BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
CONFERENCE ROOM, STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO

February 21, 1973

REGULAR HEARING

IN THE MATTER OF:

Application of Phillips Petroleum Company for a drilling permit in the Potash-Oil Area, Eddy County, New Mexico.

Case No. 4906

BEFORE: State Geologist, A. L. Porter, Jr., Secretary-Director

Land Commissioner, Alex Armijo,

TRANSCRIPT OF HEARING

NEW MEXICO OIL CONSERVATION COMMISSION

REGULAR HEARING

SANTA FE, NEW MEXICO

Hearing Date FEBRUARY 21, 1973 TIME: 9 A.M.

NAME	REPRESENTING	LOCATION
E. M. Gorence	Phillips Petroleum Co.	Odessa, Tx.
Joe V. Peacock	" "	" "
Joe O. Woodson	" "	" "
B.C. Largent	" "	" "
Jon T. Edmonson	Skelly Oil Co.	Midland, Texas
Carl Traywick	USGS	Roswell
Don VanSickle	USGS	Roswell
Bob Fulton	USGS	Carlsbad
Luther A. Green	Mary Chemical Corp	Carlsbad
James A. Russell	✓ ✓ ✓	Santa Fe
R. H. Bachman	Potash Co of America	Carlsbad
Jim Knoop	U.S.G.S.	Artesia, N.M.
J.W. Mayhew	Duval Corp	Carlsbad N.M.
John T. Boyd	I.M.C.	Jal, N.M.
Lindsay A. Brown	IMC	Hobbs, N.M.
R.H. Lane	Keeley Lee	Hobbs N.M.
James E. Walker	IMC	Carlsbad N.M.
Jerome Mathews	IMC Atty	Carlsbad
C.C. Childress	IMC	Carlsbad
Hank Daniel	USGS	Roswell

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NAME	REPRESENTING	LOCATION
N. O. Frederick	USGS	Roswell
W. B. Crowson	Shell	Midland, Tex
Ray C. Williamson, Jr.	Sipes, Williamson, Aaron & Howard	Midland, Tex
T. Scott Hickman	"	Midland, Tex
Jason Kellahin	Kellahin & Fox	Santa Fe
John O. Roberts	Kerr-McGee (Artesia)	Albuquerque
Mark K. Adams	Kerr-McGee	Albuquerque
Dan S. Harroun	self & Harroun & Haworth	Carlsbad
Nina DuHaime	R W Byram & Co.	Santa Fe
Ben Donegan	Leland A. Hodges, Trustee	Albuquerque
Richard S. Morris	Montgomery, Federici et al	Santa Fe

MR. PORTER: The hearing will come to order, please. The case to be heard this morning is the application by Phillips Petroleum Company for a location for a gas well.

The proposed gas well is in the described R-111-A area, which is generally known as the Oil-Potash Area. R-111-A establishes certain procedures for drilling in the area.

The delineated area also has a described procedure for objection to locations by potash companies who own leases within a mile of any proposed location. If such an objection is received, there is procedure for arbitration.

We did receive two objections, I believe, to Phillips proposed location, and we held a meeting down in Roswell on January 26th at 10:30 A.M. with the interested parties present.

Agreement could not be reached at that time, so we arranged for this hearing at that time.

I would like to call for appearances in this case.

MR. KELLAHIN: If the Commission please, Jason Kellahin, of Kellahin and Fox, Santa Fe, appearing in association with Mr. Joe V. Peacock, a member of the Texas bar.

MR. MATKINS: If the Commission please, Jerome D. Matkins, Carlsbad; Richard Morris, Santa Fe; and Mr. James Wolder, for International Mineral and Chemical, Libertyville, Illinois.

MR. PORTER: Are there other appearances in this case?

(No response)

MR. PORTER: This proposed location is on Federal lands, and we have quite a few representatives from the United States Geological Survey present. Mr. Fredericks, I assume you do not desire to make a formal appearance?

MR. FREDERICKS: That's right.

MR. PORTER: We will start by hearing from the Applicant. Mr. Kellahin?

MR. KELLAHIN: If the Commission please, we will have three witnesses I would like to have sworn.

MR. PORTER: Let's have all three witnesses sworn, please.

MR. MORRIS: If the Commission please, do you want the I.M.C. witnesses sworn also?

MR. PORTER: We might as well.

(Whereupon the witnesses were sworn en masse.)

MR. KELLAHIN: We will call as our first witness Mr. E. M. Gorence.

E. M. GORENCE,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Would you state your name, please?

A E. M. Gorence.

Q By whom are you employed and in what position, Mr. Gorence?

A I am with Phillips Petroleum Company, and I am District Landman of the Southwestern District, headquartered in Odessa, Texas.

Q How do you spell your last name?

A G-o-r-e-n-c-e.

Q Mr. Gorence, have you ever testified before the Oil Conservation Commission of New Mexico?

A No, sir.

Q For the benefit of the Commission, would you briefly outline your education and your experience as a landman?

A I have a B.S. degree in business administration from Kansas State College in Pittsburg, Kansas. I have been employed by Phillips Petroleum Company since 1940, except for a four-year period with the United States Navy. I have spent thirty-three years with Phillips. I have been the District Landman for eleven years.

Q In Odessa, Texas?

A In Midland and Odessa.

Q In your duties as District Landman, do you have anything to do with the area involved in this application?

A Yes.

Q Do you have anything to do with the particular lease involved in this application?

A Yes.

Q Are you familiar with it?

A Yes.
Q Now, are you familiar with the application of Phillips Petroleum Company in the case before the Commission?
A Yes.
Q What is proposed by the Applicant in this case?
A We propose to drill a 14,300 foot Morrow wildcat well at the location stated in the docket, 660 feet from the South line and 1980 feet from the West line of Section 13, Township 23 South, Range 30 East in Eddy County, New Mexico.
Q Now, is that within the area known as the Oil-Potash Area, as defined by Commission Order Number R-111-A?
A Yes.
Q And also in the area involved by the United States Department of Interior circular defining the Oil-Potash Area?
A Yes.
Q Did Phillips Petroleum Company apply for permission to drill on this location?
A Yes.
Q And your location, as you stated, is 1980 feet from the West line and 660 feet from the South line, is that correct?
A That is correct.
Q And a protest was filed to your drilling?

A Yes.
Q Did you participate in the hearing held in Roswell, the arbitration hearing before representatives of the Oil Conservation Commission and the United States Geological Survey?
A Yes, sir.
Q And were you able to reach any agreement with the potash company as a result of that hearing?
A No, sir.
Q Now, Mr. Gorence, referring you to what has been marked as Phillips Petroleum Company Exhibit One, would you identify that exhibit?
A That exhibit identifies our oil and gas lease on which the well is to be located. Our oil and gas lease covers 1,000 acres. That is a Federal lease out of Section 13, 23, 24, 23 South, and 30 East.
Q And your location is shown in Section 13 on that exhibit?
A Yes, with the circle colored red.
Q That is your proposed location?
A Yes.
Q Does the exhibit also show the expiration date of your lease?
A Yes, it expires on May 1st, 1974.
Q And that is a Federal lease?
A That's correct.

Q Have you, or has Phillips Petroleum Company, done any work directed towards determining the proper location for a well in this area?
A Yes, we have done considerable geological work in the area over a period of years. We have expended approximately one and a half million dollars for the seismic work in an attempt to find a favorable location for the drilling of a wildcat well.
Q Have you spent a considerable amount of money acquiring leases?
A Yes, we have spent approximately three hundred thousand dollars for the acquisition of leases.
Q As a result of your seismic work, what did you determine as to a proper well location?
A In our seismic work and sub-surface interpretations of the area, we have determined the requested location to be the most favorable location for the drilling of the wildcat well.
Q And there will be further testimony along that line by a geological witness, is that correct?
A That's correct.
Q What is the estimated cost to drill this Morrow test?
A Our estimate on a well in this area to be drilled at a depth of 14,300 feet, is approximately $625,000.
Q Is that based on the experiences of other operators in

the same area?

A I must admit that the figure is less than most of the other wells in the area cost. We have knowledge that some of the wells cost in excess of $900,000, however we feel that we will be benefiting from the experiences of the others, and that our well cost could be handled.

Q Now, you have stated that the proposed well location is 1980 feet from the West line and 660 feet from the South line. Is Phillips willing to drill elsewhere in Section 13?

A We would be willing to move the location to any location in the South half, Southwest quarter of Section 13, provided such a location is acceptable to the Oil Conservation Commission and the United States Geological Survey.

MR. PORTER: What was that location again?

THE WITNESS: We would agree to any location in the South half, Southwest quarter of Section 13, 23 South, 30 East.

MR. PORTER: Thank you.

Q (By Mr. Kellahin) Mr. Gorence, was this exhibit prepared under your supervision?

A Yes.

MR. KELLAHIN: At this time, I would like to offer in evidence Exhibit Number One.

MR. MORRIS: No objection.

MR. PORTER: If there is no objection, Exhibit One will be admitted.

(Whereupon Applicant's Exhibit One was admitted in evidence.)

MR. KELLAHIN: That's all I have on direct examination of this witness.

MR. PORTER: Are there any questions of the witness?

MR. MORRIS: Yes.

* * * *

CROSS EXAMINATION

BY MR. MORRIS:

Q Mr. Gorence, is this the first request Phillips has made for a location in this Section 13? Is this the first time you have ever proposed to drill a well in this section?

A There was a preliminary proposal, I believe, in the year 1969 for a well in this section, yes.

Q Was it at the same location?

A I do not recall if it was the exact location.

Q As a matter of fact, it was not at the same location, was it?

A I do not know.

Q You do not know?

A No.

Q What were the circumstances surrounding your decision not to pursue your 1969 drilling program?
A I think budgetary limitations would have to be the prime factor. Our headquarters management in Bartlesville, Oklahoma, would not follow through on our recommendation to drill a well. At the time, we were on a limited wildcat drilling budget.
Q Had you already accomplished your seismic work at that time?
A Yes, we had.
Q So your investment had already been made in your seismic work and your lease acquisitions, but your management determined at that time not to pursue the drilling program?
A That's correct.
Q Is there a procedure available to you, Mr. Gorence, for requesting suspension of this lease from the United States Geological Survey so it will not expire on May 1st, 1974?
A I understand there is such a procedure, yes.
Q Do you have to go through the motions of trying to get the location approved by the N.M.O.C.C. and the U.S.G.S. before you make that request for suspension?
A I have not checked into that, but I would presume so.
Q At this point in time, you have made no such request

for a suspension of your lease?

A No, sir.

Q Now, this particular lease that you referred to, this 1,000 acres, covers all of Section 13 and part of Sections 23 and 24; is that correct?

A That's correct.

Q And you have stated that you would be willing to drill, or move your location, anywhere in the South half of the Southwest quarter of Section 13, is that correct?

A That's correct.

Q Would that include, say, one foot out of the Southwest corner of Section 13?

A Well, I would have to say that would include that figure, but I think I will just state yes.

Q Would you also be willing to drill one foot out of the Northeast corner of Section 23?

A No.

Q That would be only moving it two more feet.

A There has to be a certain limit, in my opinion, as to how far you can move to determine what is the most favorable location.

Q If you moved right over in the corner of Section 23, you will be outside of the R-111-A area, wouldn't you?

A Yes, sir.

Q But you are not willing to do that?

A Not at this time, no.
Q You mentioned that your well cost was estimated to be $625,000, and that you have knowledge that other wells in the area have cost more than that?
A Yes.
Q Is that due to blow-outs that have occurred in the area during drilling?
A I feel like I am not qualified to speak on this.
Q You don't know?
A That's right.
Q You don't know why these other wells cost more?
A I would rather not express my opinion because I think it might be incorrect in some respects.

MR. MORRIS: I think that is all I have on cross examination.

MR. PORTER: Are there any further questions?

MR. KELLAHIN: Yes.

* * * *

REDIRECT EXAMINATION

BY MR. KELLAHIN:

Q Mr. Gorence, there was some mention of an application filed by Phillips Petroleum Company in 1969, and why the well was not drilled. That well was projected as an Atoca well, was it not? Or do you recall?
A I do not recall, but I'm sure it was approximately

the same depth.

Q Subsequent to that time, have there been other wells drilled in the area?

A Yes, there has been considerable drilling activity in the general area.

Q Has that drilling in any way affected Phillips' determination to drill in Section 13?

A Yes, sir.

Q Mr. Morris referred to the procedure for suspension which required you to go through the motion of getting the location approved. Is Phillips going through the motions in that sense?

A No. We are prepared to drill this well immediately. It is included in our current drilling budget, we have the money, and as soon as the location is approved, we are ready to commence drilling as soon as possible.

Q In addition to this well, does Phillips have plans for other wells in the area?

A It will depend on the outcome of the drilling of this well, which is a wildcat well.

Q Would a well in Section 23 fit your plans of development in that sense?

A In that sense, yes. It is very possible we would drill in Section 23 if the drilling of the well in Section 13 would so justify it.

Q But is Phillips willing to drill that as their first well?

A In Section 23?

Q Yes.

A No.

MR. KELLAHIN: That's all I have.

* * * *

CROSS EXAMINATION

BY MR. STAMETS:

Q Is there any legal reason or anything in the lease preventing Phillips from drilling a well in the North half of the Northeast of Section 23, and drilling directionally to the appropriate bottomhole location in Section 13 and producing a well and dedicating Section 13 to it?

A We have not checked into that possibility, and I cannot answer that question with certainty. I am sure there would be no objection subject to the approval of the United States Geological Survey and other regulatory bodies.

MR. STAMETS: That's all I have.

MR. PORTER: Are there any further questions?

MR. TRAYWICK: May I ask a question?

MR. PORTER: Yes.

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CROSS EXAMINATION

BY MR. TRAYWICK:

Q Mr. Gorence, do you control the North half of Section 23?

A Yes, we own all of Section 23.

MR. TRAYWICK: That's all I have.

* * * *

RE-CROSS EXAMINATION

BY MR. MORRIS:

Q I have one question prompted by Mr. Kellahin's redirect. Mr. Gorence, you said that if you go ahead and proceed to drill this well, that you would have plans for drilling additional wells in the area. Is that correct?

A Only if the results of drilling the well in Section 13 would so justify it.

Q So if you get a commercial well here, it is your plan to embark upon a drilling program on your other leaseholds in this area?

A If this well so justifies it, that's correct.

Q How many acres of leases do you hold in the area?

A We have oil and gas leases covering approximately 8,700 acres.

Q How much of that, approximately, would be in the R-111-A area?

A I would have to check that, I can't say with certainty at this time.

Q Most of it?
A I would say approximately fifty percent.
Q So if this well is permitted, and you do obtain commercial production, we can look forward to other applications by Phillips, and perhaps by others, to drill in the Potash-Oil Area?
A There is that possibility, yes.
Q Just one other question. I think you said you had a lease acquisition cost of some $300,000. This did not all relate to this 1,000 acres, did it?
A No, that is correct.
Q What was your lease acquisition cost on this one particular lease?
A Thirty-two and a half dollars an acre, which would total $32,500. That lease was purchased by assignment.
Q If a well was drilled on this lease in the Northeast quarter of Section 23, production there would hold the entire 1,000 acres including Section 13, would it not?
A If it was drilled in the North half of the Northeast quarter of Section 23, yes.

MR. MORRIS: That's all I have.

MR. PORTER: Does anyone else have any questions?

(No response)

* * * *

CROSS EXAMINATION

BY MR. PORTER:

Q You indicated that you have 8,700 acres.

A Approximately 8,700 acres in the area.

Q Do you know how many different sections the acreage is located in?

A Approximately thirteen sections.

Q Would it be your plan to ask for wider spacing than the 320 acres that is prescribed by regulation at the present time?

A Yes, it would be our plan. At this time, it is our intention, in the event of Morrow gas production, that we would ask for 640-acre spacing.

MR. PORTER: Are there any further questions?

(No response)

MR. PORTER: If not, the witness may be excused.

(Witness excused.)

MR. KELLAHIN: At this time, we will call Mr. Joe Woodson.

JOE O. WOODSON,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Would you state your name, please?
A Joe O. Woodson.
Q By whom are you employed and in what position, Mr. Woodson?
A I am employed by Phillips Petroleum Company as a Production and Mechanical Engineering Supervisor in the Southwest District, Odessa.
Q Have you ever testified before the Oil Conservation Commission?
A No, sir, I have not.
Q Would you briefly outline your education and experience as a Mechanical Production Engineer?
A I received my B.S. degree in mechanical engineering from the University of Tennessee in 1948, and I have been employed by Phillips since that date as a Production, Drilling, and Mechanical Engineer.
Q In connection with your work as a Production, Drilling and Mechanical Engineer, do you have anything to do with the casing and cementing program for wells drilled by Phillips?
A Yes, sir.
Q Have you had anything to do with the casing and cementing program as proposed by Phillips on this proposed well in Section 13?
A Yes, sir.

Q Would you briefly outline just what type of casing and cementing program you plan for this well?

A We plan to drill a 17 1/2 inch hole to 500 feet and set 13 3/8 surface casing. This casing will be cemented to the surface with approximately 600 sacks of cement. The casing will be tested to 600 pounds before drilling the shoe. After drilling the shoe, the well will be drilled down to approximately 4,000 feet, or 150 feet below the salt section.

The drilling fluids will comply with Rule R-111-A. The pipe that would be set at 4,000 feet, approximately, would be 10 3/4 inch 51-pound C-55. The hole would be calibrated for the cement job, and the casing will be cemented with Class C cement and with two percent calcium chloride and 19 1/2 pounds of salt per sack of cement.

The twelve-hour strength of this cement after setting twelve hours will be 2,430 pounds per square inch. After twenty-four hours, it will be 2,830 pounds per square inch. It will be tested to 1,000 pounds before drilling the shoe, and retested after drilling the shoe.

MR. NUTTER: What is the top of the cement going to be?

THE WITNESS: Circulated to the surface.

A (Continuing) Our next string of casing will be at 12,100 feet, and it will be 7 5/8-inch intermediate.

This string will be set in the Wolfcamp prior to drilling any abnormal pressure gas zones. This string will be cemented to the surface in two stages.

The first stage of cement will be Trinity lightweight with six pounds of salt in with 300 sacks of cement.

In the second stage, the stage collar will be set near, or just below, the casing shoe of the 10 3/4. From that point, it will be cemented to the surface with Trinity lightweight cement, followed by 300 sacks of net cement.

In the event the well is a producer from the Morrow, or in that area, a string of 5 1/2-inch liner will be set from approximately 11,800 feet to the total depth of 14,300 feet, and it will be cemented throughout from the bottom of the liner to the top of the liner.

Q Now, does the cementing and casing program comply in all respects with Commission Order R-111-A?

A Yes, it does.

Q In your opinion, is that an adequate casing and cementing program to protect the potash zone if one is encountered in the area?

A Yes.

Q Actually, as I understand your testimony, there would be

two thicknesses of cement throughout the entire potash zone, would there not?

A Yes, sir.

Q And two strings of casing?

A Two strings of casing and two thicknesses of cement throughout the entire area.

MR. KELLAHIN: I have nothing further on direct examination.

MR. PORTER: Mr. Morris, if your client didn't object to the location, he wouldn't object to the cementing program, would he? I am just trying to save cross examination.

MR. MORRIS: I am going to have to cross examine.

* * * *

CROSS EXAMINATION

BY MR. MORRIS:

Q Mr. Woodson, is your proposed casing and cementing program that you have just described the same as was submitted on the United States Geological Survey form, as part of your application for a permit to drill?

A I believe so.

Q On your intermediate string of 7 5/8-inch casing, what is your weight per foot, and what is the grade of pipe?

A From the bottom to the top, we have 4,900 feet at 29.7 pounds of S-95. We have 2,700 feet at 26.4 of S-95. Seventeen hundred feet at 26.4 pounds of 10-80.

Twenty-five hundred feet at 26.4 pounds of K-55. Three hundred feet at 29.7 pounds of S-95 at the top.

Q Do you have any estimate as to the total length of time it would take to drill this well?

A I would estimate around ninety days.

Q How much of that time would be involved in performing drilling operations within this 4,000-foot casing string, the casing string set at 4,000 feet, and how much time would be involved in the casing string at 12,100 feet?

A I don't have any figures with me, but going by other wells, I would estimate that to drill to 4,000 feet, it would take not more than fifteen days and approximately twenty days, twenty-five days, let's say, from 4,000 to 12,000.

Q Now,your procedure, as I understand it, would be that you would set this 4,000 feet of casing, you would cement it, and then you would come back and actually be performing drilling operations through that cemented string of casing, is that correct?

A That's correct.

Q During this time, do the stresses and strains of drilling have any effect upon that casing or the cementing?

A The only detrimental effect that we would anticipate would be on the casing from the drill pipe. In order to prevent that, we would install protective rubbers

on each section of drill pipe.

Q Does this procedure offer one hundred percent protection from banging against the side of the casing?

A I don't know if we could say one hundred percent protection, but we feel it does adequately protect the casing, because when these rubbers become worn, we replace them with new ones.

Q What do these rubbers consist of? They are just over-sized rubber bands around the tubing string to keep it from banging against the side, isn't that correct?

A There are different types. Yes, they are good quality hard rubber that are installed by stretching them and putting them over the drill pipe.

