BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
December 6, 1962

EXAMINER HEARING

IN THE MATTER OF:

Application of Continental Oil Company for approval of a supplemental cooperative repressuring agreement, a plan of operation for gas and water injection, certain administrative procedures, and permission to produce more than 16 wells into a single tank battery, Maljamar Cooperative Area, Maljamar Pool, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for the continued operation of the Maljamar Cooperative Repressuring Area under the Maljamar Cooperative Agreement including the allowable provisions thereof, subject to the provisions of the 5th Supplemental and Amendatory Agreement to said Cooperative Agreement. Said 5th Supplemental Agreement, among other things, provides for the unitization of all oil and gas produced from the Grayburg-San Andres formations underlying the Participating Area defined therein. Applicant further seeks approval of an initial plan of operation under said agreement and approval of an administrative procedure for future expansions of the injection area and participating area, conversion of additional wells for injection purposes, and for transfer of allowables within the participating area. Applicant further seeks authority to produce more than 16 wells into a single tank battery.

CASE 2718

BEFORE: Daniel S. Nutter, Examiner

TRANSCRIPT OF HEARING

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

The next case will be 2718.

MR. DURRETT: Application of Continental Oil Company for

approval of a supplemental cooperative repressuring agreement, a plan of operation for gas and water injection, certain administrative procedures, and permission to produce more than 16 wells into a single tank battery, Maljamar Cooperative Area, Maljamar Pool, Lea County, New Mexico.

MR. KELLAHIN: If the Commission please, Jason Kellahin, Kellahin and Fox, Santa Fe, appearing in association with Mr. Harry Dippel and Mr. Frank Barell, members of the Texas Bar, and appearing in behalf of the Applicant in this case. We will have four witnesses whom I would like to have sworn, but prior to that, I would like to also mention that Mr. Marshall Rowley and Mr. Clark Storm and Mr. Jack Schull are also appearing as interested parties in this case. Would the witnesses please stand to be sworn?

(Witnesses sworn.)

MR. KELLAHIN: Because of the history and background of this case and the rather unusual nature of it, I would like to open the case with a few remarks.

Case No. 2718 is before the Commission's Examiner on the application of Continental Oil Company, as operator of the Maljamar Cooperative Agreement and Supplemental No. 5, seeking approval of Supplement No. 5 to the original Maljamar Cooperative Repressuring Agreement.

The effect of this supplement is to unitize the oil as well as the gas in a participation area in the Maljamar Pool, Lea County, New Mexico, to implement an expanded pressure

maintenance program. Continental is also seeking in this application, approval of the plan of operation, adoption of administrative procedure for future expansion of the injection and participating areas, for transfer of allowables within the participating area, authority to produce more than 16 wells into a common tank battery, and for other matters which will be further discussed in the testimony. In addition, the Applicant is seeking a continuation of the provisions of various orders, and consolidation of these provisions into a single order for the purpose of clarity and convenience.

The Commission is certainly familiar with the Maljamar Cooperative Repressuring Agreement as one of the oldest and perhaps most successful conservation operations in the State of New Mexico. This agreement is unique in New Mexico, and the operations under it as a pressure maintenance project has been highly successful. A brief review of the history of the Commission orders might be helpful:

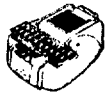
The initial agreement was entered into on August 5, 1941, as the first step of the owners of the Maljamar Pool to conserve reservoir energy and achieve, by cooperative effort, the greatest ultimate recovery of oil, coupled with the conservation of gas for which there was no market at the time.

On August 29, 1942, the New Mexico Oil Conservation Commission heard Case No. 36 -- the number will indicate how old this project is -- and entered its Order No. 485 on November 14,

1942, approving the Maljamar Cooperative Repressuring Agreement and its pressure maintenance program. The order unitized gas for repressuring within the cooperative area. Provision was made for expansion of the initial area by notification to the Commission from time to time. The order recognized the MCRA Operators Committee, and it provided a method for administrative approval of injection wells. A maximum allowable of 44 barrels for each 40-acre proration unit was set, together with provision for transfer of allowables for key wells.

Operations were carried on under the provisions of Order No. 485 for several years without modification. Then the Commission, in Case No. 56, Order No. 595, on March 28, 1945, approved a method for allocation of allowable production to the committed area by means of a void-space formula. This allocation formula is in effect at the present time. An acreage allowable of 15 barrels per day, a marginal well allowable of 20 barrels per day, and a void-space allowable are taken into consideration under this allocation plan.

From time to time the operators in the MCRA found it necessary or advisable to supplement their agreement. The first of these supplements, dated July 22, 1944, was designed only to commit additional acreage to the agreement in accordance with the provisions of Order No. 485. Supplement No. 2 came in October, 1949, and provided that additional control of the operations be vested in the operating committee.



The Commission on July 9, 1956, issued its Order No. R-841 in Case 1072, approving Kewanee Oil Company's application to inject water into the Pearl B No. 26 Well, the first approval of water injection in the MCRA area. The operators on November 16, 1953, had already approved their Supplement No. 3 to admit the Kewanee Pearl lease into the MCRA area.

The next major development was the order of the Commission, No. R-1075, entered in Case 1309, approving the operators' request for expansion of the Kewanee Oil Company pilot water injection program.

On December 1, 1959, the operators approved Supplement No. 4 to the Maljamar Cooperative Repressuring Agreement. This supplement incorporates previous supplements and the original agreement, and changed the name of the Maljamar Cooperative Repressuring Agreement to the Maljamar Cooperative Agreement, or the MCA, under which name the project is presently operating, with the Continental Oil Company as chairman.

In addition to the regular monthly allocation orders of the Commission, there has been a number of other orders affecting the Maljamar Cooperative Agreement area. These include orders for the conversion of producing wells to injection wells, injection wells to producing wells, unorthodox well locations, and other matters relating to the operation of the pressure maintenance program. A tabulation of orders, insofar as we can determine them, will be submitted to the Commission. This tabulation will set

forth the existing gas injection wells, unorthodox locations, and the location of the injection wells as approved by Order R-841 and R-1075 for the injection of water into the Grayburg-San Andres formations.

In the present case, to summarize, the applicant is seeking approval of Supplement No. 5 to the cooperative agreement, the effect of which is unitization of the liquid hydrocarbons, previous agreements approved by the Commission having unitized the gas production, which, in turn, has been utilized for repressuring the Grayburg-San Andres formation in the cooperative area.

The Supplement No. 5 gives full unitization to both gas and oil, whereas in the previous unitization, the gas was unitized for the purpose of repressuring.

The applicant, joined by the other owners, is seeking a consolidation of previous orders, which will be further discussed in the testimony to be presented. It is desired to carry forward the provisions of the previous orders, give approval to unitization of the area involved, continue approval of the pressure maintenance program by the injection of both liquids and gas into the Grayburg-San Andres formation in the Maljamar Pool, together with allowable provisions previously approved by the Commission and utilized in practice for many years over the life of this project.

With that summation, we would like to call for our first witness for presentation of testimony in this case, Mr.

Conrad R. Appledorn.

CONRAD R. APPLEDORN

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Would you state your name and employer, please?

A My name is Conrad R. Appledorn. I am employed by Continental Oil Company in Roswell, New Mexico, as a Senior Production Engineer.

Q Mr. Appledorn, have you previously testified before the Oil Conservation Commission of New Mexico and made your qualifications a matter of record?

A Yes, sir, I have.

MR. KELLAHIN: Are the witness' qualifications acceptable?

MR. NUTTER: Yes, sir.

Q (By Mr. Kellahin) Are you familiar with the application which has been filed in Case No. 2718, and with Exhibit 1 which is attached to the application and which we also offer as a separate exhibit here?

A Yes, sir.

(Whereupon, Applicant's Exhibit No. 1 marked for identification.)

Q Would you identify Exhibit No. 1 and discuss the contents

of it?

A Exhibit No. 1 is the Supplemental and Amendatory Agreement to the Maljamar Cooperative Agreement, Supplement No. 5. The Supplement establishes a fully unitized participating area for the purpose of continuing and expanding pressure maintenance operations of the Grayburg-San Andres formations on a fully unitized basis. The Cooperative Area will remain as established by the Maljamar Cooperative Agreement.

Q Would you please describe the Maljamar Cooperative Area?

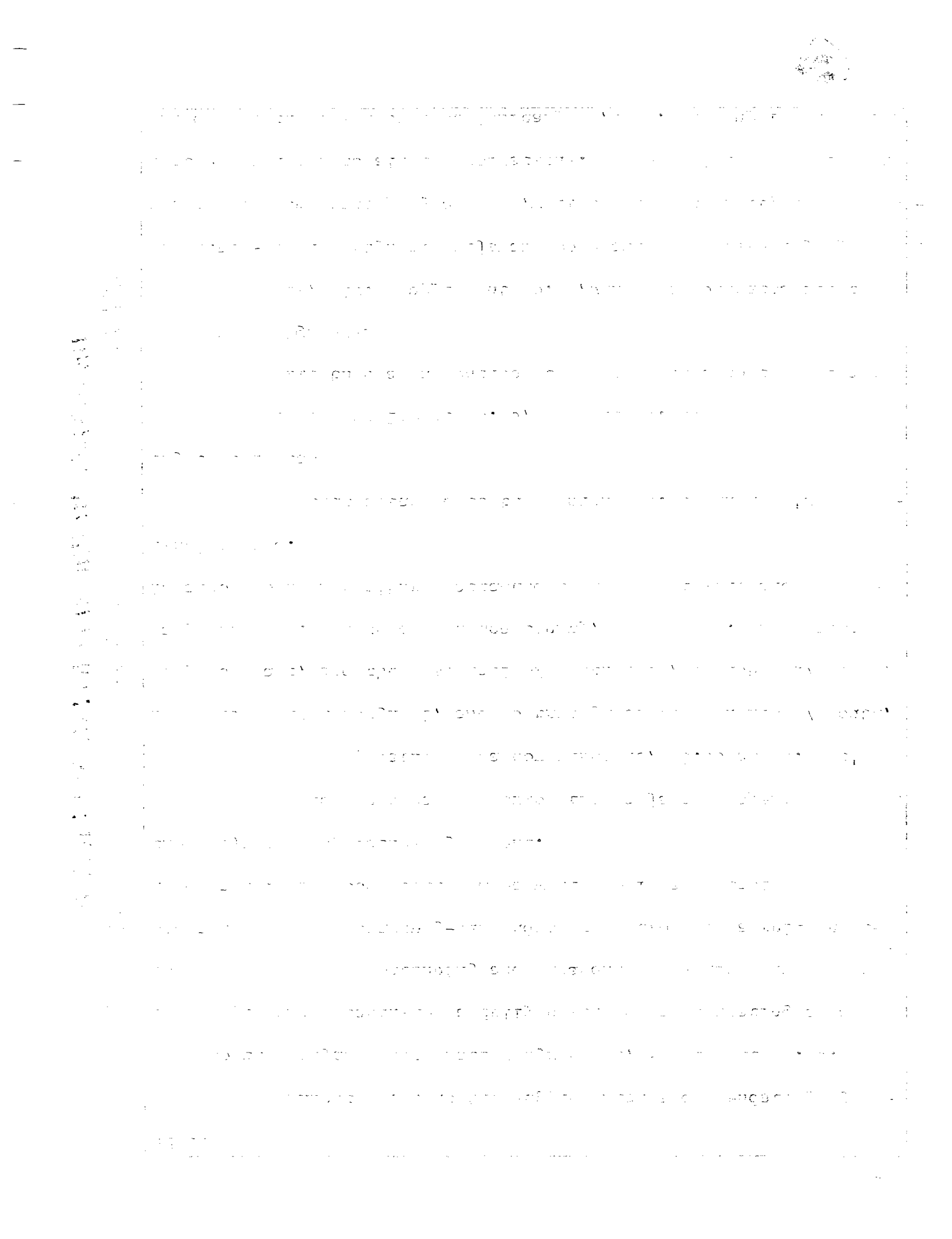
A The Cooperative Area comprises 13,786.66 acres. It's in Sections 14 through 23, and 25 through 35 in Township 17 South, Range 32 East, and the West Half of Section 30, Township 17 South, Range 33 East. These are in Lea County, New Mexico. This area is also shown on Exhibit A attached to the Supplement and is outlined in red.

Q Is that attached to the Exhibit No. 1 which we're offering in this case?

A Yes. Supplement No. 5, Exhibit No. 1.

Q Will this area continue to be committed to the Maljamar Cooperative Agreement?

A Yes, sir. Supplement No. 4,which consolidated all the original--or the original Maljamar Cooperative Repressuring Agreement and all the Amendatory Agreements,will continue to apply to the Cooperative Area and to all the formations. A copy of this supplement was filed with the Commission on February 24,1960. The Supplement No. 5



will amend Supplement No. 4 only in its application to the unitized formations within the participating area.

