BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
June 22, 1977

EXAMINER HEARING

IN THE MATTER OF:

Application of Texaco Inc. for statutory unitization, Lea County, New Mexico. CASE 5970

BEFORE: Richard L. Stamets, Examiner

TRANSCRIPT OF HEARING

A P P E A R A N C E S

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I N D E X

EXHIBIT INDEX

MR. STAMETS: We will call next Case 5970.

MS. TESCHENDORF: Case 5970, application of Texaco, Inc. for statutory unitization, Lea County, New Mexico.

MR. STAMETS: Call for appearances in this case.

MR. BATEMAN: Mr. Examiner, I'm Ken Bateman, White, Koch, Kelly and McCarthy, appearing for the applicant.

MR. KELLAHIN: Tom Kellahin, Kellahin and Fox, appearing on behalf of Phillips Petroleum Company.

MR. BATEMAN: I have three witnesses and ask that they be sworn.

MR. STAMETS: Would all of the witnesses stand and be sworn at this time?

(THEREUPON, the witnesses were duly sworn.)

MORRIS S. TODD

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

DIRECT EXAMINATION

BY MR. BATEMAN:

Q. Would you state your full name, your address and place of employment, please?

A. My name is Morris S. Todd, I live in Midland, Texas and I'm employed by Texaco, Inc. as a petroleum engineer.

Q. What is your title with Texaco?

A. Currently it is Division Unitization Engineer.

Q. Have you previously testified before the Commission and had your qualifications made a matter of record?

A. No, sir.

Q. Would you then briefly review your educational and work experience?

A. I graduated in June, 1949 with a Bachelor of Science in Petroleum Engineering from the University of Oklahoma, Norman, Oklahoma. I was employed by Texaco after that and I have been employed by Texaco as a petroleum engineer for twenty-eight years.

Q. What is your experience with the unit which is the subject of this application?

A. Well, I have been with this unitization effort since its inception in about January of 1973, approximately four and a half years.

MR. BATEMAN: Are the witness' qualifications acceptable?

MR. STAMETS: Any objection?

MR. KELAHIN: No, sir.

MR. STAMETS: The witness is considered qualified.

Q. (Mr. Bateman continuing.) Would you briefly describe what Texaco is seeking by this application today?

A. Texaco is applying for the creation of the Central Vacuum Unit, Lea County, New Mexico, through statutory unitiza-

tion through the development of that unit area by the drilling of injection wells on unorthodox locations and for a pressure maintenance allowable equal to the top allowable, eighty barrels per well per day times the number of wells.

Q. Now, would you refer to what has been marked as Exhibit One and describe the horizontal limits of the proposed unit?

A. Exhibit One is actually Exhibit A to the unit agreement, it outlines the unit area, it includes twenty-nine leases which have been numbered tracts one through twenty-nine and seventy-six wells. It includes three thousand and forty-six and two-tenths acres and like I said, it is outlined on Exhibit One.

Q. Would you briefly relate why the horizontal limits are described as they are here?

A. When this effort started back in January, probably the first meeting was held in February of '73, it included not only the unit area as outlined but it included Section 35 of 17 South, 34 East and it included the one hundred and twenty acres in Section 31 that is within 17 South, 35 East that you can see is entitled the Mobil "K" lease. Through subsequent negotiations for unitization these areas were dropped, leaving the boundary as it is outlined today.

Q. Would you proceed then with what has been marked as Exhibits Two, Three and Four to illustrate the change in the

unit boundary lines?

A. Well, we have -- we talked to these companies and asked for their authority to use these exhibits, these letters of theirs as exhibits, except Exhibit Two is a letter from Phillips Petroleum Company dated February 10th, 1976 wherein they ask that their M. E. Hale lease and their Mabel leases in Section 35 be deleted from unitization efforts and with that deletion that they would be very willing to go ahead and put their Santa Fe leases within the unit and negotiate participation and they are outlined as tracts 8, 8-A and 8-B.

Now figure three in its three-page part altogether shows the withdrawal of Continental Oil Company for their H-35 lease in Section 35, dated July 16th, 1976 and then a letter dated August 31st, '76 wherein they asked to be withdrawn from the unit and this request was recognized.

Then we have a letter from Mobil Oil Corporation dated October 21st, 1976 wherein you see Mobil had at that time three leases in the unit which two of them are identified as tracts 13 and 19 within the unit boundary and through negotiations they asked that their "K" lease be deleted from the unit boundry and it was so done.

Now, all of these leases that have been dropped, it is anticipated will be under unitization of some sort or pressure maintenance by water injection we believe within a year to a year and a half's time so every lease out here will

be afforded the opportunity of benefiting from water injection, secondary recovery.

Q. In your opinion then can the unit as now described be officially operated as a pressure maintenance project?

A. Yes, we believe it can.

Q. Are there other pressure maintenance projects in the immediate area?

A. Yes, adjacent to and southwest of our proposed Central Vacuum Unit is our Vacuum Grayburg-San Andres Unit which is a hundred percent Texaco operated project.

Adjacent to and west of Section 35, 17 South, Range 34 East is the West Vacuum Unit.

I might say the Vacuum Grayburg-San Andres Unit has been in operation for approximately four years. Now, the West Vacuum Unit operated by Texaco has been in operation approximately ten years and, of course, on further west of them, that is the recently created State Vacuum Unit operated by Atlantic Richfield in which Texaco owns an interest and then I might add with the development of Section 35 as a unit, probably, and the continued operation to the east, Phillips Petroleum Company is actively pursuing the formation of the East Vacuum Unit, the entire Vacuum Grayburg-San Andres Pool will be under unitization and pressure maintenance, water injection.

Q. In addition there is the North Vacuum Abo Unit, I

believe?

A. Yes, the North Vacuum Abo Unit operated -- of course, that's a deeper formation and then overlying the North Vacuum Abo Unit is Mobil's Bridges State Unit.

Q. All right, have you prepared a list of working interest owners and offset operators in this matter?

A. Yes, we have, that is Exhibit Five. It is prepared in a manner to show that all of the participants, working interest participants in the unit and the offset operators and there is a note that said if an offset operator is also a working interest owner he is listed as a unit working interest owner.

Q. Proceed then with Exhibit Number Six and describe the unitized formation?

A. The unitized formation is described in the unit agreement, if I might refer to it, under article two, paragraph J, where it says, the unitized formation means the Grayburg-San Andres formation identified between the depths of thirty-eight fifty-eight feet and forty-eight fifty-eight feet on the Welex Acoustic Veleocity log run on November 15th, 1963 in the Texaco State of New Mexico "O" NCT-1 Well No. 23 located in the southwest-southeast of Section 36, Township 17 South, Range 34 East, Lea County, New Mexico and it is to include all subsurface points throughout the unit area correlative to those identified depths.

Now, Well 23 is not a well that is to be a unit well but it is a twin to Well No. 10 and Well No. 23 was used as an identifying well because it drills to a deeper formation, through the formation, and it is a later, more modern log and pretty well identifies it to us and this was selected by the Engineering Committee for an example log.

Now the top of the log is Exhibit Number Six, you can see thirty-eight fifty-eight, the top of the Grayburg and you can see the entire proposed unitized interval to the base of the pay and it also includes the top of the San Andres pay which delineates or outlines the Grayburg versus the San Andres in this unitized interval.

Q. You mentioned the selection of this well by the Engineering Committee, would you just briefly relate what the Engineer Committee is and what it was composed of?

A. The Engineering Committee when this unit effort started, working interest owners met in February of '73, they formed an Engineering Committee comprised of representatives of practically all of the companies and they met at approximatly thirteen official meetings and they developed the engineering justification and the basis upon which they gave parameters and basis upon which we could create this unit. They drew the maps, they picked the pay, they did all of the engineering features necessary to form the basis for this unit.

Q. Thank you. Was a structure map prepared then in

this manner?