Q How many of those go on each joint of drill pipe?

A One.

Q Just one?

A One on each joint, yes.

Q And would the same be true as to your casing set at 12,100 feet? It would be set, cement would be circulated on it, then, during the twenty days that you would be drilling within that the same situation that you have described would be the case, as on the 4,000-foot casing?

A Yes, we would have protectors.

Q Now, these casing strings get smaller as you go down, so on the 12,100-foot string, you are operating within

a 7 5/8-inch casing size, is that correct?

A That's correct.

Q Do you use the same size rubber protectors on your drilling string?

A No, the rubber protectors will be-- well, let me back up. The rubber protectors are slightly larger than the tool joints on the drill pipe, so I would anticipate the drilling contractor would be using smaller drill pipe inside the 7 5/8-inch casing, and therefore, he would have protectors on this particular string.

Q Are you familiar-- first, let me ask this question. In cementing your 1,100-foot casing string, are there any problems in obtaining circulation of your cement?

A Yes, there would be if the entire string were cemented in one stage because of loss of circulation below 4,000 feet.

Q How many stages would you anticipate using to cement this string?

A Two stages.

Q Is there any way to check to determine whether you have continuity of cement between your stages?

A Yes, sir.

Q How do you do that?

A If you can run a temperature survey within twenty-four hours, you can pick the top of the cement.

Q Are you familiar with the other wells that have been drilled in this area?
A In this area?
Q Yes, sir.
A Not really, except for some wells we have drilled several years ago in this area.
Q Are you familiar with any abnormally high pressure zones that have been encountered during the drilling of wells in this area?
A No, sir, I am not.
Q Are you familiar with the fact that there have been blow-outs in this area?
A No, sir.
Q You are not?
A I am not familiar with that, I must say.
Q Which wells in this area are you familiar with?
A The James Ranch Well.
Q Are you talking about the well in Section 36 in the township to the north?

MR. GORENCE: No, it's in Section 2 in that same township.

Q (By Mr. Morris) Are you familiar with the drilling of the Belco Petroleum Well in Section 1 of that same township?
A No, sir. Is that a recently-drilled well?

Q Let me see, and I will give you an answer in just a minute.
A I am not familiar with it.
Q You are not?
A No, sir.

MR. KELLAHIN: To save time, we do have a witness here who is familiar with it.

MR. MORRIS: I was under the impression that Mr. Woodson was being offered as a drilling expert.

MR. KELLAHIN: He is the casing and cementing expert.

Q (By Mr. Morris) Mr. Woodson, should I talk to you or your next witness about directional drilling problems and the feasibility of directional drilling?
A I will be glad to answer any questions I can.
Q Has your company considered the feasibility of directional drilling in this area?
A Not to my knowledge.
Q Is there any reason to your knowledge that it would not be feasible?
A It may not be economical, however it is possible that a well could be directionally drilled.
Q Approximately how much more would it add to your well cost for directional drilling?
A That would depend on the number of times you had to run whip-stock to turn the hole back to the direction

you want to go in. So it's almost impossible to estimate what it might cost.

Q It wouldn't run over a couple a hundred thousand dollars extra, would it?

A I don't know, but that might be a fair estimate.

Q But that couple of hundred thousand dollars would be the difference, as far as you can see, in whether this would be an economic venture or not?

A I would have to say it would be just an estimate because of the problems you might encounter in keeping the hole going in the direction you want it to go in.

Q Have you ever participated in the drilling of whip-stock wells?

A Yes, sir.

Q When Phillips would plug the well, whether it be immediately as a result of an uncommercial well or after production, are you prepared to say at this time what plugging program would be followed?

A We follow the program as outlined by the Commission, and I understand we would have a solid column of cement throughout the salt section.

Q When you say throughout the salt section, you don't mean however solidly to the total depth, do you?

A Not unless it was required. However, if it was required, we would do it, but normally we would not need to

do that.

Q Even if a well is cemented solidly to the total depth, Mr. Woodson, does that make a perfect guarantee that there would not be the escape of gas from the reservoir, either through the casing or up around the cement outside of the casing?

A With this particular casing program that we have in this area, I feel like there is a perfect guarantee that we would not have this problem.

Q Would Phillips be willing to make a perfect guarantee to I.M.C. that in the event of the plugging of this well that no gas would ever escape into its mine?

A I don't think I am qualified to answer that.

Q Have you ever had any experience, Mr. Woodson, with wells that have been subjected to the shearing force connected with subsidence as a result of mining operations?

A No, not as a result of mining operations.

Q As a result of any other operations?

A I have had some experience with shallow subsidence due to the withdrawal of water from water-sand, and in this case, the casing in most cases was not damaged. Of course, this was shallow.

Q How shallow?

A Three or four hundred feet.

Q I see. What forces were at work there? Were there

shearing forces at work?
A Yes, there were shearing forces, but due to the shallowness, I feel the reason was that there was not enough load imposed on the casing.
Q Was there any cementing involved in this situation?
A Yes.
Q Was the cementing cracked?
A I don't know. The earth simply subsided at the surface, and left the casing sticking up in its existing position.
Q How deep was the sub-surface subsidence in this case?
A Three or four hundred feet.
Q Was it just that one instance that you are referring to?
A That's one instance I am familiar with.
Q Well, are you saying, Mr. Woodson, that if a well, say, at the 1,400-foot level, was subjected to shearing forces that your cementing program would provide a one hundred percent guarantee that there would not be such a disruption of the casing and cement that would enable hydrocarbons to escape?
A No, I couldn't say that.

MR. MORRIS: That's all I have.

MR. PORTER: Mr. Kellahin, do you have anything on redirect?

MR. KELLAHIN: No, sir.

MR. PORTER: Are there any further questions?

MR. TRAYWICK: Yes.

* * * *

CROSS EXAMINATION

BY MR. TRAYWICK:

Q Mr. Woodson, are you going to take-- make any effort in your casing program design in the 10 3/4-inch casing to remove the bulkheads from the potash zone before you submit the 10 3/4?

A Yes, we will run centralizers to insure that, and we will have cement completely around the pipe.

Q You also mentioned a temperature survey as a supplement to that. Would you also run a bond load to ascertain good cement bond to the critical areas, or is that included?

A I don't know for sure if that's included as a definite proposal, but we feel that if the cement is circulated to the surface, and if we get good cement return, then we will already be insured of good bond throughout the area.

MR. TRAYWICK: That's all I have.

MR. PORTER: Thank you, Mr. Woodson.

(Witness excused.)

B. C. LARGENT,

was called as a witness, and having been already duly sworn,

testified as follows:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Will you state your name, please?

A B. C. Largent.

Q By whom are you employed and in what position, Mr. Largent?

A I am a geologist with Phillips Petroleum Company in Odessa, Texas.

Q Is that L-a-r-g-e-n-t?

A Yes, sir.

Q Mr. Largent, have you ever testified before the Oil Conservation Commission?

A No, I have not.

Q For the benefit of the Commission, would you briefly outline your education and experience as a geologist?

A I received a bachelor's degree in 1956 from Midwestern University, and I have been employed by Phillips since that time; seventeen years.

Q Where have you worked?

A I worked in Bartlesville, our main office, for twelve years, and was associated with outside areas including Alaska, California, Rocky Mountain, the Amarillo District, and the Mid-Continent District.

Q How long were you in Bartlesville?

A Twelve years.
Q How long have you been in Odessa?
A Four and a half years.
Q In connection with your work in the Odessa District, have you had anything to do with the area involved in this application?
A Yes.
Q Did you have anything to do with the study of the geological information in the area?
A Yes, sir.
Q You did not supervise any seismic work, or anything of that nature, did you?
A No, that was before I arrived here.
Q But was that information made available to you?
A Yes, it was available and incorporated in the sub-surface studies.
Q Did you supervise those sub-surface studies?
A Yes.
Q What type of work was done in the area to determine the well location?
A We used the sub-surface control that we had, and have continued to add to as subsequent wells were drilled, and this was incorporated with our seismic control where we did not have well control. We also made a regional stratographic study of the entire north part of the

Delaware Basin, which included this area.

Q Have you prepared a map showing the surface information?

A Yes, I have.

MR. MORRIS: If the Commission please, before the witness testifies with respect to this exhibit, there may be some question as to its admissibility into evidence, and we would like to have an opportunity to interpose an objection to the exhibit before he proceeds to testify to it.

MR. PORTER: How are you going to determine that, Mr. Morris?

MR. MORRIS: Well, ordinarily, Mr. Porter, Mr. Kellahin would offer the exhibit in evidence, and I would object to its admissibility, and would ask the permission of the Commission to ask a few questions just to determine its admissibility into evidence.

MR. PORTER: Prior to his testimony?

MR. MORRIS: Yes, sir. I am objecting to his testimony on the exhibit at this time on the grounds that insufficient foundation has been laid for the introduction of the exhibit or his testimony.

MR. KELLAHIN: We haven't laid any foundation yet, Mr. Morris.

MR. MORRIS: Mr. Kellahin has admitted my objection.

MR. KELLAHIN: We haven't had the opportunity to lay any foundation. I have no objection, however, to his

asking questions on voir dire, however, to expedite the matter.

MR. PORTER: Why don't you go ahead, Mr. Morris?

* * * *

CROSS EXAMINATION

BY MR. MORRIS:

Q Mr. Largent, does the interpretation shown on Phillips' Exhibit Number Two include geophysical interpretation?

A Yes, it does.

Q And you have not made this geophysical interpretation?

A No, I did not make the original interpretation, however that has been incorporated and tied into the sub-surface control that we have, and I did supervise that.

Q You supervised the preparation of this map, using geophysical information prepared by others?

A That's correct.

MR. MORRIS: If the Commission please, to the extent that this witness has admitted that he has based his opinion in part on information supplied by others, geophysical data that was not his work, and that he did not participate in it, we, of course, are put in the position of not being able to cross examine the witness on the geophysical data that forms the basis for the exhibit, and we object to it on the grounds previously stated, and we will object to its admissibility, and we will object to any testimony based

on the exhibit.

MR. KELLAHIN: In response to that objection, the witness has testified that he prepared the exhibit based on geophysical data he examined and correlated to the sub-surface information available to him.

Now, historically, before the Oil Conservation Commission, geophysical work based upon such things as seismic surveys has uniformly been admitted by this Commission. I have yet to see a seismic survey expert ever appear before the Commission to support the underlying data. It has never been done, to my knowledge. It is a tool uniformly used by the oil industry that you accept the data available and put your interpretation on it, and we submit that the exhibit is admissible, as that is what this witness has done.

MR. PORTER: Mr. Morris, the Commission will overrule your objection.

Q (By Mr. Kellahin) Mr. Largent, referring to what has been marked as Phillips' Exhibit Two, would you identify that exhibit?

A Yes, sir. This is a plat outlining the area of the proposed well, including the sub-surface control within seven miles of the proposed location.

Q Now, by sub-surface control, are you referring to wells that have been drilled in this area?

A Yes.

Q On the basis of that information, did you correlate that with any other information you examined?
A I correlated this with the seismic information that we had, and as wells are drilled, we have made what corrections are necessary in our seismic information.
Q Now, what controls did you have for the preparation of this exhibit?
A We have had seven wells drilled in the area, and we have electric logs and sub-surface stratographic data on each of these wells.
Q And you examined the sub-surface data on each of these wells?
A Yes, sir.
Q On the basis of this information, did you make any determination as to what areas were the most favorable for drilling a well on the Phillips leases?
A Yes, I did. We have outlined a broad stratographic area where we would anticipate seeing better development of carbonates, and this, incorporated with our seismic data, has brought us to the location that we are proposing in this application.
Q What makes this location more favorable than any other?
A Well, it's the proper location with respect to what we think may be the back bank limits correlated to the two wells to the north, and the high seismic area as

indicated.

Q That then makes this the ideal location for Phillips?

A Yes, we feel it does at this time.

Q From a geological point of view, what type of reservoir is this?

A Our primary objective is the Atoca section, which is a carbonate reservoir. We do have a secondary objective which is the Morrow, which is a sand reservoir.

Q Is this reservoir similar to any other reservoir in Southeastern New Mexico?

A Yes, the carbonate that we have found in our two key wells, the Texas American Well and the El Paso Well to the north, the Texas American Well being five and a half miles to the east--

Q Give the locations of those wells.

A Section 26, 23 South, 31 East; that's the Texas American Number 26 Todd, which is five and a half miles to the east.

In the El Paso Number 1 James Ranch, which is three miles to the north, we have seen a carbonate development in the area that is called Ivanovia, which is similar to the development we see in the Lusk area, which is approximately twenty-five miles north.

Because of this development, we feel that this is the proper environment for development of Ivanovia.

Q Would you explain what Ivanovia is?
A Yes. That is a green algae which is quite well-known in our business as being quite a good porosity-producing animal. The Four Corners area is another type of this development.
Q Has this development been found in other wells in the vicinity of the Phillips location?
A Yes, the Texas American Well has eighty-five feet of this development that is porous. We have seen this development in several other wells, but not with the porosity of this well.
Q What type of porosity do you find in the other wells? What degree of porosity?
A The porosity in this section averages from five to seven percent.
Q And do you have good permeability?
A Yes, you do, in the two better wells we referred to.
Q Do you have any idea what the permeability is in those wells?
A No, I do not. There have been no cores, and our logs are not capable of that measurement.
Q What roughly is the thickness of the producing formation here?
A The Texas American Well has approximately eighty-five feet; the El Paso Well, which we consider near the up

bank limits, has nine feet of pay. The recently completed Belco Well has approximately thirteen feet.

Q We are talking about net pay?

A Yes, as interpreted from the electric logs.

Q Have you made an estimate of the reserves you would encounter in a well in Section 13?

A Yes, when we released our proposed well to management, we assigned ten billion cubic feet of reserves to this well based on 640 acres. That estimate is based on the averages of the wells in the area and volumetrics.

Q The volumetrics are based on information available from other wells also, is that correct?

A Yes, sir.

Q Do you anticipate encountering a typical well here?

A Of course, you always hope to get a Utopian kind of well, but based on this average, we anticipate ten billion cubic feet.

Q Would that all be producible reserves?

A The ten billion is what we consider producible reserves.

Q What deliverability do these wells have?

A They are quite variable. Of course, the poorer wells have poorer deliverability, but the wells nearest our location, which would be the two wells to the north, the El Paso James Ranch and the Belco--

Q That is the Shell James Ranch, is it not?

A The Shell Number 1 James Ranch is in Section 36, three miles north, and the recently completed Belco Well, which was completed in the Atoca section and has not produced, was completed for thirty-nine million, and we anticipate similar development.

Q Is there a ready gas market available in the area?

A Yes, sir.

Q How many pipe lines are there in the area?

A I believe there are three pipe lines available, at least two, and perhaps three.

Q Assuming deliverability you are discussing and the ten billion in reserves, what would be the life of a well in Section 13?

A If we had ten billion recoverable reserves and a well capable of delivering ten million feet a day, I would anticipate a life of five and a half to six years. If we go up to fifteen million a day, we anticipate a life of four years. Of course, this is something that certainly cannot be predicted, but we anticipate at least the deliverability of the Belco Well north, and obviously the Belco Well to the north would be capable of delivering considerably more, and in that case, we would anticipate a comparable deliverability, and we would anticipate a life as short as three years.

Q When you say a life of three years, do you mean you

will have produced the reserves, and would be ready to plug and abandon that well?

A Yes, that's possible.

Q And you would be through with that area then?

A Yes, this spacing unit, that's correct.

Q This spacing unit?

A Yes.

Q Now, you are talking about a three to five-year life span. The James Ranch Number 1 Shell Well has been producing for a great deal longer, has it not?

A Yes, but there is a reason associated with that. In the gas business, as most of you know, there is considerable change in the market, and I have an exhibit that will indicate what may have transpired.

Q Referring you to what has been marked as Phillips' Exhibit Three, would you identify that exhibit?

A Yes, sir. This is the gas sales compiled from the New Mexico Production Bulletin, indicating the production found in the Shell Number 1 James Ranch Well. This well is three miles north of the proposed location. It was connected in May, 1958, and in the first ten years, accumulated slightly over four billion cubic feet of gas. In the last four years, it has accumulated slightly over eight billion, which would indicate the change in the market situation, and what we could

anticipate in our area if we drill at this time.

Q You attribute this production history solely to market capability?

A Yes, sir.

Q The well has been capable of producing the gas?

A That's correct.

Q Has the well reached its peak of production?

A The indication from this curve would say yes. It started on a decline, and we anticipate it will be depleted within a few years.

MR. PORTER: While you are on that point, providing the market stays as it is, or improves, would you anticipate a decline as steep as the one shown in 1971?

THE WITNESS: I would show a decline from 1972, yes. Perhaps with the deliverability, I think we could actually anticipate a sharper decline, Mr. Porter.

Q (By Mr. Kellahin) Has the market demand, in your opinion, affected the production in Southeastern New Mexico generally?

A Yes.

Q Have you had experience in this elsewhere also?

A Yes, we are developing at this time an area known as the South Carlsbad Field, and on the release of our wells in that area, we give those wells a three-year life.

Now, we are anticipating a total reserve of approximately five billion, and this would be approximately seven million cubic feet a day.

Q Are the wells capable of producing at that rate?

A Yes, they are-- some of them are, all of the Phillips wells to date are.

Q Now, going back to your Exhibit Number Two, would you take the completed wells there-- do you have deliverability information on each of those wells?

A Do you mean today or initially?

Q Initially or today, whatever information you have on them.

A The El Paso Number 1 James Ranch at this time is capable of producing approximately four and a half to five million per day.

Q Is that the Shell James Ranch?

A Excuse me, the Shell James Ranch.

Q In Section 36, Township 30, Range 22?

A Yes, that's correct. The Belco Well, which was just recently completed, had a calculated openflow of thirty-nine million, and we don't know at this time what it will produce, but certainly, it should be capable of a deliverability of twenty million, I would think.

Q That is the well in Section 1, 30 East, 23 South?

A Yes, sir, that's correct; two miles north.

The Texas American Well, which I referred to in Section 26, five miles to the east, has an indicated openflow of seventy-five million, and that well produced for some time at approximately twenty to twenty-three million per day. However, it has some water problems at this time, and they are producing at around five million, I believe.

The other wells, although completed in the Atoca section, are not in the same formation or the same stratographic zone as this, and they have a production capability of from one to three million per day.

Q Mr. Largent, were Exhibits Two and Three prepared by you or under your supervision?

A Yes, sir.

MR. KELLAHIN: I would like to offer in evidence Exhibits Two and Three.

MR. PORTER: Is there any objection?

MR. MORRIS: We renew our objection to Exhibit Number Two, if the Commission please, on the grounds as stated previously.

MR. PORTER: The Commission will overrule your objection, Mr. Morris, and admit all three exhibits into the record.

(Whereupon Applicant's Exhibits Two and Three

respectively were admitted in evidence.)

MR. PORTER: The witness is now available for cross examination, but before we begin, we will take a short recess.

(Whereupon a recess was taken.)

(Hearing continues.)

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

MR. KELLAHIN: Mr. Porter, could I ask a couple of more questions on direct before cross examination begins?

MR. PORTER: Yes, sir.

Q (By Mr. Kellahin) In connection with the testimony offered by Mr. Woodson, there was some question raised about drilling in Section 23, and drilling directionally to the bottomhole in Section 13. Have you had any experience with directional drilling?

A No, I have not, other than the results of what we have done, but not directly with the drilling part of it.

Q You are familiar with the results of Phillips' operations in the field?

A Yes, at least on two occasions.

Q Have you any estimate as to what the cost of directional drilling would be in the fashion proposed?

A Well, as was earlier testified to by Mr. Woodson, this is very difficult to project, but I would probably estimate in the range of thirty-five percent of

additional cost.

Q But that is an estimate?

A Yes, it is.

Q Is there any certainty that you can control the direction that you are drilling wells in in this area?

A We had an occasion last year over on the eastern shelf to drill approximately a 9,000-foot well, which we attempted to do directional drilling in, and we were unsuccessful in this, due to the shortcomings of the service company involved in it.

So it is not a surety by any means that you can arrive at your location.

Q Was that problem with that particular service company, or is that common to all service companies?

A I think this is an additional risk that you take, and you expect in directional drilling.

MR. KELLAHIN: That's all I have.

MR. PORTER: I understand that directional drilling is quite successful over in East Texas, according to rumor.

Mr. Morris, do you have some questions?

MR. MORRIS: Yes, I do.

* * * *

CROSS EXAMINATION

BY MR. MORRIS:

Q Mr. Largent, you are a Petroleum Geologist?

A That's correct.
Q Have you testified here today as a reservoir engineer?
A No, sir.
Q Or as a production specialist?
A No, sir.
Q Who made the reserve calculations? I think you gave a figure of some ten billion cubic feet.
A We have a reserve group who are specialists in the field, and to give us the reserve estimates in our Odessa office.
Q So you didn't do that yourself?
A That's correct.
Q It's pretty hard for me to cross examine on this point, Mr. Largent, but as I understood your testimony, I have to ask you this. What is the basis for your statement that there are ten billion in reserves here?
A As I earlier testified, our reserve estimates were based on the average of the wells in the area and the volumetric calculations.
Q You don't have any exhibit to present to the Commission with respect to how those reserves were calculated?
A No, I do not.
Q I believe you stated that if you achieved a certain deliverability in this well, that you could deplete its recoverable reserves in some five and a half to

six years. What assumed deliverability were you referring to?