Q Will you please summarize the provisions of Supplement No. 4 that are amended by the provisions of Supplement No. 5?

A Well, Supplement No. 4 is a Cooperative Agreement. It's between parties which have lands in the Cooperative Area, and provides for the conduct of pressure maintenance operations in certain formations underlying the Cooperative Area. Control of pressure maintenance operations is vested in an Operators Committee, who, in turn, have delegated the conduct of these operations to Continental under a companion Operating Agreement.

According to the terms of Supplement No. 4, oil, gas and associated hydrocarbons are considered to be produced cooperatively, and as such, are controlled by each Operator individually. The net withdrawals from the reservoir, however, are controlled by the Operators Committee with the approval of the Commission. Gas is considered to be unitized insofar as its use is controlled for pressure maintenance operations. All of the gas produced from the Cooperative Area is dedicated to pressure maintenance and is subject to processing in the plant, and the Operators Committee determines the amount of that gas that's to be returned to the field.

Voting Interest in the Cooperative Area is based on the number of 40-acre proration units having producing or injection wells within this Cooperative Area.

Now, Supplement No. 4 is amended by Supplement No.5 in order

to provide for fully unitized operations in the Grayburg-San Andres formation within the Participating Area. Oil, gas and all associated hydrocarbons are fully unitized and are allocated to the various tracts according to the tract participations as shown in Supplement No. 5. Continental is designated as Unit Operator, and will perform all operations in the Participating Area under the direction of the Operators Committee.

To accomplish all this, Supplement No. 5 amends Supplement No. 4 in matters relating to unitized and cooperatively produced substances, the allocation of unitized gas, functions of the Operators Committee, pressure maintenance and secondary recovery operations, and the effective date and term. Administrative provisions in Supplement No. 4 are likewise modified to accomplish the requirements for full unitization.

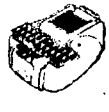
Q Will you please describe the Participating Area as it has been established by Supplement No. 5?

A This area will include 8,055.16 acres. It's described in Section II on pages 4 and 5 and also shown outlined in green in Exhibit A attached to Supplemental Agreement No. 5, which is Exhibit No. 1.

Q What vertical interval is being unitized by this?

A The unitized interval will be the Grayburg-San Andres from the top of the Grayburg to a depth of 700 feet subsea. This is described in Section III on page 6 of the Agreement.

Q What's the purpose of this unitization, Mr. Appledorn?



A This unitization will permit the working interest owners within the Maljamar Cooperative Agreement Area to conduct additional pressure maintenance operations and secondary recovery operations, supplementing the present gas injection pressure maintenance program, in the Participating Area.

Q Who is the Unit Operator?

A Continental Oil Company has been designated Unit Operator by Section V, Page 10 of the Supplement No. 5 Agreement, and will operate the Participating Area.

Q Does the agreement contain any provision for the election of a successor Unit Operator?

A Yes, sir. Sections VI and VII, on pages 10 through 12, will provide for the election of a successor if that becomes necessary.

Q How was the Participating Area in this project established?

A This area includes all 40-acre proration units which are now committed to the Maljamar Cooperative Agreement and on which a well had been drilled and had produced prior to January 1, 1959. This cut-off date accounts for the irregular shape of the area.

Q How was the cut-off date of January 1st, 1959, selected?

A The Operators determined this date because at that time they began negotiations for the allocation of equities within the Participating Area.

Q They felt that a cut-off date was essential in order to

negotiate?

A Yes, sir.

Q Are there wells within the Maljamar Cooperative Agreement Area completed prior to January 1st, 1959, that are not within the Participating Area?

A Yes, sir. There were three wells at that time on three separate tracts. These tracts were the Kersey State Lease, Tract 43, and the Wallingford State Lease, Tract 47 in Section 32; and also the Hudson and Hudson Federal Lease, Tract 10 in Section 15. At that time each of those tracts had one well.

Q Are these tracts committed to the Maljamar Cooperative Agreement?

A No, sir, they are not.

Q Were all the Operators within the Maljamar Cooperative Agreement Area who had a well completed prior to January 1st, 1959, given an opportunity to commit their wells to the Maljamar Cooperative Agreement and to join the Participating Area?

A Yes, sir, they were.

Q On what basis do the tracts participate in the Unit?

A Participation in the Unit was negotiated; the parties took into consideration such factors as cumulative production, the net effective pay volume, the producing life of the wells, the effect of prior gas injection, and any other factors which may have affected the remaining recoverable oil.

Q Are the applicable tract participations shown on Exhibit

B?

A Yes, sir, Exhibit B is the schedule of tracts and shows the participation assigned to each tract.

Q Does the Agreement provide for further expansion of the Participating Area?

A Yes, sir. Section IV, Pages 7 through 10, provides for expansion of the Participating Area. Tracts within the Cooperative Area can be added to the Participating Area with the approval of the working interest owners, the Commissioner of Public Lands of the State of New Mexico, and the Director of the United States Geological Survey. Participation for these tracts will be negotiated. The Section also provides that the Participating Area cannot be contracted. Section XXII on Pages 23 and 24 provides for subsequent joinder by working interest and royalty owners to this Agreement, and the correlative provisions of Supplement No. 4 will continue to apply as to the Cooperative Area.

Q Now basically, Mr. Appledorn, does this supplement contain all of the elements which are normally found in a Unit Agreement affecting State and Federal lands?

A Yes, sir.

Q On what date does the Agreement become effective?

A It will become effective at 7:00 A.M. on the first day of the month following ratification of the Agreement by 100 percent of the working interest owners, and approval of the Agreement by the Commissioner of Public Lands of the State of New Mexico, and

the Director of the United States Geological Survey.

Q Have you examined Exhibit No. 1 which has been offered as an exhibit in this case, and determined if that is a Supplement No. 5 which was signed by the Operators?

A Yes, I have.

MR. KELLAHIN: At this time we would like to introduce into evidence Exhibit No. 1.

MR. NUTTER: Exhibit No. 1 will be admitted into evidence.

(Whereupon, Applicant's Exhibit No. 1 admitted in evidence.)

MR. KELLAHIN: That's all the questions I have of the witness.

MR. NUTTER: Are there any questions of Mr. Appledorn?

CROSS EXAMINATION

BY MR. NUTTER:

Q Does this Supplement No. 5 actually go into the parameters that were the determining factors in figuring the participation which is outlined in the back of the Supplement?

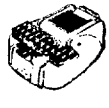
A No, sir, it does not.

Q Parameters are not here?

A No, sir.

Q Does it actually spell out the effective time that this Unit will be effective, the first of the month following --

A Yes, it does.



Q Where would that be?

A It becomes effective -- that's shown in Section XII on Page 16 of the Agreement.

Q Could you briefly go into the details of the parameters for participation?

A The participations within the Participating Area were negotiated between the working interest owners.

Q So they all don't have the same negotiated value, is that it?

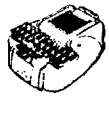
A Well, each working interest owner determined the requirements and then they sat down and worked them out. Now the allocations between the various tracts belonging to each working interest owner was then decided on the basis of 50 percent net effective pay and 50 percent cumulative production.

Q So while the individual tracts were negotiated to determine the net effective pay, possibly --

A Yes.

Q -- the basic principle of 50 percent net effective pay and 50 percent accumulative production applies to all tracts? The same formula applies to all?

A Yes, that's right. Maybe I didn't understand that. Each working interest owner, or the working interest owners sat down in a meeting and negotiated the participation by working interest owners between themselves; and then after the negotiations of these participations, the participations were then delegated to



each of the tracts on the basis of 50 percent cumulative production as of 1/1/60 and 50 percent net effective pay. The net effective pay map will be submitted by a later witness.

MR. KELLAHIN: If the Examiner please, we do have one of the engineers present who can testify to that, if you want that testimony.

MR. NUTTER: Yes, sir.

MR. KELLAHIN: We hadn't planned to offer it, but we can do so.

MR. NUTTER: I think it would be in the interest of a complete record to know the actual principles that were used to assign the values assigned to the various tracts.

Q (By Mr. Nutter) Tract No. 43 had the wells completed on it on 1/1/59, but was not committed to the Cooperative Agreement, is that the deal?

A No, sir, that's correct. It was not committed to the Cooperative Agreement.

Q Tract No. 47 the same?

A Yes, sir, that's right.

Q Tract No. 10 up in Section 15, the Hudson and Hudson had wells completed on that?

A Well No. 1-X was completed at that time. Now the Wallingford Lease, Tract No. 47, was completed and then was abandoned. It produced a very small amount of oil, and Mr. Wallingford didn't commit his tract to the Unit.

Q What's the status then of all the rest of the leases that are in the area but outside of the green line? They didn't have wells on them?

A No, sir, they did not have wells completed as of 1/1/59.

Q So those three tracts were the only ones in the red area that had a well completed on it --

A Yes.

Q --that isn't in the Participating Area now?

A Yes, that's right.

Q The tracts that have been completed since January 1st of 1959 that have wells on them which have been completed --

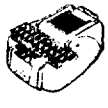
A Yes, sir.

Q -- will be permitted to come in on a new negotiated basis, is that it?

A Yes, sir, that's right. We have provisions for expansion of the Participating Area, as we've testified, and there are also -- or it has been discussed that they can be worked cooperatively. However, there are provisions for expansion of the Participating Area.

Q Under the old Cooperative Agreement up to and including the Fourth Supplement, the gas was unitized but the oil on the individual tracts was not?

A The gas was unitized insofar as its use was required for pressure maintenance in the field, and that was the only hydrocarbon that was unitized.



MR. KELLAHIN: Could I make a statement here, please?

MR. NUTTER: Yes.

MR. KELLAHIN: The order that unitized the gas in the field, just read, it was unitized; then it went on and made a provision as to how it was going to be used, there being no market for it at the time. The Operators have used that as the gas that was used --

Q (By Mr. Nutter) But each tract stood on its own as far as oil was concerned?

A Yes.

Q Now under the Fifth Supplement, all oil and gas in the Grayburg and San Andres are unitized?

A Yes.

MR. NUTTER: Any further questions of Mr. Appledorn? He may be excused.

(Witness excused.)

MR. KELLAHIN: I would like to call as our next witness Mr. Bill Mead. He has not been sworn as a witness.

(Witness sworn.)

W. A. MEAD

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Will you state your name, please?

A W. A. Mead.

Q By whom are you employed and in what position?

A Continental Oil Company, Division Superintendent for the Roswell Division.

Q In your position as Division Superintendent for Continental Oil Company in the Roswell Division, did you have anything to do with the negotiation of participating interests in the area covered by Supplement No. 5 to the Maljamar Cooperative Agreement?

A Yes, sir.

Q What role did you play in those negotiations?

A I represented Continental Oil Company in the negotiations with the other Operators in the MCA.

Q Are you in a position, then, on the basis of personal experience, to tell the Examiner the manner in which the participations were negotiated?

A Yes, I think so. I can briefly review it.

Q Would you please do so?

A Because of the age of the Maljamar Field, and because of the lack of data, logs, core analysis data, and any other information that we might have to arrive at any technical equities, it was quite difficult and we found it impossible to establish a fixed formula which was acceptable to all Operators.

A report was made by an independent consultant, and a number of parameters were considered by him, and there was a great

variation in these different parameters by various operators in assigning equities to the individual operators' tracts. Because of this and because of the fact that the different operators applied different weight to these various factors, and considered one factor more important, or considered one factor more important than another, we found it impossible, as I've mentioned, to arrive at a fixed formula.

However, each Operator had in mind approximately what he considered was a reasonable equity for his company. This equity he considered was based on his opinion as to the value of various parameters. Therefore, as a result, the equities by companies were agreed upon, and once these equities by companies were agreed upon, the allocation to the individual tracts of each of these companies was based on 50 percent cumulative production and 50 percent net acre feet.

MR. NUTTER: Now, Mr. Mead, each tract was given a value back here in Exhibit B?

A Yes, sir.

MR. NUTTER: Now a tract participation factor, that tract participation factor -- I am not making myself clear, I don't think. Let's take two tracts here on your Exhibit A in the Supplement. Over in Section 29 and 30, Tract 27 and Tract 28, two 80-acre tracts, and they each have two wells on them. Now haven't Schull et al negotiated a value for Tract 27?

A No, negotiated a value for both tracts together for

their total percentage in the Unit.

MR. NUTTER: Well, now, had both of them produced the same cumulative?

A No, not necessarily.

MR. NUTTER: But one value for both tracts was determined?

A One total value for the two tracts; then that total value was split up between the tracts, based on the 50 percent acre feet and 50 percent cumulative production.

MR. NUTTER: So each operator negotiated a value for all his property, and his property is divided up on cumulative production and the net effective pay?

A Yes, sir.

MR. NUTTER: I just wanted to get that point in the record, and I couldn't do it for a while. Any other questions of Mr. Mead?