A. The Committee prepared a structure map which we offer as Exhibit Number Seven which somewhat outlines the areal extent of the proposed unitized formation and shows that it not only exists in Well No. 23 but it exists throughout the unit area.

Q. Now has the unit agreement and the unit operating agreement been prepared and circulated among the various working interest owners?

A. Yes, sir, it has.

Q. Is that Exhibits Eight and Nine?

A. Yes, sir.

Q. Does the unit agreement contain a participation formula by which the produced unitized hydrocarbons are to be allocated among the separately owned tracts?

A. The formula for participation is outlined in the unit agreement, article thirteen, page six, wherein it is outlined that there are five parts to the formula that were arrived at through negotiations. It's twenty percent weight to the tract percent of current unit oil production for the period May 1st, '75 to November 1st, '75, plus ten percent weight to the tract percent of unit remaining primary oil reserves as of November 1st, '75, plus twenty-seven and a half percent weight to the tract percent of unit cumulative oil production as of November 1st, '75, plus twenty-two and a

half percent weight to the tract percent of unit net hydrocarbon pore volume, plus twenty percent weight to the tract percent of ultimate primary oil recovery. All of those weightings should add up to a hundred percent, if they don't we're in trouble.

Q. You mentioned that this formula was developed through negotiations, would you explain your remark on that?

A. Well, there were four meetings held through which negotiations were conducted for the selection of this formula which is the basis of participation in these agreements. Actually during these four meetings there were thirty-seven formulas proposed and those were proposed by, some by each and every company. Negotiations were, you might say, rather vigorous throughout. As a matter of fact, we tried to give up two or three times but we couldn't even get agreement on that so actually formula thirty-eight is a compromise formula which developed following the fourth meeting and the negotiating period covered a period of approximately four months and then circulated by letter ballot and given approval by the working interest owners.

Q. In your opinion is the formula fair, reasonable and equitable to all participants in the unit?

A. Yes, we believe that it is.

Q. To your knowledge what is the extent of the approval of the unit agreement today?

A. Well, we have that testimony by a landman, I think it's approximately eighty-three percent by working interest.

Q. Are you familiar with all of the terms and conditions of the unit agreement and unit operating agreement, I believe?

A. I believe so.

Q. Does the unit operating agreement contain a provision for credits and charges to be made in the adjustment among the owners in the unit area for their respective investments in wells, tanks and other personal property?

A. That is contained in the unit operating agreement, Exhibit Nine, article ten, page six and it's entitled "investment adjustments" and shortly after the unit, when it is formed and created and becomes effective, there will be a unit inventory taken of all of the equipment contributed to the unit by the various operators. The working interest owners in committee will act to price this inventory and evaluate it. Now if a participant who contributes equipment to the unit contributes a value of equipment that is greater than his unit participation is equal to, you see his unit participation times a total value, then he receives money in the adjustment. If his contribution of equipment is less than that calculated by his unit participation, then he pays, and then the unit operator, acting as such, collects all of the monies from those who pay and disburses it to those who receive and in this way in the future after the unit is formed, everybody owns alike

and according to the unit participation and all of the equipment that is contributed to the unit.

Q. All right, sir, does the unit operating agreement contain a provision governing how the cost of the unit operations, including capital investments, shall be determined and charged to the separately owned tracts?

A. Yes, sir, that is contained in the unit operating agreement, article twelve, page eight and it merely states in brief, that the unit operator will initially pay all costs and then bill everybody monthly for their share in accordance with their unit participation.

Q. Does it also provide a method for the collection of those costs in the event that an owner does not pay?

A. Yes, sir, there is a lien provision in there, I'm at a loss to quote the article right now, but in brief, in the event somebody fails to pay his bills and that usually runs over three or four months before you recognize it, why the unit operator and the unit, working interest owners in the unit, have a lien on all of that operator's share of the unit equipment and his share of unit production with his unit production primarily being used to satisfy that lien or his unpaid portion of the unit expense, unit investment, plus a reasonable interest which in this agreement is set out to be ten percent.

Q. Was that interest rate also determined by negotiations?

A. Yes, sir, it was.

Q. Do the agreements contain a provision designating the unit operator?

A. Yes, they do, it's twice. Texaco is designated the unit operator in the unit agreement by article six, page four and coincidentally it is mentioned also in the unit operating agreement as article six, page four of that agreement.

Q. Does that provision also provide for the removal and substitution of the unit operator?

A. The resignation or removal of a unit operator is within the unit agreement as article seven, page 4 and merely states for "just cause", which is usually a pretty severe thing, that an operator may be removed by an affirmative vote of ninety percent of the working interest, excluding the vote of the unit operator and that selection of his successor and, of course, his removal, will be subject to the approval of the Commissioner, meaning the Land Commissioner and his successor can be selected by a favorable vote of sixty-five percent of the working interest owners but it also provides that if the unit operator votes only to succeed himself or does not vote then his successor can be selected with a vote of fifty-one percent of those voting, excluding the voting interest of the unit operator, subject to the approval of the Commissioner.

Q. The provision of voting, is there also another provision for voting in the decision making process for the

matters to be decided by working interest owners?

A. Yes, that is provided for in the unit operating agreement, it's article four, page three and it says that all matters that come before the working interest owners for the expenditure of money or other cause may be decided by a favorable vote of sixty-five percent voting interest with two or more working interest owners voting favorably.

Q. Does the agreement identify the time of the commencement of unit operations and the circumstances under which those operations shall be terminated?

A. The unit agreement, subject to the appoval of the Commission and the Commissioner in article twenty-five, page eleven, provides that following first approval of the Commission, followed by approval by the Commissioner and then by vote of the working interest owners, that the unit will become effective at seven A.M. on the first day of the month following all of that procedure, that's the effective date.

Now the termination of the agreement is provided in article twenty-seven, page twelve, with first the approval of the Commissioner and then seventy-five percent of the working interest owners voting favorably, that unit operations can no longer be conducted economically then this unit agreement can be terminated.

Q. With respect to termination does that provision also provide for accounting to the various interests in the event

of termination?

A. Yes, it makes a provision for that, there will be, you might say or you say you are going to divide up the unit equipment or the proceeds from the sale thereof to each and every working interest owner.

Q. What is the estimated cost of the unit operations over the balance of its productive life?

A. The investment costs are in the neighborhood of eighteen million dollars.

Q. In your opinion will the estimated additional costs of conducting pressure maintenance operations exceed the estimated value of the oil, plus a reasonable profit?

A. No, sir.

Q. Has tentative appoval of the unit agreement been obtained from the New Mexico Land Commissioner?

A. Yes, it has by a letter dated February 17th, 1977. It has given us tentative approval and outlined the procedure to follow in the event of approval by the Commission.

Q. That's Exhibit Number Ten, is that correct?

A. Yes, sir.

Q. Now do you have a market for the increased production of oil and gas?

Q. Yes, the predominent purchaser out there of the oil is Texas-New Mexico Pipeline Company and Exhibit Eleven is a letter from them dated June 11, '77 stating that they can

handle all of the increased production that we will have.

Q. What about the gas production?

A. The principal gas producer out there is the Phillips Petroleum Company and we have a letter from them dated June 16th, 1977 saying that their Lea Gasoline Plant can handle the anticipated increase in gas production.

Q. The letters you are referring to are marked Exhibits Eleven and Twelve, is that correct?

A. Yes, sir.

Q. Were Exhibits One through Twelve prepared by you or under your direction?

A. Yes, sir.

Q. In your opinion will the approval of Texaco's application prevent waste, protect correlative rights and result in a fair, reasonable and equitable share of production to all parties concerned in the unit?

A. Yes, sir.

MR. BATEMAN: I offer Exhibits One through Twelve at this time.

MR. STAMETS: These exhibits will be admitted.

(THEREUPON, Texaco Exhibits One through Twelve were admitted into evidence.)

MR. BATEMAN: We have no further direct.

MR. STAMETS: Any questions of this witness?

