Case Number

4795

Application

Trascripts

Small Exhibits

ETC.

OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO
P. O. BOX 2088 SANTA FE
87501

GOVERNOR
BRUCE KING
CHAIRMAN

LAND COMMISSIONER
ALEX J. ARMIJO
MEMBER

STATE GEOLOGIST
A. L. PORTER, JR.
SECRETARY - DIRECTOR

September 8, 1972

Re: Case No. 4795
Order No. R-4392
Applicant:
Michael P. & Corinne Grace

Mr. William J. Cooley
Burr & Cooley
Attorneys at Law
152 Petroleum Center Building
Farmington, New Mexico 87401

Dear Sir:

Enclosed herewith are two copies of the above-referenced Commission order recently entered in the subject case.

Very truly yours,

A. L. PORTER, Jr.
Secretary-Director

ALP/ir

Copy of order also sent to:

Hobbs OCC x
Artesia OCC x
Aztec OCC

Other Messrs. Clarence Hinkle, Jason Kellahin, Robert LeBlanc, Donald Stevens

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASE NO. 4795
Order No. R-4392

APPLICATION OF MICHAEL P. GRACE II
AND CORINNE GRACE FOR POOL CONTRAC-
TION AND CREATION OF TWO NEW GAS
POOLS, EDDY COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 a.m. on August 16, 1972, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission."

NOW, on this 8th day of September, 1972, the Commission, a quorum being present, having considered the testimony presented and the exhibits received at said hearing, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.

(2) Applicants, Michael P. Grace II and Corinne Grace, in the above-styled cause, seek the contraction of the horizontal limits of the South Carlsbad-Morrow Gas Pool, Eddy County, New Mexico, by the deletion therefrom of the following:

TOWNSHIP 22 SOUTH, RANGE 26 EAST, NMPM
Section 25: S/2

TOWNSHIP 23 SOUTH, RANGE 26 EAST, NMPM
Section 2: All
Section 11: All

(3) Applicants further seek the creation of two new pools for the production of gas from the Strawn and Morrow formations

with the horizontal limits of each pool to comprise the following:

TOWNSHIP 22 SOUTH, RANGE 26 EAST, NMPM
Section 24: All
Section 25: All
Section 35: All
Section 36: W/2

TOWNSHIP 23 SOUTH, RANGE 26 EAST, NMPM
Section 2: All
Section 11: All

(4) That by Order No. R-3922, dated February 10, 1970, the Commission created the South Carlsbad-Strawn Gas Pool, Eddy County, New Mexico, for the production of gas from the Strawn formation.

(5) That the horizontal limits of the South Carlsbad-Strawn Gas Pool have been extended from time to time by order of the Commission.

(6) That by Order No. R-3731, dated April 18, 1969, the Commission created the South Carlsbad-Morrow Gas Pool, Eddy County, New Mexico, for the production of gas from the Morrow formation.

(7) That the horizontal limits of the South Carlsbad-Morrow Gas Pool have been extended from time to time by order of the Commission to include, among other lands, the area the applicants seek to delete.

(8) That the applicants contend that the area to be included in the proposed new Strawn and Morrow gas pools constitutes separate common sources of supply because said areas are not in communication with the area which would remain as the South Carlsbad-Strawn and South Carlsbad-Morrow Gas Pools.

(9) That the applicants attempted to show that the areas were separated by a fault, or a syncline, or both, and that the areas were not the same stratigraphically.

(10) That no wells have been completed in the Strawn formation in the area proposed as a new Strawn gas pool.

(11) That the applicant's case is practically devoid of evidence concerning the Strawn formation.

(12) That the evidence presented to show the presence of a fault is vague and unreliable.

(13) That there was no substantial evidence presented that would prove the existence of a fault as claimed by the applicants.

(14) That the evidence presented by the applicants concerning pressure and productivity differentials in the Morrow zone is not reliable due to many variables and many unknowns.

(15) That the evidence presented by the applicants concerning pressure and productivity differentials in the Morrow zone does not amount to substantial evidence.

(16) While the evidence presented does indicate there may be a syncline existing in the area of the proposed separation, there is no reliable evidence that it acts as a barrier.

(17) That the evidence presented does not show the existence of any effective barrier separating the proposed new Strawn and Morrow gas pools from the areas which would remain as the South Carlsbad-Strawn and South Carlsbad-Morrow Gas Pools.

(18) That there was substantial evidence presented that each of the wells completed in the Morrow formation in the proposed new Morrow gas pool is producing from a zone or zones productive of gas from other wells on the east side of the alleged barrier.

(19) That there is substantial evidence that there is communication between the areas to the west and to the east of the alleged barrier, that said areas constitute a single common source of supply in each formation, and that the areas should not be separated.

(20) That the applicants have failed to prove that a new gas pool for Strawn production should be created.

(21) That the applicants have failed to prove that the South Carlsbad-Morrow Gas Pool should be contracted and that a new Morrow gas pool should be created.

(22) That in order to prevent waste and to protect correlative rights, the application should be denied.

IT IS THEREFORE ORDERED:

(1) That the application of Michael P. Grace II and Corinne Grace for the contraction of the South Carlsbad-Morrow Gas Pool and the creation of two new gas pools is hereby denied in its entirety.

(2) That jurisdiction of this cause is retained for the entry of such further orders as the Commission may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

BRUCE KING, Chairman

ALEX J. ARMIJO, Member

A. L. PORTER, Jr., Member & Secretary

S E A L

dr/

(Case 4795 continued from Page 1)

Applicants further seek the creation of two new pools for the production of gas from the Strawn and Morrow formations with the horizontal limits of each pool to comprise the following:

TOWNSHIP 22 SOUTH, RANGE 26 EAST, NMPM
Section 24: All
Section 25: All
Section 35: All
Section 36: W/2

TOWNSHIP 23 SOUTH, RANGE 26 EAST, NMPM
Section 2: All
Section 11: All

CASE 4796: (Continued from the August 9, 1972, Examiner Hearing)

Application of Michael P. Grace II and Corinna Grace for capacity allowable, Eddy County, New Mexico. Applicants, in the above-styled cause, seek an exception to the General Rules and Regulations governing the prorated gas pools of Southeast New Mexico, promulgated by Order No. R-1670, as amended, to produce their City of Carlsbad "COM" Well No. 1, located in Unit O of Section 25, Township 22 South, Range 26 East, South Carlsbad-Morrow Gas Pool, Eddy County, New Mexico, at full capacity.

Docket No. 18-72

DOCKET: REGULAR HEARING - WEDNESDAY - AUGUST 16, 1972

OIL CONSERVATION COMMISSION - 9 A.M. - MORGAN HALL, STATE LAND OFFICE BUILDING, SANTA FE, NEW MEXICO

ALLOWABLE: (1) Consideration of the oil allowable for September and October, 1972;

(2) Consideration of the allowable production of gas for September, 1972, from seventeen prorated pools in Lea, Eddy, Roosevelt, and Chaves Counties, New Mexico. Consideration of the allowable production of gas from nine prorated pools in San Juan, Rio Arriba, and Sandoval Counties, New Mexico, for September, 1972.

CASE 4720: (DE NOVO)

Application of Rotary Oil & Gas Company for an unorthodox location and non-standard gas proration unit, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval of a non-standard gas proration unit in the Osudo-Devonian Gas Pool comprising the NE/4 of Section 32 and the NW/4 of Section 33, Township 20 South, Range 36 East, Lea County, New Mexico, to be dedicated to a well to be drilled at an unorthodox location 660 feet from the North line and 1980 feet from the East line of said Section 32.

Upon application of Western Oil Producers, Inc., Franklin, Aston & Fair, Inc., Featherstone Development Corporation, Olen F. Featherstone II Trust, Charles W. Hicks, Robert Gallaway, Bearing Service & Supply, Wilson Oil Company, and Wyoming Oil Company, this case will be heard DE NOVO under the provisions of Rule 1220.

The Commission on its own motion will also consider whether or not the Osudo-Devonian Gas Pool should be reclassified as an associated pool with special rules and regulations providing for oil well and gas well spacing.

CASE 4795: (Continued from the August 9, 1972, Examiner Hearing)

Application of Michael P. Grace II and Corinne Grace for pool contraction and creation of two new gas pools, Eddy County, New Mexico. Applicants, in the above-styled cause, seek the contraction of the horizontal limits of the South Carlsbad-Morrow Gas Pool, Eddy County, New Mexico by the deletion therefrom of the following:

TOWNSHIP 22 SOUTH, RANGE 26 EAST, NMPM
Section 25: S/2

TOWNSHIP 23 SOUTH, RANGE 26 EAST, NMPM
Section 2: All
Section 11: All

IN THE DISTRICT COURT OF EDDY COUNTY

STATE OF NEW MEXICO

MICHAEL P. GRACE II and CORINNE GRACE, Petitioners v. OIL CONSERVATION COMMISSION OF NEW MEXICO, Respondent.	)	No. 28329

TRIAL MEMORANDUM OF
MIDWEST OIL CORPORATION

I. STATEMENT OF CASE

Michael P. Grace II and Corinne Grace filed an application with the Oil Conservation Commission for the contraction of the horizontal limits of the South Carlsbad-Morrow Gas Pool in Eddy County by the deletion therefrom of the following described lands:

Township 22 South, Range 26 East, N.M.P.M.
Section 25 - S½

Township 23 South, Range 26 East, N.M.P.M.
Section 2 - All
Section 11 - All

This application also sought the creation of two new pools for the production of gas from the Strawn and Morrow formations, which included all of the above described land and additional lands in said townships. The application was docketed as Case No. 4795.

On September 8, 1972 the Commission issued its Order R-4392 denying the application in its entirety and finding that the application should be denied in order to prevent waste and to protect correlative rights.

Petitioners timely filed an application for rehearing which was refused by the Commission through failure to act within a period of 10 days and thereafter Petitioners timely filed a petition for review

by this Court which was docketed as Case No. 28329.

II. STATEMENT OF FACTS

At the time the application of Petitioners was filed with the Oil Conservation Commission, the South Carlsbad-Morrow Gas Pool covered the following described lands:

Township 22 South, Range 26 East, N.M.P.M.
Section 24 - All
Section 25 - All
Section 35 - All
Section 36 - W½

Township 23 South, Range 26 East, N.M.P.M.
Section 2 - All
Section 11 - All

Petitioners have gas wells in the S½ Section 25, Township 22 South, Range 26 East and in Sections 2 and 11, Township 23 South, Range 26 East and seek to have this acreage deleted from the South Carlsbad-Morrow Gas Pool and declared to be a separate and distinct reservoir or pool, although there are a number of wells producing gas from the Morrow formation located upon the other lands. ~~There is attached hereto as Exhibit "A" a plat showing the outlines of the South Carlsbad-Morrow Gas Pool as it existed at the time the application was filed and indicating the portion thereof belonging to Petitioners. We believe that the Court will take notice of the fact that since the original Petition was filed the Oil Conservation Commission issued Order R-4437 on December 1, 1972 further delineating the South Carlsbad-Morrow Gas Pool and the additional acreage is also shown on Exhibit "A". It will be noted that the S½ Section 25, Township 22 South, Range 26 East is separated from the other acreage of Petitioners in Sections 2 and 11 by approximately one mile.~~

The Morrow formation or zone is a part of the Pennsylvanian formation and under Rule 104 of the Rules and Regulations of the Commission where a well is producing from the Pennsylvanian formation or deeper 320 acres, more or less, is dedicated to each well, and any

well which is drilled within one mile of any defined pool is classified as a development well and is to be spaced, drilled, operated and produced in accordance with the rules and regulations in effect for such pool.

At the hearing before the Commission, the Petitioners contended that their wells were producing from a separate and distinct reservoir from the other wells in the defined South Carlsbad-Morrow Gas Pool and that there was no communication between the reservoirs because they were separated by a fault or a sincline or both and that the respective areas were not the same stratigraphically.

The Commission held that the evidence presented to show the presence of a fault was vague and unreliable and that there was no substantial evidence presented that would prove the existence of a fault as claimed by Petitioners. The Commission further held that while the evidence presented did indicate that there may be a sincline existing in the area of the proposed separation, there was no reliable evidence that it acted as a barrier and that the evidence presented did not show the existence of any effective barrier separating the proposed new pool.

The Commission further held that there was substantial evidence presented that each of the wells completed in the Morrow formation is producing from a zone or zones productive of gas from other wells on the east side of the alleged barrier and that there was substantial evidence that there is communication between the areas to the west and to the east of the alleged barrier and that said areas constitute a single common source of supply in each formation and that the area should not be separated.

The South Carlsbad-Morrow Gas Pool is a prorated gas pool. The oil and gas leases covering the lands within the limits of the pool which are not ~~shown on Exhibit "A" to be~~ owned by Petitioners are owned by Cities Service Oil Company, Pennzoil Company, Morris R. Antweil,

Delta Drilling Company, Mabee Petroleum Company, Midwest Oil Corporation and others. The above named parties all entered an appearance and protested the application of Petitioners in connection with the hearing before the Commission.

III. AUTHORITIES AND ARGUMENT

Petitioners allege that Order R-4392 issued by the Commission is erroneous in that Commission Findings No. 11 through 22, inclusive, are not supported by substantial evidence and are in fact contrary to the evidence as shown by the record. It is also alleged that additional information and data has become available since the hearing as a result of the drilling and completion of additional wells in the immediate area, which information will shed additional light on the basic issues involved in the case and which information and data should have been considered and reviewed by the Commission on rehearing.

The contention of the Petitioners that the Commission should have granted a rehearing because of the allegations in the Petition that additional information had been developed since the original hearing, in our opinion, does not make it mandatory for the Commission to grant a rehearing. If the Petitioners had made a tender of the testimony which they considered to be new and controlling with their application for a rehearing then there might have been some basis for granting a rehearing. This supposedly new testimony cannot now be presented on appeal because of the decision of our Supreme Court with which I am sure the Court is familiar in the case of Continental Oil Company v. Oil Conservation Commission, et al, decided in May 1962, 70 N.M. 310, 373 P.2d 809, in which it was held that the District Court could not consider new evidence on an appeal of an administrative hearing before the Oil Conservation Commission.

Because of the foregoing, the only issue involved in this appeal is whether or not Findings No. 11 through 22 in Order R-4392

of the Commission are supported by substantial evidence.

The Court is of course familiar with the substantial evidence rule which has been laid down by our Supreme Court and affirmed time and time again by numerous cases. This is to the effect that neither the verdict of the jury nor the findings of a trial court will be disturbed in the appellate court when they are supported by any substantial evidence. Stated another way, a verdict reasonably supported by the evidence or supported by sufficient evidence, or substantially supported by the evidence, will not be disturbed on appeal. (For the numerous cases in our Supreme Court, see Sec. 1001, 2A New Mexico Digest).

The substantial evidence rule as applied to decisions by administrative bodies or under the administrative law is even more liberal, as stated in Section 688, Am. Jur. 2d, page 572:

> "'Substantial evidence' has been described as such evidence as will establish a substantial basis of fact from which the fact at issue can be reasonably inferred. Substantial evidence is more than a scintilla, must do more than create a suspicion of the existence of the fact to be established, and means such relevant evidence as a reasonable mind might accept as adequate to support a conclusion. It must be enough to justify, if the trial were to a jury, a refusal to direct a verdict where the conclusion sought to be drawn from it is one of fact for the jury.
>
> "In order to be supported by substantial evidence, the evidence need not compel the inference, convince one of the facts, constitute a preponderance of the evidence, or be such as to preclude a justifiable decision to the contrary. It is immaterial whether the court would reach the same conclusion on the facts as the administrative agency. The test is not whether the evidence admitted in court preponderates against the administrative decision, nor yet whether there is merely some evidence to support the decision. The test is whether the administrative decision finds reasonable support in substantial evidence, whether the evidence reasonably tends to support the findings, or, it has been indicated, whether the decision is not clearly contrary to the overwhelming weight of the evidence. The judicial judgment is not left at large even under the admonition not to abdicate the judicial function embraced by the Federal Administrative Procedure Act, and

> courts must respect the findings of fact within its field by an agency presumably equipped or informed by experience to deal with a specialized field of knowledge. Even as to matters not requiring expertise a court may not displace the agency's choice between two fairly conflicting views, although the court would justifiably have made a different choice had the matter been before it de novo. But while findings of fact are entitled to respect they must nonetheless be set aside where the record clearly precludes the decision from being justified by a fair estimate of the worth of the testimony of witnesses or informed judgment on matters within the agency's special competence, or both.
>
> "In some cases it is stated that substantial evidence must be legal or competent evidence. Circumstantial evidence or reasonable inferences drawn from the facts may constitute substantial evidence, as may expert testimony."

The Petitioners presented the testimony of two witnesses, namely Thomas A. Baldwin and Robert Becker. The Petitioners' principal witness, Thomas A. Baldwin, resides in Pasadena, California and qualified as a petroleum geologist (Tr. p. 4-7). Through Mr. Baldwin several exhibits were introduced on behalf of Petitioners. Exhibit 2 was a structural map contoured on the Morrow formation and showed the same structural features as Exhibit 1, which was contoured on top of the Strawn formation, and this consisted of what Mr. Baldwin referred to as a "faulted sincline" on the west flank of the structure. (Tr. p. 8, 9). Mr. Baldwin also indicated on Exhibit 2 what he referred to as certain "fault cuts". He described the fault cuts to be a position in the well where the well actually passed through a fault plane and because of the faulting a part of the section had been removed or a part of the section was missing. He stated that the amount that is missing varies from about 50 feet to 100 feet in the various cuts (Tr. p. 10-11) Mr. Baldwin also testified that in his opinion the geologic conditions were such by reason of the faulting and sincline that the Grace wells were separated from the main pool, with the exception of the Grace

Carlsbad well (Tr. p. 36, 37).

Mr. R. W. Becker, appearing on behalf of the Petitioners, testified that he was a consulting geologist and that he testified on behalf of the Petitioners in connection with the original application heard before an examiner. At that time he submitted a structural plat which also showed a sincline to the west of the main structure (Tr. 185-187). On cross-examination, Mr. Becker testified that it was doubtful if the sincline acted as a barrier as far as the City of Carlsbad well in Section 25 is concerned (Tr. 190).

Mr. Frank L. Schatz appeared as a witness on behalf of Midwest Oil Corporation. His testimony showed that he was District Exploration Manager of the Midland office of Midwest and had previously testified before the Commission and qualified as a petroleum geologist. (Tr. 102, 103). Exhibits 1 through 9 of Midwest were discussed by Mr. Schatz in his testimony. These exhibits consisted principally of cross sections through the various wells in the South Carlsbad Pool. Mr. Schatz testified that Midwest Oil Corporation owned an interest in leases in Section 35, Township 22 South, Range 26 East and in Section 3, Township 23 South, Range 26 East and was operator of a well which was being drilled in Section 3. (Tr. 104). The gist of Mr. Schatz' testimony was that there were as many as four separate zones from which the various wells were producing which were referred to as Zones A, B, C and D. It was pointed out that Zone C was present in most of the wells and that these different zones constituted zones of porosity and permeability or sand lenses and that undoubtedly there was communication between these zones in different places throughout the pool. (Tr. 107-110).

Mr. Schatz' testimony indicated that he had spent approximately 21½ years in geological work in West Texas in connection with wells producing from the Pennsylvanian formation and that the missing

sections referred to by Mr. Baldwin related to the lenticularity rather than to a faulting condition (Tr. 111). Mr. Schatz further stated that he did not agree with Mr. Baldwin's interpretation of the faulting condition. He also testified that he had some seismic information of the area and it did not show a faulting condition. In this connection he testified that ordinarily seismic information would be the best evidence to show a faulting condition and that it would be quite unusual to find five or six wells in close proximity which cut faults as Mr. Baldwin testified. Mr. Schatz further testified that there was no reason, in his opinion, why the S½ Section 25, Township 22 South, Range 26 East and Sections 2 and 11, Township 23 South, Range 26 East should be separate or segregated from the other lands in the field or pool (Tr. 113, 114).

Excerpts from the testimony of the above mentioned witnesses has been given to show that there was testimony pro and con with respect to the applicants' acreage being segregated or separated by an impermeable barrier from the other lands in the pool. The testimony of Mr. Schatz was very clear and convincing from his cross sections that many of the wells were producing from the same zone or stringers in the Morrow formation.

The testimony of J. C. Ramey which was presented on behalf of Pennzoil and the testimony of R. M. Williams presented on behalf of Antweil all tended to corroborate the testimony of Mr. Schatz.

The Petitioners introduced Exhibit 1 by Mr. Baldwin which was a contour map or plat drawn on top of the Strawn formation. This was practically all of the evidence introduced by Petitioners relating to the Strawn Pool or formation and consequently the Commission was justified in its Finding No. 11 to the effect that applicants' case is practically devoid of evidence concerning the Strawn formation. Findings Nos. 12 and 13 in the order of the Commission are to the effect that the evidence presented to show the

presence of a fault is vague and unreliable and that there was no substantial evidence presented that would prove the existence of a fault. As indicated hereinabove, there was conflicting testimony between Mr. Baldwin and Mr. Schatz and the Commission had the right to accept the testimony of Mr. Schatz over that of Mr. Baldwin, which it apparently did and of course this constituted substantial evidence in support of these findings.

Findings 14 and 15 of the Commission were to the effect that evidence presented by Petitioners concerning pressure differentials in the Morrow zone was not reliable and did not amount to substantial evidence. In this connection, Mr. Baldwin testified that he took into consideration that there was a differential in pressure between the wells to the west of the fault and those to the east concerning which he testified. Upon cross examination it was brought out that he was using surface pressure except in the case of one well and that the use of surface pressure in this connection is subject to any number of variables which could make them incorrect, or not reliable (Tr. 39, 40).

Findings 16 and 17 of the Commission were to the effect that the evidence presented did ~~not~~ indicate there may be a sincline existing in the area of the proposed separation ~~and~~ but that there was no reliable evidence that it constituted an effective barrier separating the acreage which Petitioners sought to segregate. The evidence we have referred to above introduced through Mr. Schatz is amply sufficient to support these findings.

Findings 18, 19, 20 and 21 were to the effect that there was substantial evidence presented to show that each of the wells completed in the Morrow formation in the west side of the pool are producing from a zone or zones productive of gas from other wells on the east side of the alleged fault or sincline and to show that

there is communication between the areas to the west and to the east of the alleged barrier, and that all of the acreage defined as the South Carlsbad-Morrow Gas Pool constituted a single gas pool. We believe the evidence referred to hereinabove introduced by Mr. Schatz on behalf of Midwest and the testimony of other protestants clearly supports these findings.

The other finding of the Commission, No. 22, was to the effect that in order to prevent waste and protect correlative rights the application should be denied. Again, this is clearly supported by substantial evidence. However, in this connection we desire to call the Court's attention to the fact that if the findings above referred to are in fact not correct and it is true that Petitioners' wells are producing from a separate pool or reservoir, the order of the Commission denying the application cannot in any way prejudice or affect the property rights of the Petitioners. If Petitioners' wells are producing from a separate reservoir, Petitioners will eventually produce all of the gas in that reservoir, the only difference being that because the field is pro rated it might take them a little longer to produce the gas from their reservoir. On the other hand, if there is communication between the zones from which Petitioners' wells are producing and those from which other wells are producing in the area, then the segregation of Petitioners' leases on the basis of being a separate pool would certainly be in violation of the correlative rights of the other parties due to the fact that Petitioners could produce their wells at capacity, whereas the wells of the other parties would have to be pro rated.

CONCLUSION

In conclusion, we submit that there is evidence well within the substantial evidence rule which is applied in the review of administrative cases to support all of the findings of the Commission and therefore the petition should be denied and thereby the order

of the Commission affirmed.

Respectfully submitted,

HINKLE, BONDURANT, COX & EATON

By _____
Attorneys for Midwest Oil
Corporation
P.O. Box 10
Roswell, New Mexico 88201

Thomas A. Baldwin, Professional Qualifications

Registered Geologist, California, No. 175
Registered Petroleum Engineer, California, No. P-798
Certified Professional Geologist, AIPG, No. 310

Active Member, AAPG (Natl. Advisory Councilor, 1970-73)
Active Member, SEG
Fellow, GSA

Local Reference: Dr. Sherman Wengard, University of New Mexico
Professor, Geology Department
1040 Stanford Drive, N. E.
Albuquerque, New Mexico

Education: University Southern California
B. A. Magna Cum Laude
Major. Geology
Minor and graduate work, Petroleum Engineering

Experience: 35 years

1937-48 Texaco, palentology, well-site and development geology. Field work and oil field planning.

1948-61 Monterey Oil Company and predecessors exploration and development geology in all parts of U. S., North Africa, Europe, Mexico, Middle East.

1961-71 Humble Oil, research and basin studies.

1971-Present - Tetra Tech, Incorporated, Chief Geologist, worldwide geological, geophysical, and engineering service.

Thomas A. Baldwin
August 14, 1972

Chec 4795

TETRA TECH, INC.
630 NORTH ROSEMEAD BLVD.
PASADENA, CALIFORNIA 91107
TELEPHONE (213) 449-6400

SOUTH CARLSBAD GAS FIELD

AUGUST, 1972

THOMAS A. BALDWIN

TETRA TECH, INC.
630 NORTH ROSEMEAD BLVD.
PASADENA, CALIFORNIA 91107
TELEPHONE (213) 449-6400

August 10, 1972

Mr. Michael P. Grace
P. O. Box 1418
Carlsbad, New Mexico 88220

SUBJECT: South Carlsbad Gas Field Study

Dear Sir:

You have retained Tetra Tech, Incorporated to investigate the structure, stratigraphy, and reservoir characteristics of the South Carlsbad Gas Field and in particular of the "Morrow Pool" (so designated at present). You have asked us to determine:

1. Whether your wells collectively or individually are in producing communication with the wells of the main pool or,

2. Whether (as you believe) your wells produce from a zone or zones not in communication with the wells of the main pool but actually from a new pool physically separated from the main pool.

At Tetra Tech we have collected all available well logs and pertinent data and have prepared the following exhibits:

1. A structural contour map at the top of the Strawn formation. This map is similar to maps prepared by other companies and geologists. It indicates the broad and gentle South Carlsbad anticline. An irregular structural low trend separates the main producing area from all of your wells (with the exception of Grace No. 1 Grace-Carlsbad). A fault extending along this low trend and interrupting the structure is normal, down-to-the-east and hading easterly. The fault throw ranges from 50 to 100 feet. Please note that the subsea position of Pennzoil No. 1 Gulf-Federal (-7252 at top of Strawn) is anomalously low to the Grace Gradonoco, Humble-Grace and Panagra wells. This anomaly is best explained by faulting.

2. A structural contour map at the top of the Morrow formation. Regionally the South Carlsbad anticline is somewhat sharper at this deeper horizon. The Pennzoil No. 1 Gulf-Federal and the Grace No. 1 Grace-Carlsbad wells are anomalously low to the various wells on the west side of the fault. On this map fault cuts are indicated by the symbol "f" with a subsea value. In general the fault observations are rated "Fair" to "Fairly Good". Six fault cuts are recorded and therefore the possibility of a fault causing a physical separation between most of the Grace wells and the easterly wells of the field is considered "Excellent-Reliable". Therefore, all but one of the Grace wells are physically separated from the main pool.

3. An Isobar map illustrating by contours the shut in pressures on the wells producing from the Morrow. This map, based upon data filed with the Oil Conservation Commission, State of New Mexico considers the surface pressure records from wells shut in for 24 hours or longer. Various factors which can affect such recordings have not been observed or are not available (past history of water production, fluid level if fluid was present etc.). Even in the absence of such data it is apparent that the pressure records contour to a discrete and predictable form similar in shape to the structural anticline. The Grace, No. 1 Humble-Grace, and No. 1 Gradonoco record pressures higher than would be anticipated. This pressure anomaly combined with anomalously high calculated atmospheric open hole productivity of the Humble-Grace well indicates from reservoir characteristics that the Grace wells are not producing from a reservoir which communicates with the wells to the east.

4. An index map showing the locations of cross sections A and B and indicating a group of five wells which have been studied with a detailed correlation chart.

5. Cross sections A-A' and B-B', horizontal scale 1" - 1000', vertical scale 1" - 250'. These sections were drawn to illustrate the high quality of gross correlations in the area and to study the nature of the "Grace" fault previously referred to. In the Grace wells, Panagra No. 1 and City of Carlsbad No. 1 about 100 feet of the section is cut out as compared to Pennzoil Federal 12-1 and City Service Marland 1-B.

6. Correlations in the Morrow formation. No horizontal scale, vertical scale 1" - 40 feet. This section is referenced to a stratigraphic datum, the top of the Morrow formation (It should be noted that in a strict academic sense the Morrow is a Biozone, not a formation and as such was originally identified as an interval carrying a particular suite of fusselinid foraminifera. Long oil field subsurface usage has identified Morrow as a stratigraphic section lying between readily identified electric log markers. Other geologists in studies of the area use Morrow picks that vary about 20 feet above or below the pick used by Tetra Tech. Our selection is arbitrary but can be found readily in every well and is so sharp it can be picked to the nearest foot on large scale logs.

   The base of the Morrow (top of the Mississippian Chester Shale) is penetrated by many wells in the area and is a distinct lithologic unit picked in cuttings as well as an excellent electric log marker.

   A calcareous sandstone with a highly recognizable electric signature is indicated in blue about 100 feet below the Morrow top. A dashed line correlates the top of a portion of the Morrow with a sand count (from cuttings) in excess of 65%. About 125 feet above the base of the Morrow a calcareous sandstone break is correlated on the base of an individualistic gamma ray signature traceable throughout the field. Many other readily recognized electric log markers could be indicated on this section. The quality of correlation is rated as "Fully Reliable".

   The producing intervals of the various wells are indicated in red. The Grace wells No. 1 Gradonoco and No. 1 Humble-Grace are completed in an interval centered about 370 feet below the top of Morrow. The Pennzoil wells, No. 1 Gulf-Federal, No. 1 Mobil Federal "12", and No. 1 Echols are completed in an interval centered about 300 feet below the top of the Morrow.