A I believe I gave the number ten million deliverability per day, based on ten billion in reserves, and that this would give a life of approximately five and a half to six years.

Q So your statement in connection with the depletion and the time frame of the depletion is all based upon the assumption that you have made that there are ten billion in reserves here?

A That's correct, and the deliverability of that figure.

Q When you say deliverability, you actually mean producing rate, do you not?

A Yes, that's correct.

Q Does a well's producing rate, deliverability, remain constant over its life?

A Well, certainly not. As your pressure depletes, your deliverability goes down.

Q But for the purpose of your assumption, you have assumed a continuous rate?

A No, I have not.

Q You have not?

A Our reservoir people made the estimate, and they projected it with regular decline.

Q Your reservoir people did it? You didn't yourself?

A That's correct.
Q Mr. Largent, my copy of Exhibit Two is colored, but I don't have a color code shown on my exhibit. Can you help me out a little bit on that?
A I believe you will find it just above the legend.
Q It's not on mine.
A Yes, it is.
Q Oh, I'm sorry. What is the significance of the big red and blue contours across the page? Does the red there-- that doesn't refer to a particular-- I mean, what is the significance of the red, as compared to the blue?
A If you will note the arrows,and those colored lines outline the area I referred to earlier, and the stratographic position within the basin that we feel is most likely to have this carbonate build-up, and as we get into the back bank area, we would anticipate a different facies within this zone than we would in the Atoca carbonate bank.

As you get to the fore bank area, we anticipate a different facies. This is taken from the original stratographic study that was made.

Q Now, in Section 13, what formation would you expect to find and complete?
A And complete in?

Q Yes.
A Our primary objective is the Atoca carbonate area I discussed, and which is outlined on here. However, we hopefully will have Morrow sand capable of producing in this area also. That is our secondary objective.
Q Your principal objective is the Atoca, is that the formation upon which the reserve calculations were based?
A That's correct.
Q Did that reserve calculation take into consideration any contribution from the Morrow?
A No, it did not.
Q Just the Atoca?
A Yes. We would anticipate producing those simultaneously if we did have Morrow production.
Q Where is the best Atoca production in this whole area? Is that the Texas American Well that you referred to over here in Section 26?
A Based on production history, and we have a considerable longer history on the Shell James Ranch in Section 26, I would say that that is probably the best total reserve well. We do not know at this time about the Belco Well, but it appears to be a good section.
Q What interval is the Belco Well completed in?
A The Belco Well in Section 26 is completed from the

Atoca carbonate zone that I referred to.

Q Can you give me the perforations?

A Yes, I can.

MR. KELLAHIN: I think Mr. Morris referred to the Belco Well in Section 26. I don't believe there is a Belco Well in Section 26.

MR. MORRIS: Excuse me, I was referring to the Texas American Well over in Section 26. Now we are talking about the Belco Well in Section 1 of this same township.

THE WITNESS: I do not have perforations on that well. To my knowledge, it has not been officially completed.

Q (By Mr. Morris) Mr. Largent, you have stated here to the Commission that you believe it is completed in the Atoca, and frankly, we don't think it is, and we want to know what you base your opinion on.

A The Belco Well in Section 1 was completed earlier, approximately three to five months ago, in the Morrow section. That well since has been re-entered and perforated to the Atoca section and the Strawn section.

Q What information do you have upon which you are basing this? I want to know your current information that you are relying on.

A This completion, or this test, was listed in the Midland paper just last week, and I have talked to personnel with Belco. I do not have the exact perforations

down, but I think I can give them to you within ten feet of where they are.

Q Give me the information upon which you are relying in making your statement that you believe it is completed in the Atoca.

A I talked directly with personnel with Belco, and they have told me they perforated their Atoca section.

Q To the best of your information, what is the interval which they perforated?

A Approximately 12,996 to approximately thirteen thousand nine.

Q Thirteen thousand nine?

A Yes, sir.

Q And how has that been opened up? Has that entire section been opened up?

A Yes, sir.

Q Do you have the test on that zone?

A Yes. That test was first reported at thirty-six million, and the newspaper report was at thirty-nine million per day calculated openflow.

Q And how long a test was that?

A I can't answer that, Mr. Morris. That was a four-point test, I believe, and it was taken and calculated from that.

Q Are the Strawn perforations still open in this well?

A Yes, they have been perforated, but I do not know what they are doing with them. They had a calculated openflow from that zone of approximately sixteen million, but I do not know if they are producing. I do not think they are producing either zone at this time.

Q Has the well been placed on production?

A Not to my knowledge. The well was on production in the Morrow zone, but not the Atoca and the Strawn zones, to my knowledge.

MR. NUTTER: Mr. Porter, I believe that well, and we have Belco personnel present in the room, I believe that well was recently authorized for a dual completion after a hearing, and I think we have the file with us now for the dual completion for the well in another zone. So maybe the representatives of Belco could tell us what formation was recently approved, and what formation the present application is for.

MR. MORRIS: We might be able to keep this going in an orderly procedure if we know who the Belco representative is present, and perhaps he can be presented as a witness.

MR. KELLAHIN: If the Commission please, I think the Commission can take notice of its own file, and there is an application pending before the Commission at this time to complete the subject well in undesignated Strawn and Atoca pools. It was originally approved for completion

in the Morrow, and,I believe, the Strawn.

MR. NUTTER: But the Morrow has now been abandoned.

MR. KELLAHIN: I don't think it has been abandoned. They propose to temporarily abandon it, yes.

MR. NUTTER: And complete it in the Atoca and the Strawn?

MR. KELLAHIN: Yes. I filed the application, and it's in the Commission file.

MR. MORRIS: Mr. Kellahin, would it be possible for you to provide me with a copy of the application that I can look at at this time?

MR. KELLAHIN: It makes no mention of the completion.

Q (By Mr. Morris) Has it been possible for you, Mr. Largent, to make any material calculations, or any other accurate reserve calculations, with respect to the Atoca reserves in the Belco Well?

A No, our reservoir people have not really looked at that well. They will not do that until after the well is officially completed and on production.

Q So we still need quite a bit more information on the Belco Well before we can evaluate its reserves?

A That's probably true.

Q All right. I would refer you to the El Paso-Mobil Federal Well located in Section 29 of the adjoining township to the east; are you familiar with that well?

A Yes, I am, to a degree.
Q Was that well tested in the Atoca?
A Yes, there was a drill stem test on that well, and it did not recover a significant amount of gas.
Q Was that well completed in the Atoca?
A No, it was not. It is not completed officially at this time, it's on a testing program in the Morrow sections.
Q It does not appear that the well will be completed in the Atoca, does it?
A That's correct.
Q Now, the El Paso Well lies between your proposed location and the Texas American Atoca producer in Section 26 of that same township, does it not?
A That's correct.
Q So it would appear that the Atoca formation would be, as well as the Morrow formation, would be highly erratic in this area, would it not?
A Yes, that's a fact, I believe.
Q I am somewhat at a loss to understand from your map why your particular location in Section 13 is such an optimum location, and why you wouldn't have just as good a location in Section 23 or Section 24. Can you explain that?
A Yes, I think I can. As I testified earlier, this well is approximately the same distance and in the same

relationship to the wells to the north. We feel that it actually will be approximately flat to those wells.

We do indicate a slight build-up on our seismic in that area, and we have chosen the place which indicates the highest shot area. Whether or not this is the build-up, we can't be sure, but that is the hypothesis we are going on.

The other thing is that it would appear it's in the same relationship to the back bank as the two wells to the north.

Q If you shifted your location down into the Northeast quarter of Section 23, you could be at the same structural location as depicted on your plat, could you not?

A That's true, based on a one hundred foot contour. If you contour this at a fifty-foot interval, it would not be as high, and we would not have-- it would be crowding what we consider to be the back bank area somewhat, and as you can see from the map, we could have slight faulting through there. That's what we would be contending with if we went farther to the west, and that's the reason we are staying farther out to the east. There are enough hazards involved in drilling expensive wells without picking what we consider a secondary location.

It's also closer to the wells to the north than Section 23 would be.

Q I believe you gave a calculated absolute openflow on the Belco Well of some thirty-nine million?

A Yes, sir.

Q Is that based on a drill stem test?

A No, that's based on the perforated interval as reported in the newspaper, and from the personnel of Belco.

MR. MORRIS: That's all I have.

* * * *

CROSS EXAMINATION

BY MR. PORTER:

Q Mr. Largent, what price did you assign to the gas?

A What price?

Q Yes.

A I believe that was 27.9-- just a moment, I think I have it here. Twenty-seven point 219.

Q What would be the value of the gas under that section, assuming that there is ten billion cubic feet of gas?

A The value of the gas, based on that price, would be $421,000-- excuse me, I stand corrected. Pardon me, the total value that we have, based on that price, would be $2,433,300.

MR. PORTER: Does anyone else have any questions?

* * * *

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Largent, we are making a lot of assumptions here today. You were assuming a while ago that you would have 640-acre spacing, which is an assumption. So going one further, assuming the Commission would approve 640-acre spacing, and assuming the Commission would approve a location that would be in the Southwest quarter of Section 13, and assuming further that the Southwest quarter of Section 13 and the Southwest quarter of Section 14 and the Northeast quarter of Section 23 and the Northwest quarter of Section 24 were dedicated to the well, that's all Phillips' acreage, is it not?

A I believe that's correct.

Q Assuming further that the U.S.G.S. would approve communitization, you would have a well located right in the center of a 640-acre unit, is this correct?

A Yes, that's correct.

Q Are you in agreement with Mr. Gorence that you would be willing to drill a well anywhere in the South half of the Southwest quarter of Section 13?

A Reluctantly, yes.

MR. NUTTER: Thank you.

MR. PORTER: Are there any further questions of the witness?

MR. KELLAHIN: Yes.

* * * *

REDIRECT EXAMINATION

BY MR. KELLAHIN:

Q Mr. Largent, you said that you based your estimate on twenty-seven and a half cents per thousand, is that right?

A Yes, sir.

Q Is gas selling at that rate down there now?

A No, it is not. We anticipate getting considerably more. This was an analysis made in the middle of 1972.

Q This is a wildcat well, is it not?

A Yes, sir.

Q It's more than two miles from the nearest producing well?

A Yes, sir.

Q Under those circumstances, is it possible to do more than just make an estimate of what the reserves are?

A No, it's not.

Q And until you drill the well, you will not know what the reserves are, or the deliverability, is that correct?

A That's correct.

MR. KELLAHIN: That's all.

MR. PORTER: Right now, without further action by the Oil Conservation Commission, what would be the highest price that you could get for certain for the interstate

shipment of gas?

THE WITNESS: I am not qualified to answer that, I'm just not that well up to date on gas prices. I would anticipate something in the range of thirty-five cents.

MR. PORTER: I know that the Examiner in the Permean case recommended prices that high, but I haven't seen any action taken by the Federal Power Commission, so I assume it would still be sixteen and a half cents. Are there any further questions?

(No response)

MR. PORTER: The witness may be excused.

(Witness excused.)

MR. KELLAHIN: That's all we have, Mr. Porter.

MR. PORTER: Mr. Morris, would you call your first witness, please?

MR. MORRIS: If the Commission please, I will call Dr. Lindsay I. Brown.

DR. LINDSAY I. BROWN,

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

DIRECT EXAMINATION

BY MR. MATKINS:

Q Will you state your name and where you reside?

A Lindsay Brown, Winnetka, Illinois.

Q What is your occupation?
A I am in the International Marketing Department of International Mineral and Chemical.
Q Have you appeared before the Oil Conservation Commission before?
A No.
Q Would you briefly outline your education and experience in marketing?
A I have a bachelor's degree in biology, and a master's degree in agriculture from Virginia Polytech, and a Ph. degree also in agriculture from Michigan State University. My area of experience has been in soil and fertilizer, and I have been actively engaged in fertilizer marketing for the last six years.
Q Does that include marketing in the potassium areas?
A Yes, sir.
Q Are you familiar with langbeinite and sylvite?
A Yes, sir.
Q In your marketing activities with I.M.C., do you market a product which is in fact langbeinite?
A Yes, we do.
Q Showing you what has been marked as I.M.C. Exhibit One, is that in fact the product specifications on your pure langbeinite?
A Yes, it is.

Q Do you also have, besides the standard, another product?

A Yes, we make a grade called granular, which varies only in particles.

Q What is the significance of the chemical specifications in langbeinite, as distinguished from other potash products?

A The thing that makes langbeinite unique is the source of water soluble magnesium for fertilizers. It happens that magnesium is one of the sixteen elements required by plants for growth, and it happens that langbeinite is the only domestic source of water soluble magnesium for fertilizers.

Q Why is langbeinite used?

A The need for the product would vary with the part of the country because there are certain natural magnesium levels in soil. There is a magnesium requirement all over the country, and the intensity varies from one part of the country to another.

Q To your knowledge then, is the langbeinite that is being produced in Southeastern New Mexico the primary source of water soluble magnesium?

A Yes.

Q Do you have personal knowledge of how many companies have access to this particular product, and who are

marketing it at the present time?

A Yes, there are two.

Q Can you name them?

A International Mineral and Chemical and Duval Sales Corporation.

Q And both of their sources are down in Southeastern New Mexico?

A Yes, sir.

Q I hand you what will be marked, or identified, as I.M.C. Exhibit Two. Would you tell us if you prepared this information, and if so, the source of the information, and what the information reveals?

A I have participated in the preparation of the information. Most of it came from an outfit called the Potash Institute of North America, which is essentially an association of the potash producers in North America.

The figures are documented by tonnage, and the figures are furnished by member companies.

Q Does it contain actual figures as well as projected figures?

A Yes, it does.

Q I take it that the figures for 1969-'70, 1970-'71, and 1971-'72 are actual reported tonnage?

A Yes, that's right.

Q And the following four years are projections?

A That's right.
Q Can you tell us how those projections were arrived at?
A Essentially, they are linear projections from historic usage of the product.
Q What has been your experience, or your company's experience, in the growth of the use of the product?
A Over the period of the previous ten years, and this particular chart doesn't go back that far, growth has averaged nine percent a year.
Q Do you have any reason to believe that that growth will not continue?
A No, I do not.
Q I assume that since you are in marketing, you are familiar with the current prices being obtained for both standard and granular langbeinite, is that correct?
A Yes, sir.
Q Would you tell the Commission what the prices are?
A The quoted F.O.B. price of processed langbeinite is seventeen and a half dollars; granular is twenty dollars and fifty cents.
Q Has that price been stable for the past number of years?
A That's right, with a slight increase, the maximum that the price board would allow us over the last year.

MR. MATKINS: Pass the witness.

* * * *

CROSS EXAMINATION

BY MR. KELLAHIN:

Q Dr. Brown, on your Exhibit Number Two, I take it that "Ind" means industry, total for the entire industry?

A Yes, sir.

Q You gave us the price on langbeinite. Is there a different price for potash?

A Yes, there is. May I qualify your question?

Q You may.

A The point is that langbeinite is from a potash source, but its place in the market is not determined by the potash company, its place in the market is determined by its magnesium content.

Q Are langbeinite and sylvite competitive in any sense?

A No, sir.

Q In other words, you are telling us they are different products?

A Yes, sir.

Q Aren't they used for the same purpose?

A They are both used for fertilizer.

Q Could you give me the price of sylvite now?

A I can't give you the exact figure. Can I give you an approximate figure?

Q If that's all you can give me, yes.

A The price for sylvite right now is about thirty-five

cents per unit of K2O, which is the standard way of pricing potash.

Q But you don't price langbeinite that way, do you?

A No.

Q Can you give me the price per ton of sylvite of the type used in the fertilizing product?

A It would be sixty times thirty-five cents; twenty-some dollars.

Q Actually, it runs a bit higher than langbeinite?

A It might at this time, I haven't done my arithmetic.

Q Well, langbeinite is not found in this area alone, is it?

A Yes, sir.

Q Isn't there a percentage of langbeinite ore and a percentage of sylvite ore in the same area?

A This is really out of my area of expertise.

Q You don't know whether you mine langbeinite and sylvite in the same mine?

A Saying the same mine, I can't say correctly. But the same area, yes.

Q Let's say your mine is open in Section 13. Would you principally mine langbeinite or langbeinite and sylvite?

A I don't know.

Q If the core samples show that there is a higher percentage of sylvite and a rather low percentage of langbeinite, your answer would be yes, you mine them

both, isn't that correct?

A I can't answer that.

MR. KELLAHIN: That's all I have.

MR. MATKINS: I move to introduce I.M.C. Exhibits One and Two.

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

(Whereupon I.M.C. Exhibits One and Two respectively were admitted in evidence.)

MR. MATKINS: This witness needs to catch an airplane. May he be excused?

MR. PORTER: Are there any other questions?

(No response)

MR. PORTER: The witness may be excused.

MR. MATKINS: I will call Mr. Charles Childers.

* * * *

CHARLES E. CHILDERS,

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

DIRECT EXAMINATION

BY MR. MATKINS:

Q Will you state your name and where you reside, Mr. Childers?

A Charles Childers, Carlsbad, New Mexico.

Q What is your occupation?

A General Superintendent in charge of mining and engineering for I.M.C.

Q And how long have you been employed by I.M.C.?

A Ten years.

Q Have you appeared before the New Mexico Oil Conservation Commission prior to today?

A For an Examiner Hearing, but not before the Commission.

Q Would you give us your education and training background and experience?

A I graduated from the University of Illinois in 1955 with a B.S. degree in mining engineering. I came to work for Duval Corporation in Carlsbad, New Mexico, and worked there for seven years. I worked for about one year for Southwestern Potash, and then went to work for I.M.C. on February 1st, 1963.

Q What positions and jobs have you held with I.M.C.?

A I came with them as an Assistant Production Engineer; I was General Mine Foreman; Acting Mining Production Superintendent; Mine Maintenance Superintendent; Chief Mining Engineer; and General Superintendent in charge of engineering and maintenance.

Q So you have worked both underground and above the ground in the operations of I.M.C., is that correct?

A Yes, sir.

Q Briefly describe what operations I.M.C. are in in Eddy

County, New Mexico.

A I.M.C. has multi-level potash ore being mined on three different levels. We mine sylvite and langbeinite ores primarily. We produce muriate of potash, langbeinite, which is known as sulpha-mag at I.M.C., and sulpha of potash.

Q How long has I.M.C. been producing?

A Since 1940. At the present time, we have some 450 employees and an annual payroll of something over five million dollars.

Q I assume that the continuation of your operations depends on how much ore reserve the company has?

A Yes, sir.

Q Mr. Childers, have you prepared an exhibit in colored form showing I.M.C. leases in the vicinity of Section 13, and the Phillips' leases?

A Yes, I have.

Q This will be marked as I.M.C. Exhibit Three. Was this exhibit prepared under your direction and supervision?

A Yes, it was.

Q And I believe that probably can be read in connection with Phillips' Exhibit One as far as the relationship to the section is concerned?

A Yes, I believe it is the same scale.

Q Now, the code is on the exhibit, but would you briefly

explain to the Commission what you have done here?

A Yes, sir. The general area around the proposed well location, I have colored with the color blue. The I.M.C. leases are cross-hatched with red. The Phillips' leases, oil and gas leases in the same area, are shown, and the outlines of the R-111-A area is in yellow.

MR. MATKINS: I move for the introduction of Exhibit Three.

MR. KELLAHIN: If the Commission please, we have no objection to the admission of the exhibit, other than the right to correct it insofar as the Phillips' leases are incorrect.

MR. PORTER: Why don't we wait until the witness has been cross examined?

MR. MATKINS: Yes, sir.

Q (By Mr. Matkins) Now, Mr. Childers, what type of ore exists in the areas of Sections 13, 14, 15, 24, 18, and 25?

A You are covering quite a bit of territory. We have langbeinite ore and on the outskirts of the area, we have some mixed ore, as we refer to it.

Q Mr. Kellahin was inquiring earlier as to whether I.M.C. at the present time was mining mixed ore.

A Yes, they do.

Q You have a process by which you break down the sylvite

from the langbeinite, do you not?

A Yes, we do.

Q In your judgment, is the value of this ore deposit principally langbeinite or principally sylvite?

A Principally langbeinite.

Q Have you, Mr. Childers, in your capacity with I.M.C., made some evaluations of the ore body in question here, utilizing accepted methods by which such ore bodies are evaluated and delineated?

A Yes, sir.

Q Have you used more than one method?

A Yes, sir.

Q What methods have you used?

A Well, from the beginning, using a rough method of taking the holes in the general area and averaging those holes, just arithmetically, to using the polygon method, which is an accepted method of geologic evaluation of this type of ore. We went from that to a method known as the K20 foot method, where you take into consideration not only the value of the ore as far as the percent of K20 is concerned, but also the thickness of the bed.

Q Is the last method sometimes referred to as the contour method?

A Yes, sir.

Q Now, have you prepared exhibits demonstrating the

polygon method first of all?

A Yes, sir.

Q Do you have those here?

A Yes, sir.