CROSS EXAMINATION

BY MR. STAMETS:

Q. In response to Mr. Bateman's question you indicated that there would be an investment cost in this project of eighteen million dollars?

A. Yes, sir, I believe we outlined that in our application.

Q. Then in response to the next question, I'm not certain that I understood the answer. I believe Mr. Bateman asked you if the project which is envisioned here, if the additional recovery from that will pay back this eighteen million plus reasonable profit?

A. Well, I understood the question to be that he said, will the extra cost exceed the proceeds from the sale of additional oil and that's why I answered, no.

Q. So the answer is, yes, the additional recovery will exceed the eighteen million plus the return of a reasonable profit?

A. Yes, sir.

MR. STAMETS: I misunderstood one side or the other of the question.

Are there any other questions of the witness? He may be excused.

(THEREUPON, the witness was excused.)

MR. BATEMAN: I would call Mr. Davis, please.

ROBERT E. DAVIS

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

DIRECT EXAMINATION

BY MR. BATEMAN:

Q. Would you state your full name, address and place of employment, please?

A. Robert E. Davis, Midland, Texas and I'm employed by Texaco, Incorporated.

Q. In what capacity are you employed by Texaco?

A. Senior Land Representative.

Q. Have you previously testified before the Commission?

A. No, I have not.

Q. Would you briefly relate your educational and work experience?

A. I'm a graduate of Baylor University and my tenure of service with Texaco covers a period of twenty-one years, beginning March of 1956. I have had various Land Department assignments and my current assignment involving secondary recovery projects covers a period of approximately two years.

Q. What is your familiarity with the area in question today?

A. I have been familiar with the Central Vacuum Unit for approximately one year. My first initiation with the

Central Vacuum Unit began in June of 1976 at which time I attended a working interest owners meeting.

MR. BATEMAN: Are the witness' qualifications acceptable?

MR. STAMETS: Any questions of the witness?

MR. KELLAHIN: No objection.

MR. STAMETS: He is considered qualified.

Q. (Mr. Bateman continuing.) Mr. Davis, to what extent have you been able to obtain the agreement of working interest owners and royalty interest owners to the proposed unitization?

A. There are nineteen working interest owners with varying unit participation. Of these nineteen owners, fifteen have ratified the unit agreement and unit operating agreement. The combined unit participation of the fifteen owners that have ratified is eighty-three point four percent. There are four owners, according to the exhibit, who have not ratified. In my communication with my office this morning I have learned that Norman B. Stovall, Junior, one of the four unsigned working interest owners contacted our office and states that he will sign.

As to royalty owners, overriding royalty owners, there are eleven in number, seven of the overriding royalty and royalty owners have signed and ratified the unit agreement. I will make a qualification to that statement. The State of New Mexico which is the principal royalty owner has not

actually signed but they have indicated by letter that they have examined the unit agreement, unit operating agreement, and tentatively approve it and will sign upon approval by the Oil Conservation Commission.

Q. Now, you are referring to what has been marked as Exhibit Thirteen, are you not?

A. Yes, sir, I am.

Q. Which is a resume of the percent participation at this point?

A. Yes, sir.

Q. Will you please describe the extent to which you have gone to obtain approval of all of the parties concerned?

A. I have made contacts personally, I have also made contacts principally by telephone and by correspondence.

Q. In your opinion have you made a good faith effort to secure voluntary unitization of the pool?

A. Yes, I have.

Q. Are you aware of any substantial objection on the part of any unsigned interests to the proposed unitization?

A. No, I'm not.

Q. Do you have in your possession executed applications by all of the parties indicated on Exhibit Thirteen?

A. Yes, I have.

Q. Other than the State of New Mexico?

A. Yes, sir.

Q. Was Exhibit Thirteen prepared by you or under your direction?

A. Yes, it was.

MR. BATEMAN: I offer Exhibit Thirteen at this time.

MR. STAMETS: Exhibit Thirteen will be admitted.

(THEREUPON, Texaco Exhibit Thirteen was admitted into evidence.)

MR. BATEMAN: That completes the direct.

MR. STAMETS: Are there any questions of this witness?

MR. KELLAHIN: No.

CROSS EXAMINATION

BY MR. STAMETS:

Q. Mr. Davis, did you indicate what percentage of unit participation these seven royalty interests account for?

A. They account for ninety-nine point three three percent of the total royalty and overriding royalty interests.

MR. STAMETS: Any other questions of the witness? He may be excused.

I have one question, I'm sorry. The unit participation, that is based on the unit formula, is that correct?

MR. DAVIS: Yes. The unit participation of each working interest owner is derived from the unit agreement as outlined in the exhibit, the unit agreement.

MR. STAMETS: And it's not based on acreage but an allocation formula?

MR. DAVIS: Very definitely, yes.

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

(THEREUPON, the witness was excused.)

MR. BATEMAN: I call Mr. Anthony.

ROBERT J. ANTHONY

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

DIRECT EXAMINATION

BY MR. BATEMAN:

Q. Would you state your full name, please, your address and place of employment?

A. I'm Robert J. Anthony, I live in Lovington, New Mexico and I'm employed by Texaco.

Q. In what capacity are you employed?

A. I'm a District Reservoir Engineer.

Q. Are you familiar with the area in question today?

A. Yes, I am.

Q. Have you previously testified before the Commission?

A. No, I have not.

Q. Would you then briefly relate your educational and work experience?

Q. I graduated from the University of New Mexico in 1964 with a BS in mechanical engineering. I was employed immediately thereafter by Texaco as a petroleum engineer and I have been assigned to the Lovington area in the Hobbs District of Operation for the past thirteen years.

Q. Did you participate in the Engineering Committee involved in this unit?

A. I have been with this Engineering Committee since its inception in 1973.

MR. BATEMAN: Are the witness' qualifications acceptable?

MR. STAMETS: Any questions?

MR. KELLAHIN: No objection.

MR. STAMETS: The witness is considered qualified.

Q. (Mr. Bateman continuing.) Please refer to Exhibit Fourteen and generally describe the proposed pressure maintenance operation in the unitized area and the plan of operation?

A. The operations contemplated for the Central Vacuum Unit area is pressure maintenance by water flooding. Exhibit Number Fourteen is a plat showing the injection pattern with the proposed well numbers. We intend to change these current well numbering to this system on this map. It is planned to implement a forty-acre five-spot flood pattern. The pattern will be developed by drilling fifty-four injection wells and converting one currently producing well to injection.

The triangles on Exhibit Fourteen indicate with the small open dots in the center those wells that are to be drilled. One well is to be converted down in Section 7, 18 South, 35, is indicated by Well No. 131 with the solid dot, it should be solid, but it's not very.

MR. STAMETS: It's not very solid on my copy but we'll fix that.

Q. (Mr. Bateman continuing.) I notice there are no injection wells around the unit boundary, would you explain that?

A. This is done purposely to protect correlative rights until such time that cooperation can be obtained from all of the offset units that are intended to be formed and at that time the injection pattern will be expanded to the boundaries of the unit.

Now, injection is to be into the Vacuum Grayburg-San Andres formations within the interval to be unitized as indicated previously from thirty-eight fifty-eight to forty-eight fifty-eight.

Q. Would you proceed then with Exhibit Fifteen and describe a typical completion for an injection well?

A. Exhibit Fifteen is a typical injection well completion. This is the completion we intend for the wells to be drilled. We will set eight and five-eighths inch casing at three hundred and fifty feet and circulate cement behind this

pipe. The well will be drilled to a total depth of approximately forty-eight hundred feet. Four and a half inch casing will be set at total depth with sufficient cement circulated behind the pipe to tie back to the eight and five-eighths. In an aid to circulate the cement back to the surface pipe we will use a cement stage tool at the base of the salt which in this case is approximately twenty-five hundred feet.

Now, injection will be down internally plastic coated tubing, two and three-eighths inch, set on the packer approximately fifty feet above the top perforations. Annular space between the tubing and the four and a half inch casing will be loaded with inhibited fluid to prevent corrosion.