The interval (Morrow +370) produced in the Grace wells does not exhibit any porosity or gas saturation in the Pennzoil wells. The interval (Morrow +300) produced in the Pennzoil wells does not exhibit any porosity or gas saturation in the Grace wells.

As shown on the index map the Pennzoil wells referred to, lie in a north-south alignment which forms, in effect, a fence separating the Grace wells from the rest of the field.

Stratigraphically, it is clearly established that these Grace wells are not in producible communication with the rest of the field.

SUMMARY

Structurally, stratigraphically, and in reservoir characteristics it is established that your wells (with the exception of the No. 1 Grace-Carlsbad) are not producing from the South Carlsbad Morrow Pool but from a separate accumulation.

Thomas A. Baldwin
Chief Geologist, Tetra Tech, Inc.

Certified Geologist #310, A. I. P. G.
Registered Geologist #175, California
Registered Petroleum Engineer #789, Calif.
Active Member A. A. P. G.
Active Member S. E. G.
Fellow G. S. A.

TAB:dd

western union

Telegram

KA017 1972 AUG 15 AM 9 56

K KCA128(1027)(1-006922C228)PD 08/15/72 1024 =ICS
IPMTUKA TUL =ZCZC 029 A PD TULSA OKLA 15 913A CST =
THE NEW MEXICO OIL CONSERVATION COMMISSION=
PO BOX 2088 SANTA FE NMEX =

REFERENCE IS MADE TO THE APPLICATION BY MICHAEL P =GRACE
11 AND CORINNE GRACE IN CASE # 4795 AND 4796 =SEEKING
THE CONTRACTION OF THE HORIZONTAL LIMITS OF =THE SOUTH
CARLBAD MORROW GAS POOL THE CREATION OF =TWO NEW POOLS
AND EXCEPTION TO THE GENERAL RULES AND =REGULATIONS
GOVERNING THE PRORATED GAS POOLS OF =SOUTHEAST NMEX =
THIS IS TO ADVISE THAT APACHE EXPLORATION CORP OBJECTS =
TO THE APPLICATION OF MICHAEL P GRACE 11 AND CORINNNE

WU 1201 (R 5-69)

western union

Telegram

GRACE =IN CASE #4795 AND 4796 OUR OBJECTION IS BASED ON
THE =PRESENCE OF IDENTIFIABLE SANDS A B C AND D IN WELLS
=THROUGHOUT THE AREA. CONSEQUENTLY WE BELIEVE THAT =THE
MORROW GAS SANDS ARE A SINGLE PRODUCTIVE ZONE =AND
PROBATION SHOULD BE SO APPLIED. PLEASE CONFIRM =RECEIPT
THIS TELEGRAM =

APACHE EXPLORATION CORP BY J PHIL JONES FOR DONALD
L HANSEN =CENTRAL DIVN EXPLORATION MCR =

11 4795 4796 11 4795 4796 A B C D =

WU 1201 (R 5-69)

THE SUPERIOR OIL COMPANY
P. O. BOX 1900
MIDLAND, TEXAS 79701

August 11, 1972

Mr. A. L. Porter
Secretary-Director
New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico

Re: Case No. 4795, Application of
Michael P. Grace and Corinne Grace
for Pool Contraction
South Carlsbad Field
Eddy County, New Mexico

Dear Sir:

The Superior Oil Company, as operator of one well in the South Carlsbad Field and interests in three additional wells, opposes the above captioned Application for Contraction and Creation of New Pool. We believe that evidence supports that the Grace wells are and should be a part of the South Carlsbad Field.

Very truly yours,

THE SUPERIOR OIL COMPANY

T. D. Clay
Senior Petroleum Engineer

TDC/jf

Docket No. 18-72

DOCKET: REGULAR HEARING - WEDNESDAY - AUGUST 16, 1972

OIL CONSERVATION COMMISSION - 9 A.M. - MORGAN HALL, STATE LAND OFFICE BUILDING, SANTA FE, NEW MEXICO

ALLOWABLE: (1) Consideration of the oil allowable for September and October, 1972;

(2) Consideration of the allowable production of gas for September, 1972, from seventeen prorated pools in Lea, Eddy, Roosevelt, and Chaves Counties, New Mexico. Consideration of the allowable production of gas from nine prorated pools in San Juan, Rio Arriba, and Sandoval Counties, New Mexico, for September, 1972.

CASE 4720: (DE NOVO)

Application of Rotary Oil & Gas Company for an unorthodox location and non-standard gas proration unit, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval of a non-standard gas proration unit in the Osudo-Devonian Gas Pool comprising the NE/4 of Section 32 and the NW/4 of Section 33, Township 20 South, Range 36 East, Lea County, New Mexico, to be dedicated to a well to be drilled at an unorthodox location 660 feet from the North line and 1980 feet from the East line of said Section 32.

Upon application of Western Oil Producers, Inc., Franklin, Aston & Fair, Inc., Featherstone Development Corporation, Olen F. Featherstone II Trust, Charles W. Hicks, Robert Gallaway, Bearing Service & Supply, Wilson Oil Company, and Wyoming Oil Company, this case will be heard DE NOVO under the provisions of Rule 1220.

The Commission on its own motion will also consider whether or not the Osudo-Devonian Gas Pool should be reclassified as an associated pool with special rules and regulations providing for oil well and gas well spacing.

CASE 4795: (Continued from the August 9, 1972, Examiner Hearing)

Application of Michael P. Grace II and Corinne Grace for pool contraction and creation of two new gas pools, Eddy County, New Mexico. Applicants, in the above-styled cause, seek the contraction of the horizontal limits of the South Carlsbad-Morrow Gas Pool, Eddy County, New Mexico by the deletion therefrom of the following:

TOWNSHIP 22 SOUTH, RANGE 26 EAST, NMPM
Section 25: S/2

TOWNSHIP 23 SOUTH, RANGE 26 EAST, NMPM
Section 2: All
Section 11: All

(Case 4795 continued from Page 1)

Applicants further seek the creation of two new pools for the production of gas from the Strawn and Morrow formations with the horizontal limits of each pool to comprise the following:

TOWNSHIP 22 SOUTH, RANGE 26 EAST, NMPM
Section 24: All
Section 25: All
Section 35: All
Section 36: W/2

TOWNSHIP 23 SOUTH, RANGE 26 EAST, NMPM
Section 2: All
Section 11: All

CASE 4796: (Continued from the August 9, 1972, Examiner Hearing)

Application of Michael P. Grace II and Corinne Grace for capacity allowable, Eddy County, New Mexico. Applicants, in the above-styled cause, seek an exception to the General Rules and Regulations governing the prorated gas pools of Southeast New Mexico, promulgated by Order No. R-1670, as amended, to produce their City of Carlsbad "COM" Well No. 1, located in Unit O of Section 25, Township 22 South, Range 26 East, South Carlsbad-Morrow Gas Pool, Eddy County, New Mexico, at full capacity.

Docket No. 17-72

DOCKET: EXAMINER HEARING - WEDNESDAY - AUGUST 9, 1972

9 A.M. - OIL CONSERVATION COMMISSION CONFERENCE ROOM,
STATE LAND OFFICE BUILDING - SANTA FE, NEW MEXICO

The following cases will be heard before Elvis A. Utz, Examiner, or Daniel S. Nutter, Alternate Examiner:

CASE 4785: Application of Gulf Oil Corporation for rededication of acreage and a non-standard proration unit, Lea County, New Mexico. Applicant, in the above-styled cause, seeks the consolidation of a 40-acre non-standard proration unit comprising the SE/4 NW/4 of Section 28 and an 80-acre non-standard proration unit comprising the W/2 NE/4 of Section 28; Township 21 South, Range 37 East, Blinebry Gas Pool, Lea County, New Mexico, to form a 120-acre non-standard proration unit. Applicant also seeks permission to produce the allowable assigned to said 120-acre unit from its Eunice King Wells Nos. 5 and 9 located, respectively, in Units F and G of said Section 28 in any proportion.

CASE 4786: Application of Highland Production Company for salt water disposal, Lea County, New Mexico. Applicant, in the above-styled cause, seeks authority to dispose of produced salt water into the Delaware formation in the open-hole interval from 4378 feet to 4418 feet in its Russell Federal Well No. 6 located in Unit K of Section 20, Township 26 South, Range 32 East, East Mason-Delaware Pool, Lea County, New Mexico.

CASE 4787: Application of Superior Oil Company for an unorthodox well location, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks authority to drill a gas well to test the Morrow and other formations at an unorthodox location 660 feet from the North line and 990 feet from the West line of Section 5, Township 23 South, Range 27 East, South Carlsbad Field, Eddy County, New Mexico, with the N/2 of said Section 5 to be dedicated to the well.

CASE 4788: Application of Murphy H. Baxter for an unorthodox well location, Lea County, New Mexico. Applicant, in the above-styled cause, seeks authority to drill a producing well approximately in the center of the SW/4 of Section 18, Township 17 South, Range 33 East, Maljamar (Grayburg-San Andres) Pool, Lea County, New Mexico. Said well to be within the area of a waterflood project approved by Order No. R-2156.

CASE 4789: Application of Humble Oil & Refining Company for special pool rules, Chaves County, New Mexico. Applicant, in the above-styled cause, seeks the promulgation of special rules for the Many Gates-Abo Pool, Chaves County, New Mexico, including provisions for 80-acre spacing units and wells to be located in the approximate center of the NE/4 or SW/4 of each quarter section.

CASE 4790: Application of The Petroleum Corporation for special pool rules and a non-standard proration unit, Lea County, New Mexico. Applicant, in the above-styled cause, seeks the promulgation of special pool rules

(Case 4790 continued from Page 1)

for the Dublin-Ellenburger Gas Pool, Lea County, New Mexico, including a provision for 640-acre spacing units. Applicant further seeks approval of a 480-acre non-standard unit in said pool comprising the S/2, S/2 of NE/4 and E/2 NW/4 of Section 12, Township 26 South, Range 37 East, to be dedicated to its Tenneco Federal Well No. 1 located in Unit N of said Section 12.

CASE 4791: Application of Monsanto Company for a unit agreement, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval of the Burton Flat Deep Unit Area comprising 5,808 acres, more or less, of Federal, State, and Fee lands in Township 20 South, Range 28 East, and Township 21 South, Range 27 East, Eddy County, New Mexico.

CASE 4792: Application of David Fasken for a unit agreement, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval of the Walker Draw Unit Area comprising 7,040 acres, more or less, of Federal, State, and Fee lands in Sections 8, 9, 10, 15, 16, 17, 20, 21, 22, 28, and 29, Township 23 South, Range 23 East, Eddy County, New Mexico.

CASE 4793: Application of Tenneco Oil Company for a pressure maintenance project and unorthodox locations, McKinley County, New Mexico. Applicant, in the above-styled cause, seeks authority to institute a pressure maintenance project in the South Hospah-Lower Sand Pool by the injection of water and gas into the Lower Hospah formation through three wells located at orthodox and unorthodox locations in Section 12, Township 17 North, Range 9 West, McKinley County, New Mexico.

Applicant further seeks a procedure whereby additional injection wells and expansion of the project area may be approved without the necessity of notice and hearing.

CASE 4794: Application of Green & Michaelson Producing Company for compulsory pooling, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests from the surface of the ground down to and including the Devonian formation underlying the N/2 of Section 2, Township 19 South, Range 23 East, Eddy County, New Mexico, to be dedicated to a wildcat Devonian well to be drilled at a standard location in the NE/4 of said Section 2.

Also to be considered will be the costs of drilling said well, a charge for the risk involved, a provision for the allocation of actual operating costs, and the establishment of charges for supervision of said well.

CASE 4760: (Readvertised)

Application of Anadarko Production Company for a waterflood project, Lea County, New Mexico. Applicant, in the above-styled cause, seeks to institute a waterflood project by the injection of water into the

(Case 4760 continued from Page 2)

Grayburg and Queen formations through its R. E. Cole Well No. 3 located in the SW/4 SW/4 of Section 16 and its E. W. Walden Well No. 6 located in the SE/4 SW/4 of Section 15, Township 22 South, Range 37 East, Penrose Skelly Pool, Lea County, New Mexico.

Applicant further seeks establishment of a procedure whereby the conversion of additional wells to injection may be approved without notice and hearing. In the absence of objection, an order will issue based upon evidence received in this case on July 12, 1972.

CASE 4795: (THIS CASE WILL BE CONTINUED TO AUGUST 16, 1972, AND WILL BE HEARD BY A QUORUM OF THE COMMISSION.)

Application of Michael P. Grace II and Corinne Grace for pool contraction and creation of two new gas pools, Eddy County, New Mexico. Applicants, in the above-styled cause, seek the contraction of the horizontal limits of the South Carlsbad-Morrow Gas Pool, Eddy County, New Mexico by the deletion therefrom of the following:

TOWNSHIP 22 SOUTH, RANGE 26 EAST
Section 25: S/2

TOWNSHIP 23 SOUTH, RANGE 26 EAST
Section 2: All
Section 11: All

Applicants further seek the creation of two new pools for the production of gas from the Strawn and Morrow formations with the horizontal limits of each pool to comprise the following:

TOWNSHIP 22 SOUTH, RANGE 26 EAST
Section 24: All
Section 25: All
Section 35: All
Section 36: W/2

TOWNSHIP 23 SOUTH, RANGE 26 EAST
Section 2: All
Section 11: All

CASE 4796: (THIS CASE WILL BE CONTINUED TO AUGUST 16, 1972, AND WILL BE HEARD BY A QUORUM OF THE COMMISSION.)

Application of Michael P. Grace II and Corinne Grace for capacity allowable, Eddy County, New Mexico. Applicants, in the above-styled cause, seek an exception to the General Rules and Regulations governing the prorated gas pools of Southeast New Mexico, promulgated by Order No. R-1670, as amended, to produce their City of Carlsbad "COM"

(Case 4796 continued from Page 3)

Well No. 1 located in Unit O of Section 25, Township 22 South, Range 26 East, South Carlsbad-Morrow Gas Pool, Eddy County, New Mexico, at full capacity.

CASE 4797: Application of Michael P. Grace II and Corinne Grace for a dual completion, Eddy County, New Mexico. Applicants, in the above-styled cause, seek approval for the dual completion of their Humble-Grace Well No. 1 located 990 feet from the South line and 660 feet from the East line of Section 2, Township 23 South, Range 26 East, Eddy County, New Mexico, in such a manner as to produce gas from the Strawn and Morrow formations. Said well being presently designated as a South Carlsbad-Morrow gas well.

OIL CONSERVATION COMMISSION
P. O. BOX 2088
SANTA FE, NEW MEXICO 87501

file in case no. 4795

July 26, 1972

Mr. William J. Cooley
152 Petroleum Center Building
Farmington, New Mexico 87401

Re: Application of Michael P. and Corinne Grace

Dear Mr. Cooley:

By Order No. R-4034, dated October 2, 1970, in Case No. 4398, the Commission approved the application of Michael P. Grace and Corinne Grace to pool certain interests in the N/2 and the S/2 of Section 2, Township 23 South, Range 26 East, Eddy County, New Mexico, and to drill a well on each half section at an unorthodox location. Order No. R-4034 not only approved the application for pooling and unorthodox well locations, but also named the operator of the unit and provided for ratable-take and acreage factors.

The applicants, Michael P. Grace and Corinne Grace, caused the above two wells to be drilled and the wells have been designated as South Carlsbad-Morrow Gas Pool wells.

On July 19, 1972, Michael P. Grace and Corinne Grace through their attorneys, Burr & Cooley, filed an application with the Commission to contract the South Carlsbad-Morrow Gas Pool and to create a new Morrow gas pool and a new Strawn gas pool and for the removal of the restrictions imposed by the above-described Order No. R-4034, alleging that new evidence has been developed which conclusively proves structural and geological separation of the wells completed on the lands to comprise the new pools from all other wells presently completed in the South Carlsbad-Strawn and South Carlsbad-Morrow Gas Pools.

Case No. 4795 concerning the above-described application for contraction of the South Carlsbad-Morrow Gas Pool and the creation of new Strawn and Morrow gas pools will be heard by a quorum of the Commission on August 16, 1972.

C O P Y

OIL CONSERVATION COMMISSION
P. O. BOX 2088
SANTA FE, NEW MEXICO 87501

Mr. William J. Cooley
Page 2

July 26, 1972

The Commission will not consider the application of Michael P. Grace and Corinne Grace to reopen Case 4398 until after a decision has been made in Case No. 4795.

Yours very truly,

A. L. PORTER, Jr.
Secretary-Director

ALP/GMH/dr

COPY

County,

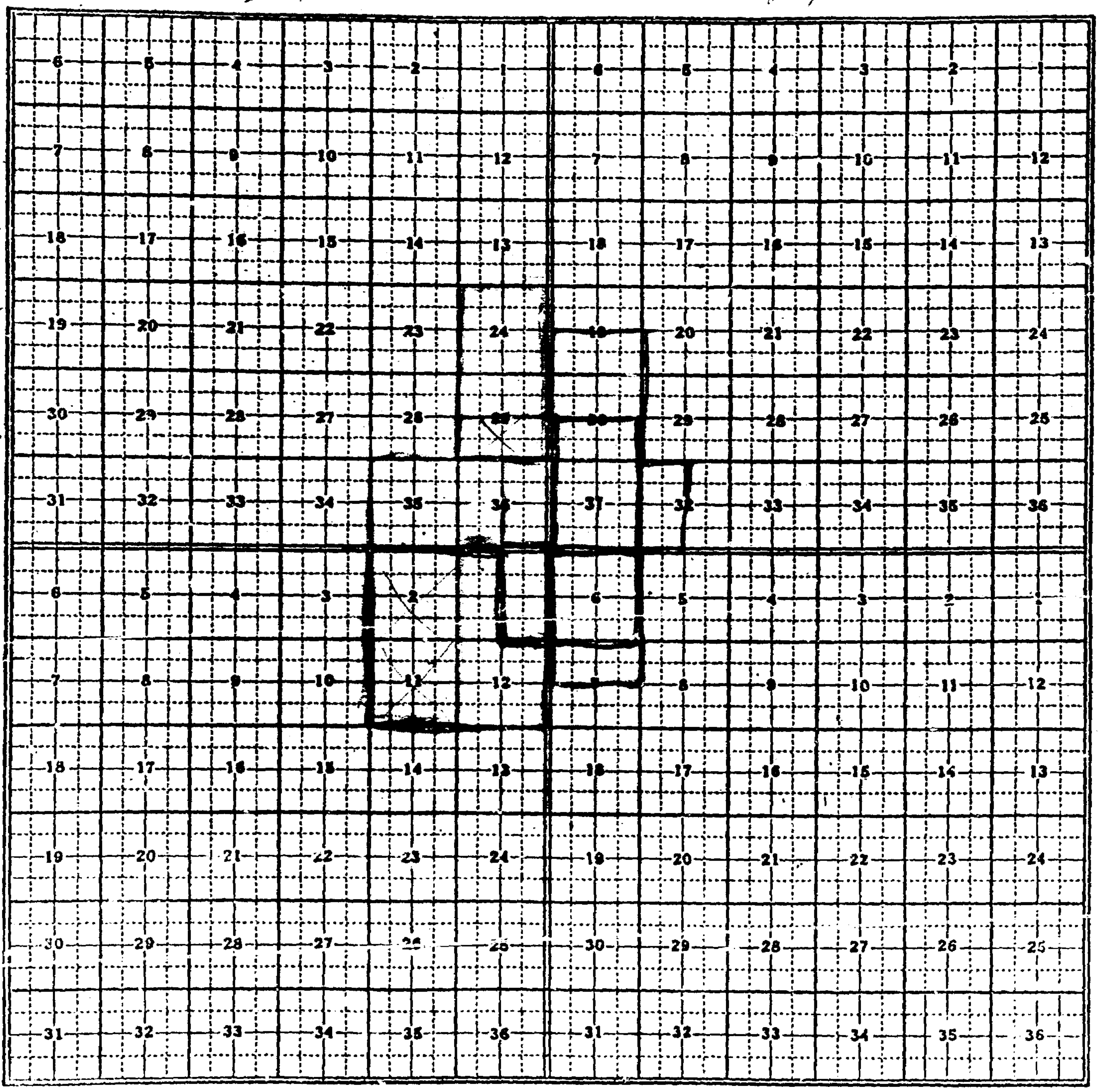
Township Range Township Range

Township Range Township Range

Form 104—(Four on Township)

26 27

22



23

Strawn

DRAFT

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASE NO. 4795
Order No. R- 4392

APPLICATION OF MICHAEL P. GRACE II
AND CORINNE GRACE FOR POOL CONTRAC-
TION AND CREATION OF TWO NEW GAS
POOLS, EDDY COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 a.m. on August 16, 1972, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission."

NOW, on this _____ day of September, 1972, the Commission, a quorum being present, having considered the testimony presented and the exhibits received at said hearing, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.

(2) Applicants, Michael P. Grace II and Corinne Grace, in the above-styled cause, seek the contraction of the horizontal limits of the South Carlsbad-Morrow Gas Pool, Eddy County, New Mexico, by the deletion therefrom of the following:

TOWNSHIP 22 SOUTH, RANGE 26 EAST, NMPM
Section 25: S/2

TOWNSHIP 23 SOUTH, RANGE 26 EAST, NMPM
Section 2: All
Section 11: All

(3) Applicants further seek the creation of two new pools for the production of gas from the Strawn and Morrow formations with the horizontal limits of each pool to comprise the following:

TOWNSHIP 22 SOUTH, RANGE 26 EAST, NMPM
Section 24: All
Section 25: All
Section 35: All
Section 36: W/2

TOWNSHIP 23 SOUTH, RANGE 26 EAST, NMPM
Section 2: All
Section 11: All

(4) That by Order No. R-3922, dated February 10, 1970, the Commission created the South Carlsbad-Strawn Gas Pool, Eddy County, New Mexico, for the production of gas from the Strawn formation.

(5) That the horizontal limits of the South Carlsbad-Strawn Gas Pool have been extended from time to time by order of the Commission.

(6) That by Order No. R-3731, dated April 18, 1969, the Commission created the South Carlsbad-Morrow Gas Pool, Eddy County, New Mexico, for the production of gas from the Morrow formation.

(7) That the horizontal limits of the South Carlsbad-Morrow Gas Pool have been extended from time to time by order of the Commission to include, among other lands, the area the applicants seek to delete.

(8) That the applicants contended that the area to be included in the proposed new Strawn and Morrow gas pools constitutes separate common sources of supply because said areas ~~were~~ are not in communication with the area which would remain as the South Carlsbad-Strawn and South Carlsbad-Morrow Gas Pools.

(9) That the applicants attempted to show that the areas were separated by a fault, or a syncline, or both, and that the areas were not the same stratigraphically.

(10) That no wells have been completed in the Strawn formation in the area proposed as a new Strawn gas pool.

(11) That the applicant's case is practically devoid of evidence concerning the Strawn formation.

(12) That the evidence presented to show the presence of a fault is vague and unreliable.

(13) That there was no substantial evidence presented that would prove the existence of a fault as claimed by the applicants.

(14) That the evidence presented by the applicants concerning pressure and productivity differentials in the Morrow zone ~~were~~ is not reliable due to many variables and many unknowns.

(15) That the evidence presented by the applicants concerning pressure and productivity differentials in the Morrow zone ~~did~~ does not amount to substantial evidence.

(16) While the evidence presented ~~indicates~~ does there may be a syncline existing in the area of the proposed separation, there is no reliable evidence that it acts as a barrier.

(17) That the evidence presented does not show the existence of any effective barrier separating the proposed new Strawn and Morrow gas pools from the areas which would remain as the South Carlsbad-Strawn and South Carlsbad-Morrow Gas Pools.

(18) That there was substantial evidence presented that each of the wells completed in the Morrow formation in the proposed new Morrow gas pool is producing from ~~the same zone that a well or wells to the east of the alleged barrier is producing from~~ a zone or zones productive of gas from other wells on the east side of the alleged barrier.

(20)~~(19)~~ That the applicants have failed to prove that a new gas pool for Strawn production should be created.

(21)~~(20)~~ That the applicants have failed to prove that the South Carlsbad-Morrow Gas Pool should be contracted and that a new Morrow gas pool should be created.

(19) (21) That there is substantial evidence that there is communication between the areas to the west and to the east of the alleged barrier, that said areas constitute a single common source of supply in each formation, and that the areas should not be separated.

(22) That in order to prevent waste and to protect correlative rights, the application should be denied.

IT IS THEREFORE ORDERED:

(1) That the application of Michael P. Grace II and Corinne Grace for the contraction of the South Carlsbad-Morrow Gas Pool and the creation of two new gas pools is hereby denied in its entirety.

(2) That jurisdiction of this cause is retained for the entry of such further orders as the Commission may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

BURR & COOLEY
ATTORNEYS AND COUNSELORS AT LAW
SUITE 132 PETROLEUM CENTER BUILDING
FARMINGTON, NEW MEXICO
87401

JOEL B. BURR, JR.
WM. J. COOLEY

TELEPHONE 325-1702
AREA CODE 505

September 22, 1972

NEW MEXICO OIL CONSERVATION COMMISSION
P. O. Box 2088
Santa Fe, New Mexico 87501

Re: Case No. 4795, Order No. R-4392

Gentlemen:

Enclosed herewith for filing are original and two copies of Application for Re-Hearing in the above-referred case.

Very truly yours,

BURR & COOLEY

By William J. Cooley
William J. Cooley

WJC:jjh
Encls.

BEFORE THE OIL CONSERVATION COMMISSION

OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

APPLICATION OF MICHAEL P. GRACE II AND CORINNE GRACE FOR POOL CONTRACTION AND CREATION OF TWO NEW GAS POOLS, EDDY COUNTY, NEW MEXICO.

CASE NO. 4795
Order No. R-4392

APPLICATION FOR RE-HEARING

COMES NOW the Applicants, Michael P. Grace II and Corinne Grace, by and through their attorneys, BURR & COOLEY, 152 Petroleum Center Building, Farmington, New Mexico, and respectfully make application to the Commission for re-hearing in the above styled and numbered cause.

In support of the foregoing Application, Applicants would show the Commission that they are the owners of certain oil and gas leasehold rights within the geographical area defined by the Commission as the South Carlsbad-Morrow Gas Pool in Eddy County, New Mexico, and that by reason of such ownership they have been affected by the Order of the Commission in the above styled and numbered cause.

Applicants verily believe the Order in the above styled and numbered cause to be erroneous in the following respects, to wit:

1. That Commission Findings 11, 12, 13, 14, 15, 16, 17, 18, 19, 21 and 22 in Order No. R-4392 entered by the Commission on September 8, 1972, are erroneous and contrary to the evidence adduced in the record of the above styled and numbered cause.

2. That additional information has been developed since the hearing of the above styled and numbered cause on August 16, 1972, as a result of the drilling and completion of certain additional wells in the immediate area, which information will shed additional light on the basic issues involved in the above styled and numbered cause.

WHEREFORE, Applicants respectfully request the Commission to grant re-hearing in the above styled and numbered cause in order to take into full consideration all matters hereinabove set forth.

BURR & COOLEY
152 Petroleum Center Building
Farmington, New Mexico 87401

By William Cooley
William J. Cooley
Attorneys for Applicants

BEFORE THE OIL CONSERVATION COMMISSION

OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION

OF

MICHAEL P. GRACE II and
CORINNE GRACE

Case 4795

FOR AN ORDER DELETING CERTAIN ACREAGE FROM THE SOUTH CARLSBAD-MORROW GAS POOL, AND FOR THE CREATION OF TWO NEW POOLS TO BE KNOWN AS THE WEST CARLSBAD-STRAWN AND WEST CARLSBAD-MORROW GAS POOLS, EDDY COUNTY, NEW MEXICO.

APPLICATION

COME NOW the Applicants, Michael P. Grace II and Corinne Grace, by and through their attorneys, BURR & COOLEY, 152 Petroleum Center Building, Farmington, New Mexico, and respectfully make application to the Commission to delete the following described acreage from the South Carlsbad-Morrow Gas Pool in Eddy County, New Mexico, to wit:

Township 22 South, Range 26 East, N.M.P.M.
Sec. 25: S/2

Township 23 South, Range 26 East, N.M.P.M.
Sec. 2: All
Sec. 11: All

Applicants further apply to the Commission for the creation of a new Morrow gas pool to be known as the West Carlsbad-Morrow Gas Pool, comprised of the following described acreage:

Township 22 South, Range 26 East, N.M.P.M.
Sec. 24: All
Sec. 25: All
Sec. 35: All
Sec. 36: W/2

Date 7-27-72
Docket Mailed
Date 8-3-72
Also for Aug. 16th

Township 23 South, Range 26 East, N.M.P.M.
Sec. 2: All
Sec. 11: All

together with such other acreage as the Commission may find properly includable in said pool.

Applicants further apply to the Commission for the creation of a new Strawn gas pool to be known as the West Carlsbad-Strawn Gas Pool, comprised of the following described acreage:

Township 22 South, Range 26 East, N.M.P.M.
Sec. 24: All
Sec. 25: All
Sec. 35: All
Sec. 36: W/2

Township 23 South, Range 26 East, N.M.P.M.
Sec. 2: All
Sec. 11: All

Applicants further apply to the Commission for removal of the restrictions imposed by Order No. R-4034 on the permissible production of the wells completed in Section 2, Township 23 South, Range 26 East, N.M.P.M., Eddy County, New Mexico.

In support of the foregoing Application, Applicants would show the Commission that since August 5, 1970, new evidence has been developed which conclusively proves effective structural and geological separation of the wells completed on the above described lands from all other wells presently completed in the South Carlsbad-Strawn and South Carlsbad-Morrow Gas Pools. That due to the above referred geological and structural separation it is physically impossible for the two wells located in said Section 2 to impair or adversely affect the correlative rights of any offset operator. Accordingly, such new evidence will conclusively prove that the production from Applicants' wells located in said Section 2 should

not be restricted by reason of the unorthodox locations of said wells.

WHEREFORE, Applicants pray that the Commission set the foregoing Application down to be heard at its next regularly scheduled examiner hearing.