MR. KELLAHIN: That's all the questions we have.

MR. NUTTER: He may be excused.

(Witness excused.)

MR. KELLAHIN: I would like to call as our next witness Mr. W. R. Hall.

W. R. HALL

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Will you state your name and employer, please?

A W. R. Hall, employed by Continental Oil Company as Division Landman, Roswell, New Mexico.

Q Approximately how long have you been Division Landman for Continental Oil Company, Mr. Hall?

A Twenty years.

Q Have you ever appeared before this Oil Conservation Commission as a Landman and made your qualifications a matter of record?

A Yes, sir, I have, but it was a number of years ago.

Q Have you, in your capacity as Division Landman, had anything to do with the Supplement No. 5 Agreement to the Maljamar Cooperative Agreement?

A Yes, sir.

Q Are you familiar, from a land standpoint, with the application in Case No. 2718?

A Yes, sir. The proposed fully unitized participating area in Supplemental and Amendatory Agreement to Maljamar Cooperative Agreement, Supplement No. 5, contains a total of 8,055.16 acres, being 280 acres or 3.476 percent State of New Mexico lands and 7,775.16 acres or 96.524 percent Federal lands.

Q I take it from the percentages you have given, then, that there is no fee acreage involved in this area?

A No, sir, there is not.

Q What percentage of the working interest ownership has executed Supplement No. 5 Agreement?

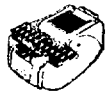
A One hundred percent of the working interest ownership has executed the agreement.

Q Has approval been given by the necessary agencies to Supplement No. 5 Agreement?

A Tentative approval has been given to Maljamar Supplement No. 5 Agreement by the Commissioner of Public Lands of New Mexico as to State lands, and tentative approval has been given by the Director of the United States Geological Survey as to Federal lands.

Q What progress is being made, Mr. Hall, toward obtaining ratifications to Supplement No. 5 from the override and oil payment interest owners?

A On October 30, 1962, or some five weeks ago, we forwarded from our Roswell Office twenty-nine ratifications to the various parties,being the total number of override and oil payment interest owners under the proposed participating area being contacted from our Roswell Office. There have been returned to us fourteen executed ratifications and we have received indications some three or four more of the ratifications will be obtained in the next several days. To date we have no indication from any of the overriding royalty or oil payment owners that they do not propose to execute the ratifications.



On November 29, or about one week ago, we issued a follow-up letter to those parties not having signed. We expect to be receiving results from this follow-up letter in the immediate future. To give some idea rather than numbers concerning the ratifications received to date, these ratifications represent slightly over 38 percent of the total overrides and oil payments burdening the proposed fully unitized participating area. There are additional oil payments on which ratifications are being solicited, and we expect to receive them in the near future.

Q Mr. Hall, do you anticipate any trouble in securing the ratification of the royalty owners and oil payment owners?

A We certainly have no indication that we are going to have any difficulty to the present time.

MR. KELLAHIN: That's all the questions on direct examination.

MR. NUTTER: Are there any questions of Mr. Hall? He may be excused.

(Witness excused.)

MR. KELLAHIN: I would like to call as our next witness Mr. Nance G. Creager.

NANCE G. CREAGER

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Would you state your name and employer, please?

A Nance G. Creager.

Q Would you spell that?

A C-r-e-a-g-e-r. I am employed by Continental Oil Company as District Geologist in Hobbs District.

Q Have you ever testified before the Oil Conservation Commission of New Mexico and made your qualifications as a geologist a matter of record?

A Yes, sir, I have.

MR. KELLAHIN: Are the witness' qualifications acceptable?

MR. NUTTER: Yes, sir, they are.

(Whereupon, Applicant's Exhibits Nos. 2 and 3 marked for identification.)

Q (By Mr. Kellahin) Now I direct your attention to what has been marked as Exhibit No. 2. Would you identify and explain that exhibit, please?

A This is a structure map of the Maljamar Cooperative Agreement Area, in Lea County, New Mexico. It is contoured on top of the San Andres formation with a contour interval of 25 feet. It shows the structure in the area to be a gently east dipping anticlinal nose. It is asymmetrical in cross section in that the south dip into the Delaware Basin is at a rate of 300 to 500 feet per mile. The northeast dip, towards the northwest shelf, is about 100 feet per mile. The strike of the beds on the

"Basin" side of the nose is in a well delineated east-west direction. The strike of the "Shelf" side of the structure is very poorly defined and can only be approximated as in a northwest-southeast direction.

The datum being mapped is actually an unconformity and is technically not a true stuctural datum. However, it is an easily picked point and very closely agrees with the true structural markers that have been mapped above and below the San Andres datum.

The Maljamar Field could be considered to be structural in appearance, but it must be defined as a stratigraphic type of reservoir. Its structural configuration is probably due more to depositional conditions than to tectonic folding, and the possibility of a commercial well is dependent almost entirely upon the proper stratigraphic conditions of sufficient porosity and permeability.

Q Now I direct your attention to what has been marked Exhibit No. 3. Would you please define the Grayburg-San Andres formations underlying the unitized area and give us a geologic description of the zones involved in the Maljamar Cooperative Area?

A Exhibit No. 3 is a Lane Wells' radioactivity log of the Continental Oil Company's -- formerly Kewanee Oil Company -- Baish "B" No. 36, located 554 feet from the north and west lines of Section 28, Township 17 South, Range 32 East. The Grayburg-San Andres formations are defined as follows:

The Grayburg formation is that formation occurring in the interval from the base of the Queen formation at 3419 feet to the top of the San Andres formation at 3797 feet. The Grayburg formation is picked at the top of a dense dolomite bed which in this well is 376 feet below the top of the Artesia Red Sand member of the Queen formation at 3043 feet. The Grayburg formation consists of some 350 feet of alternating beds of dolomite, sandstone, and dolomitic sandstone.

The San Andres formation extends from the base of the Grayburg formation at 3797 feet to an approximate subsea depth of minus 1400 feet. The top of the San Andres formation is characterized by a light grey massive dolomite bed below the basal Grayburg sandstone, which is commonly referred to as the Premier Sand.

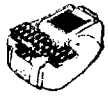
Q Have these intervals that you have discussed been marked on Exhibit 3?

A Yes, sir, they have, in red lines.

Q Have the productive intervals in these two formations been individually described?

A For convenience and simplicity, the United States Geological Survey and the field operators have given numbers to the known producing zones in the Maljamar Field.

The top of Zone 3 coincides with the top of the Grayburg formation. The top of Zone 7 is equivalent to the top of the San Andres formation. Only Zones 6, 7, 8, and 9 are considered to be



oil productive in the MCA area.

Q How are these zones delineated?

A Zone 6, the basal Grayburg sand member, averages about 110 feet in thickness. It is a fine-grained dolomitic sand. The degree of cementation varies widely. The color is usually a light tan to grey and occasionally red, due to included shale. Sandy dolomite stringers are common, and they vary in thickness and occurrence from well to well.

Zone 7 extends from the top of the San Andres formation to the top of the 8th or Lovington Sand, as it is commonly known. It averages about 120 feet in thickness. It is white to grey-tan in color, fine to medium crystalline, commonly anhydritic in the form of inclusions or fracture fillings, with occasional thin shale stringers, colitic zones, sandy zones, and fractures. The porosity is usually vuggy, although some is intergranular and colitic. The porous zone varies considerably in thickness and extent.

Zone 8 -- This zone, the Lovington Sand, averages about 90 feet in thickness. Although called a sand, it is predominantly of dolomite lithology. The dolomite is tan, light brown, and light to medium grey, fine to medium crystalline. The abundant anhydrite is usually found as inclusions or fracture fillings, although there are a few thin anhydrite beds. Shale stringers or silty dolomites are more common than in the zones above.

The sand beds are very fine grained, dolomitic, clean to shaly, grey to red. Porosity and staining is very erratic.

Zone 9 extends from the base of the 8th zone or Lovington Sand to the 9th zone water table at an approximate sub-subsea datum of minus 110 feet. The maximum thickness will be about 200 feet. The upper 100 feet contains most of the pay in wells where it is present above the water.

The dolomites in this zone are fine to medium crystalline, and generally much more anhydritic than above. The anhydrite occurs as inclusions, in filled fractures, and in beds up to 20 feet in thickness. There are fractured, sandy, sucrosic, and oolitic zones appearing in discontinuous beds. The vuggy porosity, where present, is generally good.

In summation, the 6th zone is frequently thought of as a sand, the 7th zone as a dolomite, the 8th zone as a sand, and the 9th as a dolomite. These are generalities. The 6th zone is the most widespread, the 7th and 8th are the most erratic in areal extent. The entire producing reservoir is characterized by wide variation in porosity, permeability, areal extent of the various zones, and net pay thickness of the individual zones. Based on logs and core analysis, an average porosity figure would be about 10.7 percent and an average permeability figure would be about 12 millidarcies.

Q Were Exhibits 2 and 3 prepared by you or under your supervision?

A Yes, sir, they were.

MR. KELLAHIN: At this time I would like to offer in

evidence Exhibits 2 and 3.

MR. NUTTER: Exhibits 2 and 3 will be admitted in evidence.

(Whereupon, Applicant's Exhibits Nos. 2 and 3 admitted in evidence.)

MR. KELLAHIN: That completes the direct examination.

MR. NUTTER: Are there any questions of Mr. Creager?

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Creager, is the water table in this area rather uniform, minus 110?

A No, sir. That is an average figure, I would say.

Q What does the range run?

A Can I ask a question? Mr. Coltharp?

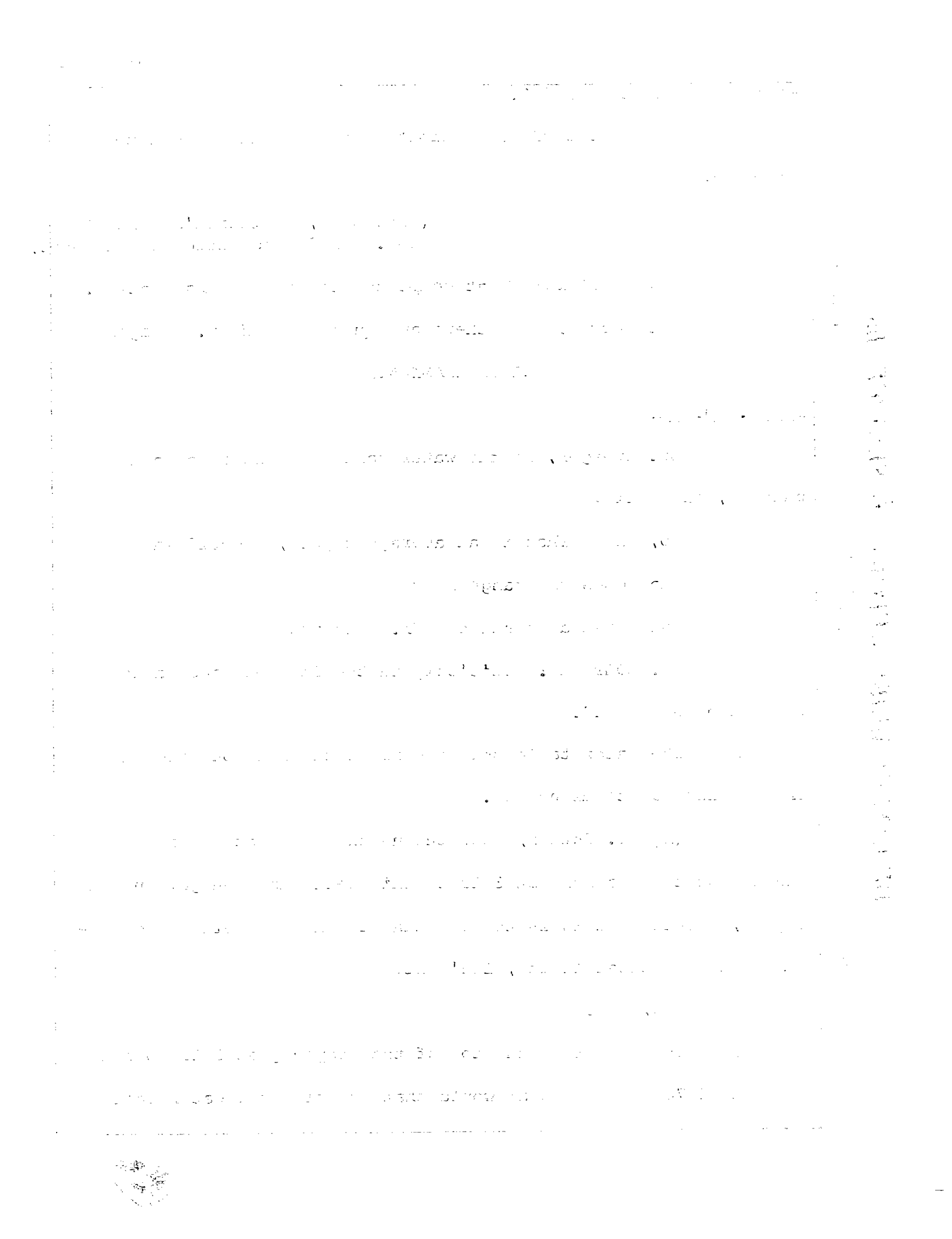
MR. COLTHARP: It's only in the 9th zone and varies from minus 50 to 210.