Q I will hand you what has been marked as I.M.C. Exhibit Four, and ask you which method that-- first of all, I will ask you whether that was prepared under your direction and supervision.

A Yes, it was.

Q And now I will ask you which method that particular diagram demonstrates.

A It's the polygon method.

Q Would you explain to the Commission how the polygon method is used?

A Yes, sir. You begin by selecting two core well locations, and draw a line between the two, and intersect that line half-way between the two, and that becomes a polygon side. Using each of the core holes, you do the same thing drawing a line between each core hole and intersecting that line with a line perpendicular to it half-way between the two holes to form another side of your polygon.

As you work around the hole, you form a polygon around the core hole, which gives the area of influence you can give to that particular core.

Q Is the proposed location of the Phillips well indicated on the map?

A Yes, it is. There is a small circle, which is the proposed location. It is surrounded by a larger circle with a radius line indicating a 1,400-foot radius.

Q Do you have core test information on that exhibit?

A Yes, sir.

Q Can you explain to the Commission the meaning of those symbols by the cores?

A Yes, sir. If you will look in Section 13 on the west side, you see the number 370. That is an I.M.C. core hole number. The circle indicates the location of that hole, and the numbers immediately below the circle indicate, first, the bed thickness, and second, the percentage of K2O as langbeinite.

Below that figure is the percent of K2O as sylvite. So in that example, core hole 370 would read 8.4 feet of 11.3 percent K2O as langbeinite, and 0.2 percent K2O as sylvite.

Q And the same information follows for each hole?

A Yes.

Q Now, you have testified that you set up your polygon by drawing a line half-way between the various core tests, is that correct?

A Yes, sir.

Q What data or information did you use from that point in evaluating the ore body?
A As you put down the perimeter of your polygon by drawing these normal lines to the lines in between the core holes, then the area that is included inside the perimeter of that polygon is given the influence of that hole, so you calculate the reserve information of that area, using that information.
Q Now, have you calculated these figures in these various polygons, and can you give us that information as to what your calculations are?
A Yes, sir. In Section 13, we have evaluated Section 13, using the polygon method, and it is calculated to be 19,116,880 tons of ore.
Q That is in the entire section?
A Yes, sir.
Q How do you arrive at that figure? Is that the average of the polygons that exist within the section?
A Yes, sir. There were four polygons involved.
Q What do you mean by tons of ore?
A Those are tons of mineable economic ore that are lying in the ground under Section 13.
Q Am I correct in saying that whether you have sylvite or you have langbeinite, they are in salt, are they not?
A Yes, sir.

Q And you must refine it out of that?
A Yes, sir.
Q Then in order to determine the amount of langbeinite, for example, in that tonnage, how do you proceed?
A By using the percent of langbeinite that is in each one of these core holes. That volume in that polygon is applied to the value of the langbeinite that is in that ore. For example, in the polygon for 370, which we have discussed, the ore grade K2O langbeinite is 11.3 percent. So our product grade is twenty-two percent K2O as langbeinite. So that's just roughly over fifty percent of the ore in that polygon is langbeinite ore.

MR. PORTER: Does that conclude your answer to that question?

THE WITNESS: Yes.

MR. PORTER: I think we will take a recess for lunch at this time. The Legislature is in session, and places to eat are at a premium, so we will take a break at this time and come back at one o'clock.

(Whereupon a luncheon recess was taken.)

AFTERNOON SESSION

MR. PORTER: The hearing will come to order, please. Ask the witness to please take the stand and resume his

testimony.

(Whereupon Charles E. Childers resumed the stand, and testified as follows:)

Q (By Mr. Matkins) You have demonstrated the polygon method, and you have mentioned also a contour method, which is in common use.

A Yes, sir.

Q Have you prepared an exhibit demonstrating the contour method?

A Yes, sir.

Q Do you have that with you?

A Yes, sir.

MR. MATKINS: Can we identify this as I.M.C. Exhibit Five, please?

Q (By Mr. Matkins) Mr. Childers, the exhibit that you have just distributed has been identified as I.M.C. Exhibit Five. I wish you would explain to the Commission what the markings on that exhibit mean in terms of identifying the ore body. Did you prepare this exhibit?

A It was prepared under my direction.

Q All right, sir.

A This is a method used to evaluate a body of ore in which you take into consideration the two most important features of that ore body. One of them is the percent of mineral, and the other is the bed thickness. So

you multiply the thickness of the bed by the K2O percentage, and in this case, this is a K2O foot contour with the K2O as langbeinite.

So using the same hole, hole 370, where we see 8.4 feet of 11.3 K2O as langbeinite, you multiply the 8.4 by the 11.3 and come up with K2O feet. Each core hole is done the same way, and the contour map is plotted using that information.

Q What do the numbers on the contour map, that you placed on the contours, what do they represent?

A The contour line number, let's pick the one here by number 370, right above it, we see the contour that has a value of 90. This means that the depth thickness of the ore bed times the K2O as langbeinite in that bed will result in a figure of 90.

You multiply those two figures.

Q In using this contour method, can you likewise make a projection as to the ore content under Section 13 as you did under the polygon method?

A Yes, you can.

Q Did you make such a computation using this method?

A No, sir.

Q What then is the significance of this contour map?

A It just shows the value of the ore that is in Section 13. It shows what we would expect to reach. Obviously,

if it is thicker ore and has a higher grade value, it is going to be of higher quality, and of more importance to us when we mine it.

For example, with the number 100 along that contour, we would expect ten feet of ten percent K2O, or the equivalent. If you had five percent of twenty percent K2O, it would result in the same thing. The higher the number, the more valuable the ore.

You can make a rough estimate of any area you would like to pick by just multiplying the area times the area of influence.

Q Does the method delineate the possible boundaries of commercial ore?

A Yes, sir. You get a better feel for what you might expect in this method between the two holes than you would in the polygon method. The polygon method assumes one area of influence around that particular hole to have the same value.

When you go from one polygon to the next, when you move from one line over into another polygon, you may be moving to something very much richer, or something very much poorer in value.

Q As a mining engineer, do you have an opinion as to which of these contours define the possible limits of commercial ore?

A The value set by the United States Geological Survey for non-potash areas for langbeinite values is four feet of four percent K2O as langbeinite. Using those values, four times four is sixteen, so the contour line would indicate where the cut-off would be.

For that reason, a value of sixteen was placed on the contour line on this map.

Q Would you please tell the Commission what is meant in the potash industry by first mining and second mining?

A Yes, sir. When you mine a bedded deposit, it is obvious that you cannot go in and take one hundred percent of that bed out in first mining. You go through and mine what you can safely mine and recover, leaving enough of the ore to support the overlying strata.

When you second mine, you are making the decision that the area will not be-- you will not go back into it. In the room and pillar method of second mining, you go in and rock the pillars and--

Q What is meant by rock the pillars?

A To rock the pillars means to mine the ore that was left in the pillar room. The rooms indicate the area that you have mined out, and in mining terms, it is more commonly called a drift. In the pillar method, for example, in our mines, all drifts run north and south, and the rooms run east and west, and are called

breakthroughs. The area we leave to support the back is called the pillar. When you second mine, you go back into an area and you mine the ore that is in that pillar and remove as much of that pillar as your mining plan calls for.

Q What are the sizes of your rooms as you first mine?

A In our mines, we have a standard of twenty-eight feet. Now, this is not standard for all room and pillar mining, but in our mines, we follow the twenty-eight foot rule.

Q What size pillars are left after first mining?

A This depends also on the amount of ore that you plan to extract on first mining.

Q What do you commonly extract on first mining, percentage-wise?

A Here again, it depends on the bed depth, and whether or not you are mining in an ore bed that happens to lie above the one you are mining right now. In this area down here (indicating), at this depth, we would plan on fifty percent extraction on first mining.

Q When you say this area, are you talking about Section 13, the area in controversy here?

A Yes, sir.

Q And if you did second mine in this area, how much additional ore would you expect to recover?

A Forty percent additional ore for a total of ninety percent extraction.

Q Have you actually, in your duties as mining engineer, or while you have worked with I.M.C., have you actually engaged or been present during the second mining withdrawal of pit pillars?

A Yes, sir, not only at I.M.C., but with Southwest Potash and Duval.

Q Let me ask you this at this stage. In using these various methods, what is the significance to your in your experience of a dry hole or a hole that shows almost no commercial langbeinite or sylvite?

A You will have to qualify that. Of course, by taking a look at the information in your surrounding core holes, generally we can say that a barren hole cannot be relied upon to be barren.

If a bed has had other ore deposits with the langbeinite or sylvite, for example, then they will replace the langbeinite so you may find a place where the langbeinite or sylvite you see in the area-- there may be a smaller area where it didn't occur, and these are called salt horses. They may be large or small so that you can hit one of these salt horses with a core test which would indicate just from that that there is no ore there. However, if there are good

holes around it, it becomes suspicious, and you may or may not have ore there.

If there is a core well hole that shows to have potash, sylvite, or langbeinite, then you can be pretty well assured that it is there.

As far as we know, there are no such things as ore horses.

Q During your actual mining development, do you mine through areas containing these so-called salt horses?

A Yes, sir.

Q Have you, on several occasions?

A Yes.

Q Have you ever mined through an area that actually contains a blank hole, and yet you mine through the entire area?

A Yes.

Q Now, when you are conducting second mining, you, of course, are withdrawing the support strength of the roof of the mine, are you not?

A Yes, sir.

Q And something occurs in that process which is called subsidence, is that correct?

A Yes, sir.

Q Mr. Childers, we have distributed what has been marked as I.M.C. Exhibit Six for identification. I ask you

if that is a drawing prepared under your direction and supervision.

A Yes, it is.

Q Is it drawn to scale?

A No, sir.

Q Is there a reason why it is not drawn to scale?

A Because it is a diagramatic drawing showing only a general section. It is not meant to show the geology of the area specifically, but just in general.

Q In addition, you wouldn't have a large enough piece of paper to put in 1,400 feet, would you?

A The bed would appear rather small.

Q On the left-hand corner, the left-hand portion, you have indicated an area which would be classified as having been first mined, is that correct?

A Yes, these are supposed to be drawings of pillars starting from the left.

Q And then you have smaller pillars, is that an indication of second mining?

A Yes. You can see the size of the first two pillars, and you can see the size of what would be the third pillar, and that has been mined through and left as two small stubs or fenders, depending upon your terminology.

Q Then on past those smaller pillars, you have shown a

collapsing of the mine area, is that correct? To the right of the drawing?

A Yes, sir. The drawing indicates pillars that have been crushed by the weight of the overlying rock.

Q And is this what is referred to as convergence?

A Yes, underground.

Q Subsidence is on the top and convergence is down below?

A Yes, sir.

Q Roughly, what type of material lies immediately above your ore bodies?

A Salt, with some stringers of polyhalite and hydride.

Q Then what is on above the salt and the other two?

A Limestone and dolomite and shales.

Q On this drawing, you have indicated a forty-five degree angle from a vertical position. What is the significance of that?

A That line is drawn in to show the subsidence angle, which is the angle that the subsidence will take. In other words, if you pull pillars up to the point as shown here in this diagramatic drawing, subsidence will then occur at an angle of forty-five degrees to the surface.

Q Have you actually observed convergence in mines?

A Yes, I have.

MR. MATKINS: If the Commission please, we want

to put this exhibit in now, as it will be used by a later witness. We want to put it in now because Mr. Childers has prepared it.

Q (By Mr. Matkins) Mr. Childers, do you have in your possession some photographs taken at I.M.C., evidencing convergence and subsidence in your mine?

A Yes, I do.

Q Do you want this whole group? Maybe you can select a few of them and tell us what they demonstrate. Mr. Childers, I show you a picture identified as I.M.C. Exhibit Seven, and if you would tell the Commission what that picture demonstrates?

A This is a pillar that has been left in the mine. As you can see, the pillar did go from here on over to the original dimensions which would take us outside of the picture. This pillar is being robbed, and you can see we have excavated some of the ore as we were driving through the pillar.

This pillar has been crushed from the weight above it, and you can see it's beginning to fail along these shearing lines. These things normally would assume the position of a sort of hour glass as the pillar is crushed from the weight of the rock coming down on it.

Q Showing you what has been identified as I.M.C. Exhibit

Eight, I ask you to tell us what that picture demonstrates.

A This is the floor here, and it shows the forces at work that are being transmitted through the pillars into the floor area, causing the upheaval of the floor.

Q Is there anything further significant about that photograph?

A No, sir.

Q And picture number nine. Would you tell us what that shows?

A This picture illustrates the forces moving in what is referred to as convergence. A while ago, these timber posts that were located in the mine-- these were not there to support the back, they were there for some other reason, but as the back and the floor have converged, begin to converge, they have broken out these timbers.

Some mines, a lot of mines, use timber for roof support, and this picture only illustrates the fact that no amount of timber we could put in here, no reasonable amount, is going to support the weight of the overlying strata.

Q Going back to Exhibits Four and Five, on each exhibit, you have indicated the location of the proposed Phillips well, have you not?

A Yes, sir.
Q And on Exhibit Four, you indicated an additional circle having a 1,400 foot radius from the hole, which I believe is also shown on Exhibit Five.
A Yes, sir.
Q You have two circles, but in each case, I assume, the circles are equal in size.
A Yes.
Q You have indicated on Exhibit Four a 1,400 foot radius to the outer circle, would you tell the Commission the significance of that radius and why it is there?
A Yes, sir. That is the circle radiating from the proposed location of the Phillips well. If we follow, which we would have to do, the forty-five degree subsidence angle, we would not be able to pull pillars within that circle for fear of causing failure of the well.
Q In other words, within that entire circle, your second mining would be precluded?
A Yes, sir.
Q How is the 1,400 feet arrived at?
A The depth of the bed in this area is 1,400 feet approximately.
Q And so within that area, you lose approximately forty percent of your ore?

A Yes, sir.
Q You heard the testimony earlier, did you not, Mr. Childers, particularly in questioning, I believe, by Mr. Morris,relating to suspended leases?
A Yes, sir.
Q Have you made an investigation into lease suspensions in this immediate area?
A Yes, sir.
Q Did you prepare what has now been marked as Exhibit Ten?
A Yes, sir.
Q And was it prepared under your supervision?
A Yes, it was.
Q Where did you obtain the information relative to this exhibit that was put on the exhibit?
A The information on Federal leases that have been suspended was received from the U.S.G.S. office in Artesia. The information on State leases suspended was received from Mr. Ray Graham.
Q You have indicated those areas that have been suspended by shading them in, is that correct?
A Yes, sir.
Q Are any of those shaded areas in the vicinity of Section 13 and the other leases in connection with the langbeinite body?
A Yes, sir.

Q Would you indicate which those are?
A Unfortunately, this map does not have section numbers on it, but you can follow the road map. You can follow State Road 126, and as we follow that road along, we see the turn-off going north up to the Duval shaft, and there is a cross-hatched area around there.

The section right here is Section 3, and the one to the left of it is Section 4, and the one south of Section 4 is Section 9. These are all in Township 23, Range 30.

Q Is the Duval Mine not adjacent to the ore body in which Section 13 is located?
A Yes, it is.
Q Mr. Childers, can you tell us whether the products known as sylvite and langbeinite have the same physical characteristics insofar as support strength is concerned?
A You are talking about the mineral sylvite and the mineral langbeinite?
Q Yes, sir.
A Sylvite has greater strength, langbeinite is somewhat weaker and is much more brittle.
Q What activities, if any, are in progress at I.M.C. with relation to the production of langbeinite?
A Well, as you noted from Mr. Brown's projections, the langbeinite, or our product sulpha-mag, made from

langbeinite, has very good growth potential.

At the present time, we are in the process of building a system which will enable us to handle more langbeinite, and the value of the capital invested in the project is $800,000. It is due to be completed April 1st.

The present growth of this market indicates that three years from now, we will be at capacity again, and we will have to make another capital investment in order to process the amount of langbeinite that it is projected we are going to need.

Q You have heard testimony that we are now producing langbeinite. Do you have any-- does the company have any projected time schedule as to when they will be required to be mining this ore in order to meet market requirements?

A At this time, our plans are not definite as to the exact time that we will move into this area. This area is part of a package that contains nearly half of our total ore reserves, and we definitely plan to mine Section 13, which is the heart of this ore body.

We cannot say exactly at what date we will be mining, but our plans indicate that we will have to be in there before a fifteen-year period is up. We think we probably are going to be in there within

ten years, and there is a good possibility that we will be there within five years.

Q There are two methods by which you can get into that area, are there not?

A Yes.

Q Would you explain that to the Commission?

A Yes, sir. We can develop from our present mine down toward these ore reserves and process the ore through our present mine and hoist the ore through our present shaft, or we could choose to sink a new shaft and have a separate mine just to handle the high grade langbeinite ore in this area.

Q Has the decision been made at this time as to the method which will be employed?

A No, it has not.

Q But you do consider this particular deposit to be really the life blood of your continued mining in the basin, do you not?

A Yes, sir.

Q Mr. Childers, has there ever been,to your knowledge, any experience with gas in the I.M.C. Mine?

A No, sir, there has not-- if by gas, you mean methane?

Q Yes, sir.

A No, sir.

Q Is I.M.C. equipped presently to work that mine, if it

contained a methane gas?

A No, sir.

Q Would you tell the Commission what changes would be required if methane were discovered in your mine?

A Yes, sir. The basic difference between a mine that is classified a gaseous mine containing methane, as all of the coal mines are now considered in the United States, is in your equipment and in your ventilation requirements.

For example, all equipment must be what is considered by the Bureau of Mines to be permissible, permissible meaning that it is permissible to be used in a mine that has gas.

It is much more expensive and much more difficult to keep up. The reasoning is that you have to be able to have the utmost confidence in your equipment that you are not going to have a spark or a flare that might ignite the gas. So our equipment is non-permissible. When you buy equipment, you have to specify if you want it to be permissible. All our distribution equipment would have to be permissible, and our equipment is not. And your ventilation requirements are more rigid.

Q Are you saying then that as far as your mining equipment is concerned that you would have to completely

re-equip?
A Yes, sir.
Q Do you have any notion of what this might cost?
A In preparation for that question, I asked our mining superintendent,who made the rough estimate of three to four million dollars, in trying to get the equipment that we have now brought up to some sort of standard.
Q You have previously testified based upon your various methods of identifying this ore body and the amount of ore present, have you prepared reserve calculations in that area, and also a calculation of the value of the ore that might be lost as a result of this well?
A I wonder if you would ask me that question again?
Q You made calculations of ore reserves, and also the amount that would be lost by the forty percent--
A In Section 13?
Q Yes.
A And the area influenced by the proposed location?
Q Yes.
A Yes, sir.
Q All right. Did you make the calculations contained in Exhibit Eleven that is now being distributed?
A They were made under my direction, yes.
Q Would you tell the Commission what you believe to be the significant data as a result of your calculations

as they appear on that exhibit?

A If you refer back to our map showing the polygon method, you can see the various areas of the section, and of the circle around the proposed location.

These calculations take that part of each polygon which is included in the two areas. For example, when you look at Section 13, you will see the area around number 369 having an area of 8,580,000 square feet, with a bed thickness of 11.8 percent, with K2O as langbeinite at 9.0 percent.

The sylvite is 4.8 percent K2O. The tons of ore in the polygon would be 7,499,550 with product tons of 3,089,000 of langbeinite, with product tons of sylvite 600,000.

Now, this is done for each segment of the polygon in Section 13, and the totals are listed. The same things were done for the area in the 1,400 foot radius circle around the proposed location.

Q You heard the testimony of Dr. Brown this morning, did you not?

A Yes, sir.

Q Relative to market prices on langbeinite?

A Yes, sir.

Q And did you, independent of that information, calculate the value as to the loss of ore in the 1,400 foot

radius area if you don't have second mining?

A Yes, I have the calculations where we used an average figure, which is not included in the polygon method. If you prefer to discuss that, we can, or if you would like to use the information which is calculated using the polygon method, we can use that.

Q I would like for you to give us your calculations.

A This calculation was made some time ago, and we just rounded off the area and said we will use a bed thickness of eight feet and percent K2O of 9.4--

Q Just a moment. Let's identify this as Exhibit Twelve. Now, you have the tonnage and the calculation as to the value of the tonnage here. Would you explain to the Commission how you calculated the value of lost tonnage?

A Yes, sir.

Q The second heading says "one hundred fifty foot radius circle". This is the circle which would have to be left around the hole, around the well, without any mining.

So this calculates the tonnage of ore that would be in that circle.

The next section shows the 1,400 foot radius circle, and it shows the area and volume, assuming the eight-foot thick bed, and then the tons of ore.

The tons that would be lost, since we are going to use forty percent of the large circle, that forty percent of the small circle will be included in that, and then we would also lose fifty percent of the small circle,for a total of ninety percent of the small circle.

We consider ninety percent the amount we can recover, ten percent is a loss at any rate. So within that circle, we will lose an additional fifty percent.

In the large radius circle, we are going to lose forty percent. We multiply that by a factor of .85, taking into consideration that recovery is not one hundred percent. We figure the ore grade over the product grade, and in this case, we use 9.4, and the product grade is 22.0.

Carrying that out, we are going to lose 537,694 tons, and for this calculation, the average figure of $18.50 per ton was used, and total amount would be $9,947,339.