BURR & COOLEY
152 Petroleum Center Building
Farmington, New Mexico 87401

By William J. Cooley
William J. Cooley
Attorneys for Applicants

II II

-4693-

Applicant to delete - T22S R26E

Sec. 25. S/2 - Morrow -

23S R26E

Sec 2 - all

Sec 11 - all

Create New Strawn and a new Mustang

T22S R26E

Sec. 24 - all

Sec 25 - all

Sec 35 - all

Sec 36 - W/2

23S - R26E

Sec 2 - all

Sec 11 - all

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO
Aug 16 1972

REGULAR HEARING

IN THE MATTER OF:

Application of Michael P. Grace II and Corinne Grace for pool contraction and creation of two new gas pools, Eddy County, New Mexico.

Case No. 4795

BEFORE: Bruce King, Governor of New Mexico, State Geologist
A. L. Porter, Jr., Secretary-Director Land Commissioner Alex Armijo, Member

TRANSCRIPT OF HEARING

NEW MEXICO OIL CONSERVATION COMMISSION

REGULAR HEARING

SANTA FE , NEW MEXICO

Hearing Date AUGUST 16, 1972 TIME: 9 A.M.

NAME	REPRESENTING	LOCATION
JIM COLLINS	CITIES SERVICE OIL	TULSA
ROBERT F. LEBLANC	" " "	"
E.H. Lowrey	" " "	Midland
J.C. Raney	Pennzoil Company	Midland
EDGAR KING	CITIES Service Oil	Midland
E.R. Manning	El Paso Natural Gas	El Paso
Bill Gressett	NMOCC	Artesia
[illegible]	Midwest Oil Co	Roswell
[illegible]	Plateau Inc	Farmington
Geo E. Ware	El Paso Natural Gas Co.	El Paso
E. H. Brown	Vickers Petroleum	Wichita Kan
JOE P COX	Union Oil Co. Calif	Midland Tex
J C Mann Jr	Belle Fourche P/L	Casper Wyo
[illegible]	TESORO PETROLEUM	Midland
JACK PEARCE	Western Crude Oil Inc	✓
John Mills	Cosden	Big Spring
Sam Hunnicutt	Charter Intl. Oil Co	Houston Tex
J H Myers	Charter Intl Oil Co	HOUSTON TEX
John L. Burns	" " " "	"
J. R. LENNON	Mobil Oil Corp.	Midland, Tex
Jack H. Jarrett	Cosden Oil & Chemical	Big Spring
Ray Mezic		

NEW MEXICO OIL CONSERVATION COMMISSION

REGULAR HEARING

SANTA FE , NEW MEXICO

Hearing Date AUGUST 16, 1972 **TIME:** 9 A.M.

NAME	REPRESENTING	LOCATION
J C Hart	Shell	Midland
J. J. Savage	Texaco	Midland
[illegible]	Texas	Midland
V. T. Lyon	CONOCO	HOBBS
Booker	CSO	Midland
M. J. Shirley	Permian	Abilene
W H Hogan	So. Union	Dallas
N. A Hannon	AMOCO	DENVER
L A Teagan	Tamarack	Midland
John W. Runyan	N.M.OCC	Hobbs
Joe D Ramey	"	"
R L Denton	Navajo Refy	Midland
F.L. Schatz	Midwest Oil Corp	"
J. Pulte	" " "	"
Jason Kellahin	Kellahin & Fox	Santa Fe

NEW MEXICO OIL CONSERVATION COMMISSION

REGULAR HEARING

SANTA FE, NEW MEXICO

Hearing Date AUGUST 16, 1972 TIME: 9 A.M.

NAME	REPRESENTING	LOCATION
	P. W. Bepam Co.	Santa Fe
Nirá DuDaime		
L M Williams	Morris R. Antweil	Hobbs

MR. PORTER: Case 4795.

MR. HATCH: Case 4795, application of Michael P. Grace II and Corinne Grace for pool contraction and creation of a new pool, gas pools, Eddy County, New Mexico.

MR. PORTER: Case 4795 was originally advertised for an Examiner's Hearing on August 9th, but on the docket for August 9th it was circulated to our entire mailing list, there was notation that the case would be continued to be heard by a formal commission on August 16th. So we will at this time call for appearances in Case 4795. Mr. Cooley.

MR. COOLEY: William J. Cooley of Farmington appearing on behalf of the applicant.

MR. PORTER: Mr. Hinkle.

MR. HINKLE: Clarence Hinkle of Hinkle, Bondurant, Cox, & Eaton appearing on behalf of Midwest Oil Company.

MR. KELLAHIN: Mr. Kellahin of Kellahin & Fox, Santa Fe, appearing on behalf of Pennzoil United INZ; and I'm also entering an appearance in association with Mr. Robert Le Blanc, a member of the Oklahoma Bar who will present the case on behalf of the Cities Service Oil Company.

MR. STEVENS: Donald G. Stevens, representing Morris R. Antweil operator in the field.

MR. PORTER: Does that conclude the appearances in the case?

Now, at this time, I would like to ask how many of

those who have made an appearnace here will be presenting testimony? Mr. Hinkle, Mr. Stevens, Cities Service.

MR. LE BLANC: We probably will.

MR. PORTER: And Pennzoil. Thank you.

MR. COOLEY: Mr. Porter, the applicant has one witness, Mr. Baldwin, we'd like to have sworn at this time.

THOMAS A. BALDWIN,

was called as a witness and after being duly sworn, testified as follows:

MR. PORTER: Mr. Baldwin, we'd like for you to take the witness chair at the end of the table, please.

DIRECT EXAMINATION

BY MR. COOLEY:

Q Would the witness state his full name for the record, please, and spelling thereof.

A Thomas A. Baldwin (witness spells, B-a-l-d-w-i-n).

Q This is quite a large room. Would you speak up so that everybody in the room can hear you clearly?

A Thomas A. Baldwin (witness spells, B-a-l-d-w-i-n).

Q Where do you reside, Mr. Baldwin?

A Pasadena, California.

Q And how are you employed?

A I'm consultant geologist and chief geologist for the Tetra Tech, Incorporated.

Q Would you briefly describe Tetra Tech Research Company and

several of their activities?

A One of the principle ones is exploration and development for oil and gas, or any other mineral, as far as that's concerned.

Q What is your educational background?

A I'm a graduate of the University of Southern California, with a strong minor in petroleum engineering, majoring in geology; one year's further training graduate work in petroleum engineering.

Q Also at the University of Southern California?

A Yes.

Q Do you have any particular qualifications with respect to the State of California?

A With the State of California, I'm registered as a petroleum engineer since the year 1948 and registered as a geologist since they started registration a year and a half ago.

Q What has been your experience with respect to the practice of your profession?

A Well, I've been in the petroleum industry in one facet or another involving geology for 35 years. I've practiced in every producing area of the United States and many other areas world-wide. I've worked in the Permian Basin in a limited standing, largely in the supervision of a crew of exploration development people.

Q Through the years, what various companies have you worked for and in what capacity?

A I worked for 11 years for the Texas Company, starting out in an apprentice basis while I was going to school and ending up as a district geologist. And I worked for Jergens Oil Company as field manager, geologist, engineer; Jergens Oil Company was purchased to form the Monterey Oil Company and I became chief geologist of that organization, serving them on a world basis of exploration in this country and Louisiana, Rocky Mountain, Permian Basin, California. I served in that capacity up until 1961 at which time Monterey was purchased by the Humble Oil Company, and with the Humble Oil Company I was given a research and oil basin study assignment which I held for approximately 10 years, taking an early retirement a year and a half ago.

Q That takes us up to when you are now working for Tetra Tech.

A I immediately left there and worked for Tetra Tech and still am.

Q Do you belong to any professional associations?

A I belong to all the normal professional associations, A.P.G., American Association of Petroleum Geologists. I've served in many associations, one as national advisery counselor at the present. I am a member of the Geologic

Society of America, Society of Exploration Geophysicists. I'm in the Local Society of Petroleum Engineers in California, the American Institute of Professional Geologists; there would be others.

Q Have you made a detailed study of the particular area in Eddy County, New Mexico, which is presently classified as the South Carlsbad - Strawn and South Carlsbad - Morrow gas fields?

A I have spent something approaching 30 actual work days studying the specific area indicated on the maps that the gentlemen have in front of them involving actually only about six sections. So the time involved was sufficient to make a sufficient study.

MR. PORTER: You say about 30 work days or 35 work days?

THE WITNESS: 30, I believe.

MR. COOLEY: Mr. Commissioner, are the qualifications of the witness satisfactory?

MR. PORTER: They are.

Q (By Mr. Cooley) Mr. Baldwin, have you prepared a structural map of the South Carlsbad - Strawn area?

A Yes, and that has been numbered here as Exhibit 1.

Q Would you explain what is set forth in Exhibit No. 1?

A Exhibit No. 1 is a structural contour map of the top of the Strawn and I would say that, in general, this map is

that which would be derived by any competent geologist in the area and has been so derived. I've had the advantage of maps that had been filed with the Commission in the past. The Pennzoil maps resemble this in many things. The surface maps resemble this in many ways. It portrays a long, south-plunging anticline regionally, with a local high in the vicinity of Section 31, 22 South, 27 East; and another sharp local high in the vicinity of Section 12, 23 South, 26 East; and then a very sharp sinclinal low on the west flank of that high which sometimes has been shown merely as a sharp contorted sincline; and sometimes, by other geologists, as a faulted sincline. I have indicated in here a faulted sincline. I support the interpretation of the fault later on in other interpretations. It indicates a separation structurally between the Grace wells in 23 South, 26 East; and the Grace well in 22 South, 22 East; and the main body of each structure.

Q It also shows a separation of the Texas well, does it not?

A Yes, Texas Oil and Gas.

Q That's in Section 11 of Township 23 South, Range 26 East?

A Yes, sir.

Q Have you likewise prepared a structural map of a Morrow formation in the same area?

A Yes.

Q Is that Exhibit 2?
A Yes.
Q And I ask you if that's the structural map to which you refer?
A That's the structural map I refer to; and on the little report here, which I prepared for Mr. Grace, which he uses, which I distributed among you with his form. That's shown as Exhibit 2, the structural map on the bottom, yes.
Q Would you please explain what you intend to portray by Exhibit 2?
A Well, Exhibit 2 was mapped and prepared first. I did more detailed work within the Morrow than any other part of the section and on Exhibit 2 I showed the same structural feature that occurred on the Strawn's structural map. However, on the Morrow, it's a little more sharply defined. Actually, the structure has a little more relief, although it's still a very broad and gentle anticline, plunging southerly with the same isolated enclosures at the south end of that which I've described previously. On Exhibit 2, I have shown not only the subsea depth of the top of the Morrow that I have used in the case of each well; I also have indicated by the symbol "F", fault cuts that I could observe in the total of, I believe, it's six wells here. I want to

qualify those fault cuts, if I may, at this time.

These occur in the intervals of approximately 6300 subsea, or better than 6000 subsea, something in this order that are up in the Cisco Canyon section. This is a section of lenticular units, shales; calcareous shales, and so forth. It's an area in the section that is difficult to work with, with what I would call pinpoint accuracy. However, others have thought they saw such cuts, so I looked for them and I feel that in these cases that I have found them; but I would qualify them as being "Weak" to "Fair" interpretations. I would point out that there are a number of them and that the fault is in approximately a straight line, and this is a better fault than the individual well would suggest. Therefore, to qualify the interpretation of this fault, this fault would be "Good."

Q Now, explain briefly what you mean by a fault cut?

A A fault cut. This would be a position in the well where the well actually passed through a fault plane. In this plane, this is what we call a normal fault. It's dipping, or fading, to the left; and as a normal fault, it is removing a part of the section, a certain portion of the section is missing in the cut east of each well, that throw of the fault. The amount that is missing varies from about 50 feet t 100 feet in the various cuts along

here.

Q This is the absence of a portion of a section, that you would normally expect?

A It is the absence of a portion of a section which occurs to the west, or in other wells to the west that we have in evidence.

Q Now, this is discernible on the logs, these wells?

A This is discernible in the large scale detailed logs. I would further call your attention here to an interpretive factor that I've thrown in, and that is a sincline to the west. All of the data is based upon information that there is a gravity high out in this direction, on the fact that we have other producing wells out in this direction. Sooner or later the direction has to start coming up again. I've taken the liberty of suggesting that the sincline, which would occur somewhere west of this anticlinal structure, is perhaps in this position. I must point out, that that's the liberty of exploration geologists to make such an interpretation.

Q Have you prepared an Isobar map of the producing well in the Morrow formation based upon pressure?

A Yes, sir. That's Exhibit 3. That's listed in the report and on the maps that are being filed here.

Q Please explain what you intend to portray by Exhibit 3?

A Well, Exhibit 3 is an Isobar map of producing intervals

in the Morrow formation and all wells regardless of their position, and regardless of any opinions I might have had as to fault separation. An Isobar map is a map that studies the static pressures of the shut in pressures or some pressure interpretation of the wells in the field. In this indication, the data that I used is that data which has been filed previously with the Oil Commission; and, in fact, all data that I am using in my testimony, occurs in these exhibits, all of this data comes from material that is on file with the Oil Commission. There is one exception, which I'll point out when I come to it. This Isobar map, then, is derived entirely from surface reported shut in pressures of wells that have been shut in for at least 24 hours. Now, I must point out that such pressures are subject to variables, and in the Commission's data here, not enough of those variables are present for a full interpretation. For example, we know that some of the wells in the field make water and water would inevitably raise the pressure in the well when it was shut in for 24 hours and would raise the apparent shut in surface pressure. We have no information, actually, about the specific water production; how much was made, no fluid level information. So, I would not point to this and say, "This is a valid pressure map of the field," but only to say what the weight of the

evidence available to us can be; and I have contoured it and it comes out with a discreet shape.

Q Now, what do you mean by "discreet shape"?

A Well, it comes out with a shape that would be predictable. The average of all of this data contours to a shape quite similar to the structural map of the field. That has some meaning, I don't know quite what meaning it does have, but it does indicate that if you did move out half a mile from this formation in any direction, you would have an opportunity to predict what the shut in pressures of a well would normally be. The exception to the shape that I'm speaking about, of course, is the fact that the Grace wells -- particularly the Grace-Gradonoco and Grace Humble-Grace down here have considerably higher pressures than you would anticipate if you merely came off the flank of the structure and attempted to predict what the pressure would be. You might have predicted that they would be down around 3,000 or perhaps 2,900 as occurs on the east flank of the structure when you move over a similar distance, but instead we find pressures up 3,308 and 3,479.

Q Now, these were the wells in Section 2 of Township 23 South, Range 26 East?

A Correct, also in the case of the Grace No. 1 City of Carlsbad and Section 25, 22 South, 26 East. We find the

structure anomaly of some extent in as much as you come from the pressures on the west of the structure from 3700 or so; when you move to the east, you drop off rather rapidly, when you move to the north, you drop off to a pressure of 2865, and so forth. When you move a comparable distance to the Grace, you drop off only to 3100 feet. This is, I think, a pressure anomaly at this point.

Q Now, the pressure anomalies which you've just testified to, tend to confirm the pool separation that you have indicated by the green fault line?

A Yes. What I'm attempting to do with this testimony is to show three different approaches to a study of whether there is communication between these wells and the principle pool. I've indicated already by the structural contoured maps that I find there is some sort of a structural interruption. I'm now attempting for the next two maps to show that there is some sort of a difference in the reservoir character, productivity and pressure; and finally, I will investigate for you the question whether they are in the same unit.

Q Then you do find the different pressure anomaly between the wells shown on the west side of the green fault line and those shown on the east side of the same line?

A Yes, I do.

Q Do those pressure anomalies conclusively require some sort of separation between the two areas, in your opinion?

A In my opinion, these pressure anomalies and productivity anomalies, which I'll show you in a minute, indicate the high probability of this. I'm taking a three way approach to this as an honest geologist. I've taken an oath to speak the truth, and I think when we do this, we all have in our minds that we're going to speak the truth about our geologic opinions. My geologic opinion is that there is a high probability of a reservoir separation, that these wells are not producing from a reservoir which is in communication with the ones to the east because of this pressure anomaly involved.

Q Now, you have just spoken of a productivity map; is that Exhibit No. 4?

A That is Exhibit No. 4, and I'd like to say to those of you who have a copy, this map was prepared Friday and the report was printed and it does not appear on your little report sheet there, so you will scratch out the numbers on Exhibits 4, 5 and 6 and put in Exhibit 4, Isobar Productivity of the Morrow; and then, the following exhibits will each pick up one number before it becomes, 4 becomes 5, 5 becomes 6 and so forth.

Q Mr. Baldwin, what do you intend to portray by Exhibit 4?

A Exhibit 4 is an attempt to investigate the question of whether there are anomalies in the productivity capacity of the wells in the Morrow that might indicate, as Isobar studies did, a separation in the pool. I must explain that this map, and I mentioned that it was prepared just Friday, this study was held up because I didn't think that it was possible to get sufficient data to make a convincing map. I finally, however, decided that it would not be proper to come without making an attempt at doing the best I could with the productivity map of the area. Again, this is the data that's on file with the Oil Commission and I've simply taken it out and contoured it to see what happens.

This is a map on the calculated open flow potential depth here and this is recorded in all but one critical case with the Commission. The critical case involved is down here with the Pennzoil No. 1 Gulf Federal in Section 1. The pressure that is shown there in the Oil Commission's report, atmospheric open flow is 1,721 M.C.F., but unfortunately, I just observed that the pressure indicated that an earlier test, the initial test of the same zone, was also referred as 1,721; and I suspect that there is merely an error in the recording or the filing. I suspect this number and that's why I didn't do the map until the last moment. All I could do

is contour the data. If this had had much higher calculated open flow, it would be more satisfactory. You would have a high in the south, one in the north, and so forth. As it is, the shapes do resemble the Isobar map and the structual maps. There is one other anomaly in the map which I suspect very strongly as being a matter of completion practice. If you'll notice, up in Section 31, 22, 27; there are two wells here involved. The Antweil is given a calculated open flow of 3,492; the well nearby, Little Jewel, is 15,780; and the nearby well to the east, the Strackbein Well, is 15,226. So, it would appear that the Antweil line is anonymously low, out of order, completely low. It appears that in some way either the numbers are incorrect or the well was damaged in completion practice in some fashion. I would straighten those contours out if I were making a vertical map. The important thing now, and I have noted it in the map, is that contouring the available data, I would have a closed area within a contour of 20,000 M.C.F. per day potential appearing in Sections 30 and 31 of 22, 27. And then, it would taper off, but suddenly down here in Sections 1, 2, and 11 of 23, 26, around the Humble-Grace and the Gradonoco, I find the high of the calculated open flow of the field of 33,229, and the Gradonoco about 37,794. It would be anonymously high to the wells to the

east. So, although there are many unknowns here, many variables, what we are drawing seems to fall together to form a pattern indicating that there is no communication between the Grace wells and the wells in the main axis.

Q This is your own lithological explanation for the productivity differential?

A This is my explanation.

Q The Iso-productivity contours that you've drawn, in general, conform to the structures of the area; do they not?

A Yes, they do.

Q And likewise to the Isobars?

A Likewise to the Isobars. The single exception being, I've developed some detail here that the Pennzoil well down here could have considerably higher calculated open flow if we had numbers that I could really believe in.

I must explain, also, gentlemen, that the quality of the drafting here reflects my ability, not that of our draft personnel. This was completed after work hours Friday.

Q Mr. Baldwin, have you prepared an index map on Exhibit 5 for a reference with respect to the subsequent exhibit?

A Yes. This map is going to, I hope, give a geographic field for the next two exhibits. We will have a sheet

with two cross sections on them, A-A' and B-B', and then we will have a sheet, and in fact, that's a sheet that's the one on the wall, which is a detail correlation study of the units only of the Morrow formation. The wells on that sheet, the final exhibit, are indicated on the index map in red and the cross sections are indicated by the barred line.

Q What is indicated by the heavy blue lines on Exhibit 5?

A The heavy blue line outlines the area which Mr. Grace has requested to be designated as a separate pool.

Q And does that area conform as nearly as possible by taking in geographical subdivisions to the fault line and pool separation to which you have just testified?

A Yes, you can follow the separation indicated by the faulting line and by the Isobar and productivity maps as far as you can follow those things, while taking on section lines or subdivisions of section lines.

Q Now, only the west half of Section 36, Township 22 South, Range 26 East, is in the area requested for the pool separation?

A Correct.

Q Why is this so?

A Because, in my opinion, the Grace well, No. 1 Grace Carlsbad is on the east side of the fault; and exhibited in correlation to the character that I see in the well on

the east side of the fault.

Q Then all of the Grace wells were not in the new pool?

A No, the one Grace well, No. 1 Grace Carlsbad, falls approximately half a mile, I felt, no, it's less than that -- about one third of a mile to the east of the fault.

Q Have you prepared a cross section A-A' and B-B' map which is marked as Exhibit 6 in this case?

A I have.

Q Would you explain what's portrayed there?

A Well, first let me qualify the section. These two sections are on a exaggerated verticle scale. The verticle scale of the location indicated here is approximately 250 feet. I had reduced them to smaller size to get an exhibit of this sort in manageable size for a hearing here. However, the horizontal scale is an inch for 1,000 feet. So there are 5 exhibits of this type in the structure, and even so, you'll note that it's a pretty gentle structure. So, with a gentle structure of this sort, that exaggeration is not too difficult to accept. What I've done here is to reduce, graphically, the electric logs of the wells within the Pennzoil part of the section, tracing them here. And, unfortunately, on this scale some of the details, many of the details, are lost. But I thought it was of value to present these because the exhibit

would be quite an important thing. That is the quality of the regional correlations in the gross sense, starting with the base of the top of the Chester Shale in the Mississippi, and the base of the Pennzoil wherever this has been penetrated; and it's penetrated in three wells in these two sections. It's a very recognizable feature and can be counted on as a guide throughout the area. I indicate next above that a unit indicated in the yellow. I don't know it's nature, but it has a very distinct electric log signature, which I will go into a little more carefully in detailed sections -- that's on the wall right now -- then the top of the Morrow, the top of the Strawn, and so forth. The gross units here, you can merely look at a log and quickly know where they correlate without any appreciable difficulty. That, however, is not out principle problem. We're concerned with a very detailed correlation, of course, within the Morrow section I indicated a fault cut in each section and while it's impossible in this case to show which little individual streaks are absent, you can, perhaps in a gross sense, see that on the right-hand side of the fault. As you look at it, the section would appear to be somewhat thickened. It would be on the well on the left-hand side in each case, this is true. Remember, however, that that apparent thickness is exaggerated about four times on the

vertical scale. However, if you had the individual logs on the scale like this, 40 feet to the inch, we could put out the individual unit and I have put out the individual units which are missing in each case.

Q Now, when you speak of missing units, in order to completely clarify your testimony, you are speaking of the Panagra No. 1 well which is on the far left on the B-B' chart?

A Yes.

Q There is simply a portion of the section missing that is present in the second well from the left, being the Pennzoil Federal No. 1; is that correct?

A That's correct. In that case, I measured approximately 75 feet of section that was not present in the Panagra which did appear to be present in the Pennzoil 1.

Q Would you proceed to explain cross section A-A'?

A I was really explaining, in general, the principles of both sections in my earlier discussion there. The same feature holds throughout A-A', with the single exception that with Merland 1-B the log didn't quote all the information. I have projected it on the section. The other correlations indicated here are the same as they were on B-B'. The wells, as you know, are the Grace City of Carlsbad No. 1 and the Cities Service Merland 1-B. It's worth noting in the Merland 1-B well there is a block

unit which would have to be at about 6,900, which does not appear as such in the Grace City of Carlsbad, and it does not appear in many other wells around there. This is apparently some lenticular unit isolated in that area and would be one of the things that would make correlation difficult in the immediate vicinity. Nevertheless, the section in the City of Carlsbad well would appear in this case to be almost 100 feet thinner than you would anticipate comparing it with not only the Merland well, but other wells in the immediate vicinity. I account for this fact, of course, by the fault cut indicated in green.

Q Have you prepared a detailed correlation of the Morrow section only, with respect to five wells in this area of interest which has been identified for the purpose of this case as Exhibit 7?

A I have, and that is the exhibit which was on the wall there. This is a correlation section, a stratigraphic correlation section hung on the top of the Morrow formation that is using the top of the Morrow formation as a datum. There is no horizontal scale. The vertical scale is one inch equals 40 feet. These were evaluated on one inch equals 20 feet, the normal large scale on file with the Commission; but for the sake of getting a manageable map I reduced it one diameter and I think you can still see in considerable detail the things that I'll

point out. The very fine lines indicated on the section are marking two feet intervals and I find there are many correlative units in here which can be picked with safety to the nearest one foot, half the intervals as indicated there. If I were to qualify this data, all I would have to say is that the quality of the detail correlation within the Morrow is totally reliable. Within these wells and within all wells I looked at, I think, that you can be completely satisfied as to the quality of the correlation, at least. The wells are hung in the top of the Morrow. I'd like to qualify that. The top of the Morrow formation is an arbitrary pick which each of us might pick at a slightly different point, and I note that among the information on file with the Commission, has been picked at varying points, perhaps, as far as 20 feet above or below the pick that I've used here. Actually, the Morrow is a unit that is described biologically. It's a biotic unit described as of certain types of fusselinid formanifera. We transferred it to become a electric log, correlated to the unit in the field and this almost always happens in the oil field, perhaps. But then, you end up, of course, with everybody having a free hand of picking a point very close to where the original pick would have been. I've selected a point here right at the pick of the gamma ray logs which moves

to the left here in a shape that I called "The Chin"; then I found something that I could describe as "The Chin" through all wells that penetrate the Morrow in this area. As I come down on the slope of the gamma ray's curve below the peak of the chin it passes through a total interval of about two and a half feet. I take the reflex point on that curve, and the reflex point on that curve can be picked to the nearest one foot. This is a very sharp unit, very recognizable, readily correlated, and it makes it possible to pick this unit within one foot; and this is the type of accuracy I wanted for this work here.

Q Now, Mr. Baldwin, you testified that there was some variation in interpretation by various geologists as to what exactly is the top of the Morrow, also whatever point might be picked by any particular geologist. The point which you have picked as being identified as the top of the Morrow is the same point in each of the five wells, is it not?

A Oh yes, it's the same point in each of these five wells and in all of the wells involved in any contour map of the Morrow. Why, sometimes two fellows could make a contoured map of the Morrow and differ in their picks of perhaps, 15 to 20 feet. They are still valid maps as long as one man makes all the correlations and makes the same

picks.

Q So as long as you pick the same points, and you have done so. Now, proceeding in detail then, what is portrayed by Exhibit 5?

A Well, I'd like to move down to the bottom of the section here and see again the top of the Chester which on this large scale you can, like the top of the Morrow, the space of the Morrow, the Chester top of the Mississippi. This can, again, be picked to the nearest foot on these large scale logs. This is perhaps the most readily recognized thing in the area. There are a few wells that don't penetrate it, but almost all wells do. Coming up from that, I've colored in yellow a fellow that we saw in the cross section. I don't know what causes it, but this has one of the most interesting electric log signatures in the area. On the left-hand side, the gamma ray curve swings from the left sharply to the right and proceeds off the scale, coming back up the scale, in effect.

Q That's the left side of the logs?

A Right. The gamma ray here, of course, is dependent upon minute radioactivity, and is dependent upon the presence of heavy minerals, and so on, which usually occur in the shale section. So as that curve moves to the right we would nearly anticipate seeing a shale. But this very sudden movement in here would suggest to me that the

bottom at the base of the underlying shale there might be formaniferous material, something pretty strong there, whatever it is, throughout the area. You can see this pick in which the gamma ray curve just proceeds to the right off of the picture and it's the only place in the section where it occurs, so it is an excellent correlation marker. If we move to the top, I've got a blue-colored unit that I haven't tossed together with the correlations, and I consider these typical of many of the correlations in the area. It has an electric log signature typified by a blocky shape on the acoustic log, which is on the right-hand side here. Now, the acoustic log, measuring the velocity of sound through this section, is one of the very useful logs, of course, in that it shows decreased velocity whenever we pass through a part of the section here. This is pretty here, but I'm speaking only of an electric signature, this sudden and blocky shape here of approximately 150 feet in thickness, and I point out particularly in four wells from the left, you have excellent correlation above and below this point. But right at this point, this particular unit is difficult to correlate, if my correlation here is correct, as reduced some four times. So all correlations are not just apple pie. They are not all that easy, but this one in four wells out of five exhibited here, is extremely good; and,

in general, is used to say throughout the field it's reliable. From time to time it does appear by some act of God. I don't know why.

Q Let me ask you, Mr. Baldwin, then the purpose of the yellow correlations, the blue correlations, the top of the Morrow, the top of the Chester, are simply to prove the detailed minute correlation that is possible and available to you in making this analysis?

A That's correct.

Q Proceed, please.

A And not only based upon electric signatures. I should have pointed out that the top of the Chester could be picked on well cuts. If you didn't have this electric log, you should be able to pick the top of the Chester with considerable ease. In fact, I've picked it on well cuttings and put it onto the section. It's the top of the sandy section here. In the well cuttings this marks the top of the point in the well near the Morrow points where the sand and the cuttings rose suddenly from 8-12 percent to about 65 percent.

Q Now, Mr. Baldwin, this first dotted line is the top of the Morrow?

A Right.

Q On the right-hand side with an arrow pointing downward and the inscription 65 percent and below, then?

A You can see that this is the top of a sandy unit and it's correlative sandy units. It doesn't have all the minute characteristics that you might have in some of these others. I've put it in parentheses because it wasn't in the electric logs.

Q Now, what is the sort of data from which you compiled this dotted line?

A This is one piece, or one section, of the data that did not come out of the Oil Commission files. This is a record of well cuts of the stratilog and so forth furnished to me by the Grace's office. I have every reason to believe that they are properly done. They are done by service people in the state, and competent geologists, in the case of the well cutting sample. I've taken these, analyzed them, looked at them to satisfy myself, and get a few more of them, and have then colored in my work sheets of these logs for the various lithologic things reported in the cuts and found that this break right here, this increase, this 65 percent, is the most distinct single detail that I saw within the Morrow.

Q It is an indication, is it not, that you approach a variance of potential productivity?

A Yes.

Q Proceed there, and explain, please, to the Commission what is portrayed by the red marks on the exhibit?