A The water table only occurs in the 9th zone and ranges from a minus 50 to minus 210.

Q (By Mr. Nutter) Now the unitized formations are from the top of the Grayburg at 3419 in this well that you gave us the log on, I believe this is the one that is the key well for determining the vertical limits, isn't it?

A Yes, sir.

Q They run from the top of the Grayburg at 3419 down to a depth of 700 feet subsea; would that be below the water table



in this well?

A Yes, sir.

Q Does the minus 700 feet subsea then go below the water table in every part of the participating area?

A I don't believe I understand your question.

Q Would the minus 700 feet subsea, which is the lower limit of the vertical limits of the unitized area, would that penetrate the water table in every well?

A Yes, sir.

Q In the unitized area?

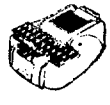
A Yes.

MR. NUTTER: Are there any other questions? He may be excused.

(Witness excused.)

MR. KELLAHIN: If the Examiner please, in my statement at the outset of this case, I made reference to some of the orders that affected the Area in the past. But in order to give some of the background of the testimony of the next witness, I would like to review some of the provisions of the orders.

As previously stated, the MCA pressure maintenance program was approved by Order 485 on November 14, 1942, wherein the Commission recognized the pressure maintenance program. Order No. R-841, which was approved in July, 1956, authorized the first injection of salt water into the Maljamar Pool. Water was injected into the Kewanee Pearl "B" No. 26 Well, located in Section 30,

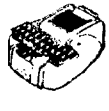


Township 17 South, Range 33 East.

Order No. R-1075 was approved October 23, 1957, and provided for the expansion of the area covered by Order No. R-841 to permit the injection of water into the Pearl "B" Well No. 21, located in Section 30, Township 17 South, Range 33 East, and in nine additional injection wells which were located approximately in the center of the MCA area.

The Operators Committee at that time contemplated unitization of the MCA with the expansion of the water injection program. Unitization of the MCA was discussed at the Operators Committee meeting which was held on June 27, 1957, and unitization proceedings have been carried on with negotiations since that date. The subsequent change in working interest ownership and the failure of the working interest and royalty interest ownership to agree on equities and the unitization agreements has delayed the final unitization. Supplement No. 5, which provides for unitization, has now been approved by the working interest owners. Approval of Supplement No. 5 by all interests no longer appears to be any problem, and therefore, concluding the initial plans of the Operators Committee to supplement the gas injection with liquid injection for the unitization insofar as the Grayburg-San Andres formation is concerned in the MCA.

With that summary, I would like to call Mr. Queen as our next witness.



JOHN A. QUEEN

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Would you state your name and your employer, please?

A My name is John A. Queen, employed by Continental Oil Company, Assistant District Superintendent, Hobbs, New Mexico.

Q Mr. Queen, have you previously testified before this Commission as a petroleum engineer and made your qualifications a matter of record?

A Yes, sir, I have.

Q In your capacity as Division Engineer, have you had anything to do with the Maljamar Cooperative Area and Supplement No. 5 and Plan of Operations as it has been adopted?

A Yes, sir, I have.

Q Have you been working on these for any length of time?

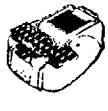
A Yes, sir, I have.

Q Would you tell the Commission approximately how long you have been acquainted with the problems of the Maljamar Cooperative Area?

A Since January of 1959.

Q Does the Maljamar Pool come under your jurisdiction as Assistant Division Engineer?

A As Assistant District Superintendent.



Q Pardon me.

A It does come under my supervision in the Hobbs District, yes, sir.

MR. KELLAHIN: Are the witness' qualifications acceptable?

MR. NUTTER: Yes, sir.

Q (By Mr. Kellahin) Would you present the immediating operating plans for the MCA, assuming approval of Supplement No. 5 by this Commission?

A In order to determine the most efficient fluid injection rates, injection pressures and the location of injection wells for the maximum economical recovery of oil from the unitized reservoirs, we propose to proceed with a continued pressure maintenance operation of gas and water injection designed to produce data for the resolution of these questions.

(Whereupon, Applicant's Exhibits Nos. 4 and 5 marked for identification.)

Q Now I direct your attention to what has been marked as Exhibit No. 4. Would you please identify that exhibit and discuss the principal aspects of it?

A Exhibit No. 4 is the initial Plan of Operation for the MCA Unit. As you will note, there is a map attached to Exhibit 4, and I would like to call your attention to this map. The MCA Unit, as you will note, lies primarily in Township 17 South, Range 32 East, and future reference to any Section in the MCA will

be to that township and range. There is one half-section, being the West Half of Section 30 in 17 South, Range 33 East, that I will specifically name, if a description is required of that part of the MCA.

With reference to this map, the cross-hatched area in the approximate center of the map outlines the first expansion of the Kewanee Pilot Waterflood in the Maljamar Pool. This was approved by Order R-841. Order 1075 approved the nine injection wells shown in the cross-hatched area by a small triangle over the well location. As you will note, four of these approved injection wells are colored in red. It is proposed to place these four wells on immediate injection upon approval of Supplement No. 5 by this Commission.

With reference to these four wells colored in red, the northern-most well which is found in Unit K of Section 21 is the Baish "A" No. 21. It is presently a producing well. The easterly and most westerly wells colored in red are present gas injection wells. The eastern well is found in Unit B of Section 28, and the western one in Unit D of Section 28. These two wells are, as I have said, present gas injection wells to be converted to water injection. The fourth well on the south is found in Unit F of Section 28, and is a well to be drilled, and it will be an injection well. These four wells were approved and their exact locations are shown in Order R-1075. A producing well, which is colored in green within the cross-hatched area and is located

to be 25 feet from the south line and 1325 feet from the west line in Section 21 of Township 17 South, Range 32 East.

Q What was the provision of Order R-1075 in regard to that well?

A Order R-1075 scheduled the well as a water injection well.

Q And what is its status at the present time?

A This well is not drilled at the present time, and it will be drilled as a producing well and for the initial injectivity program.

Q Why does the Operator propose to use only a part of the injection wells approved by Order R-1075?

A It is believed that the proposed injectivity tests will provide sufficient engineering data to determine the most efficient pattern in recovering oil from the MCA. The determination of certain injectivity data and the ultimate pattern was of course the purpose of the pilot expansion as approved by Order R-1075.

Q Does the Operator have additional plans for the injection program presently being conducted on the Pearl Lease?

A Yes, sir. As shown on this same map we are referring to,on the eastern edge there is another cross-hatched area, and the Pearl "B" No. 21, which is found in Unit H of Section 25, was approved by Order R-1075 to be converted from a producing well which it is now, to a water injection well.

Q Why is this being done at this time?

A Well, the producing wells offsetting the Pearl "B" No. 26, which has been on water injection for some time and was approved by Order R-841, have responded to the injection with water into the No. 26 well. This injection of water into the Pearl "B" No. 21 will provide for additional stimulation of oil and also provide additional engineering data on the 6th zone regarding pressures, rates and injection profiles.

Q Is the Pearl "B" No. 26 pilot area representative of the remaining MCA area, in your opinion?

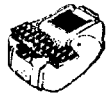
A No, sir, I don't believe it is. In the first place, only the 6th zone is productive in that area of the field, while the 6th through 9th zones are productive over the biggest portion of the MCA. Furthermore, the injection pressures and rates do not appear to be representative of even the 6th zone on data obtained from other Grayburg reservoirs under water injection in the vicinity of the MCA.

Q You have made reference to zones by numbers, six and on through nine. Are those the same zones that were testified to by Mr. Creager?

A They are.

Q What additional plans does the Operator propose upon approval of Supplement No. 5?

A It is planned to construct a water supply line from the MCA water leases to the MCA area, to install a water injection



system and to consolidate sufficient tank batteries to separate wells inside and outside of the boundaries of the Participating Area. The location and use of certain water leases were presented to the Commission during the hearing resulting in Order R-1075.

Q What procedure do you propose for expanding the plans you have just presented?

A Sufficient engineering data, such as cores, logs, pressure and injection data,and so forth,will be obtained during the proposed operation to determine the proper expansion. When this phase has been concluded and the Operator is ready to expand the program beyond the provisions of Order R-1075, a Supplemental Plan of Operation will be filed with the Commission for administrative approval.

Q With reference to what has been marked as Exhibit No. 5, which was referred to in my opening remarks, would you explain to the Commission the purpose of this exhibit?

A Exhibit No. 5 is a table listing the present gas injection wells in the MCA, the wells or locations approved for water injection, and the producing and/or injection well non-standard locations. This table also sets forth the order or date of administrative approval whereby this Commission approved these different categories.

Q Since these injection wells and non-standard locations have been approved by the Commission prior to this time, why is Exhibit No. 5 presented in this case?

A It is the Operator's intent that Exhibit 5 be made a part of this hearing so that the previous orders and administrative approvals applicable to this case would be made a part of the order resulting from this hearing and thereby consolidate the previous approvals. It would appear that a consolidation of previous orders into one would be a more workable situation for both the Commission and the Operator.

Q Mr. Queen, on approval of Supplement No. 5 by this Commission, do you propose any adjustment in the present method of prorationing for the Grayburg-San Andres wells lying within the MCA?

A The same administrative procedure as set up by Orders 485 and 595 will be followed. The MCA Engineering Committee will continue to submit to the Commission a Monthly Allocation Plan for their approval, which they have done since 1945. The re-allocation to the respective proration units will be effected only by the combining of several leases into the area defined as the Participating Area. The MCA will then consist of seven committed producing leases, of which one will be the Participating Area.

Q Do you propose to continue the semi-annual bottom hole pressure and gas-oil ratio tests for the preparation of this Monthly Allocation Plan now in effect?

A Yes, sir, we do.

Q With the final approval of the unitization of the MCA, do you propose any changes in top allowable request?

A No, sir. The top proration unit allowable of 44 barrels per day would be retained as established by Order 485 in 1942.

Q Do you propose to utilize the same method of calculating the MCA allowables that you have been using prior to this hearing and as approved by Order 595?

A Yes, sir, the use of the current void-space formula would be continued. The transfer of the top unit allowable for any shut-in well and the transfer of the difference between the calculated void-space allowable of a well and its MER is requested. This allowable would be transferred to a top unit allowable well capable of producing this transferred allowable under the conditions of the void-space formula.

Q You used the term "MER"; would you define that, please?

A The term "MER" is abbreviated in my testimony for maximum efficient rate. The maximum efficient rate of a producing well is that rate of oil, gas and water production that the well can produce for a period of time without producing excess gas and/or causing an excessive drawdown in bottom hole pressure.

Q In your opinion, would this procedure remain in line with the original use of the void-space formula for allocation within the Cooperative Area?

A Yes, sir, it would.

Q From an engineering standpoint, what does the void-space allocation plan do?

A In general, the void-space formula controls allowable

production by giving consideration to the amount of reservoir space voided from a proration unit. The formula recognizes the changing conditions of bottom hole pressure and gas-oil ratio, with depletion of the reservoir, and assigns each well a proportional part of the total void space allowable.

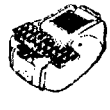
Q Does this mean that under the void-space formula, the reservoir is prorated as a result of reservoir withdrawals rather than stock tank oil production?

A Yes, sir, in this pressure maintenance program this is true.

Q Order No. 595 provides for an acreage allowable up to but not exceeding 15 barrels daily; however, the Monthly Allocation Plan has provided for an average acreage allowable of 10 barrels per day since 1948. Order No. 485 provides for a marginal well allowable of 20 barrels a day. Do you propose to maintain these allowable classifications with the void space allowable?

A Well, it is proposed to maintain the acreage allowable; however, from an engineering standpoint, it would be more equitable to eliminate the 20 barrel per day marginal well status from the overall allocation plan. This would place all wells under the acreage allowable and the void space formula, which we propose to retain. This, then, would distribute the allowable in accordance with reservoir conditions and each well's producing characteristics.

Q Referring to the void space formula, does this mean that each well is allowed to void an equal number of reservoir barrels of oil and gas to produce its stock tank allowable?



A Yes, it does.

Q What justification is there for transferring top unit allowables from a well to be shut in to another producing well?

A Under the void space formula, each proration unit is allowed to produce an equal reservoir volume of oil and gas under reservoir conditions to produce its void space allowable. This reservoir volume may be determined by multiplying the top void space allowable times the maximum void space factor of a well assigned a top allowable under the provisions of the void space formula. A reduction in gas production or an increase in bottom hole pressure as the result of shutting a well in would, in effect, be reserving a reservoir volume equal to the top void space allowable. An equal reservoir volume should then be allowed to be produced from wells capable of producing this transferred allowable under the void space formula.