Q. I understand that one of the producing wells will be converted into an injection well?

A. Right.

Q. That is Exhibit Sixteen?

A. That is Exhibit Sixteen. This is currently Sun Oil Company "B" lease State No. 7. On our Exhibit Fourteen it was Well No. 131 as indicated. This is in the southwest quarter of the northwest quarter of Section 7, Township 18 South, Range 35 East. This well was drilled to a total depth of forty-seven hundred seventy-two feet. Surface casing was set, eight and five-eighth inch at sixteen hundred and forty-nine feet, five hundred and fifty sacks of cement circulated cement to the surface. Four and a half pipe was set at forty-seven seventy-two.

Six hundred and fifty sacks of cement circulated cement to the surface behind the four and a half. The well was perforated from forty-four twenty-six to forty-seven twelve in the San Andres formation. In converting this well to injection it will be down two and three-eighths internally plastic coated tubing as the other well with a packer set at approximately forty-three seventy-six or fifty feet above the perforation.

Q. What is the proposed rate of injection?

A. Our initial injection rate is expected to be nine hundred barrels of water per day per well. While we have designed and applied for fracture pressure injection, we request the fracture pressure limit not be applied in order that injection rates can be maintained commensurate with good engineering practice.

Q. Is the volume of injection water which is proposed available for your use?

A. Injection water for the Central Vacuum Unit will be made up of formation water produced from the unit and fresh water from Texaco and Mobil water rights through water supply wells in the Ogallala formation. We do have sufficient fresh water to supply our needs.

Q. Do you anticipate any problem with corrosion in the injection wells?

A. No, we do not.

Q. Will the structure take that volume of water at a

reasonable injection pressure?

A. We have designed for a thousand pounds, now with a thousand pound injection pressure we feel we can get nine hundred barrels of water per day on the average into the unit. If we are limited to any pressure under that then we will not be able to inject at these rates and it will curtail our operations.

Q. Proceed then with Exhibits Seventeen and Eighteen and describe the production both within the unit area and within the surrounding area to the extent of two miles?

A. Exhibit Seventeen is a map of a portion of the Vacuum field. On this map in the center the Central Vacuum Unit is denoted by the crosshatched lines. The solid line just outside of the Cental Vacuum Unit boundary indicates all of those wells that have penetrated the San Andres pay within a half a mile of the Central Vacuum Unit boundary.

The outer boundaries of this map indicate all of the wells that penetrate the San Andres pay within two miles of the Unit.

Now Exhibit Number Eighteen is a tabulation of all of the wells penetrating the injection zone within the unit and within one half mile surrounding the unit. This exhibit shows the operator, lease name and well number, the surface casing size, setting depth and cementing data; the intermediate casing size, setting depth and cementing data; the

production or injection casing, as the case may be, setting depth and cementing data, the total depth of each well, the producing or injection interval, the location and any plugging data and in the outer two columns we indicate the ground elevation and the open-hole size of all of the wells completed in the San Andres formation within the unit that are to be unitized by this application.

Q. In your opinion is the unitized operation and development of this pool not reasonably necessary in order to carry on an effective maintenance program?

A. Yes, it is.

Q. Could it be done economically on a cooperative basis?

A. It could be done economically but it would present economic waste in that cooperation procedures would increase the total investment in the area and probably operating costs also which would result in economic waste.

Q. In your opinion will the pressure maintenance operation within the unitized area prevent waste and result within a reasonable probability an increased recovery of substantially more oil and gas from the pool?

A. Yes, it will. Our Exhibit Number Nineteen is a graph of predicted secondary response and the continued primary performance for the Central Vacuum Unit. The dashed lines along the lower part of the graph indicate the

predicted primary performance. The solid line indicates our prediction of the secondary performance or the pressure maintenance performance.

We predict that our increase in reserves from this project will be forty-seven million eight hundred and sixty-four million barrels.

Q. All right, now, the economic limit is projected on present prices, is that correct?

A. That is correct. The economic limit for continued primary is less than the indicated economic limit for secondary operations because of the increase in operating costs due to secondary operations.

Q. Does Texaco have a request to make with regard to the unit allowable to be assigned to the Central Vacuum Unit?

A. Texaco is operator of the proposed Central Vacuum Unit and requests that a project allowable be assigned to the Central Vacuum Unit equal to the number of wells in the Unit times top proration unit allowable of eighty barrels of oil per day for the Vacuum Grayburg-San Andres Pool.

Q. In referring to the number of wells you are including injecting wells as well as producing wells?

A. That is right. It will be a total of a hundred and thirty-one wells times eighty barrels per day at the time of completion of the initial drilling program.

Q. At what point will the injecting wells be counted

when your formula has -- want to be considered in determining the allowable?

A. Upon the date of the start of injection into that well.

Q. Is there any precedent that you are aware of for such an allowable?

A. This is the allowable granted to Texaco on their Vacuum Grayburg-San Andres Unit which was initiated January the first of 1972.

Q. In your opinion has the productive reservoir in the proposed unit been reasonably determined by development?

A. Yes, it has, the Vacuum Grayburg-San Andres Pool was discovered by Mobil Oil Company in their Bridges State Well No. 1 in 1929. Development began in the Vacuum field in 1939 and continued over a period of approximately twenty years and the development has sufficiently outlined the Vacuum productive limits.

Q. Does your application also involve the approval of injection wells at unorthodox locations?

A. Yes, it does.

Q. It has already been referred to but does Texaco have a proposal for the name of the new unit?

A. Yes, our proposed name is the Central Vacuum Unit in that it lies approximately in the center of the Vacuum field.

Q. Were Exhibits Fourteen through Nineteen prepared by you or under your direction?

A. Yes, sir, they were.

Q. In your opinion will the granting of Texaco's application prevent waste and protect correlative rights?

A. Yes, it will.

Q. With respect to that would you want to expand your remarks concerning offset operators of the unit?

A. Our injection plan as indicated on Exhibit Fourteeen leaves one row of producing wells outside of the injection boundary. When the top allowable of eighty barrels of oil per day is applied to each of these, any of these wells that have the capability of producing eighty barrels or more will be limited to eighty barrels of oil per day and, therefore, will prevent any drainage across the Central Vacuum Unit lease lines.

MR. BATEMAN: I offer Exhibits Fourteen through Nineteen at this time.

MR. STAMETS: These exhibits will be admitted.

(THEREUPON, Texaco Exhibits Fourteen through Nineteen were admitted into evidence.)

MR. BATEMAN: We have no further direct.

MR. STAMETS: Any questions of this witness?

MR. KELLAHIN: No, sir.

CROSS EXAMINATION

BY MR. STAMETS:

Q. Mr. Anthony, you indicated that the annulus in these injection wells would be loaded with inhibited fluid. Do you propose to gauge those or leave them open to determine whether there is any leakage?

A. Yes, sir, each gauge will be gauged by a pressure gauge and these pressures are reported in our area offices twice monthly.

Q. Okay. Is this proposed project in an area where the Commission has found water circulating in the salt section and other zones that it is not supposed to be in?

A. Yes, sir, it is.

Q. Okay. Is one of the theories on why that water is there high injection pressures?

A. One of the theories is that it is caused by high injection pressures. It's not mine, incidentally.

Q. Do you have a better one?

A. Well --

Q. We had an extensive hearing the other day, there was a Texaco witness and I don't recall whether he presented a better explanation or perhaps any explanation at that time.

A. Because we have not been able to prove our theory any more than we can prove the fracture theory.

Q. The Commission in recent orders, recent actions, has

done a number of different things to attempt to eliminate injection pressures such as to prohibit fracturing of the confining strata. We have issued orders with a two-tenths of a pound per foot wellhead pressure which in this case would be slightly in excess of eight hundred pounds. We have also allowed operators to file step-rate tests on individual wells to make certain that the fracture pressure has not been exceeded.