A Well, now, having established to my professional satisfaction that correlations in that area are entirely reliable, I have proceeded in red to indicate on each of these wells the interval that is producing, the perforated interval.

Coming from the right, we have the Pennzoil-Echols, and the Pennzoil-Mobile Federal No. 1, and the Pennzoil-Gulf Federal No. 1. Each of these was shown on the index map and you may remember that they are essentially running north-south with the Echols being somewhat south of any of the Grace wells, and the Gulf Federal No. 1 being as far north as the Grace wells in Section 2 that is north of the Humble-Grace, of the Gradonoco. They form sort of a fence, in effect, between those Grace wells and the main structure. The red indicates where the perforated intervals are, and it's noticeable in an area of porosity, as indicated by decreased velocity on the acoustic logs on the right-hand side of the section. In other words, this is an area where there is increased porosity, sound traveling more slowly, and this is the criterion that can be used to establish porosity in the wells of the same unit. Coming right across the interval, the same units occurs as a stratigraphic unit in the Grace wells, but there is no such decreased velocity. There is, therefore, no porosity and there is no saturation; and the wells are

not perforated at that point. The porosity and saturation of the Pennzoil wells did not exist in the Grace wells. The Grace wells, however, were perforated in a lower interval. I call this first interval we've spoken about in the Pennzoil well, Morrow + 300; below the top of the Morrow. The intervals perforated in the Grace, I called, Morrow + 370. It lies approximately 70 feet lower in the stratigraphic section. You will note that it has a decreased velocity on the acoustic log where I've colored in red. It is the interval which is perforated in procedure in these two wells.

Q These are the two Grace wells to the left-hand side of the section?

A Yes, the one on the farthest left being the Gradonoco, the second well being the Grace-Humble No. 1. It's rather noticeable that the interval in question on each of these wells did not appear to have a high porosity, nor is it as large an interval as, for example, in the Pennzoil-Gulf Federal No. 1. But it is a different zone. If you carry this across a straight correlation, I found that by the time you come to the Pennzoil well, instead of a sandstone as appeared in the Grace wells, you have an interval of very thin-bedded shaley, and possibly, limey streaks with some little sand in it. If you examine in detail these Pennzoil wells, you find that you do not

have decreased velocity opposite any of the units that are potentially safe. There is no porosity in the Pennzoil wells in that interval which is producing in the Grace wells, nor is there any saturation, of course, therefore in the Pennzoil wells. So any conclusion from this correlation here is that the third criterion for judging communication or lack of communication between the oil pools is that as to whether they are producing from the same units, from the strata, whether they are producing from the same zone is still established here. The Grace wells are not producing from the same intervals.

Q Or producible?

A Or producible. It would not be producible in this interval.

Q And conversely, the Pennzoil wells are not producible from the zone from which the Grace wells are produced?

A No, I see no indication in the Pennzoil wells that there would be any potential production in a unit that I called Morrow + 370.

Q So, there is approximately 70 feet of stratigraphic differentials between the zones from which the Grace wells are producing as compared to those from which the Pennzoil wells are producing?

A This is the average, yes. You will note there it has

thickened and thinned.

Q Then, in summary, Mr. Bladwin, structurally you find there is probability of pool separation; is that correct?

A That's correct.

Q The Grace wells and the Pennzoil wells to the east?

A I believe they are structurally separated, yes.

Q And confirming this on the basis of comparative pressures, as well as productivity, you also find considerable anomalies indicating again separation; do you not?

A I find the reservoir characters are anomalous in that there is some difference in the nature of the accumulation of these wells from wells of the main pool, yes. Unquestionably something is causing them to be different?

Q Yes.

A And in your opinion, this difference is a structural separation in the form of a fault?

Q In my opinion, the structural separation in the form of a fault may have much to do with it. But the fact that they were produced from an entirely different interval has a great deal to do with it, perhaps is all the explanation needed. But it satisfies all the three principle criterion for designating them as a separate pool.

A I noticed that you qualified or made a statement as to the various qualities of your interpretations and opinions

with respect to degree of certainty. With respect to your Exhibit 7 and your conclusion that the Grace wells are producing from entirely different stratigraphic sections than the Pennzoil wells, what is your opinion as to the accuracy of this work?

A I have to consider that this conclusion is fully reliable. I can conceive of no circumstances that could arise to indicate anything other than that the producing interval in this Gradonoco and Humble-Grace is different and is not in communication with the producing interval in these Pennzoil wells, and since the Pennzoil wells form, as I described, a fence between these wells and the main field, it would therefore be impossible for these wells to communicate with the main field.

Q Now, your exhibit clearly portrays the impossibility of horizontal communication. Would you discuss whether you feel there is any possibility of vertical communication?

A Yes, I see. In the first place, let me say that the reservoir character pretty well rules that out. But I would point out that above the Morrow + 370 zone in the two zones shown here, there is an interval of approximately eight feet.

Q These are on the Grace well?

A Yes. An interval of approximately eight feet that is quite shaley and it contains within that eight feet two

very sharp tight little shales. That occurs in both of these wells here. And then, if we come over to the Pennzoil wells, we'll find a similar situation except that the little shaley intervals here increased until it's largely shale.

Q So, there would appear to be a sufficient cap, so to speak, above the Morrow + 370, so as to prevent any vertical production, even if there were a section capable of accepting it?

A Yes. You'll note above it, however, that the equivalent section to the main Morrow over here has no indication at all of porosity, so there wouldn't be any place for vertical communication to go.

Q Considering all of this data that you have compiled in connection with this case, is there any doubt in your mind whatsoever as to the possibility of communication between the Grace wells and the main wells of the pools to the east?

A I stated as my professional opinion that there is no communication between the Grace wells and the wells on the main Morrow pool.

MR. COOLEY: Mr. Commissioner, that concludes our Direct testimony. We, at this time, offer into evidence Exhibits 1 - 7 which Mr. Baldwin has already testified were prepared by him.

MR. PORTER: No objections. The exhibits will be admitted. We will take a 15 minute recess.

(Whereupon, the hearing stood in recess.)

MR. PORTER: The hearing will come to order. Please accept my apology for extending the recess but I had an emergency appointment at 10:30 and it lasted just a little longer than I anticipated. I hate to keep the witness on the stand any longer than he has to sit there. Maybe he's comfortable so long as nobody questions him.

At this time, does anyone have any Cross-Examination?

MR. HINKLE: Yes. Clarence Hinkle of Hinkle, Bondurant, Eaton and Cox representing Midwest Oil Company.

CROSS-EXAMINATION

BY MR. HINKLE:

Q Mr. Baldwin, if I understood your testimony correctly, you are basing the separation of Mr. Grace's acreage in the south half of Section 25 Township 22, Range 26 East and in the Sections 2 and 11 in Township 23 South, Range 26 East on the structural condition that you say exists, and the fault which you have shown on several of your exhibits; is that right?

A Mr. Hinkle, pardon me if I ask if you are an attorney?

Q Yes.

A I want to try to explain it within the framework of my profession, but so that I'm sure you understand me, I'm

basing this separation supporting Mr. Grace's request that his area be considered as a separate pool on an approach of three different discussions, investigations. I consider there are three criterion with which you could relate on this question, whether it is one pool or two pools. The normal criterion we use are: first, is it an interrelated structure, if there was a thin anticline with two interpretations. But it is not, it is an anticline which has a fault, an interruption, and/or probably both a sharp sincline, which comes between the Grace wells and the main pool, with the exception of the Grace-Carlsbad well. The second criterion which I described, of course, was a criterion of reservoir condition. Do these wells resemble the same producible pool? And the third criterion was the one reflected in the section. Do the wells produce from the same unit, and this is a definite "No" they do not.

Q Are you saying, then, that there may be a sincline rather than a structure? There could be?

A I'm saying that there may be a sincline as well as a fault. I believe, and I have testified to my belief, that there is a fault and I evaluated the possibility of that as being not more than "Fair" in the six different wells in which I have picked it. But adding them all together and their correlative rights to each one, I then

say it is my professional opinion that the pick of the fault as existing is "Good."

Q Have you made any study of any other Morrow field or pool in the state?

A In the state?

Q Yes.

A I have worked on studies within the Morrow, the last one being in 1960.

Q When?

A 1960 or so.

Q What Morrow pool was it that you worked on?

A We worked on a large number of them. We had a divisional office in those years in Midland and the district office in Hobbs, and our people, we had geologists in Midland and four at Hobbs. My position was supervisory.

MR. PORTER: Was that when you were at Monterey?

THE WITNESS: You may say so. Monterey bought and acquired the Fuller and Clear Creek unit and so forth.

Q (By Mr. Hinkle) Now, isn't it a fact that in most Morrow pools in the State of New Mexico the accumulation has been caused by stratigraphs?

A It is. And I believe that it is true here. I'm sorry I failed to mention that in my discussion at the time. I guess Mr. Cooley didn't ask the question. This structure here, in my opinion, is regionally a south-plunging

anticline and although there is enclosure to the southern end of it, specifically I feel that the accumulation is the result of the disappearance of a porosity anomaly in these various units, yes.

Q Would you say, then, that the production in this area is due primarily to being stratigraphic rather than structural?

A It's a stratostructural combination, sir. If there were no structure there, I'm sure there would be no accumulation. But there is stratigraphic mention of the various units normally, yes.

Q I believe, you stated in your testimony that there was a differential in pressure between the wells to the west of the fault and those east of the fault.

A I stated there was a pressure anomaly, yes.

Q Now, were you speaking of bottom hole pressure or surface pressure?

A I was speaking of surface pressure, shut in surface pressure. We only have available to us one well on which bottom hole pressure has been recorded.

Q Well, is a study of surface pressure reliable in a situation such as this?

A I attempted to relate in some detail, but I probably spoke in technical terms. The surface pressure study is subject to any number of variables which could make it

incorrect, sir. Specifically, rise of fluid, of water, within the casing during the shut in period and so on, so that the study is, as I indicated, showed only that you could contour these things into a discreet shape which resembled the structure and you would be able to predict that a well drilled furnished a log.

Q When you use the term of "differential" in wells and pools, you are speaking of bottom hole pressures, are you not, most generally?

A If you have the data you certainly would be hoping to do so.

Q That is the most reliable method to indicate --

A That would be the reliable method if you had the other available data, which is necessary to go with the bottom hole pressure. Here, again, you would have to know what column of fluid is above you and so on.

Q Well, if there is a differential in pressure, that might also indicate drainage as well as separation of the pools, could it not?

A Yes, it could indicate drainage, or it could indicate pumping out of a unit, and so on. It perhaps is noteable, as to the anomaly, that in all cases that the Grace wells have an anomalously higher pressure than you would expect. It would be difficult to see how this could occur if the differential were caused by drainage, for drainage in

the central part of the pool would have affected them earlier. They came in late and find that they have higher pressures than they would anticipate.

Q Do you have any shooting information which establishes this?

A No, this fault knowledge, this has been considered, and I think anyone who thinks he can pick out a 75 foot fault on the basis of geophysics is just trying to sell geophysics. This is one of our main explorations. Of course, in order to find out, our geophysicists would have liked to spend some of Mr. Grace's money. I don't think you could determine this in geophysics worth a darn.

Q Well, don't you think, or in your opinion, would geophysical survey shooting determine definitely whether this existed or not?

A It would not, sir, for a very simple reason: soil in the present operation to depth of 10,000, 11,000, 10,000 feet, you have no use of sound of a wave length greater than this 75 feet. This fault would fall within the one wave length reflection. You would never see it.

MR. HINKLE: That is all.

MR. PORTER: Mr. Stevens?

CROSS-EXAMINATION

BY MR. STEVENS:

Q Mr. Baldwin, could you name the fields you especially studied in depth in Southeast New Mexico?

A Probably not. No,sir, we're talking about 10, 11 years ago.

Q Could you give me an estimate of the number?

A Oh, probably I've reviewed or worked in perhaps a dozen, half a dozen.

Q In depth you've worked with them?

A I say I worked in the area in supervision of teams of geologists.

Q Have you studied in depth any Morrow fields in Southeast New Mexico?

A Sir, this is the only field in which I've studied in detail that I'm presenting here at all.

Q Do you have any information, then, concerning the reason for accumulation in other fields and whether a fault might have an effect upon said accumulation or any separation in those fields?

A I have stated my knowledge of the stratigraphic features which help with most of the accumulations in the Morrow, sir; and that arises from the study of the literature in which I've stayed fairly current.

Q Then, basing your conclusions as to the separation of the west side of the field from the east, as you show in your exhibits is based solely, principally in any case, on the

study of this field alone; is that correct?

A On the specific detailed study of this area of this field and general study of the structures as a whole. Yes, sir.

Q You have no information of other Morrow fields in Southeast New Mexico that might not be controlled in any manner by faults?

A I haven't evaluated the situation.

Q What particularly, we're particularly concerned with, is the City of Carlsbad well in Section 25 which we will refer to mostly in this period as opposed to the well in the south. You stated in relation to Exhibit No. 1 that your interpretation would be something, to the effect, that would be derived by any competent geologist; is that correct?

A Yes, the Strawn structural map. I stated that this was an interpretation which would be similar to that that would have been drawn by any competent geologist and was drawn by Pennzoil, or a similar structure was drawn by Pennzoil and a very similar structure was drawn by Cities Service.

Q Was this the same story on Exhibit 2, the Morrow?

A Yes.

Q Would you say the same thing in relation to it?

A I'm saying the general structure. I've referred here to the fact that there is a rather well defined anticline,

broad in general, plunging southerly. I would not say that others would necessarily draw the fault, although the Cities Service map indicates this fault in the same position.

Q Now, a structure map without the fault would be, could be, drawn by a competent geologist?

A Absolutely. You could draw a structural map and qualify as a competent geologist by drawing a sharp sincline instead of the fault.

Q You say a sharp sincline, between Grace No. 1, Grace-Carlsbad in Section 36? I won't refer to Township and Ranges, but it's all in this Township. It has a minus datum of 7,975 in Grace of Carlsbad, and in Grace City of Carlsbad in Section 25, there is a minus datum of 8,328 feet depth, approximately three-quarters of a mile. Would you call that steep depth sufficient that you would put a sincline in there?

A I'd have to ask you to repeat.

Q I'll be happy to. Grace-Carlsbad No. 1 southeast of Section 36 has a minus datum of 7,975.

A Correct, sir.

Q City of Carlsbad 1 well has a minus datum of 8,300.

A Correct.

Q Is 2800 feet of depth, would you call that steep depth by which you would put a sincline to degrees?

A I didn't refer to them as being steep. If you got that impression, I'd like to correct it. I have emphasized quite a large number of times that the structure is a very mild and gentle structure. When I referred to the possibility of drawing a sharp anticline, I meant that it would have to be very narrow and relatively sharper than you would anticipate on the flank, here.

Q You say you have a mild and gentle structure. Could you have a gentle fault?

A Yes, very commonly, indeed.

Q In Southeast New Mexico?

A Well, we have them all over the world, so I see no reason why they couldn't be here.

Q You know of none in particular, though?

A In what, in Southeast New Mexico, yes.

Q Would you state that, please?

A I will. The South Carlsbad Morrow Pool.

Q Other than this, you know of no others?

A I would not be able to testify here on it, but, sir I will say that you've given me the impression that you are not acquainted with the very common concept of there being one or two normal faults on towards the crest of a very broad, gentle anticline, tension faults. This is a common think in the world as a whole.

Q Drawing your contour lines up in Section 36, and your

contour lines in Section 25 West, could a reasonable geologist pull the contour lines out sufficiently that that Grace 1 Gradonoco and the Grace 1 City of Carlsbad would be on a gentle anticline without a fault?

A I'd have to call your attention, also, to Gopogo No. 2 up here where a point has already been taken. The anomaly of the dip would have to be amplified by going over to the wells Merland 1 and 1B and Cities Service's total and you would have to satisfy this very total of the sum flexure of some other in order to get these wells in this position.

Q Did you consider Mr. Bob Becker, a geologist who testified for the applicant in the previous hearing, 4696, a competent geologist?

A I do, indeed, sir.

Q Are you familiar with the map which he submitted in that area?

A Yes.

Q Do you consider that a reasonable interpretation of the South Carlsbad Morrow?

A We could have a number of interpretations. Certainly at this hearing you had a number of interpretations. I don't recall the details of Mr. Becker's interpretation. I do recall the maps prepared and submitted by Cities Service and by Pennzoil, which showed the sincline through here

and the one from Cities Service showed the faulted sincline.

Q Now, this map you considered to be reasonable, but many other interpretations could also be reasonable, and this fault might not be there?

A Other interpretations of this structure not only could, but undoubtedly would be drawn by other geologists. Like yourself, sir, they would take the viewpoint, "I'm going to challenge thi_ man's word and see what would happen if it were not a faulted sincline." You could draw your interpretation. You would have your professional privilege to do so. This fault might not be there, but it is my professional opinion that it is.

Q You've got here a fault cut that you stated, sir. This Gopogo well in Section 24 has got a top of minus 7,912. Is that a log top?

A Yes, it has to be. I just don't --

Q Is that well still drilling?

A We have got a problem here of some sort.

Q I beg your pardon.

A I said we have a problem here of some sort. That's projected to be, pardon me, we had information at that time which was about two or three weeks ago, and this is the projected top without a log. That well is drilling, we believe we have penetrated the top of the Morrow at

probably this position.

Q The variations and things of this are such that that type might be off a few feet, plus or minus?

A Yes, indeed.

Q You mentioned fault cuts in the Cisco Canyon. You stated there was no pinpoint accuracy to these fault cuts.

A That's correct.

Q "Weak" to "Fair" interpretations?

A Right.

Q This Cisco Canyon, was this actually in the Cisco Canyon, or was it an unconformity between the permian and the Cisco Canyon; do you know?

A Yes, it was within the Cisco Canyon section. The unconformity could readily be throughout, somewhat slurred. But it was in my opinion below the unconformity, quite well below it. We'd have to go back and recorrelate the whole darn thing and I do not have all the data I would like, to pick a base permian. It is my opinion it was a cut by faulting.

Q Thus, you are certain this is in the Cisco Canyon and it is not up north between the Wolfcamp and the Cisco.

A I've stated the fault cut as "Weak", sir, in each case.

Q In that connection, it could be an unconformity or not?

A I would anticipate that if it were a drastic unconformity of any sort that you would be able to find it east-west

as well as north-south. I've found it in the six apparent fault cuts, although "Weak" in interpretations in a relatively linear direction, north-south. And I did not find such a design coming up to the east here.

Q Have you prepared an exhibit showing your actual findings of these fault cuts? Did you?

A I have not, no.

Q Your testimony is that you found them there, but you presented no evidence in implication indicating the absence of formation in the Cisco Canyon section, justifying your fault interpretations?

A I have not, the main reason being the size of the logs that would be needed to do so; and very frankly, in the time allocated to this work, I felt when I had gotten to the point of finding the producing units were not the same strata that I had, at quality, performed the chore for which I was employed.

Q You stated that there were variations in the thickness of the Pennzoil formations. Could these "fault cuts" have just been different in thickness based on different formation?

A They could be. Again, your problem would be that the cuts I observed appeared linearly north-south over a distance of approximately three miles here and I don't find similar discordant correlations as I move to the

series of the west to the east.

Q Did you check all the wells to the east and in the same general areas to see if you had any fault cuts?

A In the same areas, of course. But in much greater detail to see if a fault fading to the east would penetrate these wells in the Morrow, for example.

Q Referring to your Exhibit No. 3, the Isobar, I think you've indicated that you were using surface shut in pressures with many variations?

A I used surface shut in pressures, which are subject to error enclosed by the fact that there are many unknowns.

Q But, I think you said that it has a discreet shape?

A Yes.

Q I'm wondering in particular about the Grace 1 City of Carlsbad, again, in Section 25.

A Yes.

Q You have a pressure data there of 3135, 3138. The wells down in Section 11 and 2 are all considerably higher and yet you state that this interpretation as you drew it conforms with your structure interpretation. This 1 City of Carlsbad is one of the lowest pressures on the map. How do you equate that?

A It is also low structurally to the crest of the structure, immediately opposite of it to the east. I'm comparing it, of course, to the Merland well. It's not to the wells

two and a half miles to the south here. In my opinion, the drop from about 3735, down to the flank here to 3138 would be anomalous in that I would have anticipated a much lower pressure if this is simply on down the flank of the anticline to that extent, as compared to the flank positions, for example, on the east side from Mobile Federal 12 "1" on down to the Antweil Joell, where you dropped from 3880 down to 2960 in the same distance.

Q Then you are equating the height, subsea, with the pressure?

A No, I have not made that statement and I did not make that statement. I have attempted to explain the comparison of the Isobar map with the structural maps. I've merely stated that they make, and can be contoured, as a discreet form which would appear to be predictable beyond the data and that form resembles the shape of this structure.

Q I can understand that you would do that in 2 and 11, perhaps, but when the Grace 1 City of Carlsbad is minus 3138 in pressure and most of the wells around are 3600 and 3700, it seems that you would not be able to contour that the same as you contoured the structure. And, in fact, let me ask you this question: Your minus 3100 present contour that goes between Section 25 and 30, if you steepened it on the southwest, wouldn't it almost

exactly intercept the 1 City of Carlsbad if you dropped out that fault?

A On the contrary, you'll notice that the dashed contour in the inside area here of Section 25, which would be a 3200 contour is merely anticipated. I have given the data for that. But assuming that there has been an anticipated contour, the Grace 1 City of Carlsbad, with their pressure of 3138, would lie with considerable accuracy where you would anticipate it, between those two contours.

Q But you have no pressure on the Gopogo?

A Yes.

Q Well since on the Gopogo you have no pressure and since your 3100 contour looks as though it cuts from Section 25 and 30, wouldn't it come almost to where the Grace City of Carlsbad 1 well would fall?

A The contour throughout the map would indicate the approximate slope of the Isobar contour to be something like I've indicated here, between 3100 and the - 3200. I don't believe I would be justified in steepening it that much, but like a structural map, like your discussion of the fault, it could be interpreted differently and probably would be by each geologist here.

Q Thus, your supposed reinforcement of the structural picture with the fault really is not reinforcement with

these pressures as concerned particularly with Section 25, Grace 1 City of Carlsbad; is that true?

A I must repeat, I'm not attempting here a reinforcement structural picture. I'm attempting to take three different approaches to the study of whether there's community of accumulation here. The three approaches are structural. Now, I've dropped this one. This approach is: Are the reservoir characteristics identical among these wells. I conclude that they are not, sir. In this case, the shut in pressure is different.

Q Do you have a pressure on the Cities Service oil of the Merland, Section 19?

A Yes.

Q 2865?

A The 1A, 2865, correct.

Q It's lower than the 1 City of Carlsbad and yet you don't have it separated by fault?

A You'll notice that I drew up very sharply to the north to the Merland 1B, the recorded pressure and recorded here as a bottom hole pressure, and so I couldn't use them in comparison to the others. I'm going from the 1A Spencer 3735 and this gives me a rate of slope to the Merland to the north and I'm implying, sir, that the same rate of slope, getting off the flanks of the structure, would get me lower than is indicated in the No. 1 Carlsbad.

Q But if you pulled that fault out, and pulled the 31 line out, then the line the way it's drawn, it wouldn't show an excessive amount?

A You could most certainly draw it this way, yes.

Q How about the water in Grace No. 1 Grace City of Carlsbad. That makes a lot of water, doesn't it?

A So I'm told, yes.

Q Could the well pressure be caused by water in the well when you took your shut in pressure?

A I anticipated that it is, and that if we had the information we would find a much higher shut in here, or calculated pressure than if we were able to do this all on bottom hole pressures, the probable pressures for the fluid column and so on that this includes. You are correct, sir.

Q Is there any reason why you couldn't do that as opposed to using shut in pressures that you used?

A I don't have that type of data.

Q But it's not impossible to get it?

A It's not impossible to get it over a long period of time. Now, remember, at first I testified that I was going to testify to exhibits which were drawn from the available data in the Commission files. This is the limit of my investigation.

Q About the time of this measure, and shut in pressure,

were they all made at the same time, approximately the same times?

A No, they were not.

Q That would be another variable?

A Yes.

Q You state that if you have the belief or supposition that the pressure would be much higher, would that tend to indicate the separation then of the Grace City of Carlsbad from the wells in Section 30 and 31?

A I would say so, yes.

Q And yet you state that low pressure also indicates the separation?

A I say this pressure, although low, is, in my opinion, anomalously high to what I would anticipate. When I came off with an Isobar slope here as great as appears to be probable on the flank from the other areas; this is not a low, anomalously; this is a high with an anomalously low pressure. If we had the type of data which we would be able to derive in the case of this one well, both on productivity and on Isobar, I believe you would find that this well would be sharply high to what you would anticipate.

Q With that many variables you have in the pressures, the time of taking and the water involved therein, the probable differentials, can this really be a valid factor

in determining whether a field is separate or not; if wells are separate from other wells?

A I have previously indicated, I tried to point out when I first started my discussion of both this Isobar map and the iso-productivity map, that all of these variables have to be stated as unknowns, that if we knew all of them we could make a map here we would be proud of. I testified that only, in fact, that the available data were contourable indicating that they were related to each other through most of the field, but that they could not readily be contoured, specifically down here in Humble-Grace and Gradonoco. And in my opinion, probably could not be readily contoured to the No. 1 City of Carlsbad, indicating some sort of anomaly in reservoir conditions.

Q Turn to your Exhibit No. 4, the iso-productivity map. You stated there were many unknowns and many variables, again, in this map.

A Yes, sir.

Q In your opinion, does the initial calculated open flow potential in a particularly validated field where you have considerable water production in some wells, or even minor production in some wells affect the flexure?

A That is one of the variables that would certainly affect the flexure, sir.

Q Your well in the southeast quarter of Section 2, having the highest initial potential calculation; has the production of that well in connection with production of other wells been contoured relative with the intial potential calculated?

A Well, the well is down at the moment, but it was a pretty good well under production, I understand. I haven't gotten data to make cumulative production figures.

Q These weren't prorated?

A No.

Q Thus, basically the well was producing what the well could make subject to the pipeline requirements?

A I don't have the information, sir.

Q If you determined that this well in the southeast quarter made no particularly greater amount than the other wells in Section 2 and 11, would you suspect that initial potential calculated open flow might be seriously erroneous?

A There are certain of them that could be seriously erroneous. That one, however, appears to be based on valid data. I have indicated others in my testimony, such as the off anomaly in the Antweil well and the Strackbein well over in the east, and so on. Those, I believe, would probably be figures erroneous because of

the completion practice, but they might also be calculation error factors. This could be taken into consideration down here. But, nevertheless, the calculated open flow potential that was assigned to the well is three times as high as you would anticipate in the area.

Q What's the basis of putting the Superior No. 1 Collect Estate within the 15,000 M.C.F. contour?

A Well, we have to remember that the Superior is not a Morrow production well, so there is no information from it. The information involved -- I went into some detail, the information involved is a Commission record. The Pennzoil well here in Section 1 had a calculated open flow of 12 million plus, 12,700,000. I stated and I also repeat that I consider that to be probably wrong because the same number is repeated as an open flow potential at another place, and it seems improbable that they would be the same. In fact, practically impossible. So I really, you might say that I can use it as only a suggestion, but I'm contouring the data that was and is now available to anyone, in the Commission files.

Q You show then two anomalies, one in the south half of Section 30 and the other one in the southeast section of 2, yet you don't show an anomaly in the south half of 30 and the north half of 31 separate from the rest of the

field by a fault based on this information, do you?

A I don't show it as a separation by a fault. I show the location there of the fault that I believe I have on the structural contour maps. I showed the fault for reference. In this case, I would be able to, and I almost do, bring the 10,000 productivity line straight through and across the fault. You will notice, however, that the 5,000 productivity line on the east side of the fault are controlled by the wells Cities Service 1 and Merland 1 and 1B. The Merlands would have, then, to come in some very odd swing to the north and the general area of the fault. It would make a much sharper anomaly to this 10,000 and tie it in and then would have to bring it from the City of Carlsbad back almost at right angles, sir.

Q Yes, you proposed to separate the wells in Section 25, west half of 36, 2 and 11, with the rest of the field; yet the anomaly is down in the southeast quarter of the section.

A A stronger anomaly occurs down there. I realize the anomaly is very dim here, excepting this data. As you have suggested, the contour here where the Grace City of Carlsbad well in Section 25 is, if I tied it to the point down through Section 36 as you have indicated or suggested, I would then say there is no fault and I would

have to take it from the No. 1 City of Carlsbad and I would have to turn right at the fault line, as you indicated, and I would have to turn almost at a right angle to show the 10,000 in this well, which is pretty well controlled.

Q There are quite a few right angles there.

A It would be at a right angle.

Q It would be at a right angle? There is a right angle at the south half of 31, practically. Isn't there a right angle, practically, in the south half of 31?

A You mean, over here? Yes, this is the one I pointed out as being the strangest anomaly in the place. This would certainly suggest in this case that there is something very odd about the numbers, either their source or the cause.

Q It doesn't suggest a fault to you, though?

A Two wells, two points? No.

Q Therefore, this, then, might suggest a fault over here in Section 25 even though the anomaly is not as great?

A I have the fault indicated on the map as it was indicated on the structural maps for reference and I'm suggesting that there could be an offset by faulting.

Q I see.

A But, sir, I agreed with you that you could draw the structural map and interpret it by a sincline rather

than a fault. You also could draw this pressure line and you could take a right angle jog at this 10,000 line and bring it to the 10,000 line down in the southeast quarter of Section 25 here with a very sharp little nose point up to the Grace No. 1 City of Carlsbad, and I ask you, don't you think that would be just as large an anomaly as I have shown?

Q No, sir, I don't.

A Well, I do.

MR. PORTER: Mr. Stevens, you can resume your Cross-Examination later. I'm going to recess this hearing until 1:15.

(Whereupon, hearing stood in recess until 1:15.)

(Whereupon the hearing of Case 4795 before the New Mexico Oil Conservation Commission continued at 1:15 P.M., Wednesday, August 16th, 1972.)

MR. PORTER: The hearing will come to order, please. Mr. Stevens, you may continue with your cross examination of the witness at this time.