Q You previously requested that allowables be transferred on two types of wells. Under what other circumstances do you propose to transfer allowables besides the shut-in well classification?

A Well, if a well is incapable of producing its calculated void space allowable, then the difference between its capability and that allowable assigned by the void space formula would be available for transfer to wells capable of producing the top unit allowable under the void space formula.

Q Mr. Queen, do you have exhibits prepared which demonstrate the void space formula on wells?

A Yes, sir, we have Exhibit 6, which has been previously passed out to the Commission.

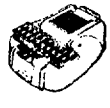
(Whereupon, Applicant's Exhibit No. 6 marked for identification.)

Q Would you please explain Exhibit No. 6?

A Exhibit No. 6 is a bar graph presentation of the void space formula and acreage allowable on a reservoir voidage basis, and it depicts five representative cases of well performance with the marginal well classification eliminated. As you will recall, I have just recommended that under our proposed procedure the present marginal well classification be eliminated from the allocation plan.

I might briefly describe this exhibit before we get into a discussion of it. As you will note, along the top are five wells depicted by cases "A" through "E". Under each case is the well name that that case actually depicts by calculation of the void space formula; the reciprocal void space factor, as shown by "R.V.S.F.", then underneath this is the well test in barrels per day for each of these different wells.

Along the left-hand side of this exhibit is a scale depicting reservoir voidage space. As you will note, there is a zero or reference line colored in red. Above this red reference line, it depicts the reservoir voidage due to the application of the void space formula. Below this red or zero line it depicts the reservoir space voided to the application of the acreage



allowable. Furthermore, this exhibit, each of the cases within the exhibit is broken into a left hand and a right hand side. The left represents the calculated allowable and the right represents our proposed allowable. I would like to make it clear to the Examiner that this is the proposed, both of these sides represent one case, and they represent our proposed procedure. We have not prepared this example on the present method of allocation, of which it could easily be done; it would still apply. This is our proposed procedure, the left being that calculated and the right being the assigned allowable from the calculated.

In all cases, the oil volume is represented by the green portion, and the associated gas production is represented by the yellow portion. Again, measured from the zero line or red line, up,so many barrels of reservoir space voided; or, down, so many barrels of reservoir space voided, whichever applies.

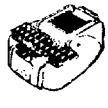
In Cases "A", "B", and "C", the effective and calculated allowables are identical. In other words, the calculated allowable for Cases "A", "B", and "C" is the effective or assigned allowable or current allowable, whichever word you would care to use. However, in Cases "D" and "E", the effective allowable is less than the calculated allowable as a result of the well's incapability to produce the calculated allowable under the void space formula, and as you will note, the calculated allowable on the left is one figure and that on the right is another figure, which is the effective allowable from our proposed procedure.

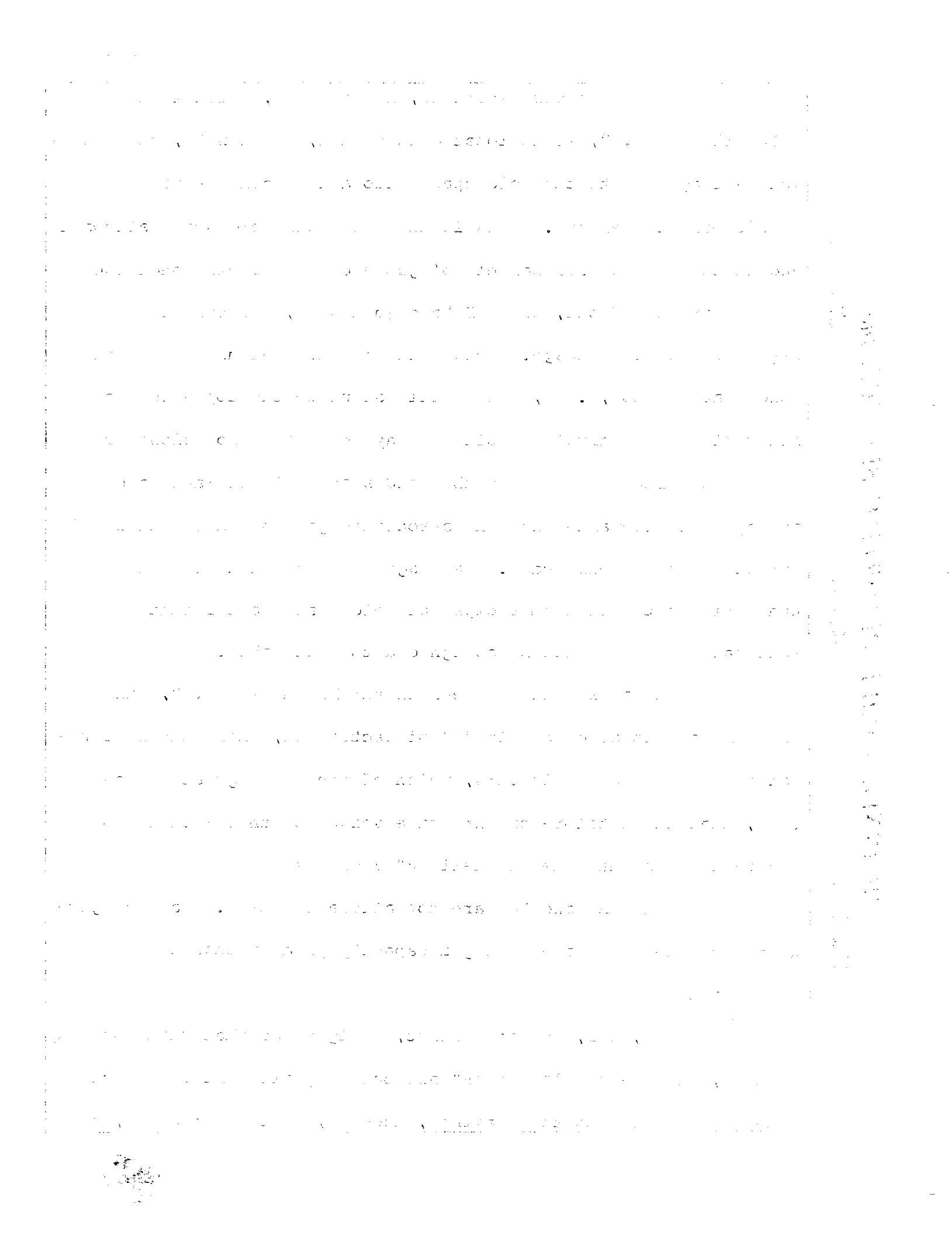
Now to be more specific, in Case "B", which is the Mitchell "B" No. 7, it is located in Unit L, Section 20, the reservoir voidage due to the void space allowable reaches a maximum of 343 barrels per day. This is the reservoir void space allowable and it consists of 309 barrels of gas under reservoir conditions and 34 barrels of oil, or as I have just said, 343 barrels per day of reservoir voidage. This well has the minimum reciprocal void space factor, .099, which will calculate the top void space allowable of 34 barrels of oil per day under the provisions of Order 595. The summation of the void space oil allowable and acreage oil allowable with the associated gas for this well is 444 barrels of reservoir space. Now again I would like to point out that this is the minimum reciprocal void space factor that a well can have and still be assigned a top allowable.

It can readily be seen in the Baish "A" No. 2, which is Case "A" and located in Unit "B" of Section 21, where the reciprocal void space factor is .164, which of course is greater than .099, that the total reservoir space voided by this well is considerably less than the Mitchell "B" 7 or Case "B".

Q Both "A" and "B" are top allowable wells. Can you give us an example of a case having a capacity greater than its void space factor?

A Yes, sir, we can. First, I might add that what you say is true, that Cases "A" and "B" are both top allowable. I would like to point out to the Examiner, however, that in Case "A", the





Baish No. 2, it voids less reservoir space to produce its top void space allowable of 34 barrels per day, and this will be discussed later. In reply to your question as to the well which does not have a top allowable, the Baish "A" No. 7, which is in Unit F of Section 21, illustrates a well -- this is Case "C" -- illustrates a well having a capacity greater than its calculated void space allowable. The reciprocal void space factor for this well is .046 which limits the void space allowable to 16 barrels per day plus the 10 barrels of acreage allowable gives a total allowable for this well of 26 barrels. This, of course, is less than the well's capability of 35 barrels per day. To fully point out the meaning of Exhibit 6, the left-hand column of "C" utilizes 343 barrels of void space allowable, reservoir void space allowable, in producing its calculated void space allowable.

Now in Case "D", which is the Simon "N" No. 5 found in Unit I of Section 29, this well depicts a well incapable of producing the calculated void space allowable. As you will recall, Case "C" had a capacity greater than its calculated void space allowable. The Simon "N" No. 5 has a reciprocal void space factor of .082 which calculates, under the void space formula, to be 28 barrels of oil per day plus 10 barrels of oil per day acreage allowable, or a total of 38 barrels of oil. This again is shown on the left-hand side of Case "D" in the green and yellow shaded areas. Although this well's calculated allowable is 38 barrels of oil per day, its capability limits this well to 15 barrels of

oil per day.

Case "E", which is the Baish "A" No. 16 of Unit I, Section 21, is a well with a reciprocal void space factor of .0157, or a fairly low reciprocal void space factor. This low factor limits the well to six barrels of oil per day for the void space allocation, plus the 10 barrels per day for the acreage allocation, thereby giving the well 16 barrels of total allowable. Now the well's present capability is 12 barrels of oil per day. This well has a total calculated reservoir voidage of 979 barrels per day as compared -- let me just find where I obtained my 979 barrels. In the left-hand column of Exhibit 6, the void space allowable is made up of 337 barrels of gas under reservoir conditions, six barrels of oil, 10 barrels, this is the void space allowable; 10 barrels of oil under the acreage allowable and associated, 626 barrels of gas under reservoir conditions, to produce the 10 barrels of oil.

Now the jagged line in this lower part merely means that this does not depict the full bar length of this, due to the space of the graph. This, as I have just testified, this calculated allowable amounts to 979 barrels of void space for both the void space allowable and the acreage allowable, and compares, for example, with the Mitchell "B" No. 7, Case "B", which voids 444 barrels of reservoir space to produce its allowable of 44 barrels per day. The actual well production under Case "E" would be 763 barrels of reservoir space to produce the 12 barrels of oil; and as previously

stated, by its reciprocal void space factor, it's a fairly inefficient well.

Q Mr. Queen, you have proposed the transfer of allowables in this participating area, have you not?

A Yes, sir, we have.

(Whereupon, Applicant's Exhibit No. 7 marked for identification.)

Q Do you have an exhibit prepared which demonstrates the effect of transfer of allowables utilizing the void space formula?

A Yes, we have Exhibit 7, which has been previously submitted to the Commission.

Q Would you discuss the information shown on Exhibit No. 7?

A Well, Exhibit 7 is a bar graph similar to Exhibit No. 6, actually the scale on the left and each well representing an individual case, "A" through "E", along the top, are identical to those on Exhibit 6. However, Cases "D" and "E" on this Exhibit 7 depict the allowables to be transferred to top allowable wells under the void space formula. Now the daily reservoir voidage to be transferred to top allowable wells is indicated as the red cross-hatched section in the right half of these two cases, Case "D" and Case "E", red cross-hatched area. The red cross-hatched area is calculated utilizing the minimum reciprocal void space factor of a top allowable well, the Mitchell "B" No. 7. This is the minimum that the reciprocal void space factor calcula-

tion, under any other well that allowable can be transferred to, would be in the direction of the Baish "A" No. 2, Case "A", and therefore would reduce the reservoir voidage transferred.

Now Case "D", to be more specific and to explain this, is Simon "N" No. 5 Well, as on the Exhibit 6. This well is currently able to produce only five barrels of the 28 barrels of stock tank oil per day calculated by application of the void space formula. Therefore, 23 barrels of stock tank oil would be available for transfer to top allowable wells. The reservoir space voided by producing this 23 barrels by a more efficient well would void a maximum of 233 barrels of reservoir space. Now again, 233 barrels is obtained by dividing the 23 barrels of oil to be transferred by the minimum reciprocal void space factor of a well that can have top allowable, which in this case, the Mitchell "B" 7, in the month of December, 1962, .099; in other words, 23 divided by .099 is 233 barrels of void space.

In this case, this represents 210 barrels of gas, and for a total of 233 barrels. This represents, as you will note, a minimum savings in reservoir space of 49 barrels per day. This 49 barrels is represented in the area immediately above the cross-hatched area of Exhibit D, and below the green line. This is a savings in reservoir space through this transfer method.

Q You mean Case "D", not Exhibit D?