Q Mr. Childers, have you ever had an explosion, other than dynamiting, in your mine?

A No, sir.

Q And in spite of whatever new equipment that you might acquire, it is fairly common knowledge among miners that the presence of methane does create the hazard of explosion, does it not?

A Yes, sir.

MR. MATKINS: I think that's all I have for now.

MR. PORTER: You may cross examine, Mr. Kellahin.

* * * *

CROSS EXAMINATION

BY MR. KELLAHIN:

Q Mr. Childers, on your Exhibit Number Four, the polygon method of computing reserves, actually the only information you are using on that is information from the various cores shown on the exhibit, is that correct?

A Pardon me?

Q The only information you have to prepare that exhibit is from the cores, isn't that correct?

A Yes, sir.

Q You have no other information-- how many cores did you have?

A Would you like for me to count them?

Q If you need to.

A In the entire map, Mr. Kellahin, or just in Section 13?

Q How many in Section 13?

A One hole.

Q And how many on the entire map?

A Nine.

Q That's the same number of core holes that you had available to you when you testified before the

Commission or one of its examiners on July 23rd, 1969, isn't it?

A Yes, sir.

Q And you prepared an Exhibit Number Seven, which listed all those core holes, is that correct? Do you recall that exhibit?

A Yes, sir.

Q Have you assigned the same values to those core holes today that you assigned to them when you testified in 1969?

A I would have to check. I think there was one hole, 371, that we used a different value. Without having that exhibit in front of me, there is no way I can check it.

Q Here it is.

A With the exception of two holes, they are all the same.

Q What two holes are they?

A Hole number 369, which is in the middle of the section on the west side of Section 18 on this exhibit that you have from 1969, we show 11.3 feet, and the langbeinite grade was 9.2 on this exhibit that we have presented today. Bed thickness is 11.8, and the langbeinite is 9.0 for hole number 371. This exhibit showed a thickness of 4.3, with 7.7 of langbeinite, and a sylvite grade of 2.1. We have shown on the exhibit presented

today 7.3 of 6.3 percent langbeinite and 5.4 percent as sylvite. The other holes that we have used are the same.

Q So on the 371 core, you have increased the thickness and increased both the langbeinite and sylvite percentages?

A No, sir.

Q Am I wrong?

A Yes, sir.

Q What did you do to it, then? I must have misunderstood you.

A We increased the bed thickness and decreased the percentage of langbeinite and increased the percentage of sylvite.

Q Thank you. Now, you had one other core on there on which you gave information, the D-5-A core. But on your Exhibit Number Four, you did not use that figure.

A Yes, sir, there is a little circle on the map which would indicate the location of that hole, but it was not used in making these calculations.

Q But in your exhibit presented in 1969, you showed an 8.4 foot thickness-- I'm sorry, 5.9 foot thickness, with twelve percent sylvite and 2.9 percent langbeinite. Would you agree to that?

A Yes, sir.

Q Had those figures been used, it would have materially

changed the figures given in your polygon, would it not?
A It would have changed the figure, yes.
Q Now, in connection with that same well, did you not testify in response to a question in the 1969 hearing that there could be considerable variation across Section 13?
A What was the question?
Q Did you not testify that there could be considerable variation in ore content across Section 13?
A I don't know for sure. Have you got a transcript?
Q Yes, sir, I do. Reading from page 48 of the transcript in Case Number 4175, heard on July 23rd, 1969, do you recall that you were asked this question: "There could be quite a bit of variation across that area, could there not?" Answer: "Across this area?" Question: "The area you propose to include in the potash zone. For example, I call your attention to the cores drilled, I don't have the number of the cores, but the ones in Section 11 and Section 13." You had two cores, as I understand your testimony, your number 370 and your D-5-A, one of which, according to your testimony, would be commercial, and one which would not. Answer:"This is partially correct and partially incorrect. There are two holes, but they are both commercial." Was that your testimony then?

A Part of it.
Q I don't want to read all of it. You used the same figures, of course, in making your reserve calculations in this area, did you not, just the information from the core holes, both on your polygon computations and on your contour method computations?
A Was the question I used the same information, or did I use the same core holes?
Q You used the information from the cores?
A Yes, sir.
Q You had no other information available to you, did you?
A No, sir.
Q You had not taken any cores since 1969?
A No, sir.
Q Now, is it common practice, Mr. Childers, before you mine, to drill core samples on a much more dense basis than you have done here?
A Would you give me a definition for "common", sir?
Q Let's word it this way: Would your company be willing to go in and dig a shaft or extend their existing shaft to this area in Section 13 on the basis of two cores?
A Is the question would we be willing to do it on the basis of two cores, or would we be willing to do it on the basis of the information we have?

Q Well, let's put it both ways. You say you have two cores in Section 13-- you have one core in Section 13.

A We have one, yes.

Q You are not using the other one?

A We have one core inside Section 13, and we have two cores right adjacent to Section 13.

Q Would you mine on the basis of that information?

A If we had no other information except that?

Q Yes, sir.

A I would say we would want another hole or two.

Q On the basis of the eight core holes, still disregarding the one core hole which you seem to just want to disregard, would you mine or dig a shaft or extend your existing shaft on the basis of that information?

A Yes, sir.

Q You would?

A Yes.

Q On your Exhibit Number Five, I don't quite understand your cut-off. Are you using the U.S.G.S. cut-off?

A The four feet times four percent K2O, the product of those numbers being sixteen. The sixteen line is shown on there, and you can get whatever information you would like from it.

Q Actually, the thickness of the ore body has a great deal to do with it, regardless of value, does it not?

Would you mine one foot if it were a high enough value?
A You mean if it were twenty-two percent?
Q Yes, would you mine one foot of it?
A Yes, we probably would take a lot of overbreak, but we would take it.
Q But in general, wouldn't you say that the actual thickness of the ore is a governing factor in the value of the ore?
A Yes, sir.
Q Now, getting to this ore value which you have given on this 1,400 foot radius. Do you recall giving testimony in the 1969 hearing of Case 4175 that the ore value in the 6,800 acres you proposed be included under Order R-111-A was $250,000,000?
A I remember that figure.
Q Do you agree with it now?
A I agree that it was used, I'm not sure it was used in exactly the way you are saying.
Q If you have a different version, I would be interested in hearing it.
A There was a value, I don't remember exactly what was said leading up to that, but I do remember a figure.
Q You will agree that you had no different information then than you have now?
A Yes.
Q And would you agree if that was your testimony which

is set out in page thirty-two of the transcript that $250,000,000 would figure out to $37,700 per acre. If that was a correct calculation, would you accept it?

A If it's correct, I will accept it.

Q On that basis, then, what figures have you used to determine you are going to lose $9,000,000?

A Whatever the exhibit was that was marked, those calculations.

Q How many acres gross are you going to leave around that well if it is drilled?

A Forty percent of the acres that are involved in the 1,400 foot radius.

Q And you are using an eight-foot ore thickness, is that right?

A Are you talking about acres?

Q Acre feet.

A You have to multiply that by eight.

Q I understood you to testify a moment ago that you are in the process of building a system at a cost of $800,000, the purpose of which is to enable you to process both langbeinite and sylvite.

A No, sir.

Q What did you say then?

A It's a system that will handle only langbeinite ore, the sylvite values would be lost.

Q So if you are utilizing this system and you are mining in the area, wouldn't you lose all of the value of the sylvite ore?
A Yes, sir.
Q So on your gross figure on this $9,000,000, were you calculating both langbeinite and sylvite?
A No, sir.
Q You are just talking about langbeinite?
A Yes.
Q No sylvite values whatever?
A No, sir.
Q Didn't you not testify in 1969 that you had a new system that would enable you to refine both products at the same time without losing either?
A Yes, sir.
Q But you are not utilizing that system?
A Yes.
Q But you don't propose to use it here?
A I don't think that can be answered with a yes or no, Mr. Kellahin.
Q Are your present plans to use it if you mine Section 13?
A The Lang-leach process is in addition to the plant we already have. Any high grade langbeinite ore, if there is a low sylvite value, would be put through the Lang-leach system.

Q What do you call low sylvite value?
A Zero point one, 0.2.
Q If you have 4.4 feet with 4.8 percent sylvite, as was shown in your core in number 384, would that be a low sylvite value?
A "Low" is a difficult term.
Q It's not as low as what you said was low a moment ago.
A It's not as low as 0.1, no.
Q Would you call 5.9 feet at 12 percent sylvite low?
A No, sir.
Q But you are going to lose the sylvite under your present plans?
A I beg your pardon, sir?
Q You are going to lose the sylvite out of this area if you follow your present plans?
A I don't believe I testified that all of this ore is going through the Lang-leach system. I merely testified that we were adding the Lang-leach system.
Q I am asking you to testify as to what your plans are, if you know.
A With the Lang-leach project, we have that much more flexibility. Any ore coming from the mine that is high langbeinite and low sylvite will be handled through the Lang-leach process, any ore that is mixed ore, that has a value of both sylvite and langbeinite

will go through the present plant, and we will attempt to recover both values.

Q Now, in connection with your Exhibit Number Ten, which purports to show the leases that have been suspended, and I assume they have been, those leases are actually in close proximity or directly over existing mining operations, are they not?

A No, sir.

Q They are not?

A Not all of them.

Q Let's take the area closest to Section 13, which would be the Duval shaft as shown right in the middle there. That is their mine there, is it not?

A To my knowledge, yes.

Q Are you mining in the area south of that where the lease has been suspended?

A That's our lease.

Q Are you mining in there?

A No, sir, no one is mining under that.

Q But they are within a half a mile of the Duval Mine, or a mile?

A I don't know where the Duval Mine is located.

Q But you will agree that they are immediately north of that acreage?

A They are north of that acreage, yes.

Q Now, in connection with this time schedule you discussed, you say your plans are not definite, but you are talking about probably fifteen years, is that right?
A I think I used probably in terms of ten years, and for sure, within fifteen years.
Q Certainly within fifteen years, probably within ten years; and how about five years?
A Possibly, I think we used possibly.
Q You have filed no five-year plan which would include this, have you?
A Yes, sir.
Q You have filed one?
A Yes, sir.
Q What does it say?
A To the effect-- can I say what it says to the effect?
Q Yes.
A I'm not sure I am quoting, but it says to the effect that we will be doing developing work from our present working ore well by mining within Section 13.

MR. KELLAHIN: I ask the Commission to take notice of the five-year plan filed by International Mining and Chemical.

MR. PORTER: We will take notice.

MR. KELLAHIN: In that connection, the map filed

does not even show Section 13.

Q (By Mr. Kellahin) When you testified in 1969, I believe this same question came up, and do you recall testifying, and this is on page 47 of the transcript. You were asked that if you are mining in routine fashion, how long would it take you to get to Section 13, and you answered: "Well, let's say maybe up to three years." Do you recall saying that?

A If I can go back, I don't think we were talking about Section 13 at that time. You added Section 13, but I don't believe we were talking about Section 13.

Q The record will speak for itself.

MR. MATKINS: I will stipulate that Section 13 was in the area, but what was brought into R-111-A at that time was five or six miles from Section 13.

Q (By Mr. Kellahin) In any event, do you recall saying three years?

A I recall it, yes.

Q Are you in the area at this time?

A No, sir.

Q So four years later, you are still not there?

A No, sir.

Q Is that any indication of the accuracy of your information in the case here today?

A I don't believe I was saying-- I think if you read

the rest of the transcript, you would see that we had no plans at that time either.

MR. KELLAHIN: If the Commission please, I think page 47 of the transcript will speak for itself.

MR. MATKINS: I believe the Commission should take administrative notice of the entire transcript in Case 4175, and make it part of the record, and the order entered in the case as well.

MR. KELLAHIN: We will agree to that.

MR. PORTER: The Commission will take administrative notice of Case 4175.

Q (By Mr. Kellahin) On this subsidence, if Phillips were permitted to drill its well in there, is it still your testimony that you are going to lose the 300-foot pillar plus forty percent of what is left in that 1,400 square foot radius?

A If the well is drilled?

Q Yes, and produced to abandonment before you get there.

A Yes, sir.

Q You still will leave those pillars in the 1,400 foot radius, is that right?

A Yes, sir.

Q Have you mined around oil wells or well shafts before?

A Personally?

Q Yes, your company, under your supervision.

A No, sir.
Q So you have had no experience at all with this, have you?
A No, sir.
Q Well, let's assume on the other hand that Phillips Petroleum Company had its lease suspended, and comes back some time later. How much later would it be before they could come in and drill after you finished mining?
A I don't know, sir.
Q You can't give us even an estimate?
A No, I'm not a petroleum engineer.
Q I am not talking about petroleum, I am talking about your mining operations. When would they be completed in such a fashion that Phillips could then move in and drill?
A I'm sorry, but I can't answer that.
Q You don't know how long it is going to take you to mine it then, is this your testimony?
A Not without more qualifications.
Q Now, Order R-111-A, you are familiar with it, are you not?
A Yes, sir.
Q It makes a provision that oil and gas wells must be plugged in a specific manner in order to protect the potash. Is there any such provision in there requiring the potash miners to protect the oil reservoir or permit it to be produced?

A Not to my knowledge.
Q There is not, is there?
A Not to my knowledge.
Q Under those circumstances, would I.M.C. be willing to guarantee Phillips that it will encounter no problem on account of your operations if it came in after you?
A I am not qualified to answer that question either, Mr. Kellahin.
Q How long does the subsidence continue after you pull out of an area?
A That's an answer that needs some qualification also. Do you mean after you pull the pillars?
Q Yes. Mr. Childers, you are a mining engineer, and let's assume you have mined an area, and have done everything you wanted to do, and you are getting out. How long before all the problems in the strata stop?
A I can't testify from actual knowledge as to when subsidence stops. Within a few months, you have six to eight-tenths of your subsidence, and I have no records that I have kept personally that showed how many years movement continued, so I can't give you a much better answer than that.
Q So this business of saying that Phillips could get their lease suspended doesn't really mean anything, does it? You don't know when they could go in there,

and you don't know when you are going to get out, and after you do get out, you don't know how long it will take the ground to settle down before it can be drilled.

A All I know is they can have their lease suspended,and a potash company cannot.

Q You heard testimony this morning that Phillips can produce this gas in five years, and you are talking about coming in in fifteen years. Certainly you are not prohibited from mining the area as Phillips is prohibited from drilling it, are you?

A Mining around a gas well?

Q Yes, sir.

A The area not influenced by the hole, we can mine, yes.

Q On your exhibits, you show a core to the south of Section 13, number 386. That area is actually barren, as far as commercial ore is concerned, is it not?

A It is 8.7 feet thick and has a value of 0.2 percent as langbeinite and 0.1 percent as sylvite.

Q You wouldn't call that commercial ore then, would you?

A No, sir.

Q Now, on this $9,000,000, you said that you will lose. If you will agree that you did testify that the entire area, some 6,800 acres included in R-111-A, had an ore value of $250,000,000, that would figure out to be $37,700 per acre. How many acres are you going to

leave in this 1,400 square foot area, can you tell me?

A If someone can divide 6,157,536 square feet in the circle by 43,580--

MR. WILLIAMSON: One hundred forty-one point thirty-six.

A Assuming the calculator is right--

Q Can you multiply that then by $37,700-- $36,700, I'm sorry.

MR. MATKINS: I think we need to object at this time because the questioning is based on false assumptions. The figure used by Mr. Kellahin is a figure for the entire body, and there are varying values within that large body of acreage. We are now restricting ourselves to values placed on one portion of one section, which does contain one of the hottest holes in the entire section, and I am certain that any calculations that Mr. Childers made in 1969 were based on averaging across the entire section. There is not a hotter hole in the acreage than in Section 13, so you can't expect this to average out to the average you are going to have across your entire leasehold area.

MR. KELLAHIN: If the Commission please, Mr. Matkins' objection assumes that the whole area is not of equal value, with which we agree. On the other hand, the witness has attempted to give a value to Section 13 based on one core hole. Sure, there is one in the offsetting section, but he

has one in the south that has no value at all down in Section 24, which has not been taken into consideration. He has another core hole, D-5-A, which he has ignored completely, and it shows 5.9 percent of sylvite and 2.9 percent of langbeinite, and that has been ignored.

So I think it's perfectly proper to take his own figures.

MR. PORTER: The Commission would like to know if the witness can give us an answer.

THE WITNESS: Yes, to the best of my ability. Any figures that were given in the hearing Mr. Kellahin is referring to were based on the entire area we were trying to bring into R-111-A at that time.

MR. PORTER: Do you recall how much that was at that time, or approximately? Did it consist of a number of sections or townships or a considerably larger area than you are talking about in Section 13?

THE WITNESS: Yes, sir. The information we are talking about today is based not on what Mr. Kellahin would suggest, one hole, but on the polygon method, which gives an area of influence to each hole.

I believe there were four holes that influenced the area, and that was the method used,as Mr. Matkins has pointed out. As I stated before, Section 13 is the heart of this ore body and has the highest grade ore running

through it, and it's going to be of a much greater value than the average for the entire area.

Q (By Mr. Kellahin) In response to that, Mr. Childers, the D-5-A core is the closest one to the proposed Phillips well, is it not?

A It's a toss-up, I haven't measured them.

Q Well, it's just as close as any other core you have, is it not?

A It's just as close, yes.

Q But you have seen fit to ignore it because the figures do not jive with the rest of the cores, isn't that correct?

A No, it is not correct.

Q Why did you ignore it?

A Because the information from that hole-- D-5-A stands for the Duval 5-hole. This hole was drilled in the area and was cored long before Duval ever got into the potash business. The information we have on that hole from Duval and from the U.S.G.S. and from the file I used to compile the data showed the values for all the holes in that area. We had values for D-5-A from the U.S.G.S. of 10.1 feet of 15.5 percent K2O, which I would be more than happy to make a polygon for, but the information is not valid because we got information from two or three different places, and we have two

or three different values. It is not our hole, and the hole information is not good, so it was left out.

Q Was the same method of core analysis used on that core as was used on all the other cores?

A I can't answer that.

Q Did you inquire into it and try to find out?

A Yes, sir.

Q But you didn't see fit to drill another hole when you saw this was invalid?

A We had our drill spacing, you will notice our drill spacing is the same all over, so we just ignored that hole from the beginning.

Q You didn't ignore it when you asked this area be brought into the potash area, did you?

A I listed the information we had.

Q But you didn't list it today?

A Because it's not valid.

MR. KELLAHIN: That's all I have.

MR. PORTER: Does anyone else have any questions?

MR. TRAYWICK: Yes.

* * * *

CROSS EXAMINATION

BY MR. TRAYWICK:

Q Mr. Childers, I am Carl Traywick from the U.S.G.S. in Roswell. We are somewhat involved here because this

is a Federal lease, and without the benefit of your exhibits, there are things I didn't understand, which may be pretty obvious, but I need to know, because there is a question involved.

You are going to get to Section 13 either by drilling a shaft or by drilling down from your present mine?

A Yes.

Q Do you own all the potash leases between where you are mining now and Section 13?

A Yes.

Q Are there some unleased areas?

A No, they are continuous.

Q So you have the leases which will allow you to get to Section 13?

A Yes.

Q When you are first mining, about what size pillars do you use-- what size pillars do you leave?

A (No response)

Q What I am trying to say is how do your pillars compare in size to the pillar you are going to leave around this well,if there is in fact a well drilled there, and if there is in fact langbeinite there?

A Mr. Traywick, as you know, you have to have a mining plan laid out, and we do not.

Q I am not a mining engineer.

A Yes, you have to have a mining plan made out. What we are saying is that the pillars that we leave would consist of fifty percent of the bed, and what we would mine would be fifty percent of the bed.

There are any number of configurations that you could have for your pillars. The dimension of the pillars depend on many things, but it would be fifty percent of the area.

Q Now, you computed this $9,000,000 loss, and I don't know where the economic limit is. May I ask,in your present mining operation, if your economic limit agrees pretty well with the U.S.G.S. limit of four feet at four percent langbeinite or four feet at eight percent sylvite?

A Could you ask the question again?

Q I will rephrase it, if it will be clearer.

A Okay, would you please?

Q In your mining operations, do you conduct first mining to a cut-off point, a point where economics versus recovery,preclude you from going into any leaner ore, and then do you retreat back? Do you conduct second mining on a retreat method?

A We have. We are not at this present time,in any of our panels,working on the retreat method, but we have

in the past.

Q Second mining then does not have to be retreating back from the economic limits?

A No, you could mine to the lease line.

Q This $9,000,000 worth of ore is based on the 1,400 foot radius figure, and the second mining pillar radius of 150 feet. I don't know where your economic limits are shown on your exhibits, but they obviously occur to the south of the proposed Phillips location, is that right?

A Yes.

Q And obviously, it's not far enough south that that circle would be appropriate. Wouldn't it be more like a half-circle or three-quarters of a circle? You are not going past the economic limits or the ore cut-off, are you?

A You are assuming that the line does not go south of the 1,400 foot circle?

Q Yes.

A I can only answer you by saying that if you are right, and it didn't, then we wouldn't mine it.

Q I just wondered, not having the benefit of the exhibits, if it's appropriate to use a full circle.