(Whereupon the witness, Thomas A. Baldwin, resumed the stand.)

CROSS EXAMINATION (Continuing)

BY MR. STEVENS:

Q On Exhibit Seven, Mr. Baldwin, I notice you have no log for the City of Carlsbad Number One, is there any significance in that omission?

A None whatsoever. I took a group of wells closely related, physically close together, which related to the story I wanted to tell. I could have put the City of Carlsbad Number One in here, and you would see it also is producing from this interval in here (indicating). Actually, it is producing from about the top, and it only has about a six-foot perforation.

Q Would you give us the perforations in that well, please, sir?

A I believe they are 11,561 to 11,567, that might be off a foot or two.

Q Could you tell us where you obtained that information

as to those perforations?

A I obtained them from the Graces' records, but to play it safe, this morning-- last night, I came over and verified that these perforations were a matter of record with the Commission and on file here with the Oil Conservation Commission.

MR. KELLAHIN: Would you repeat the perforations, please?

THE WITNESS: If I am going to do it, we better have them accurately. May I step down and get those records out of my briefcase?

MR. PORTER: Surely.

THE WITNESS: This is what I took out of the Commission records last night: 11,566 to 11,572.

Q (By Mr. Stevens) I would like to hand you an exhibit entered on April 19th, 1972 in Case 4693, and I would ask that the Commission take administrative notice of it. This is Grace Exhibit Number Three in that case, and I ask you if you would read the perforations of the Grace City of Carlsbad Number One as shown under the column headed Perforated Interval.

A If it's the same sheet I have here, it is 11,515 to 11,522.

Q Do you know any reason explaining the difference in those perforations?

A All I can say is that I first got the perforations by telephone from Juanita Jones in Carlsbad, she's with the Graces, and she gave me this perforated interval. She later called me back to say that it was an error and that their interval was that which I now have given you. That's why I went over last night to check and make sure from the official records. There presumably was an error made at that particular time and she had found the actual records for the perforations, and they are the ones which I have given you.

Q Do you possibly have the perforated log or records of perforation? I am concerned as to just what the actual perforations are, and it seems that we just don't know.

A I haven't checked to see whether the perforation log is available, and I can't go any further than I have gone from the records of the Commission at the moment.

Q Do you know if there is anyone available to testify who might be able to give actual first-hand knowledge as to where these perforations are?

A You are thinking of somebody that was on the well, an engineer, no, there is no one here available at the moment.

MR. COOLEY: Mr. Grace is present, and he was also present at the time the well was perforated, and he will be happy to testify later.

MR. STEVENS: Fine, thank you.

Q (By Mr. Stevens) I would like to ask you, if these perforations, 11,515 to 11,522, were actually true perforations as opposed to the lower perforations, wouldn't that be in the plus 300 zone on your exhibit?

A It would be approximately in the Morrow plus 300, yes.

Q Your other perforations, which you say are the correct perforations, would be in the plus 370 interval; is that correct?

A That's correct, sir.

Q This well is the subject of an additional hearing this afternoon in which we will probably go into the well in detail, is that correct?

A I would have to ask Mr. Cooley to speak on that, I am not testifying in that hearing. I haven't investigated the details of production of this particular well, and was not aware there was to be a hearing on it until yesterday afternoon, so I am aside from that issue.

MR. PORTER: In other words, you don't intend to testify in the next case?

MR. COOLEY: We will be moving for a continuance of that case.

MR. PORTER: I see.

Q (By Mr. Stevens) Since there will be a motion for continuance in that case, I would like to ask you some

more questions about that well, since we won't get into it. Do you have a log of that well?

A I have logs of that well in the suite of logs in my office, not with me right now.

Q You do not have a log here at this hearing?

A No, sir.

Q Do you know if there were any drill stem tests made on that well?

A No. That is the reason I would not testify at the moment on that well, and I have so informed Mr. Cooley, and that is the reason for the continuance of the case. Through an oversight, I was not even informed about the case, and I haven't investigated the characteristics of the well to any extent where I would feel qualified to testify.

Q In other words, you are asking that this well be separated from the rest of the field as being a separate reservoir, yet you have no log or no information about drill stem tests and only secondhand information of the perforated interval and no information of the pressures?

A Let's take your points one at a time.

Q Yes, sir.

A You say I have no log. I say I have an entire suite of logs in my office, and they are correlated accurately.

I can say with absolute certainty that the interval, the perforated interval, does not come from secondhand knowledge, the perforated intervals come from the records of the Oil Conservation Commission here, and the areas shown indicate this well to be producing from the Morrow plus 370.

Q The reason I am asking the questions is I would like to find out about some drill stem tests made above this particular zone where a great amount of water was concerned.

A I have information, secondhand information, that there were some drill stem tests that were made that showed water, but I haven't seen these today, and I am not prepared to testify about something someone told me, even if it was my client telling me.

Q Was the zone perforated drill stem tested?

A I don't know that.

Q Were the other zones drill stem tested from which gas was made?

A I think I have to comment here that you are asking me now to testify under oath on the very point which I had to tell Mr. Cooley I would not testify on.

MR. COOLEY: I would object to these questions, these are not questions of cross examination, these are not matters which were brought up on the direct testimony. I

have told Mr. Stevens once, and I will tell him again that we have Mr. Grace here who was present when the well was completed, and if Mr. Stevens wants to know the details about the well, Mr. Grace will be happy to testify.

MR. PORTER: Do you want to withdraw your question?

MR. STEVENS: My questions are not so much concerned with the perforated interval , but rather with an attempt to determine whether the well is actually producing from the area claimed to be perforated, and that possibly there could be gas circulating behind the pipe from a bad cement job. In attempting to determine this information, we have to find out where the drill stem tests were and what they contained. This is the sole purpose of my entire line of questioning, to see if the well is separate and distinct from the rest of the field; it is our contention that it isn't.

MR. PORTER: I don't believe that this witness, by his own admission, can answer those question, Mr. Stevens. Is that correct, Mr. Baldwin?

THE WITNESS: That is my contention, sir, and for that reason, Mr. Cooley is going to ask for a continuance on the next case.

MR. COOLEY: The sources Mr. Baldwin used were made very clear on his direct testimony, they came from the records of the Oil Conservation Commission with one exception, that being the log having to do with the top of the sixty-

five percent sand zone,which came out of the records of Mr. Grace. Now, I repeat for the third time that if Mr. Stevens wants information about this well, we are not trying to hide anything, and we have Mr. Grace here present and he will be very happy to testify in an orderly manner. Once again, I object to the question.

MR. PORTER: I am going to sustain the objection.

Q (By Mr. Stevens) In your Exhibit Number Seven, do you show perforations on these oil wells here?

A I do not,through an oversight. I didn't show the perforations on the State Grace Well, I am simply testifying under oath as to the perforations in those wells, and those perforations are in the records of the Commission.

Q Are there any wells, specifically does the Pennzoil United Mobil Federal 12 "1" have any perforations in the same interval that you call the Morrow plus 370?

A They are not indicated on the records, sir.

Q Have you checked those records to determine that for certain?

A My information came from the records extracted by one of Mr. Grace's people.

Q Do you know of any other wells in the field within the general area of the Morrow plus 370 foot zone?

A I have examined carefully all the Morrow producers that

are indicated on the map and haven't found the zone to be present as a porous saturated interval on any of the wells outside of these Grace wells.

Q Are you familiar with Exhibit Number Four before the New Mexico Oil Conservation Commission in Case 4693, which I will hand you a copy of?

A Presumably not, by that number anyway.

Q On this exhibit which was prepared by the Commission, it shows various perforations in selected-- in fact, in most of the wells in the field. Can you draw a correlation of the perforation intervals with the perforations of the Humble Grace and the Grace Gradonoco?

A I would have to check the actual well data for perforations. It would appear to me that the record shown here on the Corinne Grace Humble Grace Well is higher than was indicated on the data I got from the Oil Conservation Commission records. The first well, the Texas Oil and Gas Well, is correct as I examined it. The Pennzoil Echols, however, the records I had showed it to be considerably higher than this. I suppose I have to go back and take all of these and convert them back to drill depth and find out what that shows.

Q Does the exhibit show there are other wells producing within the Morrow plus 370 foot zone?

A This record shows one other well that I see right

offhand, the Pennzoil Echols, and that would be close enough. So I would assume, if this data were correct, that the data I got from the Oil Conservation Commission was incorrect.

Q How about the Pennzoil United Mobil Federal 12 "1"?

A I don't know what the record shows on that-- it shows correlation up here (indicating) and here is the Pennzoil Echols and the perforations of record, as I have them here, shows the Mobil Federal 12 "1" to have a perforated interval as shown on my exhibit. The perforation for the Pennzoil Gulf Federal Number 1 is the perforation of record also, and these are all in the Morrow plus 300. All these over here (indicating) in the Morrow plus 370 zone are Grace wells.

Q I'm sorry, but I fail to see any perforation marked on the Pennzoil Mobil Federal "1". Did you say they were marked?

A I said this was the perforated interval (indicating).

Q Where it is marked in red?

A That's right.

Q And this is contradicted on Exhibit Number Four in Case 4693?

A No. The Pennzoil Federal 12 "1" is shown as being up above-- I'm sorry, sir, but the data I got on the well, this well (indicating), is indicated, and this was the

perforated interval, and if there is a discrepancy, it would have to be checked in the records of the Commission.

Q How about the one on the far right, the Cities Service Strackbein? Doesn't that show some perforation at the same stratigraphic interval?

A It shows it to be in the Morrow plus 300 which would be the interval on the right-hand side.

Q If you presumed that some of these wells were perforated in the same Morrow 370 zone, would you propose to take them out of the field or are they not necessarily separated?

MR. COOLEY: That is asking for an assumption.

MR. STEVENS: I have asked a hypothetical question, and this man is an expert witness, and he should be able to answer it.

THE WITNESS: I have no particular fear of the question.

A We haven't made it clear evidently. I'm not sure I have a copy of this record, this Exhibit Four, but it is quite clear on our exhibit, sir, that the wells on the right-hand side, the Pennzoil Wells-- practically all of the wells on the crest of the structure are producing from this Morrow plus 300 as shown here. The Grace wells are producing from the producing zone

that I call the Morrow plus 370 which would occur approximately here (indicating). The only well that shows any perforation anywhere near that is the Cities Service Merland "A" which, in the first place, of course is at the extreme end of the field and is separated from the Grace wells by the intervals that are tight in here (indicating).

Q Excuse me, I think you may be confused. Perhaps they took a different Morrow marker?

A This would be possible.

Q Therefore, they put in all the perforations related to the Morrow marker and on that basis, the Gradonoco and the Humble Grace seem to fall in the same general area that a lot of the other wells are perforated in. If you used your plus 370 and carried it down between 300 and 400, I agree it would not show them to be in the same interval, but this (indicating) shows they are all very closely perforated to the same interval.

A Well, seventy feet is not all that big on this scale. You will notice, however, that there is a real discrepancy here between the perforations you show for the Corinne Grace Humble Grace and the Pennzoil Federal Number 1 and the Gulf Federal Number 2. Before I could do much more,I would have to take the perforations of record and convert these back to depths and correlate

them and find out what has been done to arrive at this particular exhibit.

Q This exhibit was from the Commission, not from Mr. Antweil.

A I see.

Q The question I would like to ask again if it isn't objected to, if there are other wells producing from the 300 foot zone, these two wells are not separate from the rest of the field?

A We got confused before, there are many wells producing in the Morrow plus 300, this is the interval on the right-hand side (indicating) which is being produced by the Pennzoil wells and the Cities Service wells and most of the wells in the field. The Morrow plus 370 zone, the one on the left, to my knowledge, there are not wells producing from that interval, and indeed exhibiting any porosity at this interval other than the Texas Oil and Gas and these two Humble wells and the City of Carlsbad.

Q Are there other fields in Southeast New Mexico producing over hundreds of feet with separate porosity zones?

A Of course.

Q The Morrow field in Southeastern New Mexico produces under those circumstances, is that true?

A I believe that's true.

Q Do you propose to make this field an exception to the other fields by separating these wells even though this is a producing characteristic of the field?

A I would propose, sir, that it would be perfectly legitimate in this area of the field to have a separate pool if you can establish that its producing stratigraphic horizon is not produced elsewhere, and I think the exhibits in front of you show quite clearly that the horizon producing the Humble Grace and the Grace Gradonoco Wells here occurs quite a bit below the productive interval of the Pennzoil wells. The Pennzoil wells parallel that trend on the east, and are developed vertically above that zone producing the Grace wells.

Q You have given no evidence of the City of Carlsbad Well in Section 25, showing where it was perforated other than from the statement that you made that it was produced from plus 370.

A If the Commission wishes to take a few minutes, we can go upstairs and pull the well records, and we can see what the official records show.

Q But you have no electric log information on that?

A Yes, they loaned me the electric logs and I took them back to my motel and correlated these logs and made sure I was dealing with exactly the same zone.

MR. STEVENS: We have no further questions.

MR. PORTER: Mr. Kellahin?

CROSS EXAMINATION

BY MR. KELLAHIN:

Q I'm Jason Kellahin, and I am an attorney, so you can explain to me. I am representing Pennzoil. Now, I'm a little confused as to these missing zones that you have testified to. Where are they? What formations are they missing from?

A I believe they are missing from the upper part of the Cisco Canyon section. I have testified that I was not able from the data I had on hand to pick the base of the permean, but I believe it is considerably above this. It would appear to be completely above the section, therefore, the interval cut outs from the fault pick would be in the Cisco Canyon.

Q That doesn't necessarily denote a fault.

A Not necessarily, but when you find six intervals with sections missing and those six cuts form practically a straight line, this certainly is a strong suggestion of faulting.

Q It could be an indication of a difference in deposition of the formation, could it not?

A The only way it could be a difference in deposition with this correlation would be if you had some long

narrow channel, and in that case, you should get some new sections filling the channel. No, sir, I would say that the logical and scientific interpretation of the data I have seen is that there is a minor fault through here.

Q You say a minor fault?

A Fifty to one hundred feet.

Q What are the general characteristics of the Morrow formation?

A I beg your pardon, sir?

Q What type of formation is it?

A It's got just about everything. It starts in the section with a high percentage of limestone, and as you go down sand, the contents greatly increase. I referred to the highest dash line across the section as a point I could pick out where rather suddenly the sand cuts up to about sixty-five percent. From there on down, most of the sand is pretty well calcified, hard and tight, with occasional porosity.

Q Occasional porosity, that's normally where you find your production?

A That's right.

Q Is that in what you would call the lenticular development of the sand?

A I would have to think that the industry would have to

see a lot more wells before that determination could be made.

Q What is the thickness of the Morrow formation?

A Well, I will read it rather than trying to remember it. I picked it here at 11,150 to 11,480. It thickens tremendously in other areas.

Q It is over 600 feet in many areas, isn't it?

A Yes.

Q But in your so-called fault, it does not exceed 100 feet?

A That's correct.

Q What is the thickness of the strawn?

A In this section, it is about comparable, I believe-- let me look at one of the small sections here. Approximately 1,000 feet, that's the strawn and the atoka, I haven't attempted to separate it out.

Q In preparation for this case, did you review the record in Case 4693, held in Hobbs, April 19th?

A I have read it with some care in May, principally to determine what additional work could be done in order to investigate Mr. Grace's concept that it was a separate pool. I handed the gentlemen up here, it is actually in the form of a letter to Mr. Grace, something that states the assignment for which I was employed, and that assignment was to look at, with my geological expertise, to look at the wells in the

area and determine whether the wells were indeed producing from a separate pool or from the same pool.

Q Did you review the order that was entered in that particular case?

A No. I remember something about the order at the time, I presume it simply left it as the same pool or something.

Q I read you Commission finding number seven in order 1670-L, entered in Case 4693. The finding is that production from the Morrow formation in the subject pool is from many separate stringers which vary greatly in porosity and thickness both within the individual stringers and between stringers. Would you agree with that?

A Not entirely. In fact, it was that statement that led me to believe that I might be able to bring further things to light here because the statement suggested that correlation was difficult and that you couldn't find out which stringer was right. So I made a preliminary study in May and found the quality of the logs were such that I could feel confident in making excellent correlation. I was able to investigate these stringers to find out whether they were the same or different, and thereby from the correlation, find out whether the productivity was anomalous or not, and I have done so, and it is my

determination that the stringer produced by the Grace wells is not present in the rest of the field.

Q But it is a stringer?

A It is a small interval.

Q That is true, generally, throughout the field, there are small intervals of productive formations?

A Almost all of the other wells are producing from this one interval that I call the Morrow 300. Some of them may find their porosity in the lower part of the zone and some of them may find porosity in the upper part, or some, like the better wells, may find the entire thing porous.

Q Would you refer to your Exhibit Number Seven and for the benefit of the Commission, would you please take the Commission Exhibit and mark on that exhibit, number one, the line of your cross section that your Exhibit Number Seven shows? I want the Commission's copy, not your copy, and I want you to draw a line from well to well as you display the wells.

A Are you talking about Exhibit One?

Q I want the Morrow map.

A That's Exhibit Two.

Q I want it on the Morrow map.

MR. HATCH: Here's Exhibit Two.

A I will start with the Grace Gradonoco and proceed to

the next well, the Number One Humble Grace; the next one is the Pennzoil Gulf Federal Number 1, which is here (indicating). Then I'll come back here (indicating) and proceed in a southerly direction and go to the Mobil Federal, and then finally down to the Pennzoil Echols.

Q So it is not a cross section across the pool?

A No, sir. I have indicated it has no horizontal scale, but shows that correlation could be made with such accuracy that you can see whether the producing zones correlate, and they do not.

Q You did not intend to show a cross section of the pool?

A Absolutely not.

Q Did you have a log available from which you could have constructed such a cross section?

A Well, I did construct a cross section here (indicating).

Q You constructed two cross sections.

A A and A prime and B and B prime.

Q With two wells on each one?

A Yes, Exhibit Six.

Q With two wells on each one?

A Right, sir.

Q But there are a great many more wells on the north-south line or the east-west line?

A Absolutely.

Q You didn't see fit to do that?
A Speaking not as an attorney, any geologist could continue any job forever, and some of them do, I had an assignment to perform, and having felt that I satisfactorily completed the assignment to the best of my professional ability, and feeling that I could establish a situation identifying what I was asked about, I then terminated the work and stopped charging my client.
Q What we are trying to find out is not your opinion, but what you did.
A Yes, I realize that, but if you will pardon me, I was called as an expert witness, and my opinion is here before you.
Q Referring to you Exhibit Number Three, Mr. Baldwin, which is your isobar map showing the pressures across the pool--
A Yes, sir.
Q Starting at the north end, you have no pressure on the well in the north, the Grace Number 2.
A No, the well is not completed yet.
Q And the depth shown on the other exhibit is your interpretation?
A That is an extrapolation involving some two to three hundred feet.

Q Coming on down, would you give the pressure differentials across your green line to the various wells on which you have pressures?

A Well, as I discussed earlier, the first one you would come to would be the pressure on the Number One City of Carlsbad, which is recorded at 3,138. You could, and I have stated earlier, that you could make that pressure steeper than this and bring the indicated 3,100 pounds into that well without faulting, but you would create an anomaly which would--

Q There would be an anomaly one way or the other, isn't that correct?

A This is correct.

Q It is a choice of which anomaly you prefer?

A Correct.

Q Isn't it true all the way down the line--

A It doesn't appear to be true, but when we get down to the area of the Humble Grace Well, it would be quite difficult-- it could be done, yes, you could draw an even shorter pressure separating the Gulf Federal and the Mobil Federal, but in any case, it would represent a pressure anomaly.

Q Did you investigate accumulative production from those wells at the times the pressures were taken?

A Which wells?

Q Any of the wells you used.
A Well, that is related usually to the iso-productivity over here, and in some cases where things were not comparable, most all of the iso-productivity was calculated on open-flow and was calculated at a minimum of three or four tests, one of them which was as close as I could get for twenty-four hours.
Q Did you get accumulative production on those wells?
A No, I did not. However, I would point out that these tests in all cases were made very early in the life of the well.
Q On your Exhibit Number Two, Mr. Baldwin, would you give us the differences, starting at the north, on each side of your green line, please, and I prefer they not be your interpolations, but rather the actual well depths as they exist.
A Do you want me to read from the map the intervals at which I picked the top of the Morrow?
Q Yes, I want to know the difference between the intervals on each side of your line.
A Well, remembering then that the Number 2 Gopogo is an extrapolation. I gave a minus 7,912 on the east side to the Gulf Federal Number 1; the Cities Service Merland "A" was a minus 7,850, and that would indicate an anomaly.

Q That would be approximately a mile?
A A little over a mile, yes.
Q Coming south, would you go ahead, please?
A The next pair would be the Cities Service Number 1 Merland "B" at 7,913, and across the fault would be the Grace Gradonoco at 7,967. That is an interval difference of only fifty-four feet, and again, in this case, it is just about a mile.

Coming toward the south, Cities Service Spencer is 7,960,and directly to the west across the fault, the Grace Number 1 City of Carlsbad is minus 8,003. That is forty-three feet in a distance of a mile.

Coming farther south, the Antweil Little Jewel and the Antweil Allen are at 7,956, and then a mile to the east, the Grace Carlsbad comes in at a little less than twenty feet more.

Q But you put them on the same side of the fault line?
A Yes, I couldn't find any fault cut. It is close to the axis and is producing from the interval of the other wells, and I made that option.
Q Compare that to the Antweil Number 1 Joell to the south and west.
A The Antweil Number 1 Joell is at 7,906, and is actually fifty feet. Then we would come to the Superior Collett which is to the top of the Morrow and is at minus 8,005.

Then we have the Pennzoil Gulf Federal Number 1, which is at 8,014 or nine feet of difference. Then we come to the Humble Grace Well and find it at minus 8,046.

Q Let's get back to the Number 1 Grace Carlsbad and the Antweil Number 1 Joell, you have approximately seventy feet of interval there?

A It would be sixty-nine feet, yes.

Q But you don't find a fault between them?

A Absolutely not.

Q Then seventy feet doesn't necessarily indicate a fault, is that correct?

A No, sir, the amount of structural relief involved is not at issue at all, it is whether the structural position is anomalous. If you are coming down flank and instead of coming to a predictable point at the next well, you find a higher predictable slope, then you have a structural anomaly.

Q Did you examine Exhibits Two and Four that were offered by the Graces in Case 4693, which indicated a structural low there or a saddle?

A This would be the structural map produced by Mr. Becker?

Q Or by Mr. Miller.

A Would that be two maps?

Q Yes.

A Yes, both of these geologists drew structural

interruptions in the field, as I remember, separating the main pool and the Grace wells.

Q You did not agree with that interpretation, I take it?

A I stated this could be interpreted as a rather sharply deformed sincline, and it has been by competent geologists, and it can be interpreted as a fault, and it has been by competent geologists. It can be interpreted as both a fault and as a sincline, and this can be done when a relatively small fault occurs at the bottom of a rather sharp sincline.

Q Do you know the producing characteristics of the three wells, the Humble Grace Number 1, the Grace Panagra, and the Pennzoil Number 1 Gulf Federal? Have you made a comparison of them?

A I had difficulty with the Number 1 Gulf Federal because of the state of the records here. I wasn't able to get very much data on it, however, at one point, it had a flow of 12,000 plus MCF against line pressure, and at another place, the same figure was given for calculated open-flow potential.

Q Is that all you know about the well?

A No, not all, I have examined the log.

Q I am referring to the producing characteristics.

A That's all I know about that.

In the case of the Humble Grace, the question has

been asked concerning the calculated productivity and anticipated production, and the only answer I could give was that the well was down, it was shut down for mechanical reasons. As it turned out, there are some fish in the hole.

Q Aren't the reports you have on it comparable to the reports you have on the Number 1 Gulf Federal?

A Yes.

Q How about the Grace Number 1 Gradonoco?

A I haven't checked the records recently enough, and they are not fresh in my mind. Mr. Grace might be asked that question. I believe it is relatively small, but I would rather not testify on it because I may be wrong.

Q Does open-flow have anything to do with recoverable reserves?

A Probably not. Normally, it would depend entirely-- of course, calculated open-flow on any individual well would depend on the state of production from the porous zone involved. So the size of the reservoir rarely has anything to do with calculated open-flow.

Q But you used that on your iso-productivity map?

A Yes.

Q In preparing that, did you take into consideration the length of the period of open-flow?

A There was no period of open-flow, these are calculated

open-flows which were taken from a series of tests against line pressure usually in the early stages of production.

Q Was that on a three point pressure test?

A It was in some cases, I can't say for all of them.

Q That could make a difference in the calculation.

A There are many things that could make a difference. Calculated open-flow potential, in my mind, is rather meaningless unless you have other engineering data to evaluate this, and we didn't have this.

Q If the data were correct,that would be a correct conclusion?

A That's right.

MR. KELLAHIN: That's all I have.

THE WITNESS: I'm sorry, this is my first time before this Commission, and before similar bodies in California, I would be very reluctant to suggest the recorded data of the industry was at fault, sir.

MR. PORTER: Mr. LeBlanc?

CROSS EXAMINATION

BY MR. LeBLANC:

MR. LeBLANC: Robert LeBlanc, representing Cities Service Oil Company.

Q (By Mr. LeBlanc) Mr. Baldwin, you will pardon me if some of my questions do not make sense, but I have

been trying to make notes without a set of your exhibits. There apparently were not enough to go around.

Mr. Kellahin read finding number seventy, he referred to it as number seven, and it should be number seventy.

MR. KELLAHIN: I'm sorry, I was referring to number seventy.

Q (By Mr. LeBlanc) He read to you and you disagreed--

A There have been many questions, and I'm not sure I know the number you are referring to.

Q I am curious to the part you disagreed with.

A I am curious to know what finding number seventy is.

Q I will read it in part.

A Please do. Was this one of the exhibits passed on to me?

Q No.

A Okay.

Q This is from the order issued by the Oil Conservation Commission on June 30th of this year as a result of a prior hearing involving this field.

A Okay.

Q Number seventy says that production from the Morrow formation in the subject pool is from many separate stringers; do you agree or disagree with that?

A I disagree with the "many separate stringers", there are separate stringers.

Q So you disagree with the word "many"?

A Yes.

Q It continues, from many separate stringers which vary greatly in porosity, water saturation, and thickness; do you agree or disagree?

A I agree.

Q Continuing, both within individual stringers and between stringers. All of the above refers to, I presume, both within individual stringers and between stringers; do you agree or disagree with that?

A I don't see where we can say there is a difference between stringers, and I would have to disagree with that.

Q What information do you have available to you that the Commission did not have available to it when it entered this order?

A I would say principally a detailed highly accurate calculation showing the correlative positions of the individual stringers involved in these groups of wells.

Q Do you have basic data that was not available at the prior hearing?

A I have a basic interpretation-- if I might read to you my proposal, what I think should be done, you might

understand the problem.

Q Let me just ask, are you dealing with the same information that was available at the April hearing, the same basic data?

A I am dealing with basic data that was not only available, but was and is present in the files of this Commission, sir.

Q At the outset in discussing your Exhibit Two, the structure of the Morrow, and discussing your fault, you made the statement, if my notes are correct, that others saw the fault cuts, what others were you talking about?

A The statement is not correct. I said others have interpreted a fault in that position, and the others in question are indicated by the Cities Service structural map on file with this Commission that shows a fault in this position. The only difference is it is to the north end and Cities Service, instead of going to the west as I did, shows it to the east.

Q I must have written it down wrong, but I thought I had you verbatim.

A If I said fault cuts, I would like to correct it, but I don't believe I did.

Q Did you read the transcript of the prior hearing?

A Yes.

Q Did Cities Service geologist testify about fault cuts?
A No, absolutely not.
Q Didn't the Cities Service geologist say he saw no fault cuts?
A I believe he did. I believe he drew a fault from the nature of the structure.
Q You likened your fault to that presented by Cities Service at the prior hearing, is your fault up on the west flank from east to west?
A Mine is from the west side.
Q So the two interpretations differ to that extent, as to which direction the flow of the fault is?
A I have said simply that their fault runs along the same lines I have shown.
Q Does it go between the same wells that you have shown?
A I believe that it does, but I don't have the map with me at present, and apparently you do.
Q If it did not, would that change your opinion?

MR. COOLEY: I object to counsel questioning the witness on an exhibit he does not have before him. If he wants to question him about it, let him see a copy of it.

MR. LeBLANC: I will just withdraw the question. My sole reason in asking it was because he mentioned it on numerous occasions.

Q (By Mr. LeBlanc) Is part of your conclusion based

on the shut in pressure study you made?

A That contributed to it, yes.

Q And do you say there is separation between one side of this field which you want to call another field and the other side of this field?

A I say there is,considering the reservoir characteristics and the lack of communication.

Q What shut in pressure differential, in your opinion, is required for separation to exist?

A That would be a very difficult question to ask, and a very difficult question to answer. I'm sure you couldn't put any point on that at all, sir, the difference is not a question of how different the pressure is, but it is a question of the area involved and the anomalous pressures. Had they been lower, it would be indicative of a separate reservoir.

Q With reference to the proverbial chicken and egg story, how do you determine how something is anomalous, you must have a beginning point to which you might compare it.

Q We compared all the wells completed in the Morrow, which there are quite a number, along the access, and the four on the west side which at the time had been completed and on which we had data, and you start with the major amount of data in the field and you contour your information as best you can. Then assuming that

you have predictability, you come on down and see whether the predictable form would match the minor information off to the side.

Q You might have had an exhibit, I don't have a copy, but did you indicate which of these wells, insofar as shut in pressure is concerned, are anomalous? I am trying to find out which are not anomalous.

A I have indicated specifically the Humble Grace and next, probably the City of Carlsbad, and there is some indication of the Gradonoco pressures would be higher than anticipated if you merely carry the form you have drawn on down the flank.

Q Are we dealing with the Humble Grace Well in the Southwest quadrant of your map?

A In the Southeast quarter of Section 2, 23 South, 26 East.

Q Going straight south from that well, I see two other wells.

A Straight down, we have the Grace Panagra and the Texas Oil and Gas.

Q Is 3,429 the shut in pressure of the Texaco Well?

A Yes.