A Case "D". Any top allowable well having a reciprocal space factor greater than .099, which is the Mitchell "B" No. 7,

will void less than 233 barrels of reservoir space in producing the transferred allowable of 23 barrels, such as Baish "A" No. 2 with a R.V.S.F. of .164.

Q You have been talking about the transfer in this instance of some 23 barrels. Do you have a case of a well to be shut in and transfer of the top unit allowable of 44 barrels?

A Yes, sir, we do. The Baish "A" No. 16 on Exhibit 7, which is Case "E", is located -- I have already described its location so I'll skip that -- depicts such a well to be shut in. This well has a reservoir voidage of 979 barrels per day, as calculated under the void space allowable and as testified, using Exhibit 6, with a calculated allowable of 16 barrels of oil per day. Now by shutting this well in and transferring 44 barrels to top allowable wells, the maximum reservoir space voided by producing this transferred allowable would be 444 barrels per day compared to 979 barrels of reservoir space that the Baish "A" No. 16 is producing to produce its allowable. This represents a savings of 535 barrels of reservoir voidage per day.

I would like to further point out that if this part of this allowable was transferred to a well such as the Baish "A" No. 2 in case "A" on this exhibit, that a greater saving than 535 barrels of reservoir space per day would be saved.

Q All of the preceding testimony has dealt with transfer of allowables from a well. Do you have a case showing a well having an allowable transferred to it from another well?

A Yes, sir. Exhibit 7 also depicts this. Cases "A" and "B", which are the Baish "A" No. 2 and the Mitchell "B" No. 7,show on an area colored in red, and this depicts the oil and gas allowables transferred to these wells. In both cases, these wells are capable of producing in excess of their top allowable as calculated by the void space formula. To be more specific, case "A", which is the Baish "A" No. 2, shows three barrels of transferred oil to it, and it would produce a total reservoir voidage of 286 barrels per day while producing a total of 47 barrels of stock tank oil. This is made up, the transfer of three barrels of oil carries with it 15 barrels of associated gas as produced from this particular well.

In case "B", which is the Mitchell "B" No. 7, this is a well we -- as I previously stated, with a minimum reciprocal void space factor assigned a top allowable under the void space formula; and yet it is still capable of producing in excess of the top void space allowable of 44 barrels per day. The well test MER is at 47 barrels per day. This well would then receive three barrels of transferred allowable and would produce 18 barrels of associated gas for a total reservoir voidage of 465 barrels per day. As you can see, this is considerably less than in cases "D" and "E" for the amount of oil produced.

In case "C", which is the Baish "A" No. 7, this is a well which neither receives nor transfers any portion of an allowable. I would like to point out to the Examiner that case "C",

Q Will you be able to produce the reservoir more efficiently in the future by transferring allowables as a result of the unitization?

A Yes. We will be able to produce the reservoir more efficiently because we will have the flexibility in adjusting reservoir withdrawals.

Q Would you explain that, please?

A The average Grayburg-San Andres production during July,

lower voidage figure certainly represents a more efficient reservoir rate of production.

Q In connection with that, you used the term "gross gas." What do you mean by gross gas?

A Gross gas is the total gas produced without regard to the amount of gas injected under the present pressure maintenance operations.

Q Would you present an example of the present allocation procedure, which has been in effect since 1945?

(Whereupon, Applicant's Exhibit No. 8 marked for identification.)

A Yes, this is Exhibit 8, which has been passed out to the Commission. Exhibit 8 is a copy of the Monthly Allocation Plan submitted to and approved by this Commission for December of 1962. This is this month. As you will note, the allowable is made up of one or more of the acreage, marginal well, the void space allowables, to obtain the current allowable for the month of December, 1962, for each proration unit. The current allowable is shown as the next to the last column by wells on Exhibit 8.

Q That is the allowable which was approved by this Commission for December, 1962?

A That is correct.

Q With reference to shutting in certain wells, which are producing inefficiently because of excessive gas-oil ratios or reduced bottom hole pressures, what do you consider to be an

excessive GOR in this pool?

A A specific figure which would apply now or throughout the remaining life of the production would be very difficult to ascertain. At the present time and for the purpose of our proposed procedure, we, in general, considered wells which produced with a gas-oil ratio in the neighborhood of 10,000 to one as excessive GOR's.

Q Is the gas-oil ratio the only criteria to be used in considering whether you'll shut in a well?

A No, sir. The location of the producing well to the gas injection well affecting the high gas-oil ratio, the injection rates and pressures of the injection well, the availability of injection gas and other reservoir and engineering data will be utilized in determining which well should be shut in in an effort to produce the allowable nomination for the MCA with the minimum of reservoir energy.

Q Are the excessive gas-oil ratios that you referred to on wells to be shut in due to the gas injection program currently in operation in the MCA?

A Yes. This can be shown from a comparison of the average gas-oil ratio for wells in the areas removed from the gas injection wells which normally have an average GOR of less than 2,000 cubic feet per barrel. If you would refer back to the map attached to Exhibit 4, the Pearsall "A" No. 8, which is found in Unit G of Section 33, is two locations removed diagonally from an injection

well.

MR. NUTTER: Where is that again?

A Unit G of Section 33, Pearsall "A" No. 8. This well on its last test, well test, actually had a GOR of too small to measure, as reported on Exhibit 8, which was stated as the Monthly Allocation Plan submitted to this Commission. The wells we are considering shutting in have an average gas-oil ratio of 16,585 to one -- that's for the eleven wells proposed under this procedure -- such as the Baish "A" Well No. 15. This well is in Section 21 of Unit K, the No.15, the Baish "A" 15. This well has a GOR of 19,625 to one; as you can see, diagonally offsets the injection well to the southwest. It's southwest of an injection well some seven or eight hundred feet.

MR. NUTTER: Is that the highest ratio well in there?

A Oh, no, sir. Of course, our Exhibit 8, which is a copy of the Monthly Allocation Plan, does carry all of the gas-oil ratios. I believe there's one in the neighborhood of 100,000 to one. For example, the Mitchell "A" No. 15, which is located in Unit A of Section 19, has a 74,000 to one.

Q (By Mr. Kellahin) Would the procedure you are proposing result in the conservation of reservoir energy, the prevention of waste, and in reduction in operating cost, thereby allowing an increased ultimate recovery?

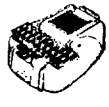
A Yes, sir, it would.

Q How will this procedure increase ultimate recovery?

A The amount of gas injected into the Grayburg-San Andres reservoirs is limited by the injection wells' ability to take gas at available pressures. Gas-oil ratio control by shutting in high gas-oil ratio wells will divert injected gas into reservoir channels, which have been less swept by gas, and thus, ultimately, sweep new channels and produce more ultimate oil than if this procedure had not been performed. Gas-oil ratio control will also help maintain a higher reservoir pressure, a lower reservoir oil viscosity, and increase the solution gas-oil ratio. These reactions will enhance oil recovery over that amount which could be expected without the proposed procedure being placed into effect.

Gas-oil ratio controls will also reduce operating cost, which tends to increase ultimate oil recovery. Another advantage in a unit with an effective program of gas-oil ratio control, is that a re-cycling of inefficient gas injection will be reduced, thereby reducing gas compression charges. Another consequential factor is that under this program the nominated MCA allowable could be obtained from fewer, more efficient producing wells, thereby reducing the number of wells in operation, which will reduce the overall operating cost and tend to increase ultimate recovery.

Q Do you anticipate that the wells shut-in in this program of gas-oil ratio control will be shut-in until the termination of pressure maintenance operations?



A No, sir. The shut-in wells would be observed and tested from time to time to determine their producing capabilities. When the wells return to a more efficient producing condition, then they would be considered for restoration to producing status.

Q May any well receive the transferred allowable that you propose?

A No, sir. No well will receive a transferred allowable unless its MER is in excess of 44 barrels per day and the well qualifies for a top allowable under the acreage and void space formula currently in effect.

(Whereupon, Applicant's Exhibit No. 9 marked for identification.)

Q Have you prepared an example of your proposed procedure, showing the effect it will have on the total MCA allowable?

A Yes, we have, Exhibit No. 9.

Q Now referring to Exhibit No. 9, would you discuss the information shown on that exhibit?

A Exhibit No. 9 is a direct comparison with the Monthly Allocation Plan submitted for December of 1962, which was Exhibit No. 8. The Exhibit No. 9, however, is with our proposed procedure as herein testified.

MR. NUTTER: Before you get into Exhibit 9, if we can take a 15-minute recess.

(Whereupon, a short recess was taken.)

MR. NUTTER: The hearing will reconvene.

MR. KELLAHIN: If the Examiner please, Mr. Rowley is here and he's interested in this case. He has to leave early on account of his plane connection.

MR. ROWLEY: I certainly do appreciate this. I am Marshall Rowley, speaking for Carper Drilling Company, Inc. Our company originally developed part of this field, and we have operated 29 wells therein. We are proud to have participated in this project since its inception, and we feel that the field is an excellent example of good oil field procedures resulting in greater recovery.

We now feel that waterflooding the field, as proposed by the Applicant, will continue this good conservation program. Therefore, we support this application in its entirety and urge that the Commission approve the same.

MR. NUTTER: Thank you. You may proceed now, Mr. Kellahin.

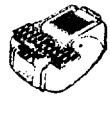
Q (By Mr. Kellahin) Mr. Queen, you had just started discussing Exhibit No. 9. Do you want to start over on that again, please?

A Exhibit No. 9 has been prepared to present a comparison of the Allocation Plan for December, 1962, as proposed by us, in comparison to Exhibit 8 which was actually submitted. This Allocation Plan or proposal would be submitted to this Commission for their approval in conformance with Order 595, which was approved in 1945.

Q Would you present this comparison to the Commission at this time?

A On the Monthly Allocation Plan submitted for December, 1962, as approved by the Commission, Exhibit No. 8, the Continental Oil Company -- and I'm referring back to Exhibit No. 8 now -- the Continental Oil Company Baish "A" No. 2, which is on the first page about two-thirds of the way down, Continental Baish "A" No. 2, Unit B, Section 21, did not have a marginal well allowable since its production test was greater than 20 barrels per day. As you will recall, the present allocation formula calls for a marginal well classification of any well producing less than 20 barrels per day. As you will note, the acreage allowable for the Baish "A" No. 2 is ten barrels per day, the void space allowable is 34 barrels per day since its reciprocal void space factor was sufficiently high to allow this well a top void space allowable as calculated by the void space formula which was approved by Order 595.

The reciprocal void space factor is shown on Exhibit No. 8 at about two-thirds of the way over, at .0164. The current allowable as shown on this same Exhibit 8 was therefore 10 plus 34, or a top allowable of 44 barrels per day. To re-emphasize, this was approved by the Commission, as has been done since 1945 by this same procedure. In comparison, this same well on Exhibit 9 shows that, of course, the well has no marginal allowable since this category is proposed to be eliminated. It has an acreage



allowable of 10 barrels per day, a void space allowable of 34 barrels per day under the same void space formula. The allowable available for transfer away from this proration unit is zero, as shown in the third column from the end, no transferred allowable away from the well since it is a top allowable well. The allowable transferred to the well is shown as three barrels per day, providing a current allowable for the well of 47 barrels per day as shown in the right-hand column of this Exhibit 9. The MER as indicated on the producing test for the Baish "A" No. 2 was 47 barrels per day. This is also shown on this Exhibit 9, as well as Exhibit 8. This rate is the MER as indicated by its bottom hole pressure of 553 pounds, its gas-oil ratio was 1489 cubic feet per barrel, and also the void space allowable of 34 barrels, as calculated by the void space formula.

Q Could you give us an example of a shut-in well and a well that's incapable of producing its allowable?

A A shut-in well might be shown on the first page of Exhibit 9 as the Baish "A" No. 16, the next to the last page of Exhibit 9. The Baish "A" -- I believe, did I say 19? I mean 16.

Q You said 16.

A It's 16 -- well, both of them are. I would like to testify as to 16. Baish "A" 16, located in Unit I, Section 21. We might read across on this to fully qualify or explain the exhibit. This information over to the last four columns, or three columns, is identical to what has been submitted for several years.

On a 32/64ths choke, three-hour test, the well produced 12 barrels of oil and 148 MCF gas for gas-oil ratio of 16,333. The October, 1962, bottom hole pressure was 474 pounds. We do not list this well's reciprocal void space factor, since we propose to shut it in. It probably would be in the vicinity of .023 or .03. The void space is zero, since it is not even calculated as being a shut-in well. The transferred allowable from this proration unit would be 44 barrels a day, since we are conserving the reservoir void space, as would be determined by the void space formula and the right-hand column shows a shut-in well. In regards to a well that is not capable of producing its calculated allowable, I'll -- still, again on Exhibit 9, the first page, the Simon "N" No. 5, Carper Drilling Company Simon "N" No. 5 located in Unit I of Section 29 produced 25 barrels per day on 32/64ths based on three-hour test. The GOR is 3,060; bottom hole pressure of 571, has a reciprocal void space factor of .082. Since its test is greater than 10, it has an acreage allowable of 10. The calculated void space factor was 28 barrels per day. This is one of the wells that we discussed on Exhibits 6 and 7, which was the case "D" in 6 and 7, if you would care to look at it.