If an order were issued limiting Texaco to two-tenths of a pound per foot but providing for administrative procedure for higher pressures than that, would that be an acceptable order?

A. We can accept that on the basis of running step-rate tests and getting increased pressures.

Q. It would be something to get you off the ground until you had some water in the formation where you could take good step-rate tests?

A. Yes, sir. May I ask a question?

Q. Certainly.

A. Is there any chance at all of the pressure limitation being taken off if we are able to prove that fracture pressure is not causing this water from going behind the pipe.

Q. To answer your question with another imponderable, the underground injection control regulations being proposed by the Federal Government have a fracture pressure limitation in them and it may not be within our authority to go less or

go higher than fracture pressure.

A. We have to accept their controls?

Q. We can all take them to court, that would be about the only option we would have under those circumstances and their regulations speak of the confining strata and they are not concerned with fractures within the formation itself, so within those parameters I think there will be room for a certain amount of leeway.

A. I hope they have to come out and take those tests to determine what that fracture pressure is, I don't know how to do it.

Q. Now I was looking at Exhibit Number Eighteen and unfortunately this does not have the exact locations of those wells or I haven't seen it. It makes it difficult but on page two, it looks like the fifth well down, Continental's H-35 No. 7, indicates a cement top at fifty-seven eighty on the long string but I just went through and I marked it very rapidly and in checking back here I see that there is intermediate casing at forty-one eighty-nine so I don't believe that's the problem. What I'm looking for is wells in there which could represent channels for water getting out of the injection zone of the hole. I think perhaps the H-35 No. 9 may be one of those with the intermediate casing set at thirty-five hundred, the long string at ten nine and the top of the cement at fifty-eight ten. It seems like that might

provide a channel for water?

A. Yes, sir.

Q. And there may be others on here as well upon later examination, The State BA No. 6, Getty's Marathon McAllister No. 7, Marathon Warren State, like perhaps No. 5 and No. 10 and the Mobil State DD No. 1, Phillips Santa Fe 7 Well and a few others that I have marked in here.

I would point out that it has been the Commission's policy in recent orders to not authorize any injection in immediately offsetting wells that are plugged in a suspect manner or which do not have adequate casing or cementing to protect the injection zone until those have been repaired. Also the Commission has written letters to other operators for these wells requiring that they do cement them back in accordance with its 104. I would just point that out for your benefit and we may ask for a little more information on these particular wells so that I can have the locations.

A. I'm sorry that was left off, apparently on some of these pages that has been cut out, it was on here.

Q. Okay, I see. I was looking for the location over there in the far left-hand side but here it is on the right-hand.

A. It's on the right-hand side and I see that on some pages it has been deleted and I'm sorry that happened. I didn't know that had happened until you pointed it out.

Q. Well, it's not at the same location, some pages it's the last column and some it's the third from the last but it looks like it's on every page I have here.

A. Oh, yes, I see it's on the far right-hand side of some pages and, yes, I see it now. I thought they were all on there but I sure missed it when I put them in two different places.

Q. I would assume that some of these wells will be project wells which Texaco could then initiate repairs on?

A. Yes, sir. I haven't reviewed this closely to see exactly which wells they are but that is a true statement. We will repair any of these that are project wells and any Texaco wells within the unit boundary or nearby that do not qualify will be fixed too.

Q. Perhaps before you leave today you might want to review this list and see the wells that I have marked?

A. Yes.

MR. BATEMAN: Incidentally, if I might try to clarify something, on Exhibit Eighteen as I understood it, the ground elevation and open-hole size on the two right-hand columns on most of the pages are given only for wells within the unit, is that correct?

A. These are San Andres wells that are to be unitized inside the unit. We did not give this information on all of the other wells that penetrated the zone but went to some

other producing interval.

MR. STAMETS: Okay. Any other questions of this witness? He may be excused.

(THEREUPON, the witness was excused.)

MR. STAMETS: Anything further, Mr. Bateman?

MR. BATEMAN: Nothing further.

MR. STAMETS: Mr. Kellahin.

MR. KELLAHIN: Call Bill Mueller.

W. J. MUELLER

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q. Please state your name, by whom employed and in what capacity?

A. My name is W. J. Mueller, M-u-e-l-l-e-r. I'm employed by Phillips Petroleum Company as Reservoir Engineering Advisor in the Southwest Region Office, Odessa, Texas.

Q. Is the subject matter of the Texaco application within your area of responsibility for Phillips Petroleum Company?

A. Yes, sir, all of Southeast New Mexico is handled out of the Regional Office.

Q. Have you previously testified before the Commission and had your qualifications as an expert witness accepted and made a matter of record?

A. Yes, sir.

MR. KELLAHIN: If the Examiner please, are the witness' qualifications acceptable?

MR. STAMETS: They are.

Q. (Mr. Kellahin continuing.) Mr. Mueller, will you state for the Examiner what Phillips' position is, first of all with regards to the statutory unitization?

A. Phillips has no problem at all with the statutory unitization here requested by Phillips. We are a proposed seven point eight percent working interest owner in the unit and we just haven't got all of our paperwork done at the home office but to the best of my knowlege we will sign.

Q. You intend to sign the operating agreement and the unit agreement to participate in the unitized area, is that correct?

A. Yes, sir.

Q. I show you what has been marked as Phillips Exhibit Number One and ask you to explain to the Examiner the reasons behind your two requests as set forth in that exhibit?

A. The reasons behind these two requests are that Phillips Petroleum Company has substantial production off-setting the Central Vacuum Unit and we think that on this

request one there is enough doubt as to what future volume of water injection may be or how it may be restricted that we do not feel that the Central Vacuum Unit should be granted a project or bonus allowable or additional allowable over and above a project allowable equal to eighty barrels of oil per day for each proration unit in that Central Vacuum Unit unless it's tied to reservoir voidage replacement. In other words, I think the bonus allowable in a pressure maintenance project out there has to be tied or earned by voidage replacement.

Q. Let's go through the exhibit, if you would please, and simply read it in its entirety so we can have an opportunity to understand what you are proposing?

A. Okay. (Reading.) Phillips Petroleum Company as an offset operator, hereby objects to the assignment of any additional or special allowable over and above a project allowable equal to the number of developed proration units in the project times the top individual unit allowable, unless the additional or special allowable is contingent upon full reservoir voidage replacement of all produced fluids, that is oil, gas and water. Phillips Petroleum Company therefore recommends that the Special Rules and Regulations for the proposed Texaco operated Central Vacuum Grayburg-San Andres Pressure Maintenance Unit provide for an allowable assignment as follows: "A project allowable equal to the top unit allowable for the Vacuum Grayburg-San Andres Pool times the

number of developed forty-acre units in the project area plus a special allowable equal to that percentage of the project allowable by which net water injected, that is total water injected minus the total water produced, exceeds the volumetric equivalant reservoir voidage in barrels of the project allowable and its associated produced gas." (End of reading.)

This would be on a monthly basis similar to a pressure maintenance report probably required by the Commission on all pressure maintenance fields where you nominate for an allowable. We would visualize this as showing that the actual injection was sufficient to replace the project allowable voidage by some percentage and that would be granted then as a special allowable and earned by injection.

Q. You heard Mr. Anthony's testimony with regards to a project allowable and how does your proposal differ from the one Mr. Anthony testified to on behalf of Texaco?

A. Mr. Anthony proposed a project allowable equal to the total number of wells completed in the Grayburg-San Andres formation and would include the fifty-three or fifty-four some odd new wells that he drilled. The project allowable spoke of here would not exceed the seventy-six current wells in the proration unit. Mr. Anthony's project allowable would be something like ten thousand barrels a day where I believe this would be like six thousand barrels a day.

Q. What are the specific areas adjacent to the Texaco

project area that Phillips operates?

A. Immediately west of the proposed Central Vacuum Unit Phillips operates the M. E. Hale lease and the Mabel lease in Section 35 and is currently actively pursuing the unitization of Section 35 and anticipates unitization of that section by the end of the year.