Q As we proceed north, we have 3,654 as the pressure for the Panagra Well?

A Correct.

Q And as we proceed, you have pressures of 3,308?

A Correct.
Q What makes this so unusual?
A If you were in effect to draw a cross section through the isobar, you would find you were coming over a hump starting with the Humble Grace Panagra and going down again to the Texas Oil Company Well. A similar hump exists on the other side of the fault slightly more to the north, but the flank coming down to the west, the high in the area, would actually indicate pressure slightly greater than the Pennzoil Number 1 Gulf Federal. I haven't extrapolated my numbers to quite that extremity, but that is what is indicated.
Q Are the two Grace wells in Section 2, I believe that's where they are located, producing from the same interval?
A At the moment, it is my understanding that they are.
Q What is the shut in pressure on each of these wells?
A The Humble Grace is 3,479 and the Gradonoco is 3,308.
Q What is the difference in those two figures?
A One hundred seventy-one pounds.
Q Do you attach any significance to the difference in those two pressures in wells producing from the same zone on the same side of your field?
A I am merely saying, as far as I can say, that there is a tendency for pressure drop-off as you go down flank, as to what the significance is, there could be a number

of interpretations of it. It may be merely that you are getting a little more water as you go down the flank, but it could be a decrease in the amount of porosity.

Q Is there communication between those two wells?

A I believe there is.

Q We might have a problem on terminology, you refer to the Morrow plus 300 as being what is generally considered the main pay in the field?

A I assume that it is, I haven't read any reports by others to the extent of knowing what they are saying is the main pay.

Q What is your opinion?

A In my opinion, this is the main pay for the wells on the other side of the fault, the main Morrow pay.

Q Did you comment on whether or not that main pay was present in the two Grace wells in Section 2?

A Yes, I did, in detail. That main pay is not present as a porous saturated interval, it is present as tight sand, but the log does not reflect any porosity and of course, therefore, there is no saturation.

Q There are no hydrocarbons in it?

A I wouldn't go as far as to say there is no oil stain.

Q Was it tested with a drill stem test?

A At which interval?

Q At all.
A I assume it was, I don't know. I believe that it was, but you are asking me on one of many wells right now.
Q Hypothetically, if it were drill stem tested in what is called the main pay and tested for hydrocarbons, would that affect your opinion in any way?
A If it had been tested within the interval I described here as the Morrow plus 300 and made such a significant show of gas, not hydrocarbons, but gas flow, as to indicate it is a commercial producing well, it most seriously would affect my argument, but I have no information to that extent whatsoever. The interpretation of the log is that this could not occur. In almost any interval in here, you could run a test and get a little gas show.
Q Drill stem tested for 650 MCF with bottom hole pressure similar to the other wells in the field, would that change your opinion?
A No, it would not, that would be pretty small. I would like to ask you a question here concerning what data you apparently have in your hand.
Q If I had any data, I would be giving it to you.
A You are giving me hypothetical questions?
Q I asked you hypothetically.
A I prefer to know when a question is hypothetical, I think

that would be fair play.

Q I thought I mentioned that it was hypothetical, perhaps I didn't.

In your qualifications, you said you were a geologist major with a major in geology and a minor in petroleum engineering, is that correct?

A Correct.

Q What type of studies have you conducted? Would you classify them as geological or as engineering?

A I would classify them as reservoir geology, using my petroleum engineering background. They are primarily geological studies, but when you go into pressure differentials, you are showing engineering factors.

Q In conducting the type of studies you say you conducted, using at least thirty man days of work, would drill stem tests of the wells in the field be relevant or irrelevant?

A Relevant, sir.

Q Do you consider a drill stem test of the City of Carlsbad Well as being relevant?

A Yes. In fact, the City of Carlsbad made water in the interval I referred to as the Morrow plus 300, and I considered that a relevant factor.

Q These fault cuts that you show on your map, on your Exhibit Number Two of the Morrow structure, at what

depth do you see those?

A They are indicated on the map, sir, I could read them off.

Q Would you say they appear approximately between, let's say, minus 6,200 feet?

A In that order.

Q And the Morrow appears at approximately 8,000 feet?

A Approximately, correct.

Q And at minus 6,200 feet, you say there is a seventy-five foot fault?

A A seventy-five to one hundred foot fault.

Q Do you see any fault, any evidence of fault cuts, in the Morrow formation itself?

A I see no fault cuts. One of the gentleman asked the question earlier this morning concerning productivity and anomaly in the area of the Antweil Allen and the Antweil Little Jewel. I would consider this as evidence of a potential fault separation, and I would look for it if I were the operator. Other than that, I have seen no evidence of faulting within the Morrow.

MR. LeBLANC: Thank you, sir.

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

(No response)

MR. PORTER: Mr. Cooley, do you have any redirect?

MR. COOLEY: No further questions.

MR. PORTER: The witness may be excused.

(Witness excused.)

MR. PORTER: I believe Mr. Grace indicated he would testify.

MR. COOLEY: He is willing to testify if anyone wants to call him.

MR. PORTER: Is there anyone who would like to have Mr. Grace take the stand to testify?

(No response)

MR. PORTER: Does that then conclude the testimony of the Applicant, Mr. Cooley?

MR. COOLEY: That concludes our direct, we may wish to put on rebuttal witnesses.

MR. PORTER: I believe it was indicated by the other people who made appearances here, Midwest, Pennzoil, Cities Service, and Antweil, that they would also like to put on testimony. Do you have any preference as to the order of your testimony?

MR. HINKLE: We have a witness who has an appointment in the morning, and we would like to be sure he gets through this afternoon, so we volunteer to go first.

MR. PORTER: Will you have your witness stand and be sworn?

* * * *

FRANK L. SCHATZ,

was called as a witness, and after being duly sworn, testified as follows:

MR. HINKLE: We only have five copies of our exhibits, there are nine exhibits in all, so I am going-- there is one exhibit, Exhibit One, which has an index to all the rest, so I am going to ask the witness to put it on the board and then put on each exhibit as it comes up and explain it.

DIRECT EXAMINATION

BY MR. HINKLE:

Q State your name, your residence, and by whom you are employed.

A Frank L. Schatz, S-c-h-a-t-z, and my residence is Midland, Texas, and I am employed by Midwest Oil Corporation.

Q In what capacity?

A I am District Exploration Manager of the Midland office as well as a geologist.

Q Have you previously testified before the Oil Conservation Commission?

A Yes, I have.

Q And qualified as a geologist, a petroleum geologist?

A Yes.

Q So that your qualifications are a matter of record with

the Commission?

A Yes, sir.

Q Have you made a study of South Carlsbad Morrow Gas Pool area?

A I have.

Q And are you familiar with all the well logs and information that is available in the area?

A I am familiar with the Morrow part of the field, I have not made a study of the Strawn or the Atoka sections.

MR. HINKLE: Are the witness' qualifications acceptable?

MR. PORTER: Yes, they are.

Q (By Mr. Hinkle) Have you prepared,or has there been prepared under your direction, certain exhibits for introduction in this case?

A I have.

Q These are the ones that have been marked officially as Exhibits One through Nine?

A Yes, sir.

Q I refer you to Exhibit One, will you explain what it is and what it shows?

A Exhibit Number One is a cross section reference map, I have prepared five sections. These are designated as A A Prime, B B Prime, C C Prime, and I have also prepared two sections which I call walk around sections,

which go from well to well and attempt to show correlation in the field. If I had put them all in one section, it would be quite lengthy, and these are broken up into two cross sections, D D Prime and cross section E E Prime.

A A Prime through D D Prime are up here on the board, I will wait to put up E E Prime until later.

Q Does the exhibit also show the ownership of the acreage in the area?

A No, sir, it does not show all the ownership of the acreage, but it shows ownership of the Midwest acreage located in Section 35, 22 South, 22 East, Section 3 of 23 South, 26 East; and we also have portions in Sections 32, 33, and 34. I might add that for the most part, these are owned jointly with other companies. We are operator currently of the State Number 1W at the location in Section 3.

Q What is the present status of that well?

A That well yesterday morning was below 8,700 feet on a Morrow contract.

Q Referring you to Exhibit Two, will you explain what that shows?

A Exhibit Two is a cross section, A A Prime, across the northern end of the field from the Grace City of Carlsbad to the Cities Service Spencer A to the Cities

Service Strackbein.

This sand indicates that there are, in my opinion, four main producing sands in the Morrow, or the South Carlsbad Morrow Field. I have broken these down into zones, and these are referred to as Zone A; the orange is Zone B; the green is Zone C; and the red is Zone D.

Q And you have used the same colors and designations on all of your exhibits?

A Yes, sir.

Q What does Exhibit Number Two show?

A I'm sorry that you can't see from that distance, but the perforations were reported to us through Commercial Scouting Service and have been noted on the wells, and I have noted by the red dots the producing intervals in these wells.

In other words, on this well (indicating), our information shows that this well is completed in this interval for a calculated open-flow of 10,599,000. Our information shows that the Cities Service Spencer 1A is completed in this zone (indicating) and in this zone (indicating) and that completion was for nineteen--

MR. PORTER: Would you identify those zones by the letters you have indicated?

THE WITNESS: This is Zone B; this is Zone A.

A (Continuing) Our information indicates that the Cities Service Strackbein is completed in Zone A, Zone B, and Zone D. This section (indicating) attempts to show that there is more than one or possibly two producing intervals in the field.

Q Referring you to Exhibit Three, will you explain that one?

A Exhibit Three is cross section B B Prime, extending from the Grace Humble Grace to the Pennzoil Gulf Federal to the Superior Collett and the Pennzoil Gulf Federal Number 2. Our information again shows that the Grace Humble Grace is producing from Zone C; the Pennzoil Gulf Federal is producing from Zone B; the Superior Collett is not producing in the Morrow section; and the Pennzoil Gulf Federal Number 2 is producing from Zone A, Zone B, and Zone C. I might add that I made these sections before I had an opportunity to see the section that was produced during the cross examination showing the perforated intervals across the field,which I believe had been prepared by the Commission.

Q Is there anything else you have to say with respect to Exhibit Three"

A No, sir.

Q Referring you to Exhibit Four, would you explain that?

A Exhibit Four is cross section C C Prime going from the

Texas Oil and Gas Number 1 Pan American State to the Pennzoil Mobil Federal Number 1 to the Phillips Drag Number 1. Cross section C C Prime shows, based on the information available to us, that the Texas Oil and Gas Pan American State is producing from Zones A, B, and C. Our information also shows that the Pennzoil Mobil Federal is producing from Zone B and Zone C. The Phillips Drag is shown to be producing from Zone A, Zone B, and Zone C.

Q Referring you to Exhibit Five, will you explain that?

A Exhibit Five is the stratigraphic Section D D Prime. It is the first of the walk around sections. This goes from the Cities Service-- from the Grace City of Carlsbad to the Cities Service Merland "A" to the Merland "B" to the Cities Service Spencer A to the Antweil Little Jewel over to the Cities Service Strackbein Three. This section shows that the Grace City of Carlsbad is producing from Zone B. I might add to the point of contention, apparently the Cities Service Merland "A" is producing from Zones A, B, C, and D; the point of contention being that the Grace City of Carlsbad Number 1 if there is a discrepancy in perforations and the perforations in the records of the Commission indicate that it would be perforated in Zone C. If it were perforated in Zone C, we would

find it producing from the same zone that we find producing in the Cities Service Merland "A" and "B". The other wells that I have shown on the section, the Cities Service Spencer is shown to be producing from Zones A and B and the Antweil Little Jewel only out of Zone B. The Strackbein is producing from Zones A and B.

Q Will you put on the board Exhibits Six through Nine?

A Yes, sir.

(Whereupon the witness complied.)

Q (By Mr. Hinkle) Referring you to Exhibit Six, will you explain what that shows?

A Exhibit Six is the stratigraphic Section E E Prime, which is a walk around section, and which tries to connect a number of the wells just so we can relate the zones stratigraphically. It starts here with the Pennzoil Gulf Federal and extends just around in a circle. I have no reason for any particular configurations other than to try and connect as many wells as I can in one section.

Here again, I show the productive interval of the Pennzoil Gulf Federal Number 2 as being from Zones A, B, and C. The Superior Collett is not productive in the Morrow. The Pennzoil Gulf Federal Number 1 is productive only in the B Zone. The Grace Panagra is

productive in the C Zone. The Grace Humble Grace again is productive in the C Zone. The Grace Gradonoco our information shows that this well is producing both from the D and the C Zones. The Texas Oil and Gas Well is productive in the A Zone, the B Zone, and the C Zone. The Pennzoil Mobil Federal Number 1 is productive in Zones B and C. The Pennzoils Echols Number 1 is productive in Zones B, C and D. The Phillips Drag is productive in Zones A, B, and C.

The purpose of this section and the previous walk around section was to identify the wells that are producing in what I consider to be identifiable sand zones in the Morrow. Whether they are separate and distinct sand bodies, I cannot say, but they can be identified on logs, and I might say that my identification lines, my correlation lines, are quite similar to the ones prepared by Mr. Baldwin.

Zone A is probably the least zone-- D is the least productive zone, C and A are probably half and half. I agree with previous testimony that Zone B appears to be the most widespread productive zone, however, it is made up of many lenticular sands with porisities scattered up and down through the section.

Q Now, referring you to Exhibit Seven, will you explain what this is?

A Exhibits Seven, Eight, and Nine are three porosity isopacks which I prepared, using the available logs in the field. The porosity of Zone A indicates that there is a tight zone in Zone A that is in the upper sand in the Pennzoil Gulf Federal and extends up to the Grace Carlsbad, according to our information. On the east side of the field, there are a couple of wells that have no porosity, but my inspection well, the Grace Panagra, has no porosity. My interpretation is that there is some scattered porosity in Zone A throughout the field.

Going on to Exhibit Eight, this is an isopack of the porosity of the B Zone. I might add that this isopack (indicating) is at a five foot interval.

MR. PORTER: Which exhibit is that?

THE WITNESS: Exhibit Seven.

A (Continuing) Exhibit Eight is on a ten foot interval. This is what we discussed before as being probably the most widespread productive zone in the field, that is, the orange colored B Zone. You can see from the isopack that the sand is quite a bit thicker throughout the field in this area-- not the sand, but the sand porosity is thicker in this area than in either the A Zone or the C Zone. I have no isopack on the D Zone.

Q Mr. Schatz, in preparing these exhibits and in your

studies of this area, did you find anything that would indicate a faulting condition?

A No, I did not.

Q There is nothing contained in the logs that would indicate faulting in the position which Mr. Baldwin has referred to?

A No. I have spent approximately twenty-one and a half years in working the geology of West Texas, and we have found in this period of time that there a great amount of lenticularity in the Pennsylvanian section in the Northwest end of the Delaware Basin. I suspect that the missing section which was referred to by Mr. Baldwin is more related to the lenticularity in the Cisco Canyon Zone than it is to a missing section.

Q Do you know whether or not the Commission in defining the South Carlsbad Morrow Gas Pool included the entire Morrow formation or was there definition limited to certain zones in the Morrow?

A It is my understanding that the findings of the Commission considered the Morrow as one pool, although it was made up of many stringers.

Q Do you know whether or not that is true generally in designating or defining the Morrow Pool in Southeast New Mexico?

A In my studies of the Morrow and Pennsylvanian Sections

throughout Southeast New Mexico, I have found that they have been grouped together and considered as one field.

Q Is that under the assumption that there is some communication between the different producing zones in the Morrow?

A I don't know how to answer that, because I really don't know what the findings have been based on.

Q Would the fact that the Commission had in each instance designated the Morrow formation as a pool at least imply that there is some communication between the different producing zones in the Morrow?

A It would in my opinion imply there could be communication between the zones, and as we have seen on Mr. Baldwin's cross section, the shale breaks are very thin between the numerous sand stringers.

Q Have you formed any independent opinion on that as to whether or not there is communication?

A I have mixed opinions on that. In some areas, I think without a doubt there is communication as you see one sand layer go on another; in other areas where the sand is separated by say one hundred feet of shale, I would say it would be unlikely there would be any communication. In the case we are talking about, we are talking about two reservoirs which are separated

at approximately at most, by seventy feet. I would say it would be unlikely by the amount of sand shown in the section and the many shale breaks in there that it would-- I would think it would be likely that there would be some communication, although personally, I cannot guarantee that or vouch for that.

Q You heard the testimony of Thomas A. Baldwin today, do you agree in whole or in part with his testimony?

A Yes, sir, there are a number of points that he has made which I believe are valid.

Q In what respect do you not agree with him?

A I don't agree with his fault interpretation. I believe he mentioned that there was some gravity information that he had available to him that indicated this faulting. We have seismic information available to us which he has discounted which indicates there is no faulting in the area.

Q The seismic information that you have indicated that there was no faulting at all, is that right?

A In the vicinity of the fault that he is proposing.

Q Ordinarily, would seismic information be the best evidence you could obtain of faulting conditions?

A Ordinarily, in Southeast New Mexico and West Texas, it is quite unusual to find a well that has cut a fault, and I believe that to find five or six wells in close

proximity which have been identified as having a fault in them, I think this is quite unusual. There is considerable alignment of stratigraphic units in Southeast New Mexico around the northwest side of the Delaware Basin, and this lenticularity can be demonstrated in many places,and I think that possibly the missing section could be related to this lenticularity of similar facies, and you do have the thickening and thinning as demonstrated on Mr. Baldwin's sections.

Q In your opinion, is there any justification from the information you have and the studies you have made for segregation of the South half of Section 25, Township 22 South, Range 26 East and Sections 2 and 11 in Township 23 South, Range 26 East from all of the other acreage in the pool?

A No, there is no reason in my mind why these should be separated or segregated from the field itself. I have attempted to demonstrate by my cross sections that the sands themselves are continuous throughout the field and are present in most of the wells,and I have attempted to show on my isopack that the porosities if not continuous, certainly are present in a great number of the wells suggesting that we do not have an isolated case in Sections 2 and 11, and in the South

half of Section 25.

Q Is there anything that would lead you to believe that the wells in those sections are any different from any of the other wells in the pool?

A No, sir.

Q Do you have anything else you would like to present to the Commission in connection with this matter?

A I have not discussed Exhibit Nine.

Q Oh, I'm sorry, go ahead.

A Exhibit Nine is a porosity isopack of the C Zone, the green zone over here (indicating), and this shows a thick sand porosity up in Section 30, and this extends on a line with the thick sand porosity indicated in the two Crace wells in Section 2. But I might point out that the porosity is also present in many of the other wells in the area as shown on the cross sections. It has been perforated as part of the producing interval in a number of the other wells.

Q Is there anything else you would like to present?

A One other point I would like to make, and that is that this field is set up on 320-acre proration units, and in assigning a 320-acre unit to a well which is not in the exact center of that prorated unit, this implies that the producing area extends beyond that 320-acre assigned unit.

Q And that one well will effectively and efficiently drain 320 acres or more?

A That is the impression I get by the assignment of 320-acre proration units.

MR. HINKLE: That's all we have on direct. I would like to offer Exhibits One through Nine in evidence.

MR. PORTER: Are there any objections?

(No response)

(Whereupon Midwest Oil Corporation Exhibits One through Nine were admitted in evidence.)

MR. PORTER: Any questions of Mr. Schatz?

MR. COOLEY: Mr. Examiner, since there seems to be a critical discrepancy in testimony as to where the various wells are perforated, it would seem to me that a recess might be in order so that we might get the official files of the Oil Conservation Commission to ascertain the perforations of record.

MR. PORTER: How many wells would that involve?

MR. COOLEY: It would require pulling about five files, I believe.

MR. PORTER: Let's take a short recess.

(Whereupon a recess was taken.)

(Hearing continues.)

MR. PORTER: The hearing will come to order, please. Mr. Schatz, would you take the stand, please? Mr. Cooley?

MR. COOLEY: Yes, sir.

MR. PORTER: You have some questions of the witness?

MR. COOLEY: Yes.

CROSS EXAMINATION

BY MR. COOLEY:

Q Mr. Schatz, in your direct testimony, you testified that a possible explanation for what has been called the missing sections by Mr. Baldwin could well be explained as lenticular development in the Cisco, is that correct?

A Yes, sir.

Q Would you expound a little bit on how that could occur?

A Around the edge of the Delaware Basin, we find that the seas transgressed and regressed and as they came to a standstill in many places, they developed sand bars and comparable depositions of limestone or sandstone. The limestone or sandstone in adjacent areas could well be shaled and as often as not, a comparable thickness of shale as that represented in the sand or the limestone.

Q What shape do these things usually take?

A They take an elongated shape parallel to the depositional edge of the basin.

Q Any particular width?

A No, it variesquite a bit depending on the time of still

sand. If you know anything about the ABO production in New Mexico, you will know that the ABO producing zone is probably one or two locations wide and that's all, in other areas, it could expand to a mile wide.

Q Now, these elongated lenticular sections are thicker than the surrounding shales, is that what your testimony is?

A Yes, sir.

Q Now, the reverse was found to be true with respect to the wells where Mr. Baldwin found what he called fault cuts. Isn't it true that he said he found sections missing?

A Yes, sir.

Q Now, your elongated build-up of the reef or shoreline would not explain that, would it?

A Yes, sir.

Q Would you explain?

A In a well that had a thicker section, a well where you had a build-up, and a well where you have a thinner section instead of saying it is missing by being cut out, there would be no elongated limestone or sandstone body in that position.

Q But there would be a difference in the type of rock, would there not?

A Yes, sir.

Q In those two cases?
A That is very likely, however, as the seas regressed and transgressed, you get deposits of these thin beds of rock which are in some places time equivalents, but they are not subsea or subsea equivalents. In other words, in one area, what might be encountered at 10,500 feet might be the same zone which is found in an adjacent well at 10,700 feet.
Q Would you not expect to find these reductions in overall formation development to expand over various areas of the pool to the east if this was the explanation of it?
A Would you repeat your question?
Q If the situation was such that the missing section, as we have called it, was accounted for by lenticular deposits along the shoreline, wouldn't you expect this condition to extend over the eastern part of the pool as well?
A The lenticularity has been demonstrated on Mr. Baldwin's section of thickening and thinning, and this can occur in any of the wells. If you will note his correlation of the Morrow section and take the thickness interval -- I don't know which exhibit it is, if you would move that map (indicating).
Q Exhibit Seven.

A No.

Q Is this the one you are talking about (indicating)?

A No, it would be Exhibit Six, the cross section of A A Prime and B B Prime.

If you will measure the thickness between the first blue line and the second blue line on those two wells, I believe that you will find that one is thicker than the other and the same is true over in the cross section A A Prime. There is a thickening and thinning rapidly, and I believe that is shown on my sections, but you see the sand thickening and thinning, and it really is unpredictable as to what the thickness is there. There is a possibility of alignment of thick or thin if it paralleled the depositional structure of the bed.

Q Could that thickening and thinning extend to a point of one hundred feet differential? Isn't that quite a stretch of the imagination to assume that the thickening and thinning of the zone would approach a one hundred foot difference?

A I don't think there is any question that it could. If you look at the correlation of your zones, you will find it is difficult to correlate the zone or beds across from one well to the other. There will be a small amount of thickening and thinning and it would

not at all be unusual to find what you might say was the missing section, if you want to call it that, or thickening or thinning, as I would refer to it, of one hundred feet.

Q You have correlated all the logs in the field, have you not?

A In the Morrow section.

Q But you have not correlated above the Morrow?

A No, sir.

Q In the area where Mr. Baldwin feels, in his opinion, the fault is?

A No, I have not.

Q So you simply have not looked for the fault cuts that he said he found?

A No, I haven't, I just questioned his postulation of the fault cuts in the Cisco Canyon section where you recognize the probability of extreme variations of thicknesses in these units. It is not at all unusual to find these thickenings and thinnings as you go up and down the depositional section.

Q This could happen anywhere in the zone, is that correct?

A Yes.

Q But you find nothing striking about the fact that only five wells in the entire pool show this thinning in almost a straight line following the fault line that

he has postulated?

A I think it is very likely that this follows a line of depositional similarity. I think his missing section, as he prefers to call it, is due to the lenticularity of the bed rather to any faulting.

Q You stated that in your opinion, seismic information would be the best evidence of faulting in this particular pool at the depth encountered here, and at the depth testified to by Mr. Baldwin?

A Yes, I think that is the best evidence that you can get for faulting.

Q Are you particularly expert in seismic work?

A Yes, sir.

Q Did you hear Mr. Baldwin testify about the length of the sound waves necessary to detect or to do seismic work at these depths?

A Yes, sir.

Q Do you disagree?

A I think it is a matter of the quality of the records. It is very possible that you could recognize a small fault if it extended any vertical distance. If it were just a thin vertical interval that it cut, I think that it would be difficult to recognize it.

Q If the flow of the fault is less than one cycle, would it be discernible through your seismic efforts?

A I cannot answer that, I do not know.
Q It would be like a minnow getting through a large net, would it not?
A That's a possibility, however, if the fault were of a magnitude of seventy-five to one hundred feet, I think it is a very good possibility that you could recognize it, that's my personal professional opinion.
Q And there is a very good possibility that it would be missed, is there not?
A Yes. The fact that we saw no fault substantiated my opinion that there is none and that the alignment and missing section is in fact a lenticularity of the bed and the lenticularity along the northwest side of the Delaware Basin.
Q But you have just testified that there is approximately equal opportunity to miss as well as to see a fault in seismic work of the type fault as we have here.
A I would say that there is a possibility of missing it.
Q But you still say that if you don't see it on your seismic, it is not there, is that your testimony?
A If I don't see it on the seismic?
Q I thought your statement was just a moment ago that when you saw no fault in your seismic work that there was no fault.
A I said that there was the likelihood that there is no

fault there because we did not see it, and because we know that the Cisco Canyon section has this great lenticularity, so as Mr. Baldwin did in his testimony, we added these two facts up and came to the conclusion that there was no fault. That's why I say that in my opinion, there is a likelihood that there is no fault there.

Q Now, you testified in answer to one of Mr. Hinkle's questions that it was the practice of the Oil Conservation Commission to group the various Morrow intervals together wherever accumulation of Morrow production occurred, is that a correct rephrasing of your testimony?

A That is my understanding of the problem. The Morrow has been a difficult section to work with out here. I am sure Mr. Baldwin remembers back in 1960, it was so difficult that no one considered it to be a primary objective at that time. It is difficult to follow these thin stringers around, and in order to identify these porosity zones, you would have to identify where the best place was that you could locate the porosity.

Q This would go to the question of vertical segregation of the pool, would it not? Rather than horizontal segregation on the basis of some structure features.

If there were two adjacent Morrow pools that were

completely separated by an impermeable fault, it would be your recommendation to the Commission that two pools be created, wouldn't it?

A If it could be demonstrated conclusively that there were two separate fields separated by an impermeable fault.

Q Then it would be your recommendation that they be segregated?

A I think what you would have to consider here is how far apart these wells were located and the evidence on which you base your fault information.

Q Well, if you just had one area where Morrow deposition occurs and then at some time, in some point in geological time, a fault occurs and divides that into two completely non-communicating areas, it would be your recommendation, would it not, that they be treated separately because they are separate common sources of supply?

A We're looking here--

Q I am asking you a hypothetical question.

A We are looking at the sand sections that extend over what might be three hundred or four hundred feet and if you have a fault in the neighborhood of seventy feet displacement, there is an awfully good possibility that in movement of the fault, you displace one sand against a completely different sand, and then you would

have to assume you have an impermeable fault, and I don't see an impermeable fault here.

Q If you were completely convinced that there were two adjacent areas productive of the Morrow, but not in communication with each other, you would recommend to the Commission that they be treated separately, would you not?

A If I knew there was a definite separation based on bottom hole pressure studies and based on the differences in the quality of gas--

Q I asked you to assume there is no communication.

A That has been definitely proven without a shadow of a doubt?

Q I asked you to assume it and that precludes having to prove it.

A Assume there are two separate fields that have been proven by bottom hole pressure information and all the other kinds of data that they are separate and apart--

Q Did you ever answer the question?

A No, I haven't. You asked a wishy-washy question, and I am having trouble giving you a wishy-washy answer.

Q It's not wishy-washy at all, it is a very simple assumption. There is no communication between the two hypothetical areas.

A You are setting me up to pull the rug out from under me, and I don't want to get set up.

Q I have asked you to assume these things, and to give me an answer. We are belaboring this.

A We sure are. Mr. Porter, do I have to answer that question?

MR. PORTER: We would like to have your opinion.

A If it could be proven without any question of doubt--

Q You are assuming it, you don't have to prove it, it is assumed.

A This is a tricky word, "assume". If there was absolutely without any doubt no communication--

Q That is what the hypothetical question is.

A I believe I would ask for two separate pools.

Q So the question is are the pools in the area under discussion actually separate or not, is that right?

A I think that is what the question is in the Commission hearing.

Q And in your discussing this, you were talking about various methods by which you would prove the absence of communication and total separation, and there are many methods of doing that, are there not?

A Yes, sir.

Q And many tools that could be used?

A Yes, sir.

Q Even if you had all of those tools, you still would not be one hundred percent absolutely positive, there is no way it can be one hundred percent positively proved, this separation of two adjacent areas?

A No, sir, I don't think it is any more possible to absolutely prove it at 11,000 feet, prove that there is separation, any more than you have a chance to prove that there is not. It is really a moot question.

Q It is not a moot question. It is a difficult point to prove either positively or negatively, is that true?

A That's true.

Q Thus when we are faced with the situation of a necessity of making a decision as to communication here, the Commission decide whether they are or are not separate, even though we can never be one hundred percent sure. We can only deal in probability, can't we? It is more probable that it is separated or it is more probable that it isn't.

A I will go along with that,and it is more probable that it is not.

Q That is just the best the Commission can do for any party that appears before the Commission?

A That's right, based on the testimony presented by the witnesses. The witness who offers the most likely probability of what is happening down at 11,000 feet.

Q Mr. Schatz, I want to call your attention to the Mobil Federal 12 Number 1.

A Is that the Pennzoil?

Q Yes, the Pennzoil United Mobil Federal 12 Number 1. I hand you Grace Exhibit Number Seven, which you could compare with your own and which is on a scale five times larger than your own.

A Yes.