I didn't mention it, but the other wells, I believe, are also shown on there. Again the well, the well has a calculated void space allowable of 28 barrels a day. The well has only five barrels of allowable to be applied to the void space allowable, therefore leaving 23 barrels of transfer allowable to some other

well, -- to a top allowable well, not some other well.

The current allowable on the right shows 10 barrels of acreage allowable, 5 barrels of void space allowable, for 15 barrels, which is the well's capability to produce.

Q Mr. Queen, if we assume that only gas injection were continued in the Maljamar Cooperative Area until it reached its economic limit, wouldn't the gas-oil ratio approach infinity as the gas cycled from the injection wells to the producing wells through previously swept out zones?

A Yes, sir, it definitely would, and this is why the MER of the field will change. This is also the basic purpose of changing the injection medium from gas to liquid prior to that stage of depletion.

Q You stated that the Continental Baish "A" No. 2 was producing at its MER, I believe. Would you explain why the rate of 47 barrels per day represents its MER?

A Well, in all probability this well is producing at a figure slightly lower than its MER. This conclusion is based on the relatively low gas-oil ratio of the well in comparison to the average of the field. As you will recall, the Baish "A" No. 2 has a gas-oil ratio of 1,489, and the average of the field for October of 1962 was about 3650 cubic feet per barrel. This low gas-oil ratio in comparison to the average, and its bottom hole pressure in comparison to the average, which is approximately -- the average here, 553, probably means that this well is producing

below its MER. The best determination of the MER, in fact, is the void space formula, in that if a well in this reservoir which is under pressure maintenance operation is produced too hard or produces too much above its MER, the gas-oil ratio will go up, the bottom hole pressure will go down, thus affecting the void space allowable for that well through the application of a void space factor. The Baish "A" No. 2 has a reciprocal void space factor of .164, which actually indicates its producing characteristic is fairly efficient. It is a fairly good reciprocal void space factor. To give you an example of a well that is producing above the MER, I would like to refer you to Baish No. 7, which was case "C" in Exhibit 6 and 7. As you will note, the well tests of this well is 35 barrels per day. This well is also shown on the first page of Exhibit 9, the Baish "A" No. 7 in Unit F of Section 21. On a 10/64th for 24-hour period, the well produced 35 barrels of oil with 8180 gas-oil ratio. It has a reciprocal void space factor of .046. The void space allowable is 16 barrels for this well, although its total allowable is 26 barrels, and yet it has a capacity of 35 barrels. This indicates to me this well is producing above its MER and should be curtailed on its test.

The void space formula, therefore, in my opinion, is a direct control for allowable determination for each proration unit. As previously testified, before a well can receive transferred allowable, it must qualify for top allowable under the void space formula, and this the well cannot do if it has been produced

at an excessively high rate, or in other words, above its MER.

Q Now would you summarize the comparison between the December, 1962 Allocation Plan as approved by the Commission, and what the allowable would have been under the proposed procedure of transfer of allowables, as presented by Exhibit No. 9?

A The December, 1962, current allowable, which was Exhibit 8, as approved by the Commission for the MCA was 4387 barrels of oil per day. This is shown on the last page of Exhibit 8 as a total for the MCA Area of the leases committed to the MCA Area, in comparison with 4,250 barrels under the proposed plan. This total amount for the MCA is also shown on Exhibit 9 on the last page. However, the actual production will probably be approximately ten percent below the nominated allowable.

Q Under the procedure as you are proposing it, will the Commission have control of the allowable assigned to the Maljamar Cooperative Area?

A Yes, sir, they definitely will. It is proposed that the Monthly Allocation Plan be submitted in exactly the same procedure as it has been in the past 20 years for the Commission's approval. In essence, there is no change in the proration of oil in the MCA unit with the exception of the transfer of allowables to produce the unit in a more efficient manner.

Q In other words, what you are saying, Mr. Queen, is that the void space formula as approved by Order No. 595 will remain in effect in the future as it has for the past 20 years, is that

correct?

A That is correct.

Q Will all the wells within the Maljamar Cooperative Area be treated in a like manner in the assignment of allowables, and particularly in the use of transferred allowable?

A Not exactly. It is proposed that any well within the MCA Area located within a distance of 1,000 feet or less from the unit boundary of the MCA will not be permitted to produce at rates greater than twice the top proration unit allowable, unless and until the Operator furnishes waivers from the offset operator or until evidence that the offset operator has been notified and no protest is made to the Commission concerning such producing rates within ten days after such request for permission to produce the higher rates has been received by the Commission.

Q Now are there any wells presently producing within the Maljamar Cooperative Area but outside of the Participating Area that are presently capable of producing in excess of top proration unit allowable as calculated under the void space formula?

A No, sir, there is not.

Q Is there any additional testimony or changes you propose to present regarding the Monthly Allocation Plan?

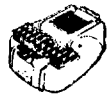
A No, sir.

Q What other changes in the gas pressure maintenance operations do you anticipate upon a favorable ruling from the Commission in this case?

A With approval to transfer a proration unit allowable, the entire injection program now in operation will be given additional consideration for revision. An example of possibly changing the location of an injection well, with administrative approval, of course, for a better sweep efficiency, is on the Pearsall "A" Lease. Refer again to the map attached to Exhibit 4, in Section 33 at the lower middle of the map, the Pearsall "A" No. 15, which is in the northwest corner of Unit B almost shown on the line there, did not take any gas during July, 1962, and it has a chronic low injectivity history. The Pearsall Well"A" No. 14,which is found in the northwest corner of Unit G of the same section, could be converted to gas injection with probable good effects on the surrounding wells.

The decision to change an injection well would be prompted by the non-uniformity of reservoir-energy dissipation in the surrounding producing wells and the anticipated degree of improvement which might be expected with the change. Other factors which would be considered before changing an injection well would be the bottom hole pressure, the well productivity, and the state of depletion of the surrounding wells. This type of work would especially be conducted during the early stages of water injection. However, it would continue throughout the life of the field.

Q Would the Commission have any method of control on which wells will be shut-in due to excessively high GOR, and the wells which will receive transferred allowable?



A Yes, they definitely will. The Monthly Allocation Plan will be submitted by the Engineering Committee exactly as it has in the past for the Commission's approval. This schedule will list any change of the wells shut-in and the total allowable for each producing well changed.

Q It will show, then, the transfer of allowables and the shutting in of wells from time to time as they occur, is that correct?

A That is correct.

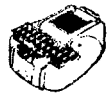
Q Could the Engineering Committee transfer an allowable to a producing well to the extent that the well would be producing in excess of its well test MER?

A No, they could not and stay within the limitations of the void space allocation plan. Furthermore, if a well was produced in excess of its MER, its gas-oil ratio would rapidly increase and its bottom hole pressure would decrease such that the well would no longer be entitled to a top allowable under the void space allocation plan, and thus restrict the transfer of allowable.

Q Then each proration unit has an upper limit to the amount of allowable that could be transferred to the well on that proration unit, is that correct?

A Yes, sir, that is correct.

Q Do you have any additional comments to present regarding this phase of your testimony?



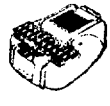
A I might summarize by saying that the Monthly Allocation Plan proposed after approval of Supplement No. 5 is exactly the same as that now in effect, with the elimination of the marginal well allowable and adding the right to transfer a proration unit's allowable. The elimination of the marginal well allowable will place these wells under the restriction of the acreage allowable and the void space allowable formula, thereby treating all wells in the MCA unit exactly the same. The provision for transfer of allowable will provide for more efficient operation of the reservoir, it will prevent waste, and will increase the ultimate oil recovery.

Q Mr. Queen, in the application in this case, it was requested that an exception be granted to the provisions of Rule 309-A for permission to produce more than 16 wells into a central tank battery, is that correct?

A Yes, sir, it is.

Q Would you briefly state the reason for this request?

A Well, at the present time there are approximately 60 Grayburg-San Andres tank batteries within the boundaries of the proposed unit. Of course, there is more than one tank battery on some of the leases. The tanks in many of the batteries are in poor condition and in need of replacement. It is our intention, when the unit is approved, to construct three to possibly five central tank batteries, in lieu of replacing equipment at the old battery sites. It is also our intention to install ACT units at



these central batteries. Approval for the ACT units will be sought administratively under the provisions of Rule 309-A.

Q How do you propose to test the wells connected to these central tank batteries?

A We propose to install satellite stations for test purposes. These satellite stations will be equipped to handle from eight to fourteen wells. The test production will be measured by a metering heater treater or similar equipment and then returned to the trunk line which connects the satellite station to the central tank battery. This installation will allow us to test each well at least once each month if we so desire.

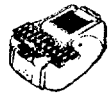
Q Is the sole purpose of the satellite stations for well testing purposes?

A No, sir, it is not. This procedure will provide for a more economical system in lieu of long individual flow lines; however, the main purpose is for well testing. The production from the individual wells coming into the satellite station will be diverted by means of a manifold to either the test treater or to a common flow line connecting the satellite station to the central tank battery. All required treating of the oil will be done at the central tank battery.

Q Will there be any commingling of production?

A No, there will not be.

Q Are you prepared to state the location of these central tank batteries at this time?



A No, sir, I am not. Our final selection will be based on our final Plan of Operation. In other words, our injectivity test. We would like to request the Commission's permission at this time to construct batteries with more than 16 wells producing into them in order to permit proper planning in the future. The actual location of these batteries will be presented to the Commission at the time our administrative request for permission to install the ACT at the battery is submitted.

Q I take it, then, you intend to install ACT equipment concurrently with the construction of the consolidated battery?

A Yes, sir, that's what we plan to do.

Q Will the production from the participating area be kept separate from the remaining Maljamar Cooperative Area?

A Yes, sir, it will.

Q How do you propose to expand the water injection program within the Maljamar Cooperative Area from the present approved injection wells as set forth on Exhibit 4?

A Well, the expansion pattern cannot be determined until additional results have been obtained from the pilot expansion program as set out in my testimony on the Plan of Operation.

Q When sufficient data have been obtained from the pilot expansion areas, do you plan to approach the Commission for continued expansion outside of the area as approved by Orders R-841 and R-1075, and carried forward by the order resulting from this hearing, by hearing or by administrative approval?

A It is proposed that the procedure be continued as set out in Order 595 so that the Secretary-Director of the Oil Conservation Commission may approve by administrative procedure the extension or deletion of the area under fluid injection, the number of and location of injection wells, and the conversion of injection wells from one fluid to another insofar as the area and wells lie within the MCA.

Q What data do you propose to submit to the Commission at the time any change in the injection program is requested by administrative approval?

A It is planned to submit all the information required by Rule 701-B.

Q Were Exhibits 4 through 9 prepared by you or under your supervision?

A They were.

MR. KELLAHIN: At this time we would like to offer in evidence Exhibits 4 through 9.

MR. NUTTER: Continental's Exhibits 4 through 9 will be admitted in evidence.

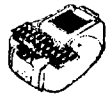
(Whereupon, Applicant's Exhibits 4 through 9 admitted in evidence.)

MR. KELLAHIN: That completes the direct examination.

MR. NUTTER: Are there any questions of Mr. Queen?

CROSS EXAMINATION

BY MR. LONG:



Q Malcolm Long. I might have missed it somewhere along the line, but how do you intend to protect the diversified interests, diversified ownership?

A The production within the participaring area will be kept separate from the production outside of the participating area, which will continue on a lease basis.

MR. LONG: Thank you.

BY MR. NUTTER:

Q Mr. Queen, you say the production from within the participating area will be kept separate. How about the transfer of allowables across the lines of the participating area?

A We do not propose to transfer any allowable across a lease line.

Q And you regard the participating area as a lease?

A That is correct.

Q And the other leases as separate leases?

A Yes, sir.

Q I believe I understand correctly that your proposal for the computation of these allowables applies to the entire MCA unit whether it's in the participating area or not?

A Yes, sir.

Q For the calculation of the allowables?

A That is correct.

Q Would the two times limit, the two times the top allowable limit which you would impose on any well within 1,000 feet

of the outside of the unit apply inside the participating area, or 1,000 feet inside the red line?

A Inside the red line, since all the wells are subject, within the red line are subject to the void space formula and the acreage formula.

Q They would have the maximum production of two times top allowable if they are within 1,000 feet of the red line?

A Right. This restriction is, of course, to prevent drainage.

Q How about the case where there are leases within the red line which are not committed to the unit? Would you limit the production to two times top allowable if the well was within 1,000 feet of those leases?