To the east of the Texaco Central Vacuum Unit area Phillips operates some Santa Fe properties on the far south-east corner but we are also the expeditor for the total East Vacuum Unit that will encompass the rest of the Grayburg-San Andres reservoir.

Q. If the Texaco application as proposed by Mr. Anthony for the project allowable, if that is approved by the Commission without imposition of the restrictions that you have proposed what if any adverse effect will that have upon Texaco and its offset operation?

A. Adverse effect upon Texaco?

Q. I'm sorry, Phillips.

A. It could have an adverse effect upon Phillips and all offset operators insofar as if water injection would be severely restricted to a casing point, you could say that the restriction may be as bad as to where produced water and if the produced water is small you could see an injection well out there injecting one barrel of water per day but having an eighty barrel allowable it would definitely hurt our

correlative rights if a large withdrawal is permitted in this project without corresponding injection.

Q. Would you now explain -- well, first of all read to us your second proposal on Exhibit Number Two.

A. The second proposal on Exhibit Number Two is: (Reading.) Phillips Petroleum Company further requests that the following provision be included in the Special Rules and Regulations for this proposed unit: "Any producing well in the unit area which directly or diagonally offsets a well outside the unit area producing from the same common source of supply shall not be granted any special allowable nor be permitted to produce in excess of top unit allowable for the pool without having same authorized after notice and hearing wherein it is proven that substantial response to injection has occurred." (End of reading.)

This is the same wording condition we requested of the Commission when Texaco formed their Vacuum Unit.

Q. Was this proposed addition to the Vacuum Unit adopted and set forth in the Commission's order for that case?

A. Yes, sir, it was.

Q. What is the reason behind that proposal, Mr. Mueller?

A. We feel that as a direct offset producing operator that no well along the unit boundary should be granted permission

to produce in excess of the corresponding production permitted the well on the other side of the unit boundary.

Q. Such a restriction is not placed in the Texaco order in this case, what adverse effect, if any, would it have on Phillips' interest?

A. It could possibly permit offset drainage.

MR. KELLAHIN: That concludes my direct examination of Mr. Mueller and we move the introduction of Phillips Exhibit One.

MR. STAMETS: The exhibit will be admitted.

(THEREUPON, Phillips Exhibit One was admitted into evidence.)

MR. STAMETS: Any questions of this witness?

MR. BATEMAN: Just one.

CROSS EXAMINATION

BY MR. BATEMAN:

Q. Mr. Mueller, would you give us an example of how the proposed formula would work, you can make any kind of assumption you want to in terms of figures?

A. Okay, in terms of figures, the proposed project allowable on a monthly basis would be assigned to seventy-six proration units within the project, times eighty barrels, which I believe is six thousand and eighty barrels of oil per day project allowable. Now to earn an allowable over and

above that Texaco would have to inject the hydrocarbon reservoir voidage replacement caused by this allowable. In other words, currently out there you could estimate somewhere in the neighborhood of, say four reservoir barrels of voidage for each barrel of oil and its associated gas produced to the surface that Texaco would have to inject in the amount of approximately twenty-five thousand barrels of water per day to fill this voidage and then any additional net injection above that as a percent of this voidage they would then earn in a special allowable, such if they were injecting fifty thousand barrels of water a day they would have twice the project allowable.

Q. Twelve thousand, roughly?

A. Yes, sir.

MR. BATEMAN: Okay, no further questions of this witness.

CROSS EXAMINATION

BY MR. STAMETS:

Q. Mr. Mueller, I haven't really had any firm testimony today on which to base the necessary reservoir factors to set out the formula that you have proposed but just looking at what Texaco would like to put in the ground, nine hundred barrels of water per day per well and they appear to be duplicating each of these produced wells with an injection well

if they put that volume of water in the ground every day wouldn't they at least be offsetting the voidage?

A. Yes, they would if they put the nine hundred in.

Q. And if they propose to limit it here to eighty barrels per well and, of course, that would apply to the project area which would be the injection wells plus the offset wells, if they were able to show each month that they had at least offset the voidage then you would have no objection to the allowable formula that they have proposed?

A. That's right.

Q. Do you have the various reservoir factors that we would need to establish a formula or any type of voidage limitation?

A. I have a set of curves that are being used by the East Vacuum Committee but I think probably Morris -- do you have the PVT data for the Central Vacuum -- I believe all of the units out there are using the same.

(THEREUPON, the hearing was in recess.)

MR. STAMETS: The hearing will resume.

REDIRECT EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Mueller, for purposes of the record would you identify what I have marked as Phillips Exhibit Number Two?

A. It is a PVT or pressure volume temperature data on

the Vacuum Grayburg-San Andres crude. It is a composite of several samples taken by various operators throughout the field and was a combination of data put together by the three or four engineering committees and it shows plotted versus pressure on the bottom. The scale on the right-hand side of the chart is solution gas-oil ratio in cubic feet per barrel and those two scales will apply to the solubility curve such that at eight hundred pounds pressure this crude still has in solution approximately three hundred and seventy cubic feet of gas, so three hundred and seventy cubic feet of gas are produced with each barrel of crude and comes out of solution. Any gas-oil ratio in addition above this three hundred and seventy would be free gas that is coming out of the reservoir.

Another curve on this is the BO or formation volume factor of this crude and it is scaled again on the pressure on the bottom and it uses the left-hand scaling over here and it is marked BO in reservoir barrels per stock tank barrels.

So at eight hundred pounds again you would come up to this curve, the BO curve, and read over that for each stock tank barrel at the surface you have voided one point two four barrels of reservoir space.

The other curve on here is a BG curve which is a gas formation volume factor and it is used to correct the free gas produced in association with the oil to an equivalent reservoir barrel voidage. An example here, if we take a well

that, say the bottom-hole pressure is eight hundred pounds out there and we produce one barrel of oil with a fifteen hundred gas-oil ratio, the voidage created by that one barrel of oil is one point two four reservoir barrels, the fifteen hundred producing gas-oil ratio of that, three hundred and eighty of solution of that barrel so you have in essence eleven hundred, fifteen hundred minus three eighty -- eleven hundred and twenty cubic feet of free gas. So then you would come to the BG curve and at eight hundred pounds, you see you have for each MCF you are voiding approximately three point two reservoir barrels, so you would take three point two times one point one -- about three point five -- and you add that, the three point five barrels of reservoir voidage due to free gas to the one point two four due the barrel of oil and you would end up with four point seven. So for each barrel of oil produced from this reservoir under these conditions there are four point seven barrels of reservoir space voided.

Q. In your opinion, Mr. Mueller, are the factors contained on Exhibit Two appropriate to apply to the Texaco operated Central Vacuum Unit?

A. Yes, sir.

Q. Why?

A. Because like I say, they are a composite I think of Texaco's data, Phillips', Shell's, all of the operators together when this was first broken into the various engineering

committees and they put their PVT data together.

Q. If the Commission adopts in its order Phillips' recommendation will the operator, Texaco, have any difficulty in administering this portion of the order?

A. None, I would not think any at all.

MR. KELLAHIN: I have nothing else.

CROSS EXAMINATION

BY MR. STAMETS:

Q. Mr. Mueller, if some sort of voidage formula is used so that the project does not produce more than it re-injects, why should the edge wells be limited?

A. The voidage formula we are proposing only to be used in determining an additional or bonus allowable over and above what we would call the project allowable which is the top allowable for each forty-acre unit so Texaco would automatically based on, I think it is their Exhibit Number Nineteen here, their production curve, their current production estimated in this unit is approximately thirty-two to thirty-three hundred barrels a day. Immediately upon unitization Phillips has no objection to that project being assigned a project allowable -- not upon unitization, upon their injection well completion drilling -- up to six thousand barrels. Now they do not have to inject any water to earn that. What Phillips wants to do is make sure there is enough water

injected to compensate for that and above that to earn any bonus allowable.