Q And I also hand you photostatic copies of Pennzoil's wells completion records submitted on the Mobil Number 1 and the Pennzoil Gulf Federal Number 1 and ask you to superimpose all the perforations that are reported there onto the Grace Exhibit Number Seven. When you have completed that, let me know.

Mr. Schatz, I am also handing you well completion reports on the Pennzoil United Echols Number 1, and I would also like you to superimpose the reported perforations onto Grace Exhibit Number Seven.

(Whereupon the witness complied.)

Q (By Mr. Cooley) Have you completed, Mr. Schatz?

A Yes.

MR. HINKLE: What exhibits are these?

MR. COOLEY: This is Grace's Exhibit Number Seven.

MR. HINKLE: Are you making this for the purpose of showing that your exhibit is incorrect?

MR. COOLEY: I am not.

MR. HINKLE: You are putting the information on your exhibit.

MR. COOLEY: I am asking him to make comparisons.

Q (By Mr. Cooley) Mr. Schatz, directing your attention to Grace's Exhibit Seven, would you describe for the record what you have done?

A I have placed on the Pennzoil Gulf Federal Number 1 and the Mobil Federal 12 Number 1 and the Pennzoil Echols Number 1 the perforations from the logs.

Q How have you indicated them?

A I have indicated them by boxes on the Echols and straight lines adjacent to the depths on the other two wells.

Q Now, correlating the perforations in the Pennzoil Gulf Federal Number 1 with the perforations and producing intervals marked in red on Exhibit Seven with respect to the Grace wells, the Gradonoco Number 1 and the Humble Grace Number 1, do you find any perforations at all in what Mr. Baldwin referred to as the Morrow plus 370 zone?

A Yes, sir.

Q In the Gulf Federal?

A No, sir, not in the Gulf Federal.

Q Proceeding next then to the well in the far right, the Echols Number 1, did you find any perforations in

that zone whatsoever that would correlate to what we will call the Grace Productive Zone?

A The Grace Productive Zone is narrow in scope and includes approximately thirty feet. In what I would refer to as my C Zone, I have not limited my C Zone to the top thirty feet of the interval, and therefore, I would say in my C Zone, or in your Morrow plus 370, whatever you want to call it, I would say that the Gulf or Pennzoil Echols is similarly producing in that C Zone.

Q You can call it any zone you want to call it, I am referring to the thirty foot interval that Mr. Baldwin referred to as the Morrow plus 370 zone.

A Yes, sir.

Q Are there any perforations in that thirty foot interval in the Echols Number 1 Well?

A No, there are not.

Q Thank you. There are perforations above and below it?

A Yes, above and below, and I believe your red markings on there indicate that the productive interval is incorrect on your exhibit.

Q Don't volunteer information, I just want you to answer my question. Are there or are there not any perforations in this zone? If you want to say something additional later, you can on redirect with your attorney.

Directing your attention to the Mobil Federal Number 1, are there any perforations in the zone in question?

A Yes, sir.

Q What are those perforations?

A If I can read them off here-- 11,503-- I can't read this too well. Eleven thousand five hundred three to 11,508; and 11508 to 11513.

Q That is a ten foot interval, is that correct?

A Yes, and there are additional perforations in the next sand zone below that.

Q That's what you call Zone D?

A No, that is Zone C. What you have colored yellow on here is my Zone D.

Q With respect to the ten foot interval of 11,503 to 11,513, I want to direct your attention to the blown up electric log, and I ask you to tell me if you see any significant porosity development in that particular section in that ten foot interval.

A I see what I interpret to be porosity from 502 to 503-- excuse me, 504 and then it's back at about 508, and I would say there is a possibility that it is porous at that point.

Q Directing your attention to the gamma ray side of the log, doesn't it appear that the area you just

mentioned is shale rather than sand?

A It's starting to drop back between six and ten.

Q And that is indicative of shale, is it not?

A Well, between eight and ten, it is indicative of being a shaley bed, the perforation is at eight.

Q In your opinion, is it possible that this two feet to which you testify here would make any significant contribution to the production of that well?

A I think there is a possibility it could, I do not know that as a fact.

Q It is not nearly as well developed as the area colored in red above which is characterized as being the main productive interval of that well, is it?

A No, it is not.

Q How would you compare it in percentage of permeability?

A I'm not a log expert, and I would not want to make a comparison.

Q It is a pretty small fraction as compared to the permeability of the section above it, the main section, is that correct?

A Vertically, it is a small part of the total overall producing interval.

Q In summary of the three Pennzoil wells portrayed on Grace's Exhibit Seven, only one is perforated in the Morrow 370 plus zone, the thirty foot thickening, is

that correct?

A Only one is perforated in that thin zone that you are identifying.

Q That was my question. The one well that does have a ten foot perforation, it is your testimony in this case that compared to the main producing zone of the well, it is only a small fraction of the well's producing potential?

A No, I did not say that, I said it was a small fraction of the total overall interval.

MR. COOLEY: I have no further questions.

MR. PORTER: Are there any further questions?

MR. HINKLE: Yes.

REDIRECT EXAMINATION

BY MR. HINKLE:

Q The information that you used to superimpose these figures on Grace's Exhibit Number Seven were from what records?

A These were from the United States Department of Interior, Geological Survey, Well Completion or Recompletion and Log.

Q Copies of which have been filed with the New Mexico Oil Conservation Commission?

A Yes, sir.

Q Were these corrections on Exhibit Seven, these

amendments to Exhibit Seven, caused because the USGS report was different from what was shown on Exhibit Seven? In other words, are these corrections of Exhibit Seven? Was Exhibit Seven incorrect in showing the perforations?

A I will have to say that Mr. Baldwin did not show the perforations of the log on here. He indicated the producing interval by red coloring and the zones that were perforated below his red zone were not indicated with the red.

Q Now, in your opinion, superimposing the information on Exhibit Seven, does that change any of your testimony in this case?

A No, sir.

Q You are still of the same opinions you were before?

A Yes, sir.

MR. HINKLE: I have nothing further.

CROSS EXAMINATION

BY MR. STEVENS:

Q Mr. Schatz, on your Exhibit Number Five, you show the perforations of the City of Carlsbad Number 1 to be at approximately 11,520 plus or minus a few feet?

A Yes, those are the perforations in question.

Q We have had testimony that those perforations might be down at 11,566 plus or minus a few feet.

A Yes, sir.

Q In your opinion, are there any other wells perforated in the same general interval within the Morrow formation equivalent to that 11,566 perforation in the other wells shown on this cross section?

A Yes, sir, as I mentioned before, if we move those perforations down from the B Zone to the C Zone, we will then, as I have demonstrated on my exhibit and we have talked about it on Exhibit Seven, that is the same producing interval that is producing on the Pennzoil well. If we move it down and if it is what we actually have and what I have plotted is incorrect, then if we move it down, we will still be in the same zone we have just identified on Exhibit Seven as being productive.

Q The C Zone?

A Part of the C Zone.

Q And the C Zone is generally productive over the entire field?

A That is in my opinion. It is widespread.

MR. STEVENS: No further questions.

MR. PORTER: Does anyone else have any questions?

CROSS EXAMINATION

BY MR. KELLAHIN:

Q Mr. Schatz, in your opinion, is it practical or

professional to break what you have named as your C Zone down into separate little intervals and say they are separate sources of supply?

A I would say in my opinion that if you started to say every sand stringer thirty feet thick would be a separate pool and tried to give pool rules to them that we would end up with a horrendous problem.

Q Would a separation of twenty feet be an effective separation in this particular sand?

A A separation of twenty feet?

Q Two zones twenty feet apart in the C Zone. I am referring back to the testimony in connection with Grace Exhibit Number Seven when Mr. Cooley was asking you about the perforations of one well being twenty feet lower than the other. Is there any effective separation between those two zones in your opinion?

A I would like to say that I consider the C Zone as a sand zone made up of many stringers. These are the sort of zones that you could break out and say they can be correlated over the large area. Within these zones, I found the sands to be thickening and thinning in such a way as to indicate that there is an awfully good possibility,and that's all I'll say. They could be connected, their porosities could be connected well to well, and I don't know whether twenty feet

is the limit, but twenty feet is not within the realm of possibility that you could have a build-up and build into another sand, and thereby afford communication.

MR. KELLAHIN: If the Commission please, I would like to inquire as to Exhibit Number Seven. Was Exhibit Number Seven, which was marked by the witness, part of the record in this case at this time?

MR. COOLEY: I intend to introduce it.

MR. PORTER: It has not been offered as yet.

MR. COOLEY: I intend to introduce it.

MR. KELLAHIN: That's all I have.

MR. PORTER: Does anyone have anything further from this witness?

MR. COOLEY: Yes, sir.

CROSS EXAMINATION

BY MR. COOLEY:

Q Do you know whether any drill stem tests were conducted on the lower perforations in the Echols Well?

A No, I don't know whether there were any drill stem tests conducted.

Q I hand you a portion of a well completion report entitled "Drill Stem Test Data Submitted by Pennzoil United Inc. on their Echols Well", and I ask you to review that and see if there were any drill stem tests

shown-- strike the question, I have the wrong one.

I hand you drill stem test data submitted by Pennzoil United with respect to their Mobil Federal Number 1 Well which is the only well that has perforation in the Baldwin zone 370.

A The interval in question, 11,503 to 11,513, none of the drill stem tests cover that interval.

Q Here is the second page of it (indicating).

A The second page of the same data. The drill stem test number eight from 11,491 to 11,517, which covers the perforated interval, 11,503 to 11,513, Packers failed after five minutes. There are no other results.

Q And that is inconclusive, sir?

A Yes, I would say so.

Q Mr. Schatz, do you concur that any perforated intervals that you show on your exhibit should be corrected to conform with the Oil Conservation Commission official records?

A Yes, sir. I apologize for any that are incorrect, I don't know what happened. In the one we are talking about, the City of Carlsbad Well, apparently that had been reported in prior testimony to the Commission and was reported incorrectly. I apologize for any incorrect perforations, and certainly agree to having them placed in the proper interval.

Q You agree with the Oil Conservation Commission records which reflect that the City of Carlsbad Well is perforated at 11,566 to 11,572 feet?

A If that is what the Commission records say, then I have no basis for questioning them.

Q Then you amend and correct any exhibit you have that show the perforations of that well to be otherwise?

A Yes, sir.

MR. COOLEY: I would like to introduce corrected Exhibit Number Seven.

MR. PORTER: Would you describe the exhibit?

MR. COOLEY: It is the exhibit entitled "Correlation of the Morrow formation" and it is Grace Exhibit Number Seven, and an uncorrected copy has already been introduced in evidence. Mr. Schatz, pursuant to my request, has shown perforations below the red marked producing zone as indicated on the exhibit on the Mobil Federal 12 Number 1 Well at intervals of 11,503 to 11,513.

THE WITNESS: They are indicated by short horizontal lines at the depths.

MR. COOLEY: Would you take this fountain pen and bracket them as boldly as possible and put an asterisk and then write the word "Corrected"?

(Whereupon the witness complied.)

MR. PORTER: The exhibit has been offered, are

there any objections?

MR. KELLAHIN: We would like to compare the exhibit to our own before we agree to its introduction.

(Whereupon Mr. Kellahin was handed the exhibit in question.)

MR. COOLEY: I renew my motion to introduce into evidence corrected Grace Exhibit Number Seven.

MR. KELLAHIN: We ask that the Commission take notice of its own records which will show that the zones have been perforated and are open to the well bore. Of course, if there is anything in the records to indicate otherwise, you will take notice of that also. But it is our belief that all the zones are open to the well bore.

MR. PORTER: Have you any objection to the admission of the exhibit?

MR. KELLAHIN: No, not with that stipulation.

MR. PORTER: Do you have any objection to this stipulation, Mr. Cooley?

MR. COOLEY: To my own exhibit?

MR. PORTER: To Mr. Kellahin's stipulation.

MR. COOLEY: The Commission always takes notice of its own records, so of course not.

MR. LeBLANC: May I ask a question?

MR. PORTER: Yes.

MR. LeBLANC: Robert LeBlanc, representing Cities

Service Oil Company. I don't know what perforations we are talking about. Where are the perforations that you say are not correct? I am requesting that information from the Grace attorney.

MR. COOLEY: These are different perforations that are not shown.

MR. LeBLANC: What are they?

MR. COOLEY: In one case, the Pennzoil Mobil 12 Number 1.

MR. LeBLANC: Did you refer at all to the City of Carlsbad Well?

MR. COOLEY: We did not.

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

(No response)

MR. PORTER: The amended exhibit will be admitted.

(Whereupon Grace's Amended Exhibit Number Seven was admitted in evidence.)

MR. LeBLANC: We took the recess before because it was mentioned that there were about five wells that you wanted to check the Commission records on.

THE WITNESS: These (indicating) are from checking upstairs, we brought them down here.

MR. LeBLANC: Was one of them City of Carlsbad Well?

THE WITNESS: No, we had checked that out already, and we have the records here and have given the results of the records. We checked the records on the City of Carlsbad Well last night, and the records show the perforations at 11,566 to 11,572.

MR. LeBLANC: What records did you check?

THE WITNESS: The Commission records upstairs.

MR. COOLEY: Well completion records.

MR. LeBLANC: What are the dates of those records? Perhaps then I can explain the reason for my question. The Cities Service Oil Company in April of 1971 received a carbon copy of a letter addressed to Alex Armijo, State Land Commissioner, carbon copies were sent to both Gulf and Cities Service. The letter was written by William J. LeMay, and the letter was addressed to Mr. Alex Armijo. The letter was dated April 14th, 1971, and refers apparently to a lease, but indicates-- states that the well was perforated from 11,516 to 11,522. That was in April of 1971. Are these records earlier or later information? Which is correct?

THE WITNESS: I took later information-- I'm sorry, I didn't record the date.

MR. LeBLANC: I am trying to find out where the well was perforated.

MR. BALDWIN: The date of the record is May 4th, 1971, and the perforated interval given is 11,566 to 11,572, in

the Morrow.

MR. LeBLANC: Then I have to assume that the letter written to Mr. Alex Armijo was incorrect.

MR. BALDWIN: It is incorrect according to Mr. Grace's records, and he is prepared to give testimony on that subject.

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

(No response)

MR. PORTER: He may be excused.

(Witness excused.)

MR. PORTER: Mr. Kellahin, do you desire to present testimony?

MR. KELLAHIN: Yes, I do.

MR. PORTER: Will your witness come forward and be sworn?

J. C. RANEY,

was called as a witness, and testified as follows:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Will you state your name, please?

A J. C. Raney.

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

A Pennzoil Company as a Petroleum Engineer.

MR. HATCH: I don't think the witness has been

sworn.

J. C. RANEY,

was duly sworn, and testified as follows:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Mr. Raney, now that you are sworn, would your answers be the same to the questions I have just asked?

A Yes, sir.

Q Have you testified before the Oil Conservation Commission and made your qualifications as a petroleum engineer a matter of record?

A Yes, I have.

Q Mr. Raney, in connection with your work for Pennzoil, have you done any work in the South Carlsbad Strawn and Morrow Gas Pools?

A Yes, I have. I am the engineer in charge of production and engineering work in the South Carlsbad area.

Q In your position as engineer in charge of production, are you familiar with the producing characteristics of the pool, generally?

A Yes, sir.

Q Are you familiar with the pool delineation and have you formed an opinion of the area of this pool?

A Yes, I have made studies of this pool. In relation to this, I was also a witness in the April hearing in

Hobbs.

Q Did you testify at the proration hearing in April?

A Yes, I did.

MR. KELLAHIN: Are the witness' qualifications acceptable?

MR. PORTER: Yes, they are.

Q (By Mr. Kellahin) You are familiar with the application presently before the Commission in Case 4795, are you not?

A Yes.

Q Has Pennzoil taken a position in connection with the application?

A Yes, Pennzoil Company is opposed to the deletion of Section 25, Township 22 South, Range 26 East, and Section 2 and Section 11 in Township 23 South, Range 26 East.

Q What is your opposition based on?

A Our opposition is based on the fact that all the wells in the sub-pool are producing from a common source of supply in the Morrow formation. We believe this to be true, even though the wells are producing from various intervals within the total Morrow formation which is approximately 600 feet thick.

Pennzoil is of the opinion that the producing intervals are interconnected at some point out in the

reservoir.

Q Now, does Pennzoil operate wells in the pool?

A Yes, we operate four wells in the Morrow formation. One of these wells is very close to the proposed area to be delineated from the current South Carlsbad Morrow Pool.

Q Is that the Gulf Federal Number 1?

A Yes, it is. This well is east of the Grace Gradonoco Well and the Grace Humble Grace Number 1. This well is located in the west half of Section 1.

Q That is 23 South, 26 East?

A Yes.

Q Now, are the producing characteristics of that well similar to any of the Grace wells?

A Yes, they are very similar in that these three wells, the Gulf Federal Number 1, the Humble Grace Number 1, and the Grace Gradonoco Number 1 all have produced approximately 750,000,000 cubic feet of gas, and are essentially dead or producing very little gas at line pressure, and we feel this is very characteristic of the wells in that area.

Q In your opinion, are those wells essentially depleted?

A At this time, they are. During the period of time these wells produced,the gas varied because of the capacity at which they were produced.

Q What do you mean by that?

A Pennzoil Gulf Federal Number 1 has been produced at about 2,000,000 MCF a day and has been on production for approximately a year and a half. The two Grace wells, the Gradonoco and the Humble Grace, have been on production for approximately six months.

Q Then they were produced at a higher rate?

A Yes, they were produced at capacity, maximum capacity.

Q Now, referring to what has been marked as Pennzoil's Exhibit Number 1, would you identify that exhibit?

A Yes, this is a structure map of the Morrow formation in the South Carlsbad area.

Q Would you discuss some of the features shown on that map?

A This is a structure map on the top of the Morrow formation in the South Carlsbad field. The interpretation is indicated on the map that there is a structural low or a saddle existing along the central portion of Section 1, Township 23, Range 26 East. We believe, with the limited amount of sub-surface geological data that this is the most logical interpretation that can be made.

We would like to point out that this map is similar in nature to Exhibits Two and Four presented by the Graces in Case 4693 at the April, 1972 proration

hearing.

Q Is this map essentially the same as the one presented by Pennzoil at that hearing?

A Yes, it is, with additional data to the south in Sections 18 and 19, Township 23, Range 27 being added since that hearing.

Q That is the result of the drilling of the Phillips Drag Wells?

A Yes, sir.

Q Turning to Exhibit Number Two, would you identify that exhibit?

A Exhibit Two is a completion cross section of the intervals of all the wells completed at the time this exhibit was made-- of the wells completed in the Morrow formation in the South Carlsbad Pool. This exhibit was prepared by New Mexico Oil Conservation Commission personnel and presented by them at the April, 1972 proration hearing.

I have examined this data and am in agreement with it in general and the corrections to be made on it.

Q Are there any corrections to be made on it, did you say?

A The Corinne Grace City of Carlsbad Number 1 apparently needs to be corrected. The rest of them appear to be all right.

Q Now, does this exhibit, in your opinion, indicate that

these wells are completed in a common source of supply?
A Yes, and in some instances, they are completed at the same interval.
Q Would you point them out?
A If the corrected perforations in the Corinne Grace City of Carlsbad are corrected, the Gradonoco is generally producing in the same interval and, as I said earlier, we believe these intervals are connected somewhere out in the reservoir, at some point out in there.
Q On this exhibit, are all the intervals hung on the top of the Morrow?
A Yes.
Q There are other pages to the exhibit, would you discuss those, please?
A This was used-- prepared by the Oil Conservation Commission. In preparing this first page of the exhibit, this is the completion data and the geological data that they used in preparing this exhibit.
Q Have you examined the exhibit and in your opinion, does page one correctly reflect the data it is supposed to?
A In general.
Q Except for the instance you mentioned?
A Yes.
Q Now, the wells in the Morrow have been completed at different intervals and produced at different intervals,

have they not?

A By intervals, I assume you mean time intervals?

Q Yes.

A Yes, this is correct. The discovery well in the Morrow formation was the Mobil 12 Federal Number 1, and that is the oldest well as far as production is concerned.

Q Now, does that have any bearing on the validity of the pressure data?

A In my opinion, the use of the current bottom hole pressure data whether it has been surface or drill stem tested, or the shut in bottom hole pressure, is inconclusive in determining if there are separate reservoirs and/or separate sources of supply. My opinion is based on the fact that there are different amounts of productivity, rate of production. Some wells make some water, and some wells don't, and this data on bottom hole pressure would prove rather inconclusive in determining whether or not this was a separate source of supply.

Q Are any of the pressure datum available to any extent?

A I have tabulated the bottom hole pressure data of the Pennzoil wells and the two wells of Phillips known as the Drag 1 and the Drag 1B.

Q Skipping over to what has been marked as Pennzoil's Exhibit Five, would you identify that exhibit?

A Exhibit Five is a summary of the bottom hole pressure data that I could come up with as far as our records are concerned in the Midland office of Pennzoil. This data,taken along with the other data that was presented by the Graces, as far as drill stem test data, presented April 19th, 1972, at the proration hearing in Case 4693, in evaluating this data, there is some indication of drainage or interference and down at the Phillips Drag 1B, the latest pressure available at this surface pressure, I had to calculate bottom hole pressure using a grade of 6.08 and the Drag 1A shows lower pressure than the Drag 1B, and in my opinion, this pressure in 1A is possibly caused by the accumulative production of the Echols Number 1 and possibly up in the Mobil 12 Federal Number 1 of Pennzoil.

Q Approximately over what distance does that extend?

A It is approximately one mile from the Echols Number 1 to the Drag 1B and about three-quarters of a mile to the Drag 1A.

Q Does that indicate to you that they are one common source of supply then?

A This indicates that this possibly could be, but as I said before, by the use of the pressure data that has been gathered now, this would be proved rather inconclusively by that means.

Q Then it is your testimony that you would need more accurate bottom hole pressure data to determine that?
A That is correct, and it would take rather extensive pressure data.
Q Wouldn't you also have to examine the accumulative production of these wells?
A Yes, because I believe a heavy role was placed on this by the amount of pressure that is withdrawn from the wells.
Q Referring you to what has been marked Exhibit Three, would you identify that exhibit, please?
A Exhibit Three is a structure map on top of the Strawn lime formation.
Q What are the general features of this one?
A This exhibit indicates a structural low or a saddle in the area of Sections 1 and 2,Towaship 23 South, Range 26 East. Again, from the limited data that is available in the area, it is my opinion that this is the most logical interpretation that can be made in the area.
Q That is similar to the one reflecting the Morrow formation?
A Yes.
Q And was this exhibit similar to the one offered at the hearing in Hobbs?

A Yes, it's the same map with the addition made in Section 16, 23, 26 East on the Phillips Wells, this is new data.

Q Now, referring you to what has been marked as Exhibit Number Four, would you identify that exhibit?

A This is an exhibit similar to Exhibit Number Two which was presented and it came from the same source and, in general, I am in agreement with this data that has been prepared by Commission personnel.

Q What does that reflect?

A This, to me, reflects that the wells completed in the Strawn formation are generally all completed in the same reservoir and common supply source.

Q Returning now to the Morrow, is it your opinion that there are two separate sources of supply as proposed by the Graces?

A No, there are not two separate sources of supply.

Q Is it necessary for the Commission, in your opinion, to create a new pool as indicated by the Graces?

A No, we believe that the creation of new pools, whether they be Morrow or Strawn or Morrow and Strawn, is unnecessary and will cause waste and violate the correlative rights of the offset lease owners. Also it would be-- we believe it would violate the correlative rights of the offset lease operators and owners because

without the tool of proration to enforce penalties on the wells that are drilled in unorthodox locations--

MR. COOLEY: I object and ask that the answer be stricken on the grounds that the issue of proration has no part in this case. If proration is proper for the wells in the Carlsbad Pool, it certainly should be instituted, but it certainly is not an issue in this case.

MR. KELLAHIN: The answer to the question was not directed necessarily to proration, it was directed to the necessity for protecting correlative rights and his answer should stand.

MR. PORTER: The Commission will overrule the objection, Mr. Cooley. We recognize that proration is not at issue here, but that the correlative rights could be affected.

Q (By Mr. Kellahin) Mr. Raney, you heard the testimony of Mr. Baldwin this morning and the cross examination he was subjected to. Are you in agreement with his interpretation of the faulting in either the Morrow or Strawn formations?

A No, I am not. This is based on the fact that the small flow of this fault that has been suggested in there is of such a small nature and whether or not this could be, this fault could be cut by five different wells is very unlikely. I base my opinion also on the bottom

hole pressure data that you can use,and this would indicate there is some communication between wells.

Q In your opinion, are the Grace wells in a separate and distinct reservoir from the South Carlsbad Morrow Gas Pool?

A No.

Q Are they in a separate and distinct reservoir from the South Carlsbad Strawn Gas Pool?

A No.

Q Were Exhibits One and Three prepared by you or under your supervision?

MR. NUTTER: Exhibits One, Three, and Five.

MR. KELLAHIN: Thank you.

MR. GRACE: O. C. C., thank you.

A Yes.

Q And the other exhibits were offered by the Oil Conservation Commission in Hobbs in April of 1972?

A Yes.

MR. KELLAHIN: At this time, I offer Exhibits One through Five inclusive.

MR. PORTER: Are there any objections to the admission of these exhibits?

(No response)

MR. PORTER: The exhibits will be admitted.

(Whereupon Pennzoil's Exhibits One through Five

were admitted in evidence.)

MR. COOLEY: I understand that the Oil Conservation Commission exhibits, whichever exhibits they are, show incorrect perforation intervals on certain wells, and they have been amended; is that correct?

MR. KELLAHIN: No.

MR. COOLEY: Then I do object.

MR. PORTER: Was that one exhibit?

MR. KELLAHIN: Yes.

MR. PORTER: Was that exhibit in there?

MR. KELLAHIN: The exhibit was in error, and the witness so testified that it would be subject to correction in line with the testimony as to the Grace City of Carlsbad Number 1 Well. The testimony is in the record, and the witness has pointed out that the exhibit is in error on that point.

MR. PORTER: You object to the exhibit going in?

MR. COOLEY: I would like it to be corrected on its face so it does not get overlooked and lost in the record.

MR. KELLAHIN: Could you mark that, Mr. Raney?

(Whereupon the witness complied.)

MR. KELLAHIN: That is Exhibit Number Four.

MR. HATCH: The exhibit has been marked and has been shown to Mr. Cooley.

MR. COOLEY: I have no objection to the corrected

exhibit.

MR. PORTER: The exhibit will be admitted.

(Whereupon Pennzoil's Exhibit Four was admitted in evidence.)

MR. PORTER: Now, Mr. Cooley, do you have any questions?

MR. COOLEY: Yes, one moment please.

CROSS EXAMINATION

BY MR. COOLEY:

Q Mr. Raney, you are not a geologist, are you?

A No, sir.

Q There are certain engineering facets of the production characteristics of the pool that would bear upon whether this area involved here is one or two pools, are there not?

A Yes, sir.

Q And there are certain geological aspects?

A Yes, sir.

Q Did you prepare your Exhibit One?

A No, sir-- it was prepared under my supervision by our geological people.

Q Are you prepared to discuss it?

A To some extent.

Q Calling your attention to your Exhibit Number One, you refer to the area running roughly northeast-

southwest, across the pool, as being a saddle?

A Yes, sir.

Q Would that also be synonymous with a sincline, or is that a geological term with which you don't want to get involved?

A I don't want to get involved with it because it has been about twelve years since I have been involved that much with geology.

Q But just as a layman myself having observed geologists, usually when they have no other control of point one or point two, they will go on a fifty percent basis. In other words, if you have a well with a one hundred pound differential in pressure and you have no other control and you want to draw on fifty pound contours, normally you would assume that you would go fifty percent of what is between the wells.

A Yes, this would be one way.

Q Isn't it the most common?

A Or mechanically. Actually, going out and measuring the distance between with a divider and measuring the distance out.

Q That is what I am getting at, you would measure the distance out and if you wanted to contour on fifty foot intervals, you would go halfway between the wells.

A On a hypothetical basis.

Q Do you have any reason why you would deviate from that?
A On a hypothetical basis, no.
Q Do you have any reason in this particular field as to why you would deviate from that practice?
A Not having the data available.
Q Calling your attention then to your Gulf Federal Well, it's depth is minus 8,189, is that correct?
A Yes, that's the top of the Morrow.
Q And the Grace Gradonoco Number 1 was minus 8,136, is that correct?
A Yes, sir.
Q And your nearest contour line is your 8,100 foot line, and your 8,100 foot contour surrounds it, is that correct?
A Yes, sir.
Q Which of these two wells is closer to the 8,100 foot contour line?
A The well to the west. You have control at the Superior Collett Well-- I mean to the east, you have control there to the west, and in the Grace Gradonoco, there was no control at the time the map was drawn, and we still don't have any control.
Q I ask you to answer my question. Which of those two wells is closer to your contour line?
A This is what I am saying, you have control here

(indicating) and this is what you use. You have control on the outer side of the Pennzoil Gulf Federal Number 1 and the Superior Collett Well, but you don't have any control on the west side of the Grace Gradonoco Well.

Q Comparing the Superior Collett Well with the Gulf Federal Number 1 Well, which of those wells are closer to the 8,100 foot contour line?

A That's a pretty close figure in there, you could go either way.

Q Look at it closely, there's quite an obvious difference in the two, and it is in a critical area.

A It should be closer to the Superior Collett Well.

Q The contour line should be closer to the Superior Collett Well?

A Yes, sir.

Q Did you testify as to whether you felt it is a sincline or didn't you want to go into that?

A No, I didn't want to go into it, but we believe it is either a structural low or possibly a saddle in there.

Q Now, you testified that you are familiar with the production history of the pool, is that correct?

A Yes, sir.

Q Are you familiar with the production history from day to day and the present producing conditions of the Grace

wells?

A I am familiar with the accumulative and monthly production, which is available to the Commission, and I get-- I personally am responsible for production, and I get weekly reports from our wells and from the field.

Q Do you know what the present production of the Grace Gradonoco Number 1 Well is?

A I don't know for sure, what I would tell you would be hearsay.

Q Well, did you review its production for the last month?