A I see no objection to that. There are those three wells that, I believe it was testified that they were producing at the time we started our unitization procedures. I see no point in restricting the allowable to prevent drainage to twice the top allowable.

Q The three wells --

A Kersey 1 and 2 in the North Half, Northwest Quarter of Section 32, and I believe the Hoover State No. 5. I am not quite as familiar with these as Mr. Appledorn was when he read them off. I recognize them, but rather than testify which specific ones they were --

MR. NUTTER: I believe it was the Wallingford.

MR. MEAD: Wallingford and Kersey, and Wallingford and

Smith is plugged and abandoned.

MR. NUTTER: That is not producing any longer?

MR. MEAD: No, it is not.

A The other three wells are the wells that are producing.

Q (By Mr. Nutter) How about up there in Tract No. 10 on Section 15; are those wells producing up there?

A In Section 15?

Q Yes, sir, Tract 10 in Section 15. I believe it has some wells on it. I wonder if those are producing.

A The Continental well, of course, is in the participating area. The Hudson No. 1 is producing, and I believe that the No. 2 Well, that those two wells -- I would have to check that before I could testify as to whether they are or are not producing.

Q But the two times top limitation within 1,000 feet could apply there, could it not?

A I think it would be equitable, it probably should.

Q Mr. Queen, I wonder if you would go into a little more thoroughly as to how the Baish "A" No. 16, which has no acreage allowable, no calculated void space allowable but a top transfer allowable of 44 -- first of all, you said you do have the reciprocal factor for that well. I wonder if you could just give us that, please?

A I don't believe I said I had it. I believe I said it could be calculated, if you'll give me just a minute I will do so, -- or not calculated, determined. The table that was approved by

Order 595 and as determined by PCT analysis by Core Laboratories on a sample in the Maljamar Pool would give this well, which has a -- Which well --

Q We are talking about the No. 16, the GOR 16,333 and the pressure is 474.

A I would have to interpolate above 5,000 to 1, particular table I have here doesn't carry that far. This could be calculated, and I started to. They merely pointed out, in the confusion, that this is shown on Exhibits 6 and 7 both. The Baish "A" No. 16, we tried to show these wells that we testified from Exhibits 8 and 9 on these; as you will notice, it shows .0157 as the reciprocal void space factor.

Q That reciprocal factor is so low that the void space allowable is infinitely small?

A It's six barrels, as shown by the green, six barrels per day on case "E" of Exhibit 6.

Q How come it doesn't receive a calculated void space allowable on the Exhibit 9?

A Exhibit 9 is our proposed procedure, and this well would be shut-in, and as a shut-in well, we propose to transfer the reservoir void space allowable of 334 barrels of reservoir space, which is equivalent to a top allowable, under the void space formula of 34 barrels per day to be transferred, plus the 10 barrels acreage. It would not have, since it is shut-in, an acreage allowable or the calculated allowable. It is our thought that by this procedure,

in carrying these different columns, that the Commission would have better control and easier control as to what we were actually doing. Now it actually has a calculated allowable, but if we are going to shut-it in, we would see no reason to show it because we propose to transfer the void space allowable from the reservoir standpoint. Again I would like to refer back to Exhibit 6. It has a calculated allowable of six barrels of oil, and the associated gas, using the reciprocal void space factor, would be 337 barrels of gas under reservoir conditions, for a total of 343 barrels of reservoir space. If we shut-in, this 343 barrels of reservoir space, then we feel that we are entitled to transfer the top void space allowable of 34 barrels per day; and of course, if the well is shut-in, it cannot produce its acreage allowable of 10 barrels and it would also be transferred.

Again, this would be a conservation of energy, since under this well, to produce that 10 barrels of oil, we would have to produce 626 barrels of gas, where if it was produced in some of the other wells, for example, case "A" -- for that well to produce its 10 barrels of oil we only produced 51 barrels of gas, compared to 626. This is the reason why we feel like that by transferring this top proration unit allowable of 44 when converted to reservoir conditions, that we can do it and can produce less reservoir voidage than we are now doing under the present plan, and conserve energy.

Q In the case of any well which is going to have its

allowable transferred away and be completely shut in, you would not show the calculated void space allowable?

A We would not. It would be no problem to show it, it's just a matter of a simple calculation. We have not, in the use of the void space formula, the reciprocal void space factor, in the use of the void space formula. As you will note, we do not include it in our calculation. That is why we did not include it on here. Under the column "Reciprocal void space factor," there is no figure shown and we did not use it in our summation.

Q Is the maximum allowable that can be calculated under any conditions for the void space allowable 34 barrels a day?

A For the void space allowable, yes.

Q And that is the maximum, then?

A That is correct.

Q Is it Continental's intention to maintain gas injection in all of the wells that are presently on gas injection?

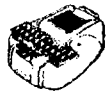
A Not necessarily. As I tried to infer, upon approval of our application we would certainly watch our injection program very carefully to see whether we can improve it. It is entirely possible that an injection well would be shut down and not replaced. It is possible that a gas injection well that is not now being used, that is a producing well, might be added.

This has been discussed for the last three to four years and has been recognized that there needs to be some additional control on where we inject our gas and how much. This has not been

able to be done because of the leases, and we would cause undue drainage and the Operator would not be allowed to produce his fair share of the allowable if he merely shut a well in on his lease. With the unitization, this would eliminate this problem.

To give you another example, the Mitchell "B" No. 17 in Unit M of Section 17 is a gas injection well. The Mitchell "B" No. 15 -- I'm sorry, I called it "B", it's Mitchell "A" No. 15 -- the Mitchell "A" 15 has a gas-oil ratio, on page 3 of the Exhibit 9 if you care to look at it there, and the "A" 15 is in Unit A of Section 19, has a gas-oil ratio of 74,000. So evidently we are diverting a considerable amount of gas from the injection well to that producing well. Whether we would shut down Baish "A" No. 15 or whether we would convert it to an injection well would require a considerable amount of engineering study. The producing characteristics of the offset wells, their present producing rate, the amount of pay open, and all of these things would depend on which we would do. We have made no attempt at this date to make this type of engineering study. We have only made sufficient one to call the attention of the Commission to the type of study we would make on doing it. We would not shut down all the gas injection wells. We would probably not continue them all in the same manner. Unitization does allow us considerably more control for improving our efficiency of our pressure maintenance program.

Q How many 40-acre tracts are in the participating area?



A I believe there are 201. However, all of these proration units do not have a producing well on them.

Q They all have a well on them?

A They have had at one time. There are four wells, as I recall, that now have -- they do not have a producing well on them. If you would like to have those, I will be glad to give them to you. Would you like to have those?

Q Yes, sir.

A I could give them to you offhand, but rather than getting mixed up, I would like to take a second here. A well that is not now producing is in Unit H of Section 23, the Miller "B" No. 5. Another well that is shut down and plugged and not producing is also in Unit H of Section 33; as you will note, there are a couple of wells, one of those is a shallow well that never did reach the Grayburg-San Andres. Another well that is not producing -- and I'm jumping around here a little bit -- is up in Section 16 at the top. This is within the MCA and not within the participating area. On my map I do not have outlined -- I believe this well is immediately outside the participating area. The No. 4 Well in G.

Q Of 16?

A 16. While I am up in that area, a well that is outside the participating area but inside the MCA is in Unit D of 17. Another well that is within the participating area and the MCA is over in Section 25 to the east in that section -- I am a little

bit confused on my units. It's within the Southeast of the Southeast, the No. 12 Well. That well is plugged back and is now a water supply well. However, it did produce for a period of time. These four wells are within the MCA, two of them within the participating area and two without, I believe. Three within the participating area and two without, the total of five wells. I'm rambling.

Q How about the No. 1 there in P of 17 up at the top?

A This is in the Southeast of the Southeast of 17?

Q Yes, sir.

A That is presently a Paddock well that did produce from the Grayburg-San Andres. It now has an injection well on the same proration unit right in the same corner.

Q So that 40 is developed as far as this pool is concerned?

A That's right. I would like to point out the non-commercial well in Section 18, the No. 40, which is in the Northeast of the Southeast of Section 18.

Q So there are 201 proration units in there, and of the 201, they all either have a producing well or an injection well, with the exception of two in the participating area?

A Three in the participating area. Three, I believe, in Section 33, Section 23, and Section 25.

Q Yes.

A If the Examiner please, I would also point out something of interest. We have four, five proration units that have injection

wells on them that do not have producing wells on them. Would you like to know what these are? They do have gas injection wells, but not a producing well on the proration unit.

Q All right, if you would run through those.

A In Section 23 in the Northwest of the Southeast, the No. 11 Well, Miller "A" No. 11. The Miller "A" No. 5 in the Southeast of the Southwest, the same Section. The Miller "A" No. 6 in the Southwest of the Northeast of Section 26, Section 26; up in Section 17 the one in the Southeast of the Southwest we just discussed has an injection well. In the opposite corner of Section 17 in the Southwest of the Southwest, it has an injection well but no producing well.

Q How many total injection wells are currently --

A You have asked me a question that I cannot answer right offhand, Mr. Nutter. I don't have that figure available, but it is somewhere in the neighborhood of 30, 32.

Q So of the 30 or 32 wells, 25 or 27 of them would be the second well on a 40-acre tract, if you have five tracts that have injection wells only on them?

A That is correct. If you will notice that, right now all I can think of is the fact that we do have different leases, the injection wells primarily on lease lines unless a big lease is involved, and then they are off of the center of the 40-acre proration pattern. But this was specifically done because this was not a unitized field. The wells were not drilled on the exact

corner, most of them are 25 feet in from the 40-acre proration unit that they are located on.

MR. NUTTER: Are there any other questions of Mr. Queen? He may be excused.

(Witness excused.)

MR. KELLAHIN: If the Commission please, that completes our presentation of this case. I would like to make some very brief comments. I don't want to belabor the point of our application. I think it has been stated by the witnesses much better than I could do.

I would like to point out to the Commission that this case sounds somewhat complicated and there have been a great many things discussed here today simply for the reason that this is an old, old project affected by many, many orders. Our list shows -- and we are not sure that we have them all, we show some 34 orders affecting the Maljamar Cooperative Agreement Area in one fashion or another, not including the Allocations Orders which were based on the monthly nominations which have been made.

For that reason, we had to, in order to give an intelligent discussion of what we propose here today, go back and review many of the provisions which are already in the orders, which are already in existence. We have tried to emphasize the fact that this void space formula is nothing new. It's been in operation down there for several years. The reason we had to go into it today is to show how it will operate under our proposed change.

It's the same formula with no change in it. The maximum allowable of 34 was set up under that formula, the 10 barrels was set up under that formula. Those two we propose to continue in the order we are asking here. That is nothing new, it's already in existence.

The 20-barrel minimum allowable we are proposing to forego. It's in the present order but we propose as a more efficient method to eliminate the 20-barrel minimum allowable which exists in the present orders.

The transfer of allowables sounds like a new program, and to some extent it is; however, the old orders provided for a limited transfer of allowables, particularly from the injection wells. They were referred to, I believe, as key wells in the old orders which are in existence. So transfer of allowables again is not new, although we are proposing somewhat of an expansion of it for the purpose of more efficient reservoir management.

The administrative approval for expansion of the project exists in the present orders. Nothing new there.

In essence, the whole thing is rather complicated and we are asking for a consolidation order, when we are talking about 34 some odd orders. It was our proposal that we be permitted to submit to the Commission a proposed order in this case because of the nature of it, and I believe we will be able to annotate it in the margin, those provisions which are contained in the old orders, so you can then look back at them and determine just where they came from, and we would ask permission to do that.

MR. NUTTER: Mr. Kellahin, you took the words right out of my mouth. I was going to ask you if you would be willing to prepare one.

MR. KELLAHIN: Thank you for your consideration, and that completes our case. I believe there is a fellow that has a statement.

MR. SCHULL: I am Jack Schull that has a lease in Artesia, New Mexico. We have been an operator in the Maljamar Field since 1939 and have participated in the Maljamar Cooperative Agreement since its inception. In our opinion, this has been an outstanding conservation program and has already resulted in recovery of millions of barrels of oil that would not otherwise have been recovered. The next step in this long-range conservation program is the communitization of the area and the operation that has been proposed here today. In order that the Maljamar Cooperative Agreement Area can be operated on a sound engineering and economic basis and achieve the greatest ultimate recovery of oil, it is essential that the various features of the previous order be continued and the proposals made here today be approved.

MR. NUTTER: Thank you. Does anyone have anything further to offer in this case? We will take the case under advisement, and the hearing is adjourned.

(Whereupon, the hearing was adjourned.)

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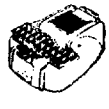

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Proceedings 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.

WITNESS my Hand and Seal this 11th day of January, 1963.

Ada Dearnley
NOTARY PUBLIC

My Commission Expires:

June 19, 1963.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 2718, heard by me on 14, 1962.

....., Examiner
New Mexico Oil Conservation Commission