A I think I can answer your question in the polygon method. Part of that circle was given the influence

of a hole that had very little in it, and no value was given for that part of the polygon.

Q One more quick question. If the well is there when you conduct first mining, and it was a producing gas well, but it's properly plugged and abandoned before you are in this area second mining, will your loss be decreased from the $9,000,000?

A I would have to say no, right now. As long as there is the danger of our getting gas into the mine by rupturing that casing, it would be the same.

Q What you are saying is that whether it's a high pressure producing well, or whether it is a properly plugged dryhole, you are not going to approach any closer on second mining than 1,400 feet?

A I don't feel right now that I am in a position to speak for my company on that.

MR. TRAYWICK: That's all I have.

MR. PORTER: Mr. Childers, I have a question that you might give me your opinion on. Do you think you could ever safely drill a gas well to an area that had been mined out?

THE WITNESS: I feel that my opinion would not be very valid because I don't really know. I think there are people here that can answer that question for you.

MR. PORTER: All right, another question. Could

you give me the extent of your mining operations in the last five years?

THE WITNESS: Do you mean right now, or could I prepare the information for you?

MR. PORTER: Well, does anyone here feel they are able to answer that question as to how much you have mined out in the last five years?

THE WITNESS: I can give it to you in tonnage roughly. Roughly, twenty million tons. We don't keep our records that way, sir, and I can only compute it from information I have in the office.

* * * *

CROSS EXAMINATION

BY MR. NUTTER:

Q You have revised your open mining operations on plats submitted to the Commission each year to show your open mining at the end of each year, is that correct?

A Yes.

Q So a comparison of the map five years ago with the map recently submitted would show where you have mined in the last five years?

A Yes.

MR. PORTER: Does anyone else have any questions of this witness?

(No response)

MR. PORTER: I believe you haven't offered your exhibits.

MR. MATKINS: No, sir. I would like to offer Exhibits Three through Twelve.

MR. PORTER: There was some question as to one of them.

MR. KELLAHIN: If the Commission please, in connection with Exhibit Three, which shows the potash company's leases and the Phillips Petroleum Company leases, there have been several areas omitted that should be on there.

MR. PORTER: Is this the exhibit you are talking about (indicating)?

MR. KELLAHIN: Yes. In addition to those shown, Phillips holds all of Section 24, all of Section 25, all of Section 19, except for the north half of the northeast.

MR. PORTER: All of Sections 24 and 25?

MR. KELLAHIN: Yes, sir. All except for the north half of the northeast of Section 19, which Phillips holds jointly with El Paso Natural Gas. All of Section 30, which is also jointly owned with El Paso. The West half of Section 29 is jointly owned with El Paso, and all of Section 31.

MR. PORTER: The Commission will accept Exhibits Three through Twelve with the corrections noted by Mr.

Kellahin.

MR. KELLAHIN: If the Commission please, I do think the witness did not answer a question posed by Mr. Traywick. Mr. Traywick asked if he used the same cut-off as the U.S.G.S., 4.4 percent langbeinite, and I don't believe I heard an answer.

THE WITNESS: Do we use the same cut-off as they do?

MR. KELLAHIN: Yes, sir.

THE WITNESS: What do you mean by cut-off?

MR. KELLAHIN: I mean just what Mr. Traywick meant, what is commercial ore and what is not. Do you use the same figure as the U.S.G.S.?

THE WITNESS: Yes, sir.

MR. KELLAHIN: Thank you.

MR. PORTER: If there are no further questions, the witness may be excused.

(Witness excused.)

(Whereupon I.M.C. Exhibits Three through Twelve were admitted into evidence.)

JOHN BOYD,

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

DIRECT EXAMINATION

BY MR. MATKINS:

Q Mr. Boyd, please state your full name and where you reside.
A John T. Boyd, Pittsburgh, Pennsylvania.
Q What is your occupation?
A I am a Consulting Mining Engineer.
Q Do you have your own consulting company, of which you are President?
A Yes.
Q That is John T. Boyd Company in Pittsburgh?
A Yes, sir.
Q Have you appeared before this Commission previously?
A No, sir.
Q Would you please then give your background as a mining engineer and your experience over the years as a mining engineer?
A Yes, sir. In 1935, I graduated with a B.S. degree in mining from Ohio State University. I then spent nine months in Canada in gold mining in Southwestern Quebec. From there, I went to Pittsburgh, and went to work with the Pittsburgh Coal Company for three years. I then moved on to Ohio and worked for Anaco Company of Ohio for three years.

In 1943, I joined the firm of J. W. Womer and Associates, and from 1943 to 1964, I worked as Senior Associate. At that time, I took over the company and

it became John T. Boyd and Associates. In 1967, Mr. Womer retired, and in 1968, I made it John T. Boyd Company.

Today I have twelve engineers and five draftsmen, a group of about twenty-five people altogether working for me.

Q What types of ore bodies, and what parts of the world do you have experience in mining, Mr. Boyd?

A Well, I worked in most all of the states of the United States; I worked in Australia in coal; Canada and Chile in coal and iron ore and limestone; France in iron ore; Greece in iron; Israel in copper; Mexico in coal and iron ore; the Philippines in coal; and the United Kingdom in coal; and Ethiopia in potash.

Q Now, you have had experience with potash, I believe you mentioned Ethiopia?

A Right. I have also had experience in potash here in the Carlsbad area of New Mexico. I have worked with Southwest potash operations since the beginning. I have worked for Freeport Sulphur Reserves in both Eddy and Lea Counties.

Q Do you also have experience in Canada in potash?

A Yes, in Canada in potash work there. I worked feasibility studies for Continental Minerals, evaluations for I.M.C. reserves, and the Consolidated Mining

Company of Canada. I made feasibility studies for them, as well as for Canberry Reserves of Saskatchewan.

Q In these feasibility studies, would they include such activities as defining ore bodies and determining the proper mining processes to be employed?

A Underground mining methods, yes, sir.

Q Mr. Boyd, are the polygon and contour methods two accepted methods of defining ore bodies in the mining industry?

A Yes, sir.

Q Specifically, when was your experience with Southwest potash in Eddy County, New Mexico? What years were you there?

A Well, I have been in and out of the operations since they started with core drilling and the work with the mining plans, shaft locations, all the way through, and we still work on an assignment basis for them.

Q Were you called in early in the development of that particular ore body to assist in developing a pillar mining plan?

A Yes, sir, and I was project engineer on developing the pillar mining method in conjunction with W. R. Herbert of their engineering department. I did much research before the project was really started, because when you go into pillar mining, you have to take two things

into consideration.

You have to know the strength of your ore, and how much you can mine on your first mining, because if you are going to pull pillars, you have got to keep your mine stability before you start retreating with your pillar work.

The second thing is in pulling pillars in the Carlsbad area, there has to be four to five hundred feet of salt let down subsequently so it would bend and flow and eventually hit the floor. By doing that, the size of the pillars had to be determined.

The experimental work started way back in 1936 or 1937 when the Bureau of Mines worked with United States Potash in Carlsbad, and they did a lot in compressive strength, both of potash and also the roof salt, roof material, which sort of gave the guidelines of just how to go about it, because in your first mining, if you take too much ore, too high a percentage of ore, and load your pillars too high, they will compress, and before you get back out, chances are your equipment will be too high for your mining operation.

So the main thing we did was to more or less determine about fifty-eight percent on first mining. The rule of thumb is for every foot of overburn, you

have a pound of PSI pressure. The overburn lies anywhere between 144 and 150 pounds per cubic foot.

In this case, you have 1,400 feet of overburn, or 2,800 PSI on your pillars. Then your salt roof will run roughly 4,000 PSI, and if you have K2O, it's down around 28, but most of your ore is a combination of your salt plus your mineral, and 34 or 35 hundred PSI is a good operating range for the ore.

Then another thing that works with you in your first mining is, say, you leave a fifty by fifty pillar, I'm talking about feet, and say, you're mining a ten-foot ore body, the Bureau of Mines found that in their work, they used L over D, that's the shortest length of any pillar divided by the height of the ore vein, and it would give you a ratio to work with instead.

Say, like, you have fifty feet divided by ten, which will give you five. Then if you take the square root of five, which would be two-plus, your twenty-eight would go up to as much as 6,000 pounds that your pillar would hold without any subsidence.

Q Are these some of the factors that you take into consideration in your developing a pillar mining plan?

A That's right.

Q And did you, subsequently throughout the following years, periodically return to observe the result of

your mining plan?

A Yes, sir.

Q And to observe the results of the pillar pulling and the subsidence that thereby occurred?

A Yes, sir.

Q And were you there in the mines of the Southwest and on the surface in 1957, in the spring of 1957?

A Yes. I can't give you the specific date, but I was in and out during that period.

Q And you observed both underground and surface subsidence?

A Right.

Q I hand you what has been marked as Exhibit Thirteen, and ask you if that is a typical portrayal of the type of surface cracking that occurred at Southwest during 1957.

A Yes, that's very typical. Not only that, but potash mining results in the pulling apart of water pipe lines and the subsidence of roads, good subsidence, which is the result of good cover mining.

MR. MATKINS: I might point out that the numbers appearing on the front of the two previous exhibits are not to be used. It should be the numbers on the back.

THE WITNESS: I would like to stipulate that I did not take these pictures.

MR. MATKINS: I understand that, but you noted

the date thereon and you did observe those types of conditions in 1957?

THE WITNESS: Right.

Q (By Mr. Matkins) Would you, in the course of your inspection of the mine, return to the same spot in the mine from time to time to observe the amount of subsidence and the rate of subsidence that was occurring? Perhaps I should say convergence?

A Yes. In pillar mining, you also develop up to the edge of your ore zone, or to a stipulated line, and start retreating, and from time to time as you retreat, you don't get back in to see the pillars that have been brought down to a stipulated size because it's a little bit too dangerous.

Q I am going to show you some other pictures made in 1957,which reflect subsidence, and ask you if you did not observe this subsidence taking place at this rate and in this manner in 1957 at Southwest's mine. The first picture being Exhibit Fourteen.

MR. KELLAHIN: If the Commission please, the question states "at this rate", and I haven't heard any testimony as to any rate. I would like to have identified what rates we are talking about.

MR. MATKINS: Well, the exhibits are identified by pictures.

MR. KELLAHIN: As compared to what?

MR. MATKINS: To subsequent pictures that have been taken.

Q (By Mr. Matkins) Will you note the date on that picture?

A February 21st, 1957.

Q And I will hand you Exhibit Fifteen-- first of all, in Exhibit Fourteen, does there appear to have been any subsidence that had taken place?

A I would say no. There shows some flaking of the ribs, but I would say the convergence would be minimal.

Q Now, Exhibit Fifteen, which is dated February 28th, 1957, and I believe indicates a 5.2 foot height, can you observe signs of subsidence in that picture?

A Yes, sir.

Q You will note there is a marking on that pillar (indicating).

A Right.

Q And there is a number appearing there, is there not?

A Yes, 558 is still visible.

Q Now, I hand you Exhibit Sixteen, dated March 7th, 1957, which shows a height of 4.4 feet.

A Yes.

Q Can you see additional signs of cracking and convergence in that picture?

A Yes, sir. In this picture, the 558 number has gone

from the pillar, however it's marked on the bottom of the exhibit, and there is some spalling of the ribs, and some flaking of the roof.

Q Now, as to Exhibit Seventeen, the date thereon appears to be March 14th, 1957, and that shows a height of 3.2 feet, and it also has a box with a number on it. I believe the number is on the left-hand corner.

A Right.

Q Can you see additional signs of convergence in that picture?

A Right.

Q Do these pictures typically represent the type of subsidence that you observed within the Southwest mine?

A Yes.

Q Did the subsidence, or convergence, often appear in the rapid period of time indicated by the dates appearing on the pictures?

A Yes, I would say that this is more or less the normal sequence of subsidence.

Q Now, I would like to refer you to what was previously introduced as Exhibit Six, which is a diagramatic drawing prepared by Mr. Childers. I believe you have a copy there?

A Yes, sir.

Q You heard his testimony, of course, that this is not

to scale?

A Right.

Q But do you agree that it fairly depicts the methods in which the subsidence occurs as you withdraw your pillars insofar as there is a forty-five degree angle running out from your pillar-pulling activities?

A Right, this is just a picture drawing, it's not drawn to scale, and it shows the salt zone and also the shales and limestone and the dolomite that are above the salt zone, and it shows that the dolomite and limestones shear and break up as subsidence occurs, whereas in your salt, you get a bending action.

Q Again, will you clarify where the salt section is?

A Right next to the ore zone, and it extends approximately-- this picture is not to scale, but it is my understanding that the salt zone is about 450 feet thick.

Q Were you present during all of the testimony at this hearing?

A Yes, sir.

Q And you heard the testimony relative to the casing to be employed by Phillips in the event they are granted permission to drill?

A Yes, sir.

Q Can you take into account those details and indicate your opinion and why you reached that opinion as to

the effect, particularly of the shifting salt, upon such casing, should an oil well be in existence, or a gas well be in existence on the left-hand side of this diagram. I think first you should tell us what might happen if it is a producing well, and what you believe might occur to a plugged well.

A If you had an oil or gas well on the extreme left-hand side of the diagram, and you quit mining at this particular spot (indicating), your oil and gas well should be stable,because the forces lie anywhere between forty-five and forty-eight degrees, depending on the area.

That is what Mr. Childers referred to that required a 1,400 foot radius to create that condition. However, if you said, "Well, we're going to mine nearer to the oil or gas well", this zone here moves toward your oil and gas well, and especially, if you say maybe a 700 foot radius, you would be in a position where your casing would be indisturbable, and if you went nearer than a 700 foot radius, you would have your casing down into the salt material that would be flowing, and this salt, say, if you're mining a ten-foot section, is sort of homogeneous material, where it doesn't break, but it will flow, and it will elongate or move for as much as four or five feet, and if you have a

casing in that zone, it will take-- well, something has to give, and it will take the casing with it.

Q Have you seen, in your experience, examples of subsidence and horizontal shifting, shearing off material placed in the earth by man?

A No, sir.

Q You haven't observed that personally?

A The only places I have observed casings sheared was around strip coal mining, where the whole hillside is blue, and the casing and gas well is taken right with it.

Q But it is your opinion that the force of the salt with lateral movement would take the casing right out?

A Yes, sir. You could depict it as more or less a slide, which is just going to move, and if you have some hard material-- well, the forces are just tremendous.

Q I would like to ask you whether your answer to that question is taking into consideration the type of casing and cementing described this morning.

A Yes. I am no expert on the strength of steel and concrete that goes in, but I know that, for example, that underground, you have places where the salt is twenty-eight feet wide, and they act as beams, and if you have salt flowing against a fixed object, you could have a lateral beam as much as twenty-eight foot wide, and you could have forces building up on the casing

that would go anywhere from six to nine hundred tons.

Q Based upon the testimony you have heard, and upon your experience, and you have worked coal mines and other mines which contain gas, can you conceive of problems caused by subsidence which might allow gas into the potash mine?

A Yes. Even if the well was plugged, you could shear the well, and then you would have to depend on how good the well was plugged. Or if you sheared an active well, you could get migrating gas. Just this past year, the United States Bureau of Mines put out regulations for non-metallic mines, and they stipulate in this that underground mines are comprised of metallic and non-metallic mines, and they stipulate under Section 57-21, gaseous mines are classified as containing two percent methane with a safety lamp, or if they find .5 percent in any return airway, the mine is considered gaseous.

The Health and Safety Act of 1969, which went into effect March 30th, 1970, classified all non-gaseous coal mines as gaseous, and the net result has been that the provisions specified the equipment to be used, and this has cut their production anywhere from twenty to thirty percent,and their overall mining costs have gone up anywhere from one dollar to two dollars and a

half a ton.

Q Mr. Boyd, based on your experience in the Carlsbad potash basin, can you briefly tell us what precautions and what additional things would be required in order to continue mining in these mines, should methane appear?

A Well, this is quite lengthy.

Q I think that you could perhaps just go over the major requirements.

A There are about fifty-eight different items. Number one, they cut out smoking by the men in the mine.

Two, there would be no cutting with open torches unless it is in a fresh air current, and there is no evidence of methane. The mine intake and return would have to be located in a separate shaft.

Booster fans would operate with permissible molders, and not be anymore than one percent of methane. They would put on so-called fire bosses to examine the mines three hours prior to the men going to work.

Their cross-cuts would have to be made every one hundred feet. And the big thing that would really hamper production would be, taking the last open cross-cut where you have six thousand feet of air going through, you would have to hang curtains along one rib and take your air tool within thirty feet of

the face, and that means that your shuttle cars have to travel through these canvas curtains, and it would really hamper production.

Then it goes on to say that any piece of equipment that you work beyond the last open cross-cut has to be permissible and maintained permissible, which adds to your maintenance and operating cost.

Q Mr. Boyd, based upon your experience in subsidence and convergence, can you tell us approximately how long it would be before a gas well could be drilled through a worked-out mine area?

A In my opinion, I would say that eighty-five percent of your subsidence takes place within a year and a half, two year period, and you have got to say that ninety-six, ninety-eight percent, is done within five years.

If you were drilling a well in an area that was completely pillared, the settlement should be such that you shouldn't have any trouble in five years.

Q In five years?

A Yes. I would have to stipulate that that would be in an area that was completely pillared.

MR. MATKINS: I believe that's all I have now, Mr. Porter.

I would like to offer these exhibits.

MR. KELLAHIN: No objection.

MR. PORTER: Exhibits Thirteen through Seventeen will be placed in the record.

(Whereupon I.M.C. Exhibits Thirteen through Seventeen, respectively, were entered in evidence.)

* * * *

CROSS EXAMINATION

BY MR. KELLAHIN:

Q Your last question and answer was based on the assumption that the mine had been completely pillared. Do you mean by that the type of pillarage that is common practice in the Carlsbad area?

A Yes, sir.

Q Do you mean also that the pillars are then removed on second mining?

A Yes.

Q No pillars are left?

A No. My stipulation there is that say they had a set of mine entries that they did not pillar. Well, I would advise not to put a well down through those entries because they would probably still be subsiding or compressing.

Q What size openings would those be?

A Well, I would say they would be twenty-eight to thirty feet wide, and they would be cross-cut on eighty-foot centers, which would be twenty-eight foot wide.

Q About how high?
A Well, as high as the ore body, anywhere from eight to ten or eleven feet.
Q Are the mine openings in the area generally the same size as the ore bodies?
A Yes, except if it's not practical.
Q It might not be practical to mine just four feet, in other words?
A Oh, yes, they have equipment that will work with four feet, but if they are using mining cars, they might want additional height which would permit them to use higher mine cars.
Q Are any of the potash mines in Southeastern New Mexico classified as gaseous?
A No, sir.
Q Do you know of any oil or gas wells that have been drilled close to potash mines?
A Not to my knowledge, no.
Q You don't know of any?
A No, sir.
Q Now, at the outset of your testimony, you testified that the polygon and contour methods were accepted methods for determining reserves?
A Right.
Q How much information is required to come up with

an actual determination of reserves?
A Well, number one, you drill what we call a primary grade, and you evaluate what you have there, and then you go to your second grade, where you put holes in between with 2,000 to 2,500 foot centers.
Q That would give you enough information to evaluate your reserves?
A Either that or the polygon method would tell you.
Q But could you make an accurate determination on one core hole?
A That's more or less your primary grade, and if you had your holes drilled, I would call your reserve calculation partially proven.
Q But it wouldn't be a complete determination?
A No.
Q In your opinion?
A No.
Q Now, you also mentioned in connection with the contour method that you used a foot percentage cut-off. What percentage cut-off are you talking about?
A The rules say you establish either a four-foot cut-off or a five-foot cut-off, depending on the overall nature of your ore body and what equipment you want to use. Say your interval between your four and five foot cut-off line would be maybe three or four percent of

the total reserve. You would evaluate whether or not to cut off at five feet where you could use larger equipment, and consequently have larger tonnage.

Q With a smaller percentage overall?

A Yes.

Q What percentage would normally be used in a situation like that?

A Well, I would say it would have to be under five percent.

Q In other words, you would have over five percent before you mine it?

A What I mean is the difference between the four-foot cut-off and your total reserves.

Q You may go down to four feet, and then you may mine a little bit more?

A Right.

Q So your settling or convergence is at about five feet?

A Well, just to correct you, in the Carlsbad area, the method is they may have four feet, but to make sure they get the ore bed, they always send up overbreak that will go anywhere from three to six inches.

Q So they would be mining five feet or six feet?

A Yes.

Q And this is the subsidence that would occur, five or six feet?

A Yes, that's the area that would converge where the salt

top would hit the salt floor.

Q I believe you testified that subsidence would be completed, would be ninety-seven percent complete, in five years.

A Right.

Q In your opinion, would it be safe to drill within five years, assuming you stay away from the open mine?

A Yes, sir.

Q Just as an example, Mr. Boyd, assume that Phillips Petroleum Company drilled their well in the south part of Section 13, and the potash company had completed their mining in the south part of the section, but they were still mining up in the north part. Would that pose any problems?

A It would depend on the pillaring.

Q Let's assume they were done pillaring within the whole area.

A I see no problem.

Q How far away would the pillars have to be pulled before it would be safe to drill a well in there?

A Well, I think the five-year lapse in time would more or less take care of that.

