five wells in the field, in addition, we have an interest in the Carson Unit operated by Shell. We wish to concur in the Sunray Mid-Continent application and request that our concurrence should not in any way lead the Commission to feel that we have departed from our views that one well would adequately and efficiently drain 80-acres, and at this time we are willing to concur with the application and request of Sunray.

MR. PORTER: Anyone else have a statement to make?

MR. PAYNE: Mr. Commissioner, I have received communications here on behalf of Honolulu Oil Corporation and Magnolia Petroleum Corporation adopting the view of Sunray Mid-Continent Oil Company, and we will put these in the record.

MR. PORTER: Thank you, Mr. Payne. Any further statements? The Commission will take the case under advisement and we will have a short recess.

(Recess)

Oil Conservation Commission

Mabry Hall, State Capitol, Santa Fe, New Mexico.

Re: Continuation of Rules and Regulations set forth in Order No. R-1069-B, Case No. 1308. Magnolia Petroleum Company, as an operator in the Bisti Lower Gallup Oil Pool, hereby supports Sunray Mid-Continent Oil Company in its request for a continuation of 80-acre spacing and proration units for this pool in San Juan County, New Mexico. We feel that the preponderance of geological and engineering testimony supports 80-acre spacing for this reservoir.

D. V. Carter

Magnolia Petroleum Company.

New Mexico Oil Conservation Commission

Attention Mr. A. L. Porter, Secretary and Director

Santa Fe, New Mexico.

In regard to Case No. 1308 to be heard before the Commission January 14, 1959, it is the position of Honolulu Oil Corporation that Order R-1069-B be continued and made a permanent order. Honolulu Oil Corporation has one well producing in the Bisti Lower Gallup Oil Pool at the present time.

George R. Hoy

Honolulu Oil Corporation

Midland, Texas.

New Mexico Oil Conservation Commission

Capitol Annex Building

Santa Fe, New Mexico.

Attention: Mr. A. L. Porter, Jr.

Gentlemen:

Pursuant to the Commission's Order No. R-1069-B dated January 17, 1958 the subject case has been scheduled for the regular hearing docket of January 14, 1959.

Pan American Petroleum Corporation is an operator in this field and has participated in previous hearings concerned with the adoption of rules for this field, and generally supported the rules that are currently in effect on a temporary basis. It was our opinion at the time of these prior hearings that the proper size unit for this pool was 80-acres. All data which have been gathered in the interium period have confirmed our conclusion that one well will efficiently and effictively drain in excess of 80-acres. Therefore, we recommend that the present temporary rules, now in effect, be adopted as permanent rules for this pool.

It is requested that this statement of our position be read into the record of the January 14, 1959 hearing.

Very truly yours,

Alex Clarke, Jr.

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, Joseph 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 Hearing before the New Mexico Oil Conservation Commission was reported by me in Stenotype and reduced to typewritten transcript, 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 22nd day of January, 1959, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Joseph A. Trujillo
NOTARY PUBLIC

My Commission Expires:

October 5, 1960