In other words, there is an incentive to form a unit just to get a project allowable, I don't think that the unit needs automatically a big bonus allowable for these injection wells that are drilled. That should be something that is earned because there is considerable doubt, I think, in everybody's mind, are they going to be able to put nine hundred barrels of water a day below voiding pressure? They may do it this month but they may not do it next year.

Q. Let's see if I've got your recommendation. What Phillips' position is, you are willing to give them eighty barrels a day for each producing well as a project allowable with only water going in the ground?

A. Yes, sir.

Q. But you would not allow them, you would not wish them to have more than eighty barrels per day for each producing well until they could demonstrate that the total production was being offset by the total injection?

A. Right. In other words, I can compete equally with them on an eighty-barrel allowable for a forty-acre deal.

Q. So at this early stage where perhaps injection has not reached the full limit is the time that you would like to have the edge wells on limited production, not at the stage where voidage is equal to or less than injection?

A. The edge wells are going to be in the project, however, I think we all believe this total field is going to be under waterflood in two years and there will no longer be edge wells, there will be cross-line agreements with all of them, so the restriction on the edge wells should really -- I want to have to say -- it should remain in effect for the life of the unit unless there is a cooperative agreement.

Q. If the applicant, Texaco, is injecting a volume equal to the voidage or greater than voidage and we restrict these edge wells, isn't it possible that oil could be forced off?

A. Well, no, once he shows response he can -- you know, the statement says that they should be restricted until he has proven response to water injection.

Q. That's after notice and hearing?

A. Yes.

Q. Is there any reason for that if he demonstrates monthly with his pressure maintenance report that he is equaling or exceeding voidage?

A. No, I don't believe there would be.

Q. Okay. What was the original pressure in this?

A. Phillips uses in its unit reports around sixteen hundred and fifty. Morris said sixteen thirty-eight is what you have in the Central Vacuum Unit.

Q. Yes, I would ask that of Texaco witnesses, just

anyone who has that figure. What was the original pressure?

A. We used sixteen thirty-eight, we are uniform.

Q. Sixteen thirty-eight, okay.

MR. STAMETS: Are there any other questions of this witness? He may be excused.

(THEREUPON, the witness was excused.)

MR. STAMETS: Would you like to offer your second exhibit?

MR. KELLAHIN: Oh, sure.

MR. STAMETS: Without objection the second exhibit for Phillips will be admitted into evidence.

(THEREUPON, Phillips Exhibit Two was admitted into evidence.)

MR. STAMETS: I've got a few more questions for Mr. Anthony.

MR. BATEMAN: Well, we have a few more things to say.

MR. STAMETS: Okay. Let me get this in while I'm still thinking of this, Mr. Anthony.

(THEREUPON, Mr. Anthony was recalled as a witness.)

CROSS EXAMINATION

BY MR. STAMETS:

Q. Will your injection pressure -- are you trying for a pressure maintenance project to return the pressure in the

formation to sixteen hundred and thirty-eight pounds or are you attempting to increase the pressure above sixteen hundred and thirty-eight pounds?

A. We would probably eventually, about the time we got fill up have reservoir pressure in excess of sixteen hundred and thirty-eight pounds. The injection pressure plus hydrostatic head which would be approximately twenty-three hundred pounds, just the hydrostatic pressure and whatever injection pressure you have at that time would be at least at the formation face and the average reservoir pressure from an injector to a producer would probably be in excess of sixteen hundred pounds.

Q. It sounds a little more like a waterflood than a pressure maintenance project?

A. Essentially it is a waterflood. I don't believe in this case we are in such a point of depletion in a large portion of the area that just pressure maintenance would actually be economical.

Q. You still have some top allowable wells inside this proposed unit?

A. That is true.

Q. But you also have some wells that have declined, have they declined to a marginal status?

A. We have marginal wells, I believe we have probably fifty-six or fifty-seven percent of the production from the

unit is from marginal wells. That's just a guess, I'm not absolutely sure but there are some wells that are completely depleted and shut in, the Arco leases for instance, up on the north end of the unit, have been depleted and are shut in and on the south end of the unit there are some wells that are very near their economic limit, down to two or three barrels of oil per day.

Q. As far as those wells are concerned it would be a waterflood and the top allowable wells would be pressure maintenance?

A. That's true.

Q. How long a period of time do you think it would take for fill up?

A. I believe my calculations indicate approximately seven years to fill up at a sixty thousand barrel a day injection rate, that would be probably twelve to eighteen months from the unitization date. We would have sixty thousand barrels a day since we would have cooperative lease line agreements and additional injection wells from what our map shows here today.

Q. By that time would you project that the top allowable wells would probably be low rate producers?

A. I would not predict that the top allowable wells will ever go below top allowable under this plan of operation.

Q. Assuming primary-type operations, would they have

declined by that time?

A. Oh, I see what you mean. Without injection the most of them probably would be. We made numerous calculations in an attempt to determine the reserves from these top allowable wells and I believe that there are a few that would probably remain top allowable as long as eight to ten years but the majority of those top allowable wells would be below top allowable in eighteen to twenty-four months from the unitization date.

Q. By instituting this project at this time will you achieve a greater element of recovery than you would by allowing all of the wells to decline and then starting a waterflood?

A. That's true. By initiating water injection early in the life of a reservoir the formation volume factors are such that additional reserves can be obtained rather than waiting until everything has depleted to economic limit.

Q. Can your injection rates be controlled so that your production rate won't exceed eighty barrels a day times a hundred and thirty-one?

A. Yes, at the time top allowable is achieved and fill up is achieved then the injection rate will be controlled by -- I can't think of the term I want now -- valves anyway that will restrict injection to probably in the order of one point one or one point two times reservoir voidage.

MR. STAMETS: That's all of the questions that I have at this time. Any other questions of Mr. Anthony while he is on the stand? Mr. Bateman, you have some redirect. Mr. Anthony is excused.

(THEREUPON, the witness was excused.)

MR. BATEMAN: I would call Mr. Todd, please.

(THEREUPON, Mr. Todd was recalled as a witness.)

REDIRECT EXAMINATION

BY MR. BATEMAN:

Q. Mr. Todd, do you have any comment to make concerning the proposal for the allowable made by Phillips Petroleum Company?

A. Mr. Stamets, we just had to reply to Mr. Mueller's comments here. We still stand for our application. We, I'm sure, plan to earn everything we get like Mr. Mueller talked about. We have no objections at all to the edge wells being limited to eighty barrels per day, just immediately offset. Under our plan as we develop with the interior wells, saying not the edge wells but the interior wells, until there is lease line development, being granted you might say unit allowable for every injection well and so on and we injecting and the offset properties not injecting, we fail to see that we are going to drain them. We believe that we would be

putting in the pressure and if anything we will be pushing toward them.

Now I want to say that we kind of feel like the administration of this procedure is that you can talk back and forth, Mr. Mueller gave an excellent example, but this phrase at the first paragraph, "and its associated gas", this bothers us. Now that PVT analysis that was used, of course that's true, that's used by all of the companies, if I might say, that is based upon an analysis of the reservoir fluid of several wells and combined by engineering committee, used both, true by the -- I'm repeating Mr. Mueller -- by the East Vacuum, the Central Vacuum, Section 35 proposed unit and so on.

Now the simple fear is my own fear of when I first saw this and Mr. Mueller talked about eight hundred pounds, I think it is our opinion that this reservoir more on the average is around five hundred pounds. Now while this is engineering data used, actual reservoir performance often times has a way of deviating away from the theoretical and we would assume that the administration of this procedure as recommended by Mr. Mueller would be based upon really a produced gas-oil ratio and, of course, right now where our preliminary fears were based upon current calculations, we calculate that according to sales to produced oil like for the records for February it's something like about sixteen

hundred and twenty-one to one and with a reservoir pressure at five hundred pounds you can look in there and that's more like five and a half or six to one with the formation volume factor of one point two. Well, five and a half plus one point two is what, six point seven. Okay, if we had six thousand barrels a day sometime down the -- now I assume that where our pressure is going up, true, but this is one potential fear we have and for your consideration in, you know, deciding whether this is to be applied or not.