Q Well, that would also assume that the pillars had been pulled for a distance back to the well site.

A Right.

Q What distance?
A Well, I would say, just offhand, fifteen hundred or two thousand feet.
Q You were talking about the danger of gas in the mine. Actually, do you agree with Mr. Childers that they could leave the normal pillars in, taking fifty percent of the ore in a 1,400 foot radius?
A Yes, if the fifty percent mining is done on an orderly basis, you would have stability.

MR. KELLAHIN: That's all I have.

MR. PORTER: Are there any further questions?

MR. TRAYWICK: Yes.

* * * *

CROSS EXAMINATION

BY MR. TRAYWICK:

Q Mr. Boyd, in your opinion, subsidence is virtually complete in five years, based on leaving ten percent of the ore in place?
A That's based on ten percent left in and crushed down from your top.
Q If you were mining at two different levels underneath or within 1,400 feet of the well location, would that affect your opinion as to that time period?
A Well, you would have to scrutinize both levels, and both levels would have to be completely mined out.

Q But it wouldn't compound it any if it were simultaneously done?

A No.

MR. TRAYWICK: That's all I have.

MR. PORTER: Are there any further questions?

(No response)

MR. PORTER: The witness may be excused.

MR. MATKINS: At this time, I will defer to my more learned associate, Mr. Morris, for the rest of our evidence.

MR. MORRIS: I will call Mr. Hickman.

* * * *

TROY SCOTT HICKMAN,

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

DIRECT EXAMINATION

BY MR. MORRIS:

Q Mr. Hickman, will you please state your name and where you reside?

A Troy Scott Hickman, I live in Midland, Texas.

Q How are you employed, Mr. Hickman?

A I am an engineer for the consulting firm of Sipes, Williamson, Runyan, and Aycock.

Q What position do you hold in that firm?

A Senior Evaluation Engineer.

Q Would you briefly state your education and experience in the petroleum industry?

A I received a B.S. degree from Texas Tech in petroleum engineering in 1957. I received an M.S. degree in petroleum engineering from Louisiana Tech in 1968.

Upon graduation in 1957, I was employed as an engineer by Texaco. I worked approximately four years as a field engineer, and seven and a half years as a reservoir engineer for Texaco.

In December, 1968, I resigned my position with Texaco and moved to Midland with my present firm.

Q What have been your duties with your present firm since that time?

A Principally, the evaluation of oil and gas reserves, and the determination of fair market values, and the evaluation of development programs.

Q As part of your duties, do you advise clients as to whether to drill or not to drill particular locations?

A Yes, I do.

Q Have you been retained by I.M.C. to make a study in connection with the present application before the Commission?

A Yes, I have.

Q Specifically what have you been asked to study?

A To study the occurrence of hydrocarbons in the vicinity

of the subject acreage as related to the Pennsylvanian Age rock, particularly the Atoca and Morrow as they are commonly called.

Q Have you been asked to determine the magnitude of reserves and the life of reserves that might be expected in the vicinity of the proposed location?

A Yes, I have evaluated all the existing wells in this area for that purpose.

Q Generally, what source material have you used in making this study?

A I have used material taken from the Commission files in the District Office and the Santa Fe Office. I have used data that we have in our own files in Midland, which is fairly extensive. I have utilized information from commercial data services. These are primarily our sources.

Q I will refer you first to Exhibit Number Eighteen, will you discuss the information shown on that exhibit?

A This shows a generalized geological section of the Delaware Basin area in the vicinity of the proposed location, and parallel to that section is an acoustic log taken from the El Paso Number 1 Arco State, a well which is nearby this proposed location. Marked on there are the picks that I make for the Pennsylvanian Age rock, the top of the Strawn, which is carbonate

in this area, and the top of the Atoca, which is pillar.

A witness discussed this as being a carbonate bank. I went down and chose the pick where I feel like the Morrow sand begins, and the actual interval between the Atoca and the Morrow includes what would be considered by most people as Upper Morrow, which is usually a carbonate, but it is sometimes difficult to pick, and I saw no reason to spend more time doing it.

Q Please refer to the next exhibit, Exhibit Nineteen, which is identified as a structure map on the top of the Strawn line.

A This is a large scale copy of what was furnished to the Commissioners. Some of this data is a little hard to see.

Q Go ahead, Mr. Hickman, if you will, with your description of the information shown on this exhibit. What exhibit is it, and what does it show?

A This exhibit covers an area of Southeast Eddy County and Southwest Lea County, with the acreage in question about centered in the middle of this map. There are imposed on this map contour lines which are contoured to the top of the Strawn line.

There is also my method of a coding system and a legend is included on the map showing the Atoca and

Morrow compresses, or attempted compresses, within this area.

Q And you have Section 13 and the proposed location colored in yellow with a green dot, respectively, is that right?

A Yes, sir. It's not on mine, but I hope it's on everybody else's. Imposed on this also are two cross sections with lines labeled A to A Prime and B to B Prime.

Q Now, does this exhibit show all of the wells completed in the Pennsylvanian formation, the Pennsylvanian section?

A No, in this regard, that the Strawn is also a Pennsylvanian Age, and there are some Strawn completions particularly in the South Carlsbad area, which are not shown on this. Mainly because I did not judge it to be germane to the problem at hand.

Q Just for identification, where is your South Carlsbad area on the map?

A On the extreme left-hand side of the map, a little above the center of the map.

Q And while we are talking about it, how does it relate geologically to the area under consideration?

A It has, as you can see, a considerably higher structural position. Actually, at this point, I would say you are going up on your northwest shelf out of the

Delaware Basin area.

Q You have some lines shown on this exhibit connecting wells, the lines being marked as A A Prime and B B Prime. What does that signify?

A Those are the structural cross sections which I have prepared, and which will be subsequent exhibits.

Q While we are talking about this exhibit, I note that the Belco in Section 1 of the township under consideration has been marked M.S. What does that signify?

A That's the index code for a Morrow sand completion. However, it was brought out in Mr. Gorence's testimony this morning, and in your cross examination of him, that subsequent to the knowledge that we had, and we tried to acquire the latest data available, but Belco is making application for a dual completion, and apparently have perforated up in the Strawn and up in the Atoca in addition to the Morrow sand completion.

Q So that designation should be changed accordingly, if that information is correct?

A Yes, it should be.

Q Would you move on now to your next exhibit, Exhibit Twenty, being the cross section A A Prime. Mr. Hickman, I would like for you to explain the exhibit, first, generally what it shows, and then, if you would please point out the pertinent information with respect to

each well on this exhibit insofar as it is pertinent to show the nature of the various reservoirs that these wells seem to be completed in.

A We'll start-- first, let me say these are log sections, either gamma ray acoustic logs or gamma ray neutron logs. Throughout the Pennsylvanian Age rock, they are long structurally on a 10,000 foot reference line which appears a little bit above the middle of the cross section, and we have tied in with the correlation lines for the positions of the Strawn, the Atoca, and the Morrow sands, and the top of the Barnett shelf, which marks the beginning of the Mississippian Age rock.

On the left-hand side of the cross section is the Shell James Ranch United Number 1, and we have imposed on these log cross sections information concerning drill stem tests which were taken during the course of drilling and completion of the wells.

We have shown intervals which were perforated and either completions or attempted completions with the resulting test results.

Where we have the data available, we have imposed the mud weight used in the well at that particular depth.

Starting with the Shell James Ranch United Number 1,

starting at the bottom on this one, if you will look down almost above your Barnett shelf, there are a series of perforations indicated in the margin in the center of the log, and these are marked out, and this indicates that these perforations are no longer open.

On the very bottom set of perforations, we have used brackets to try and enclose the various perforations, and we have attempted to delineate from the use of the brackets the procedure followed in this case.

The only interval at the bottom of the Morrow tested at a non-commercial gas rate of 100 MCF per day. They then opened three additional zones and got a total test rate of 175 MCF per day.

They have moved up their hole and opened up quite a large interval in the Morrow sand up through the Atoca-Morrow section. Here, they got a very low fluid recovery with no gas show.

They then moved up above the top of the Atoca carbonate bank, and completed a little stringer around 12,920 feet.

For those of you who have real good eyes, you can perhaps make out that depth. They tested this zone on a four point test and got a calculated openflow of 9,000,000, with an actual test rate of 7.4 million.

The well currently is producing at around 4.6

million average per day.

It went on production in February, 1958, and accumulated almost twelve billion cubic feet of gas through November, 1972. In 1972, however, the bottom hole shut in pressure at the time the well was tested on the four point test was 8,230 pounds, this being abnormal pressure.

This is a grading of .64 per foot, and in oil field terminology, your normal grading is considered to be .46 PSI per foot.

Q What does the abnormal pressure indicate?

A Of course, you can get real technical here about deposition, but to a reservoir engineer, this quite often indicates a closed type of reservoir, one in which you would not expect to have water drive,or support, or drive mechanism, other than solution gas.

It is also usually the type of reservoir that is fairly limited.

Moving on to the recently drilled Belco Number 3 Well, here is a situation where I do not have the latest perforations, and it is my understanding that the well is perforated both in the Strawn, I would assume in and around the interval of the drill stem test, which is 4.4 million feet per day, and then in the top of the Atoca. I do not know if the stringer

which is productive in the Shell James Ranch Number 1, and which does not appear to be anywhere near as deep in this well, is the stringer which has been perforated or not.

The only drill stem test was the one up in the Strawn in the Pennsylvanian Age. They moved down for the completion test, moved down into the Morrow sand, and first opened a little stringer about in the middle of the interval, and got a fairly low gas rate, and then they opened up an additional interval and had a calculated openflow of 6.5 million and an actual test rate of 5.7 million.

The reported shut in bottom hole pressure there on seventy-two hours appears to be a little bit sub-normal, a little bit low. This could be an incomplete build-up or something of that nature, and I don't know how significant that is.

This well is still making application for completion, and it is not connected to the market, and there is no way to know, although they have apparently gotten some good initial rates on testing there.

There is no way of knowing the actual quality of this well in terms of reserves.

Moving on to the El Paso Number 1 Arco State 16, there were three drill stem tests conducted on this

well. Starting with the top one, there was a gas flow of 6.4 million per day with an abnormally high shut in pressure given at 66 PSI per foot. This abnormal pressure, you will find, is common throughout the Strawn and Atoca and on to the Upper Morrow.

The actual Morrow sands themselves seem to be normally pressured with one or two exceptions.

The second drill stem test was expanded to the Upper Morrow and the Morrow sand, and they got a non-commercial gas flow rate. They then tested the bottom of the Morrow and got about 4,000 feet of gas cut drilling mud and 540 feet of salt water, and got a normal pressure grading on their bottom hole pressure.

They then came up to around 14,100 feet and perforated and ran a drill stem test in that little interval, and that shows .21 MCF per day-- that should be 21 MCF per day, and a non-commercial gas flow rate.

They then opened up an additional interval around 14,000 feet-- well, around 13,900 feet, and made a completion at this point, with a calculated openflow of 3.8 million and an actual testing rate of 2.2 million. The bottom hole pressure gives a grading of .64, which we see quite often in these abnormally pressured zones.

This well went on production in December, 1971, and through November, 1972, it produced only 183 million

feet of gas. It's current producing rate is 200 MCF per day.

We might note here a trend which you will see throughout this particular area of interest. You get a fairly decent flow in the drill stem test, in this case, they got 6.4 million feet per day indicated flow, and they came back on the subsequent completion, and they got an actual test rate of 2.2 million per day. Then when they actually put the well on the delivery line, the well was down and averaging around 200 MCF per day in less than a year's time.

This occurred in several other instances in this area.

The next well is the El Paso Mobil Federal Number 1, and this is a recently drilled well which officially has not been completed. There were four drill stem tests conducted throughout the Pennsylvanian,as shown on the right-hand margin.

The upper test was through the Atoca carbonate bank, and this was a dry test. They just got their water blanket back with a slight gas cut to it.

This well, I think, is somewhat significant in that it lies between the Texas American Todd Federal 26, which is a good producer in the Atoca, and has a good Atoca section in it, I think the Phillips

geologist testified as to some 85 feet of net pay, and the proposed Phillips location. This well is situated about half-way in between there, and it was dry on the drill stem test.

They got down lower in the Atoca and ran a couple of more drill stem tests, and one of them had 4.5 million per day indicated flow with the same abnormal pressure.

The last drill stem test was down in the Morrow sand, and they recovered 9,000 feet of gas and some gas cut water blanket with abnormally indicated pressure which is a little unusual normally in the Morrow. I think this points out the very limited extent of any reservoir in the Morrow. They come and go and are quite erratic, and the completion of this well was down in the Morrow sand, and at the time I prepared this data, the four point openflow test had not yet been filed, but there was a reported test rate of 1.2 million over a three-hour period.

This well, as I say, at last check was still testing, and had a reported shut in bottom hole pressure of 6,461, which would be normal at this depth.

The last well on the cross section is the El Paso Number 1 Sundance Federal. There were three drill stem tests conducted on this well in the Pennsylvanian

Age rock.

The upper test which straddles the Strawn-Atoca, and which really is a test of the Atoca core, would indicate about 900 MCF per day, once again getting abnormal pressure and giving about a .65 grade.

The second drill stem test was down in the Upper Morrow interval, and recovered 5.5 million per day--or produced at 5.5 million per day with the same abnormal pressure.

They made one other test down in the Morrow sand and it was a dry test,and they got back water bracket and ten feet of mud.

This well is closest to the El Paso Mobil Federal, which was completed in the Morrow sand, or at least, is testing at what appears to be a commercial rate, whereas this well in the Morrow sand had no recovery on the drill stem test.

I think this is common throughout the area, there is little correlation of the actual producing zones.

This well was completed throughout the Atoca and Upper Morrow interval, actually they first perforated a little interval right in the Atoca itself and got a half a million per day test rate. They then dropped down to the lower part of that zone and opened up a larger interval. It's an interesting situation in

this well where the four point pressure test which was filed-- let's back up. These perforations covered two drill stem tests. They took the total flow from the two drill stem tests, which was 6.4 million if you add those two together.

They went in and perforated both intervals and tested, and submitted a four point openflow potential and a calculated openflow of 3.3 million. So the openflow was actually less, about half of what the drill stem test indicated.

Before this well was ever produced into the line, an adjusted openflow was submitted, the calculated openflow was only 449 MCF, down from 3,376 MCF per day.

This well went on production in November of 1972, and in November, 1972, it produced at an average rate of 386 MCF per day, which is quite a low rate for deep wells.

In December of 1972, it produced at an average rate of 174 MCF per day. It looks like we are having instant depletion of this well, and it must have a very limited reservoir.

I believe that covers everything.

Q If you will just go right on into your next cross section, B B Prime.

A These well locations are marked on the map, and we used

the same symbols and what-not.

The first well is the Texas American Todd Federal 14. This well had four drill stem tests, indicated in the Pennsylvanian Age series. The first test was in this Atoca carbonate bank, and this got a little gas to the surface, but it was too small a rate to measure.

They dropped down a little bit lower in the Atoca and they got a 1.2 million per day flow, with the abnormal pressure again.

They dropped down and ran two tests in the Morrow sand. The upper test was about the best drill stem test I have seen out of the Pennsylvanian rock, 14 million per day indicated flow on the drill stem test.

They dropped down a little bit lower and got virtually a dry recovery, just a water blanket and some mud. They naturally came in and tried a completion opposite their best drill stem test, and opened up an interval actually in the Morrow sand and the Atoca and submitted a calculated openflow of 6.7 million, and an actual test rate of 4.3 million.

This well went on production in March, 1971, and as of November, 1972, had accumulated 87 million feet. The well currently will not produce into the gathering line system, so for all practical purposes, the well is depleted after only making 87 million feet, and

having a drill stem test indication of 14 million feet per day.

The center well, the Texas American Todd Federal Number 26, had no drill stem tests run, and Phillips testified it was perforated in the Atoca and they got an openflow of 75 million, with an actual test rate of nearly 11 million.

The well went on production in March, 1970, and is currently averaging better than 5 million feet a day. It had accumulated through November, 1972, almost 9 million feet. This, in comparison to the other completions in the area, shows it is a very good well.

The last well on the cross section, which you will probably be glad to hear, is the Texas American Todd State Number 36-- let me back up to the Todd 26. These wells are located fairly close together, as you can see from your map, and as you can see, I forgot to add on these cross sections a horizontal scale, however, we did place the wells in their relatively proportional distances from each other. So it bears some mentioning.

The Texas American Todd 14 and the Number 26 are located fairly close together. There is just one section between them.

The last well is the Number 36, and they ran four

drill stem tests. All of them were, with the exception of the last one, all of them were either dry or had low gas rates. The last one had an indicated rate of 4 million, with abnormally high pressure down into the Morrow sand, as compared to some areas where the pressure was normal, which indicates the definite lack of communication between these sands. This well had a calculated openflow of 2.5 million, and an actual test rate of 2.1 million.

The well has never been connected with the market, even though this gas was contracted for. However, the original contractor has, I guess the right word is, determined that the well was not commercial enough to warrant a pipe line connection, so the contract was broken.

As I understand it, Texas American is now negotiating for another contract on this well. They had a test rate of 2.1 million per day, and additionally, this well has abnormal pressure, although it's down in the Morrow sand where we usually have normal pressure.

I would tend to agree with the pipe line company, I doubt the commerciability of this well, once it's put in the gathering system.

Q Mr. Hickman, what conclusions can you draw from the information shown on these cross sections and the

completion and testing procedures and production data that you have already referred to.

A I believe the principal conclusion is that I agree with Phillips that their proposed location is a wildcat. We see here an area with problems, problems both as to drilling the well due to the many, many abnormal pressure zones which tend to cut your drilling mud and cause problems, potential blow-outs.

The problem of not having any idea of what you are going to encounter in the way of reserves is more significant to me. There is hardly any correlation between producing intervals, and from a reservoir standpoint, there seems to be no correlation. Even when you make a good drill stem test, it doesn't seem you are going to make-- well, even when you make a completion and a good initial test, it doesn't mean you are going to have something in the area for any period of time. It's a very chancy area, and out of the eight wells in the immediate area which we have covered by cross sections, the Shell Well is a good well. It's producing what I call out of an abnormally developed stringer, and I would hate to bank on finding that again.

I do not agree with the Phillips geologist who indicated in his testimony that this was the Atoca

carbonate bank. I disagree with that.

But regardless of where it is, it is a good well. The Texas American Todd Federal 26 in the Atoca carbonate bank is a good well. The El Paso Sundance Well was depleted before it ever produced in every sense of the word. The Texas American Todd Federal 14 depleted before it did anything. The Texas American Todd 36 is an extremely doubtful well, and the pipe line company felt it was non-commercial.

In my opinion, the well will be non-commercial. The Belco Well, we don't know about yet, but it looks good at this time. We like Belco, and we hope they make a darn good well.

The other well, the El Paso Mobil Federal, is still testing, and we don't know what kind of quality well it is.

So this is a very chancy, risky area, an area of drilling problems and high costs.

Q Mr. Hickman, we have grouped together as Exhibit Twenty-two a series of accumulative plats followed by production history plats with respect to the area wells, and Exhibit Number Twenty-Three is a summary sheet. Would you, in the interest of time, summarize this Exhibit Twenty-Two and point out, if you will, without going through every well, well by well, the type of

information that you have developed in the course of your study of this area?

A This composite exhibit contains three different types of data, one being bottom hole pressure divided by deliverability factors. This is used in a depletion type gas reservoir,as we are dealing with here,to indicate both the original gas that is in communication with the well bore, and also to determine recovery, what part of this gas will be recovered. Marked on each of these particular graphs is the original gas in place, my determination of the original gas in place for the various wells. The pressure points which were used in the determinations are shown on these graphs. The pressure point information comes from the Commission Form C-122, and the other points come from the annual shut in pressure forms, Commission Form C-125.

The second piece of data shown is the production graphs of the gas rate in millions of feet per month versus time as delineated in years and months. We have shown in the early years just the average rate for the years, and then in 1972, and in some cases 1971, we have actually plotted the individual months and imposed them on these graphs. We have also shown a projection line which is our projection of future

performance on these wells.

There is one other piece of data which is present only on one well, the El Paso Arco State Well. We have, in addition to the rate times production graph, platted a rate-accumulative production graph. A rate-accumulative production graph can often be used to project the wells' performance.

Q Have you prepared the information here on all of the wells shown on the cross sections for which data was available?

A Yes, I have.

Q And in addition, have you presented some data on additional wells?

A Yes, I have. In addition, I have moved a little bit to the south of this immediate area in an effort to learn as much about the Atoca and Morrow as we could. We picked up three wells operated by Texaco in the Paduca Field. These three wells are all completed down in what I pick as the Morrow sand interval, and I have also included the producing curves, or producing history curves, on these three wells.

Q Would you go to Exhibit Twenty-Three, it being your summary sheet, and point out the information shown on there?

A We have listed by field, and then by operator, and then

by well, the well which I have included in my study of reserves and future performance.

Next to that, I have the date of initial production, and as you can see, some of these wells are not yet connected.

Then we have accumulated production as of December 1st. Next to that, we have reserves as of December 1st.

Now, these reserves being what, in my professional judgment, remains to be produced by these various wells. The next column is ultimate reserves, or ultimate recovery. This is simply a summation of accumulative production plus reserves to give what in my opinion would be the ultimate recovery of the various wells included in this study.

Then the last column is my calculations of what the total producing life of these various wells will be. This includes their remaining life plus the amount of time they have produced to date.

Q Can you summarize the situation as to what is shown on this exhibit, and how it relates to the proposed Phillips well?

A Yes, sir. I think we would have to do this kind of semi-statistically. On the Belco Well, we do not know the quality of it. It may turn out to be an excellent well. The El Paso Mobil Federal, we do not know the

quality of. So excluding those two wells, we have nine wells, and out of those nine wells, three of them are economic successes, the Shell James Ranch, the Texaco well, and the Todd Federal 26. There is one well which came part-way toward returning the cost money, and that was the Texaco 67 Cotten Draw. You certainly wouldn't drill for this amount of reserves, but at least in comparison to the other wells, it made a few dollars. The rest of the wells were economic busts.

You can see we are producing out of, even in our good wells, a low porosity, fairly tight, either carbonate or sand, and I think, in my capacity of experience, you would expect long life out of these wells, and my subsequent calculations indicate that you will have long producing lives out of some, and the remainder of the wells will have very short lives, on the order of what Phillips testified to.

So in summary, we have a situation here where it is either feast or famine. There are a few good wells that have been made, and which will give a good return on the money, however, these wells do have long producing lives. There are others where you will not make good completions, you will make non-economic wells, and consequently, you won't have long producing

lives, simply because there is nothing there worth producing.

MR. MORRIS: If the Commission please, we offer into evidence at this time I.M.C. Exhibits Eighteen through Twenty-Three.

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

MR. KELLAHIN: No objection.

(Whereupon I.M.C. Exhibits Eighteen through Twenty-three, respectively, were admitted in evidence.)

MR. MORRIS: That's all we have on direct examination.

MR. PORTER: Did you say you had no objection, or no questions?

MR. KELLAHIN: I said that we have no objection, I'm sorry I do have a question or two.

* * * *

CROSS EXAMINATION

BY MR. KELLAHIN:

Q Admittedly, there is not too much information available to determine just what is under Section 13, is there?

A That's right, I agree.

Q The closest well is something over two miles away?

A I believe that's approximately right.

Q And I believe you were making some comparison to the

El Paso Sundance Number 1. That is more than six miles from the proposed Phillips location, is it not?

A Well, it's not quite six miles, but it's in that range.

Q And the El Paso Mobil Number 1 Federal is about four miles from the proposed location?

A Well, it's a little closer than that. I will contest you on that. It's more like two miles, sir, two and a half miles, maybe.

A VOICE: Three miles.

A Okay, I'll go with the compromise figure of three miles, it's getting late.

Q Well, the important thing is there are no wells closer than two miles, is that a correct statement?

A That's a correct statement, yes.

Q So we are comparing the strata underlying Section 13, the South section of 13, to really an unknown factor, are we not?

A I would qualify that if I might, sir?

Q Yes, sir?

A We know it's an extremely rocky area, and we know that sand and carbonate reservoirs come and go, and most of them are very small. This much we know about the area, but I agree with you, specifically, what is under this one section, no.

Q If you will accept the fact that the Belco Well is a

good producer, then two out of the three of the closest wells are good producing wells, are they not?

A I don't follow you on that statement.

Q Two out of the three closest wells are good producers, isn't that correct?

A Well, I couldn't concur on that. The Belco Well, which I hope does make a good well, based on other information, even these extremely good tests are not a guarantee that it will be a commercial success. The Shell Well, which is undoubtedly a commercial success, is out of this one little stringer, and this stringer does not appear to be developed in the Belco Well, and the Belco Well lies directly between the Shell Well and the proposed well.

Q By the same token, the Texas American Todd Federal and the other wells you are comparing are in a different stringer too, are they not, than say the Belco Well?

A No, sir.

Q They are in the same stringer?

A Well, whether the Belco Well is perforated in the Atoca carbonate bank, I could not testify to at this time, and this is the prime target for the Phillips well, and this is the zone that the Todd Federal 26, which Phillips testified to as being a significant well, is in. So the Belco Well would be in that zone, and so

would the Todd Federal 26.

Q But the Todd 14 and the Todd 36 are not in that zone, are they?

A They are in the Atoca Upper Morrow, however, they might be perforated below.

A VOICE: They are.

A Then no, sir.

Q In your Exhibit Number Twenty-two, I only had a rather hazy look at it, but as I understood it, you are projecting a producing life of seventy-two years on the Shell James Ranch Number 1 Well?

A Yes, sir.

Q But your exhibit only shows production from 1966, is that correct?

A The exhibit, plus my other data on the cross section, indicates this well went on production in February, 1958.

Q Are you basing that on total production or are you basing it on the exhibit, this seventy-two year life?

A That's on total production.

Q Over and above the fourteen years it has been on the line?

A Yes, sir.

Q Did you take into consideration the fact that in the past four years that well accumulated 8 billion cubic

feet of gas as compared to 4 billion in the preceding ten years?

A Yes.

Q Did you give any weight to that in projecting this seventy-two year life?

A I believe in the last couple of years-- I agree with the testimony that Phillips put on that in the last couple of years, or the last year and a half or so, that this well has established a capacity decline. We could knock out the first fourteen years of it being under-produced due to proration, and this would knock it down to fifty-eight years.

Q Due to proration or due to pipe line takes?

A Well, pipe line, yes.

Q It isn't even a defined pool, is it?

A It carries a field name. There is information filed which shows when they moved in in 1959, they moved it from an undesignated field to a designated field.

Q But it is not a prorated pool?

A No, it is not.

Q On your reserve calculations, I believe you gave 31 billion cubic feet to that well.

A Somewhere in that neighborhood.

Q My Exhibit Number Twenty-three has come apart, and I don't have that information.

A Yes, that's correct, 31.5 billion.
Q If it produced during the last four years at a rate of 8 billion, that would mean about a fifteen-year lapse, would it not?
A If it held steady. These wells do not hold steady. As Phillips testified to this morning, their pressure depletes, and they drop off in deliverability. If you refer to the production graph there, you can see a decline in the last few years.
Q What reservoir pressure are you using?
A Around 1,000 pounds.
Q What well head pressure are you using?
A Maybe six hundred pounds.
Q Do you know what pipe line is taking that gas?
A I looked that up, and knew it. El Paso Natural Gas pipe line is in there, but I'm not sure whether they are taking it. I just don't recall.
Q Do you know what pressure that pipe line is being operated at?
A We contacted Shell, and they indicated that there was a 1,000 pound gathering pressure.
Q You are familiar with the energy crisis, are you not? You have at least read about it?
A Yes, sir.
Q Would that affect the taking of gas in the State of

New Mexico?

A It has affected the takes in New Mexico.

Q That could account for the production from this well in the past four years, could it not?

A I don't follow your question.

Q Admittedly, the takes were increased from the Shell James Ranch Number 1 in the last four years.

A Yes.

Q Was energy storage a factor in this increase, in your opinion?

A I would say quite probably.

Q Could you not anticipate further demand on a greater scale in the future which would result in lower pipe line pressure?

A Actually, increased demand loads your pipe line and runs your gathering pressure up.

Q They do use compressors in pipe lines, do they not?

A Once a particular well gets down to where they can't produce at a satisfactory rate, they will use compressors.

Q And that could shorten the producing life of this well, could it not?

A It could have some effect on the producing life, but not significant.

MR. KELLAHIN: I have no further questions.

MR. PORTER: Are there any further questions?

(No response)

MR. PORTER: The witness may be excused.

(Witness excused.)

* * * *

ROY C. WILLIAMSON, JR.,

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

DIRECT EXAMINATION

BY MR. MORRIS:

Q Mr. Williamson, will you state your name and where you reside?

A My name is Roy C. Williamson, Jr., and I live in Midland, Texas.

Q How are you employed, Mr. Williamson?

A I am President of the consulting firm of Sipes, Williamson, Runyan and Aycock.

Q Is that the firm that Mr. Hickman is associated with?

A That's correct.

Q Would you briefly outline your education and experience in the petroleum industry?

A I was graduated from the University of Oklahoma in 1956 with a degree in petroleum engineering and geological engineering. I was in the Air Force for a couple of years, and then joined Gulf Oil Corporation in West Texas in 1959. I remained with Gulf for

approximately nine years, at which time I left and joined the predecessor firm to our current firm. Since that time, I have been actively engaged in evaluation work, primarily in the West Texas and New Mexico area.

Q Mr. Williamson, have you made a study concerning the drilling and cementing and other operating problems in connection with the proposed Phillips well?

A Yes, I have.

Q First, concerning the drilling problems in connection with this proposed well, would you outline some of the problems that you have studied and give us the conclusions that you have reached in that connection?

A Yes. I think we have had testimony already presented that we are dealing with some abnormally high pressure zones in the Strawn, Atoca, and Upper Morrow zones.

This fact in itself requires abnormal mud weight to hold these pressures. This problem is further compounded by the fact that Morrow sand is proven to be very susceptible to damage, and it's common practice for operators to try and drill in an underbalanced condition. This underbalanced condition will then allow the formation to flow, and will not allow any filtrate to enter the formation and possibly damage it.

So you can see by drilling on the razor's edge,

so to speak, that it is possible for a potential blow-out to occur, or for the hole to unload, requiring the bringing in of surface equipment. High mud weights could cause loss of circulation problems also.

This is further complicated by the fact if the well does begin to get out of control, and by that, I mean if the pressures encountered in the reservoir begin to unload, the column of mud in the hole would require shutting in at the surface. A high pressure gas bubble at the bottom of the well due to density difficulties could rise through the mud column and indeed impart the high pressure on the surface equipment.

Of course, these can be designed for this, and I am sure all prudent operators would take this into account, but these are problems unique to this area, and they do show the need for special programs to control them.

Q Have there been blow-out problems in the immediate area?

A I would not say that any well has lost control and blown wild to the atmosphere, but I do know several cases where wells had to be shut in to balance this lost circulation.

Q Should a blow-out occur, what could happen-- what does happen in a typical situation that could pose a

continuing hazard to the potash mining operations, should that happen to the Phillips well in this case?

A Well, just for an example, we all know wells do get loose, and they could catch on fire. I realize this is an extreme case, but it could happen. The well could unload the surface equipment that is trying to maintain control of the well, and which could be adequate, or might not be adequate, to maintain this pressure. The well could catch on fire in such a case and damage the hole or the casing in the hole, and it's possible the hole could be lost by that. I mean lost where it could not be properly plugged or controlled for any future pressure leak from the well.

Q Is blow-out danger a significant factor in this immediate area?

A It's more likely to occur in this area than you might have in other areas because of these abnormal pressure zones that you do incur.

Q Were pressure control problems present to some extent in the drilling of the Belco Well immediately north of the proposed location?

A We understand that this was the case.

Q Have you analyzed the casing and cementing and drilling program that has been proposed by Phillips in this area?

A Yes, I have.
Q And were you present here today when the Phillips' witnesses gave their estimates of well costs?
A Yes.
Q Do you have any comment to make concerning that program, or those costs?
A Well, I think that certainly the program as presented, although I have not won out the calculations, is very adequate for the pressures that are anticipated being encountered.

In our experience with well costs, I would expect the well cost presented by Phillips to be somewhat low, and that would indicate no problems would occur and no expensive mud problems would be anticipated, nor would any blow-out problems occur.

I will agree that later operators do have an advantage, and they might be able to control this, but there are some additional hazards because of the pressure zones.

Q Would you comment concerning the problems of adequately cementing the well for drilling and production purposes and also for plugging purposes?
A As Phillips has indicated, because of the depth, you are going to have to stage your cement job. You would not be able to move a complete column of cement from

the deep string to the surface. You would have to have a second stage procedure.

When you do have a deep hole, you have to stage your cementing, and you have a chance for additional problems as to effective cementing jobs. I have an example of this.

In visiting with two companies, Burton and Western, who have been quite active in cementing and treating these wells in this area, one of their main problems has been communication between perforations. They have treated one set of perforations, and they do have adjacent problems to another set. So even in the area of the producing zone, there have been cases where the best cement jobs have not been achieved.

I believe you asked me to discuss the plugging of the well?

Q Yes.

A Of course, plugging could naturally occur when the well is depleted, and plugging could occur if an uneconomical well is obtained. We all know there are recommended techniques and procedures for adequately plugging wells. We know they have been approved by the Commission, and supposedly, this does prevent any escape of hydrocarbon to the surface, but I will say this, that any time a man-made hole is made to some depth,

naturally the chance of communication from some deeper formation to the surface is much greater than if that hole was not there.

So even though we do have accepted risks that we take in petroleum industry, in my opinion, we are dealing with a situation here in this case of a potash mine where we cannot stand any contamination from gas.

We do have the chance for some contamination with a well there than if we didn't have a well there. With a well there, gas could in some manner escape from the lower formation and find its way to the mine.

Q Would you comment concerning the feasibility of drilling at the proposed location at such time as the potash has been mined from the area and subsidence and convergence has ceased?

A In my opinion, after the subsidence has ceased as you have stipulated, the hazard of drilling a well through the zone would not be any greater, and we have seen this overcome by the drilling industry in other areas of the country. Naturally, you would have some void space in the mine, but at the same time, there are many examples of wells that are drilled in caverns, Pecos County being the prime example, and there are methods where this can be controlled, and successful drilling operations can be conducted.

Q Would you please comment on the engineering and cost feasibility of drilling directionally from somewhere in the Northeast quarter of Section 23 into the Southwest quarter of Section 13?

A Of course, I have not made a specific cost study, and as pointed out by one of the Phillips' witnesses, the problems of cost would be rather dependent upon how many times you had to set a whipstock, and how much you did whipstock the hole.

But in my opinion, I would estimate the cost should not be more than fifteen percent over the normal well cost.

As to feasibility, there have been many cases in the industry where the bottom of a hole has been moved much more than we are looking at here. Here, we are looking at a long section where you have fourteen thousand feet in which to connect, and I cannot see where this would be an operational impossibility.

Q Mr. Williamson, one more question. If shearing of the casing or damage to the casing should occur after the well is plugged, would there be any way of re-plugging the well once that had occurred and problems then developed?

A In my opinion, there would not be. This would be a case where you would have a deep plug if you have a

competent casing program to the surface, and if that plug leaked, or if you wanted to enter the well, of course, you could always do that. If you change or shear or move the casing near the top of the hole, of course, you destroy the ability to re-enter the same well bore, and there would be no way to go in and seal off any zone that was found to be leaking.

MR. MORRIS: That's all we have on direct.

MR. PORTER: Are there any questions?

MR. TRAYWICK: Yes.

* * * *

CROSS EXAMINATION

BY MR. TRAYWICK:

Q Mr. Williamson, do you expect pressure above or below the ten thousand foot casing?

A I think normally we expect them below it.

Q I don't know what you mean by abnormal pressure.

A As we talked about a little while ago, we are looking at a normal grade of .42. Here we are looking at .65. Mr. Hickman pointed this out, and he pointed out we have pressures lower in the deep zones, which is not normal.

Q What would it take to control these abnormal pressures?

A I have not made that calculation.

MR. TRAYWICK: That's all.

CROSS EXAMINATION

BY MR. KELLAHIN:

Q Mr. Williamson, you encounter a similar situation in the South Carlsbad pool, do you not?

A Yes.

Q They do have a similar situation?

A Yes.

Q Do you know of any blow-outs that have occurred over there?

A Not to my knowledge.

Q And I understand that you don't know of any blow-outs in this area?

A No, if you define a blow-out as a wild well blowing to the atmosphere without control.

Q You have been talking about blow-outs. The term was your choice, you define it.

A I would say loss of control is where you have shut in surface equipment to maintain control of the well, and if the well vents to the atmosphere uncontrolled, then that is a blow-out.

Q Is that the type of blow-out that you say would cause possible damage to the potash zone?

A Yes.

Q The type you are talking about?

A The one where it is vented to the atmosphere, this

would create hole damage.
Q That's the type of blow-out you were talking about, and you don't know of any here?
A That's right.
Q Now, you said you understand that Belco had some problems. What is your source of information on that?
A We have done consulting work for Belco, and we do have information on their wells from time to time.
Q Did they have a blow-out?
A No.
Q Did they have anything that occurred which would be a potential danger to the potash?
A As the situation occurred, no.
Q Now, you have testified that you could see no reason Phillips couldn't drill after subsidence had occurred.
A That's correct.
Q You are not prepared to say what date that might be, are you?
A No, sir.
Q Have you ever had any experience in drilling over an abandoned potash mine, or any other kind of mine?
A No, sir.
Q So you don't know from your own experience what problems might be encountered?
A No, other than the cavern type of problem you have

here drilling through and embedded formation.
Q That would be the same as a lost circulation zone?
A Yes.
Q You don't think there would be any other problem if overburden has occurred?
A If we make the assumption that subsidence has terminated, no.
Q When would you say subsidence would have terminated?
A I'm not qualified to comment on that. I would have to take the word of the mine expert.
Q You are talking about drilling a well now.
A I didn't say when.
Q You don't know at what stage of subsidence you could drill a well?
A No, sir.
Q You just assume there has been complete subsidence?
A Right.
Q One hundred percent?
A No. If you are talking about ninety-five percent completion of subsidence, and if we can define the motion, whether it's vertical motion or shearing motion, I think that would have to be a factor.
Q So there is more than just the fact of subsidence involved here?
A You have circulation problems and potential subsidence.

Q And also shearing action?
A If there is any remining.
Q So you could have five percent that could cause damage, is that right?
A I don't know.
Q Now, in connection with directional drilling, have you had any experience with that yourself?
A I have not had direct control in setting up a directional drilling program, no.
Q You are a reservoir engineer?
A Yes.
Q You are not a drilling engineer.
A No, sir.
Q Are you at all familiar with directional drilling problems?
A Generally, yes.
Q Do you encounter any damage to the casing when you are directionally drilling?
A Certainly, you are drilling a hole at an angle.
Q Could that be a potential danger to the potash zone?
A Not if it were directionally drilled outside of the potash zone.
Q But you are drilling into the potash area.
A No, my assumption was the well would be set out of the area of potash mining.

Q But you are drilling into Section 13, which is in the potash zone.
A You are drilling under Section 13, below the potash zone.
Q And you say damage to the casing above that point would cause no damage to the potash zone?
A If it were well outside of the potash zone, no.
Q How would you define the potash area?
A I am not qualified to describe the presence of ore, I have not made a study of it.
Q Then you do not know whether they could economically directionally drill the well or not.
A What I am going on is what has been testified to here today.
Q You are talking about directionally drilling outside of the mine now?
A Yes.
Q Not outside of the potash zone.
A Well, I would presume the mine and the potash zone are coincidental.
Q Is there anything in the record to support that?

MR. MORRIS: If the Commission please, I think counsel is badgering the witness.

MR. KELLAHIN: I certainly am. He said we can directionally drill the well, and I am trying to find out on what basis we could directionally drill this well. My

question to the witness was clearly limited to the assumption I asked him to make, and that was that he was drilling in the Northeast quarter of Section 23 into Section 13.

MR. MORRIS: I think there has been evidence presented here as to where the lines are, and Phillips could go over to Section 23, and we would have no stand to object to their drilling the well over there. It certainly seems that would be the most feasible thing to do from both their standpoint and our standpoint.

Now, I don't know what counsel can hope to accomplish by continuing this line of questioning.

MR. PORTER: Let's ask the witness. Do you think you could successfully directionally drill to a location, a bottom location, as requested by Phillips?

THE WITNESS: In my opinion, yes.

MR. PORTER: Without danger to the potash?

THE WITNESS: Yes, sir, sticking to the assumption that the well bore went through the mine level outside of the potash zone, outside of the mining zone.

MR. PORTER: Does that answer your question?

MR. KELLAHIN: No, because he keeps referring to the potash zone, and I want to know where it is.

THE WITNESS: I don't know.

Q (By Mr. Kellahin) Let's assume for a moment that there

is potash under Section 23, and we are drilling through that. My question is would damage to the casing in that zone be a potential hazard to the mine in Section 13?

A As you ask that question, I can say yes.

Q It would be?

A Yes.

Q On the same assumption, would there be a danger of getting a bad cement job?

A Under what condition?

Q On whipstocking, on directional drilling.

A Through the mine?

Q I am talking about drilling in Section 23 through the potash ore under Section 13.

A Under those conditions, a bad cement job could present a hazard to the potash mine.

MR. KELLAHIN: That's all I have.

MR. PORTER: Are there any further questions?

(No response)

MR. PORTER: The witness may be excused.

(Witness excused.)

MR. PORTER: Does that conclude all the testimony?

MR. MORRIS: Yes.

MR. KELLAHIN: Yes.

MR. PORTER: Gentlemen, in the interest of time,

I have another meeting, the Commission will allow you fifteen days to file your closing arguments, if you so desire.

The Commission will take this case under advisement. This hearing is adjourned.

(Hearing adjourned.)

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, RICHARD E. McCORMICK, a Certified Shorthand Reporter, 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; and that the same is a true and correct record of the said proceedings to the best of my knowledge, skill and ability.

Richard E. McCormick
CERTIFIED SHORTHAND REPORTER

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