Now say it is six to one and if our allowable upon unitization is six thousand and eighty barrels per day, six times that is around thirty-six thousand barrels which as I understand the way this would have to be applied. If we had a potential, say we are injecting through restrictions around thirty thousand or thirty-six thousand, well, there would be no way we could and if we had the potential to produce above this and those be the reservoir performance figures there would be no way that we could get an increased allowable and produce in excess of over six thousand barrels a day.

Did I make myself clear, sir? I tried to use this very figure right here. Now assuming this is the reservoir performance, the thing we really fear is the gas-oil ratio will be higher than this indicates but assuming this is a reservoir performance and five hundred pounds, which we think

the average reservoir pressure is now, that comes out around a formation volume factor of around five and a half. In other words, the gas produced at the surface would be about five and a half cubic feet or five and a half barrels per MCF. Well on our calculations at the sixteen twenty-one to one it came out around six so this falls right in line, we say the reservoir performed about that way and you add to it the formation volume for the crude oil and assume it's around six, well, our allowable is six thousand barrels per day, six thousand and eighty. Well six times that is thirty-six thousand barrels. We've got to produce above that as I understand it to get any increased allowable. We've got to inject above thirty-six thousand barrels a day and say that's all we can get in the ground, we might wind up with a lot of potential here with no possibility of producing above six thousand barrels a day.

MR. STAMETS: I understand what you're saying and that certainly sounds exactly like what Phillips has proposed in this case.

A. Well, we think it's -- that exhibit, sir, I don't know what number it is, it shows the decline curve. The economics of this thing to selling it is based upon eleven thousand six hundred and eighty barrels a day.

We could see with this reservoir voidage and its project allowable and it's associated gas, we can see that there is no way that we could get to this under that formula and we

just wanted to leave that thought for your consideration.

Q. (Mr. Bateman continuing.) Was the factor in your concern then the potential that injection pressures will be limited in the future to the extent that you can't possibly --

A. Well, we can't possibly now. If we could inject something like sixty thousand barrels a day and this calculation came out thirty-six thousand, see we would have all sorts of room above that. Thirty-six minus sixty would be twenty-four thousand barrels per day, we would have all sorts of room to produce all of the potential we could but if our injection should be limited necessarily by law then this formula, as I understand it here, could severely penalize us, lengthen the life of the project and with this potential I could foresee some operators objecting to even voting this unit into effect.

CROSS EXAMINATION

BY MR. STAMETS:

Q. If you can't get that much water in the ground, where is the production going to come from?

A. Well, we can't tell until we perform like this. Now thirty thousand barrels a day at fill up we should normally have -- probably we could easily have that potential of over eleven thousand barrels a day.

Q. It's still not clear in my mind that you've got a

problem in this case.

A. Maybe we don't but that one phrase, "associated produced gas" bothers me.

Q. But it is clear when you produce oil and you do produce associated gas you have reservoir voidage?

A. Yes, sir.

Q. And when you've got reservoir voidage you've got drainage from somewhere?

A. Yes, sir.

Q. Phillips is concerned that the drainage is going to come from their property which is not being flooded. Does that seem like a valid concern?

A. Well, with us injecting and them not as yet, we can't see that we will be doing anything but driving it across over to them.

Q. If your injection doesn't equal your voidage then where is that oil coming from?

A. Well, I anticipate that our injection is going to exceed our voidage.

Q. If it exceeds your voidage where is your problem?

A. The mechanics of getting an increased allowable in case we do develop a potential in excess of six thousand barrels per day which we hope to do.

Q. Oh, you are not talking about this particular case today but you are talking about that one off in the future

somewhere?

A. Well, a year or two down the line with this rule applying.

Q. I see. Well, but now assuming that none of this is carved in stone and could not be changed under changing circumstances, that would just simply be some future case before some examiner or the Commission?

A. I'm sure what we would have to do then if this were adopted, I'm sure we would have to make application to change it sometime in the future, is that what you mean, sir?

Q. Yes, right.

A. Well then I'm sure we would do that but I just wanted to express that our recommendation, application, still stands and we do have a fear in the administration of this.

Q. It would appear that you could live with this for the next few years but your concern is sometime in the future?

A. Sometime maybe a year and a half from now. I don't know, when does that curve kick us to the top? Well, if we unitize here in -- see in a year from now we are going to be kicking up. Well, in two years from now we should by all calculated predictions have an allowable in excess of six thousand barrels a day.

Q. What is a hundred and thirty-one times eighty?

A. It should be eleven thousand six hundred and eighty.

Full lease line development with a hundred and thirty-one plus sixteen should give us this figure, eleven thousand six hundred and eighty which was the basis for our calculations of economics for this project.

Q. Okay, that is the maximum daily allowable that you are looking for under your formula?

A. Yes, sir, at the present time.

Q. And you apparently feel that you will have some difficulty in injecting an amount of water which would equal the reservoir voidage at that rate?

A. No, I don't know how to answer that. I believe we will be injecting above reservoir voidage but this phrase, "and its associated gas", when you tack that on there as produced oil plus associated gas that makes any calculation of voidage that might be -- well, your statement is true, your statement is true, that's a possibility, I back up. When you said that we're afraid that we might not be able to inject voidage?

Q. Yes.

A. That's true, not as far as the oil goes but when you get the associated gas onto it.

Q. Is there any way that you can achieve this level of production that you have projected here in 1980 in excess of ten thousand barrels a day unless you have a response to this injection?

A. No, sir, that's right.

Q. And to have a response you have to exceed voidage, right, your current voidage?

A. At fill up and at least equal the voidage after fill up.

MR. STAMETS: Any other questions of this witness?

MR. KELLAHIN: No, sir.

MR. BATEMAN: No further questions.

MR. STAMETS: If requested by the Examiner could Texaco furnish a sample of a pressure maintenance project report which might have some of these factors on it?

MR. TODD: You mean a monthly report?

MR. STAMETS: Yes, if I wish to consider a report which had voidage in it could you make me up a sample and send it in?

MR. TODD: That calculation that we make on each project as a process of monitoring the project, the injection, the ratios, fill up volume, status of fill up and so on and so forth?

MR. STAMETS: Could you just go ahead and send me one of those as an example of that for my information?

MR. TODD: Yes, we will, sir.

(THEREUPON, a discussion was held off the record.)

MR. STAMETS: The only thing I'm not certain we covered is under 65-14 A(4) where it says that the Commission

must find that such unitization and adoption of one or more of the methods of unitized operation will benefit the working interest owners and royalty owners of the oil and gas rights within the pool or portion thereof directly affected.

Do you have a witness who will tell me that it will do that?

MR. BATEMAN: I have at least three.

MR. STAMETS: One will be fine.

MR. BATEMAN: Mr. Todd, in your opinion will the adoption of the pressure maintenance project that is proposed under this unitization agreement benefit the working interest owners and the royalty owners of the oil and gas rights within the pool or the portion thereof that is directly affected?

MR. TODD: Yes, it will.

MR. STAMETS: Any other questions of Mr. Todd? He may be excused.

(THEREUPON, the witness was excused.)

MR. STAMETS: Anything further in this case? The case will be taken under advisement.

REPORTER'S CERTIFICATE

I, SIDNEY F. MORRISH, a Certified Shorthand Reporter, do hereby certify that the foregoing and attached Transcript of Hearing before the New Mexico Oil Conservation Commission was reported by me, and the same is a true and correct record of the said proceedings to the best of my knowledge, skill and ability.

Sidney F. Morrish, C.S.R.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 5770, heard by me on 6-22, 1977.

Richard L. Stamets, Examiner
New Mexico Oil Conservation Commission