A The last month, no. My production goes through June, I believe.

Q When is your most recent production information from the Grace Gradonoco?

A June. There was a monthly production of 71.086 MCF for thirty days, about 2.2 million per day.

Q You wouldn't call a well that has produced that much gas dead, would you?

A It's not as good a well as far as production is concerned as some of the other wells in the field.

Q Would you please answer my question, if you want to explain after you make your answer, you may, but would you call a well that makes 72,000,000 cubic feet in one month dead? How much money is that?

A I don't know what he gets for the gas.
Q Assume it is thirty cents.
A That would be all right-- it's not a good well.
Q How much money would that be?
A Thirty cents would be $21,000 a month.
Q Twenty-one thousand dollars for the month of June?
A That's right. We couldn't drill a well for 71,000,000 MCF.
Q This well is already drilled. You wouldn't call this well dead, making $21,000 a month, would you?
A No, but the decline is what I base part of this on.
Q Now, at one point in time, did you have an offsetting well to the Gulf Federal reach a level of two plus million a day?
A I don't have that data with me, but we have never produced a well over, this is just recalling from memory, no more than probably three million a day for conservation reasons.
Q Are you familiar with what producing rates have been used with respect to the Grace Gradonoco and the Humble Grace?
A Yes, sir.
Q What were those?
A I know what they were initially, I have a monthly production of around 7,000,000 initially.
Q From which well?

A The Gradonoco.
Q What did that well test at?
A I don't know offhand, about 7,000,000, this is just from memory from previous exhibits this morning.
Q And what was the production history with respect to the Grace Humble Grace Well?
A It came in for roughly five and a half to six million. This is based on the monthly production that was reported to the Commission.
Q It produced that much?
A Yes.
Q It had a calculated open-flow of approximately thirty million, didn't it?
A Yes.
Q As compared with your well of approximately twelve million, is that correct?
A Yes. May I say something else?
Q Yes.
A Absolute open-flow is supposed to measure a well's ability to produce, but because of the irregularity and uncertainties that you run into in running these tests and because of current Commission rules, which we agree with, of one hour per point, then absolute open-flows are not very good measures of a well's capability to flow.

Q But it is a measure of permeability, isn't it?
A It depends on how the well is cleaned up prior to the time it is run.
Q A point I want to ask you, you wouldn't consider it unusual to produce a well that had twice the capacity as an offset well, would you?
A I sure would.
Q At twice the rate into the line as an offset well?
A I sure would. I wouldn't produce it at that rate.
Q It was produced at much less than capacity, was it not?
A Yes.
Q I believe you testified it was produced at capacity. Whose wells?
A The Graces. Don't you want to retract that? You did testify they were produced at capacity.
Q No, I don't. I didn't see this, I was told by reliable sources.
A That's hearsay.
Q Sir?
A Your only information with respect to the manner in which these wells were produced was hearsay, you have no personal knowledge of how they were produced?
Q No, sir.
A Are you aware that these wells were choked back to a considerable extent and still are, the Gradonoco, the

Humble Grace has another problem right now.

A I will say that I was in Carlsbad a week ago today, and drove by the Humble Grace on the way to our part interest well, the Superior Collett, and saw, and I'm volunteering this information, saw the Humble Grace flaring.

Q You don't know whether this was with or without permission of the Oil Conservation Commission?

A It--

Q Do you know whether it was with or without the permission of the Oil Conservation Commission?

A I would assume it was not.

Q Your assumption is incorrect. Do you know whether or not it was?

A I don't know.

Q As a matter of fact, they are testing in this well with the full knowledge and permission of the Oil Conservation Commission.

My question to you was are you aware that the Gradonoco Well right now is being choked back to considerably less than capacity?

A No.

Q You are not aware of anything contrary to that, are you?

A No, either way.

Q Was the production history of your well, in terms of

decline, similar to that of the Grace well?

A No, our well did not decline nearly as fast because the withdrawal was not near as great. I base this on the decline curves which we have, and I only had a six month production on the Grace Gradonoco and the Humble Grace to establish the decline.

Q It is not unusual for a well to make what is known as flush production and then level off, is it?

A Well, we have wells in the area that make flush production and stay up and above line pressure and they level off, but they will hold their pressure higher and make more gas than these three wells.

Q You don't know what gas the Humble Gradonoco or the Humble Grace eventually are going to produce, do you?

A I can estimate it. I have very little data, but as far as shut in pressure, calculated bottom hole pressure, and gas analyses of the Carlsbad Morrow Gas, you can come up with estimated volume,and these volumes are pretty close.

Q My question was they are not to the point of plugging and abandonment at this point, are they?

A Well, sometimes they try to convince me that ours is, and it is making close to the production of the Gradonoco. From what I can see right now, the Humble Grace, by driving by a hundred and fifty yards away, is not

making anywhere near it.

Q Apparently you are not familiar with the fact that there is a mechanical problem in connection with the Grace Humble Grace Well?

A Yes, I am.

Q The fact that there are several strings of pipe in the hole and a Packer and various other types of junk, that would rather adversely affect the productivity of the well until it is repaired, wouldn't it?

A If it can be repaired.

Q If it cannot be repaired, it is lost for mechanical reasons, isn't that right?

A Or for reservoir damage.

Q Do you have any knowledge of reservoir damage?

A Not in the Humble Grace Well, but in the Morrow.

Q Isn't this well the best well ever drilled in the field?

A It possibly is, but calculated open-flow to me is very inconclusive and not a very good tool.

Q It doesn't indicate any damage to the formation, does it?

A Yes.

Q It does?

A That bottom hole pressure and build-up and analysis would indicate.

Q I am talking about the Humble Grace Well.

A I don't know about the Humble Grace.

Q So you have no knowledge or any reason to believe there is any reservoir damage in the Humble Grace?
A If they have foreign water in there, I do believe it.
Q You say "if", do you have any personal knowledge about the condition of the well?
A Some that I would rather not expound on.
Q I want to know about any information you have.
A It will be hearsay.
Q Then you don't have any personal knowledge?
A No, I have never worked on the well.
Q What tools, Mr. Raney, would you use if you were called upon to set about to prove separation of two producing areas? What would you say the standard tools of the industry would be?
A Geological data--
Q And you are not prepared to discuss geological datum, you told me.
A No. Production data.
Q What does production data indicate to you, one way or the other, in this pool that is conclusive in any fashion?
A I think it is around these wells in Exhibits One and Two.
Q Do you have any proof of communication?
A Yes, I have some proof based on some of the data presented by the Graces, that there is some pressure drop.

Q What does this information tell you?
A That the wells are very similar in nature. If you go on into reservoir characteristics, porosities, water saturation, and if you can measure permeability,and if these are all similar, the wells are similar in nature.
Q You say "if they are", do you know whether they are?
A I believe the pressures are very similar and the porosities are too.
Q Are you aware that these are producing from separate intervals?
A I don't believe they are producing from separate intervals.
Q Have you analyzed logs?
A Yes, and whether or not they are interconnected somewhere out in the reservoir, it is our opinion that they are interconnected out there, and I can see that assuming that the data presented to the Commission in April is correct.
Q What data?
A Exhibit Three in Case 4693. This is something I did not present because I don't feel pressure data is properly conclusive.
Q That was my next question. It was your testimony, wasn't it, that in this particular pool and in this particular case, you consider bottom hole pressure basically

unreliable?

A I will take every bit of data I can get. When you can't get every bit of data that you need, you take every bit you can possibly find, and I have tried to do this in determining if there was any interference between wells.

Q But you have no pressure proof of interference of any sort?

A Of the pressures presented, there is an indication of probable drainage.

Q Describe that indication.

A In the Gradonoco Number 1 at the interval of 11,648 to 11,692, final shut in pressure was 4,427. In the Pennzoil Gulf Federal Number 1 from 11,647 to 11,683, the final shut in pressure was 4,809. At the time this final shut in pressure was taken on the Gradonoco on January 15th, 1972, there had been one-quarter of a billion cubic feet of gas taken out of the area with a pressure drop of some four hundred pounds. This is indicative to me that there was pressure movement out that far. And there has been more gas taken out than that.

Q Then the assumption you are making is that production from your wells is what caused lower pressure in the Gradonoco Well?

A That's one point you can take, the other point is whether or not this final shut in pressure was built in long enough, five minutes, one hour, two hours, three hours.

Q You don't know whether it was stabilized or not?

A No, this is why it is hard to use this data.

Q So really this data is totally inconclusive?

A Not totally, rather inconclusive.

Q Would you qualify the bottom hole pressure data as poor?

A No.

Q As good? As excellent?

A I don't think it's excellent.

Q Then your classification is inconclusive?

A Well, no, it's not. What do you consider good?

Q You are the expert.

A Well, I would consider this data fair to good data. This is all that is available, and I used it realizing the uncertainty involved.

Q But you had control over the bottom hole pressures you took in your own wells, is that right?

A Yes.

Q And you knew the fluid build-up?

A No, sir.

Q You knew the conditions under which they were taken?

A Some wells will never build all the way up, but we are

satisfied that they were up sufficiently enough.
Q You don't have any idea how long the build-up was?
A No, I don't.
Q Would you tell me how you concluded there is no fault as portrayed by Mr. Baldwin?
A The main thing that I would consider is in this zone, it is not likely. I told you a while ago I don't consider myself an expert geologist, but I have heard testimony all the way from twenty-five to one hundred feet, and in the log interpretation of the Morrow, it is very hard to interpret that, and I don't believe this could be picked up. That is also the opinion of our competent geologist.
Q He is not here to testify, is he?
A No, he's not.
Q And it is largely a geological question as to whether there is or is not a fault?
A No, I think it has to do with engineering too insofar as production data and pressure data are concerned.
Q We have gone through the fact that production data is inconclusive.
A I did not say that, I said it was rather inconclusive.
Q And of little value in this particular case?
A I didn't say that, you did.
Q On your direct testimony, you did.

A I did not.
Q If the record says you said it, will you agree?
A If the record says that, the record is wrong.
Q Your Exhibit Number One shows a considerable accumulation of gas in the sincline area, do you find this to be uncommon?
MR. KELLAHIN: Exhibit Number One doesn't say anything about gas accumulation.
Q (By Mr. Cooley) The presence of it in a well having productivity speaks for itself, does it not? I am asking about the presence of gas in the well there and the productivity, this is a matter of record. Do you find it an unusual occurrence for this to become a saddle or sincline, as you have shown here (indicating)?
A We are coming down into a low here (indicating).
Q Would you expect to find your biggest well at the lowest point of the reservoir?
A By biggest, what do you mean?
Q Isn't the Humble Grace the biggest well ever drilled in the pool?
A I will state again that I do not put much emphasis on absolute open-flow, and to me, the producing capacity of that well indicates, whether there is a mechanical or reservoir problem, that it is a very poor well.
Q Didn't you agree with me that although absolute

open-flow may not be an indication of what ultimate production will come from the well, absolute open-flow of wells within the same pool is a valuable comparative device?

A I don't think it's valuable because of the way they are drawn.

Q They provide some tool, do they not?

A An indication, but it would be good if you could get the same person to run them all and under the same conditions.

Q I will repeat my question. Do you find it anomalous to find as good wells as there are in the field to be in the low area of the pool?

A I don't consider those good wells.

Q Is it anomalous in your opinion to have wells of the same quality in a sincline?

MR. KELLAHIN: I think he has answered this five times. He said that he doesn't think they are good wells.

THE WITNESS: I believe his last question had to do with quality, whatever that may be.

Q (By Mr. Cooley) Whatever they are, do you find it anomalous for them to appear in the sincline?

A They're pool wells. When you get further up structure in Sections 31 and 30, these are better wells. I wish we were up there.

Q Are you familiar with the production history of the Superior Collett Well?

A The Collett is a Strawn well.

Q Can you give me any explanation, in your opinion, as to why it is not completed in the Morrow?

A Yes, sir, because we are an owner in this well, and when the pipe was set through, they felt the Strawn was a better zone, and the well was going to be completed at that interval, and we then planned to go back and complete it later on in the Morrow.

MR. COOLEY: No further questions. Thank you.

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

(No response)

MR. PORTER: He may be excused.

(Witness excused.)

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

MR. PORTER: I believe that leaves Antweil and Cities Service,and both of you plan to present testimony.

MR. STEVENS: I understand that Cities Service is not prepared to present testimony, and we would like to present testimony for a short time.

We will agree to forego oral argument if the Commission should like, and submit written argument so we can finish without going into the evening.

MR. COOLEY: We would like very much to finish up tonight if at all possible also.

MR. PORTER: We would like to have finished up too, but this hearing has proceeded much slower than a hearing of this type should, much slower than usual.

Let's take about five minutes and come back.

(Whereupon a recess was taken.)

(Hearing continues.)

MR. PORTER: The hearing will come to order, please. The Commission will recognize Mr. Stevens at this time.

MR. STEVENS: Donald Stevens, representing the operators of Morris R. Antweil. We have one witness we would like to have sworn.

R. M. WILLIAMS,

was called as a witness, and after being duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. STEVENS:

Q Would you state your name, occupation, your residence, and your position with your company?

A R. M. Williams, I live in Hobbs, New Mexico, and I am a Petroleum Engineer with Morris R. Antweil.

Q Have you made your qualifications a matter of record with the Oil Conservation Commission previously, and have they been accepted?

A Yes.

MR. STEVENS: Are the witness' qualifications accepted?

MR. PORTER: The Commission considers the witness qualified.

Q (By Mr. Stevens) Would you state the purpose of your testimony at this late hour of the day, Mr. Williams?

A Yes, sir. We are concerned with the application before the Commission particularly in respect to the proposed segregation of the Grace City of Carlsbad in Section 25 from the main body of the South Carlsbad Morrow field, and particularly from our offsetting well, the Antweil Little Jewel, and our interest in the Cities Service Spencer Well, the wells offsetting the Grace City of Carlsbad to the east and southeast.

Q Do you have an electric log and drill stem test perforation and information concerning the City of Carlsbad Well?

A Yes, I do.

Q Is the electric log on record with the Commission?

A Yes.

Q Is the drill stem test data on record with the Commission?

A No, the drill stem test data was not filed with the Commission as required.

Q Would you briefly summarize the drill stem test, the

perforations, and the production in connection with this well?

A Yes. I think the drill stem test is significant information. The well was tested from an interval of 11,493 feet to 11,556 feet in the Morrow, and recovered 8,946 feet of water, salt water, with a final shut in pressure of 4,863 pounds.

The drill stem test below that, from an interval of 11,560 feet to 11,641 feet had gas to the surface in fifteen minutes and flowed at several rates, but it did flow at a rate of 4,382 MCF per day on a one-half inch choke.

Q Where did you receive this information on these drill stem tests?

A Since the information was not available with the Commission, we received this from Williams and Lee Scouting Service.

Q Is that the usual industry source for information on wells?

A Yes.

Q Subsequent to the drill stem tests, could you summarize what was done for the well?

A The well was perforated near the testing, and the well tested for considerable water. The well started making gas and was finally made a pretty good gas well

with approximately fifty barrels of water per hour production with the gas.

Q What were the initial perforations that you first determined on the well?

A The initial perforations that we obtained through the scouting service and from Cities Service--

MR. COOLEY: I object on the grounds that there has been previous testimony about a mistake concerning the interval of perforations, and I thought we were agreed at this point that the perforated interval in the well as it stands today was 11,566 to 11,572, the interval reflected by Commission records. There has been nothing to refute this.

MR. STEVENS: We are attempting to refute this right now, we are going to show that subsequently there is information on file with the Commission of perforations in another area in that well. We don't really know where the perforations are, and this is our principal point of testimony. We feel that the perforations should be proved and not just stated from hearsay information.

MR. COOLEY: That's my precise objection, this scouting service report is nothing but impounded hearsay information.

THE WITNESS: We will leave that out.

MR. STEVENS: We will withdraw the question, Mr. Examiner.

THE WITNESS: I would like to call the Commission's attention to, as Mr. Cooley pointed out, the Commission records-- the completion records show perforations in the well from 11,566 to 11,572 feet, also a valid part of the Commission records is Exhibit Number Three entered in Case 4693 by the Graces that shows the perforated interval of the City of Carlsbad being 11,515 to 11,523. So both of these sets of perforations are part of the Commission records, and in considering the separation of this well from the wells to the east of it on the grounds that it is producing from another interval, our point is that the completion interval in the well and the producing interval in this well should be determined,and the best way to determine it would be with the perforating records that are normally made by the perforating company when they shoot the well.

Q (By Mr. Stevens) In the perforations from 11,566 to 11,572, was that interval drill stem tested to your knowledge?

A No, that perforated interval lies between the set of drill stem tests, the water test and the gas test, and this is actually in a fairly tight low porosity interval indicated on the log.

Q Is this a good well from the sense of having high productivity?

A This, I would say is an excellent well to be able to

produce the gas that it has produced with the amount of water it brings with it.

Q In your opinion, from looking at the logs and where the well is perforated, from 11,566 to 11,572, would such a zone make such a good well?

A It would be doubtful to me, because of the lack of porosity.

Q Is there a possibility that this gas is coming from another zone, perhaps behind the pipe through, perhaps, a bad cement job?

A This is a distinct possibility, communication behind the pipe.

Q You could have both water from above and gas from below at this perforation, is that correct?

A Correct.

Q I ask you to refer to Exhibit Three in C[illegible] 4693, solely for the purpose-- I will withdraw this question.

MR. STEVENS: I have no further questions.

MR. PORTER: Does that conclude your direct examination?

MR. STEVENS: Yes.

CROSS EXAMINATION

BY MR. COOLEY:

Q Mr. Williams, am I to understand you to say that there was a distinct possibility of communication behind

the pipes and that this would be vertical communication, is that correct?

A Yes, sir.

Q And that the water would be above and the gas below? I believe that's the way the question was put to you.

A The water was above and the gas below. On the one reported set of perforations where the water was.

Q Let's distinguish which is which.

A Okay. The reported perforated zone of 11,566 to 11,572 lies below the test that recovered considerable water. The perforated zone of 11,515 to 11,522 is in the zone of tested water.

MR. COOLEY: Mr. Commissioner, is there any doubt in the Commission's mind as to where we stand as to where the perforations are in the City of Carlsbad Well?

MR. PORTER: There is some doubt in my mind, Mr. Cooley. I am wondering if it would be possible to have a record of the perforations presented?

MR. COOLEY: This is what I was getting at. I would propose we be allowed to submit as Exhibit Eight in this case a late submission, the perforating record on this well, if it is anywhere to be found. We will make every effort to locate it and forward it to the Commission.

MR. PORTER: Any objections?

MR. LeBLANC: I have no objection, but can you state

that there is such a perforation record?

MR. COOLEY: I said if one exists and can be found, and we will make every possible effort to locate it. I can't promise to produce something that doesn't exist though.

THE WITNESS: These are normally available by perforating companies when they perforate the well.

MR. PORTER: Let us know as soon as you can.

MR. COOLEY: We will before the week is out, and we can settle this once and for all as to where the well is perforated.

THE WITNESS: This was the purpose of our testimony.

MR. COOLEY: We have no other questions of this witness then, if that is the sole purpose of inquiry. We want to lay it once and for all to rest.

MR. PORTER: Does anyone else have any questions?

(No response)

MR. PORTER: You didn't have any exhibits, did you?

MR. STEVENS: No, sir.

MR. PORTER: The witness may be excused.

(Witness excused.)

MR. PORTER: Does anyone else desire to present testimony?

MR. COOLEY: We would like to put on about two minutes of very brief rebuttal testimony by Mr. Robert Becker.

ROBERT BECKER,

was called as a rebuttal witness by the Applicant, and after being duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. COOLEY:

Q Would you please state your name, your residence, and occupation for the record, please?

A R. W. Becker, Consulting Geologist, Roswell, New Mexico.

Q Mr. Becker, have you on previous occasions been retained by Mr. and Mrs. Michael P. Grace in connection with the South Carlsbad Morrow Gas Wells that they have?

A Yes, I have.

Q And did you testify on their behalf at the hearing in Case 4693, held in Hobbs in April of this year?

A Yes, sir.

Q And prior to that time, did you make a thorough study of the wells in the South Carlsbad Morrow Gas Pool?

A Yes, of the Morrow.

Q Of the Morrow Gas Pool?

A Yes, sir.

Q Did you,in connection with that study, prepare a structure map?

A Yes.

Q Did you submit it as an exhibit in Case 4693?

A Yes.

Q In preparation for that structure map, did you examine any logs of the Cisco, particularly directing your attention to the Cisco formation to ascertain whether there were any fault cuts?

A No, sir.

Q You made no effort to locate any fault cuts?

A No, sir.

Q Did you, in preparation of that map, show any particular structural features trending northeast-southwest in the South Carlsbad Morrow Gas Pool?

A Yes, the map shows a north-northeast south-southwest trending structural anomaly with a rather steep sincline on the west side.

Q Does that overlie approximately the same line as does the fault that was prepared as an exhibit and testified to by Mr. Baldwin earlier this morning?

A Yes, sir.

Q Have you had an opportunity to examine Mr. Baldwin's presentation?

A Yes, I saw it last night.

Q How long have you known Mr. Baldwin?

A Less than twenty-four hours.

Q All of your preparation for the previous case was done before ever having met Mr. Baldwin?

A Yes, sir.

Q But your steep sincline follows almost identically the same line as does his fault, is that correct?

A Yes, sir.

Q Now, is there a matter of opinion, in your opinion, between geologists as to whether this structural feature would be a fault or would be a steep sincline, or both?

A It could be a fault, yes. My interpretation was that it is a sincline.

Q But in your opinion, it would be just as fair to classify it as a fault running down at the bottom of the sincline. In other words, both situations could possibly occur?

A Yes, they could.

Q I take it you don't consider Mr. Baldwin's presentation unreasonable?

A No, sir.

Q Does the steep sincline which you portrayed constitute a structural interruption of the South Carlsbad Morrow Gas Pool, in your opinion?

A Yes, sir.

Q And in your opinion, is it probable that this structural feature that you showed on your exhibit back in April constituted an effective communication barrier between the two sides of the sincline as you portrayed it?

A I think it is very probable.
Q Are you familiar with the producing characteristics and the particular strata from which the Humble Grace Well and the Grace Gradonoco are producing?
A Yes, sir.
Q Are you likewise familiar with the strata from which the Pennzoil wells to the east are producing?
A Yes, sir.
Q Do you have an opinion as to whether these wells are producing from the same strata?
A No, sir, I believe the zone producing the Grace wells to the west is separate from the zone producing the Pennzoil wells in the east.
Q What do you base that conclusion on?
A On my studies. I have submitted a cross section which shows the lower part of this zone producing in the Grace wells to be pinching out to the east, and this is absent in the Pennzoil wells to the east. My cross section showed the Number 1 Gulf Federal and the Humble Grace and there is definitely no correlation between the two pay zones.
Q Likewise, does-- or is the zone from which the Pennzoil well is producing absent or present in the Grace well?
A It's present, but tight.
Q Is it productive?

A No, sir.

MR. COOLEY: I have no further questions.

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

MR. STEVENS: Yes,sir.

CROSS EXAMINATION

BY MR. STEVENS:

Q Mr. Becker, you stated that the sincline probably, and I am paraphrasing you, probably constituted a separation between the two parts of the field?

A Yes, sir.

Q And you also stated, as I recall, that the sincline tended to conform with the fault as drafted by Mr. Baldwin in his exhibit?

A Fairly well, yes.

Q I would like you to look at Mr. Baldwin's Exhibit Number Two and I hand you your Exhibit Number Four in Case 4693. On which side of the fault is the Carlsbad well as shown in Mr. Baldwin's Exhibit Number Two?

A The City of Carlsbad in Section 25?

Q Yes.

A The fault is to the east.

Q Which side of the sincline as depicted in your Exhibit Number Four in Case 4693 does the well fall?

A To the west.

Q Would you contend that your sincline would separate

the City of Carlsbad Well from any possible well that might be west and not east?

A I am primarily speaking of better control to the south.

Q We are interested in control to the north. Your picture shows the City of Carlsbad Well at the same anticline as all the other wells in Sections 30, 31, and 36, is that correct?

A Yes, sir.

Q Thus, you would not state the City of Carlsbad Well is separate and distinct from these wells in Sections 30 and 31?

A Would you repeat that question?

Q You would not then state that the City of Carlsbad Well in Section 25 is separate from the wells in Sections 30 and 31 to the east, based on the information you submitted on your Exhibit Four in Case 4693?

A Based on my interpretation, it would be doubtful.

Q The Applicant requests that these fields be separated, at least on the City of Carlsbad in Section 25. From your information, this should not be granted, is that correct?

A Well, I don't know. It's a facies change, and where this facies change is, I don't know, and no one else knows.

Q Mr. Baldwin had three bases by which he states the field should be separated. One of them was the structure.

Based on your information that you submitted on Exhibit Four in Case 4693, that basis would not hold up, is that correct?

A Would you repeat that?

Q Mr. Baldwin had three bases by which he says the field should be separated. One of them was structure. Based on the information you submitted on Exhibit Four in Case 4693, that basis would not hold up, is that correct?

A My interpretation could be changed with later information.

Q Do you know of any later information as relates to the City of Carlsbad in Section 25?

A No.

Q Then there is no reason to change your interpretation, is there?

A Other than what he came up with in his study that I was unaware of.

MR. STEVENS: I have no further questions.

MR. PORTER: Are there any further questions?

MR. KELLAHIN: Yes, sir.

CROSS EXAMINATION

BY MR. KELLAHIN:

Q Mr. Becker, you made reference to your cross section, was that Exhibit Five offered in Case 4693?

A Yes.

Q On that exhibit you have in front of you?
A Yes.
Q You show the Grace Number 1 Humble as open in what you call the main gas sand?
A Yes, sir.
Q And the same sand open in the Pennzoil Gulf Federal Number 1 and the Pennzoil Gulf Federal Number 2 and in the Antweil Number 1 and the Missouri-New Mexico Land Well.
A The main gas sand in the Humble Grace is tight, that was designated in the drill stem test.
Q You show perforation there, do you not?
A No, the perforations are down in the lower zone.
Q How do you show the perforations in this exhibit?
A It's very small. There is a little circle on the right-hand side of the depth column.
Q Is that the only perforation in that well?
A That was the information I had.
Q But you do show the presence of the main gas sand in the Grace Number 1?
A Yes, and it's tight, the drill stem test shows that.
Q You show a lower sand in the Pennzoil Gulf Federal Number 1, don't you?
A No, you can see that is shaled out. You can see a great difference between the two wells.

Q Have you any evidence to indicate that the zone, the actual zone, in the Pennzoil Gulf Federal Number 1 is not the same interval opened in the Humble Grace Well?

A Well, other than the perforations that are different in there.

Q That's just a question of log interpretation, is it not? It could be the same zone, could it not?

A No, this interpretation I am convinced is correct.

Q But it is an interpretation?

A Yes, but I believe any geologist would agree with it.

MR. KELLAHIN: That's all I have. Thank you.

MR. PORTER: Any further questions?

(No response)

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

(Witness excused.)

MR. PORTER: Does that conclude the testimony in this case?

MR. COOLEY: Yes, as far as I am concerned, it does.

MR. STEVENS: Are we going to waive closing statements?

MR. COOLEY: In order to expedite adjournment, I would concur with Mr. Stevens' suggestion.

MR. PORTER: How long would you think it would take if you presented closing statements at this time?

MR. COOLEY: An hour if everybody did.

MR. PORTER: In that case, I think we will give you the opportunity to file written statements.

MR. COOLEY: Mr. Examiner, the standard procedure in Court is that the party having the burden of proof, which the Applicant in this case has, they would file the brief in chief and then a rebuttal brief and we would like very much to do this in this case. In other words, we will file a brief with everybody else, or we will file a brief and then they can file a brief, whatever you choose, but we would like to be heard last.

MR. PORTER: Is this agreeable to the other parties?

MR. HINKLE: It's all right, but I think you better specify a time.

MR. PORTER: How much time would you like to file these closing statements?

MR. HINKLE: Do you want the Applicant to file a brief, or do you want us all just to make statements?

MR. PORTER: My preference is that you just all file a statement.

MR. HINKLE: That would be my preference too.

MR. PORTER: Is that understood?

MR. COOLEY: As I put it, I don't mind filing them simultaneously, but I would like a chance to file a supplemental statement.

MR. PORTER: I believe the other parties in the case would like the right to also file answers.

MR. COOLEY: Mr. Porter, it is standard procedure in all Courts of law where a person having the burden of proof is heard last-- I mean first and last.

MR. PORTER: Let me consult with our attorney.

MR. HATCH: It is not required here, it is within the discretion of the Commission as to how many of these statements and briefs may be filed. I have no objection to what Mr. Cooley has suggested, but I don't think it is required.

MR. PORTER: The Commission will allow you that privilege, Mr. Cooley, but I think the statements should be filed within the next ten days. That would be the 26th of August.

MR. STEVENS: Would it be possible to give him a chance to file his and then us a short time to reply and him a short time to answer our reply,as opposed to him having a free shot of what we do?

MR. HATCH: I think Mr. Stevens' recommendation is reasonable.

MR. PORTER: We will go along with his recommendation.

MR. STEVENS: The 26th of August is a Saturday.

MR. PORTER: We will give you until Monday, the 28th.

MR. STEVENS: Do I understand that he has until

a week Monday for his first brief and then we will have time after that to answer it?

MR. PORTER: I would like for the whole thing to be taken care of within ten days. I don't think it should take any longer than that.

The Commission will take the case under advisement.

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C E R T I F I C A T E

I, JOHN DE LA ROSA, a certified Shorthand Reporter, in and for the County of Bernalillo, State of New Mexico do hereby certify that the foregoing and attached pages 3-61 of the Transcript of Hearing before the New Mexico Oil Conservation Commission was reported by me: I, RICHARD McCORMICK, a certified Shorthand Reporter, in and for the County of Bernalillo, State of New Mexico do hereby certify that the foregoing and attached pages 62-196 of the Transcript of Hearing before the New Mexico Oil Conservation Commission was reported by me; and that the same is a true and correct record of the said proceedings to the best of our knowledge, skill and ability.

CERTIFIED SHORTHAND REPORTER

Richard E. McCormick

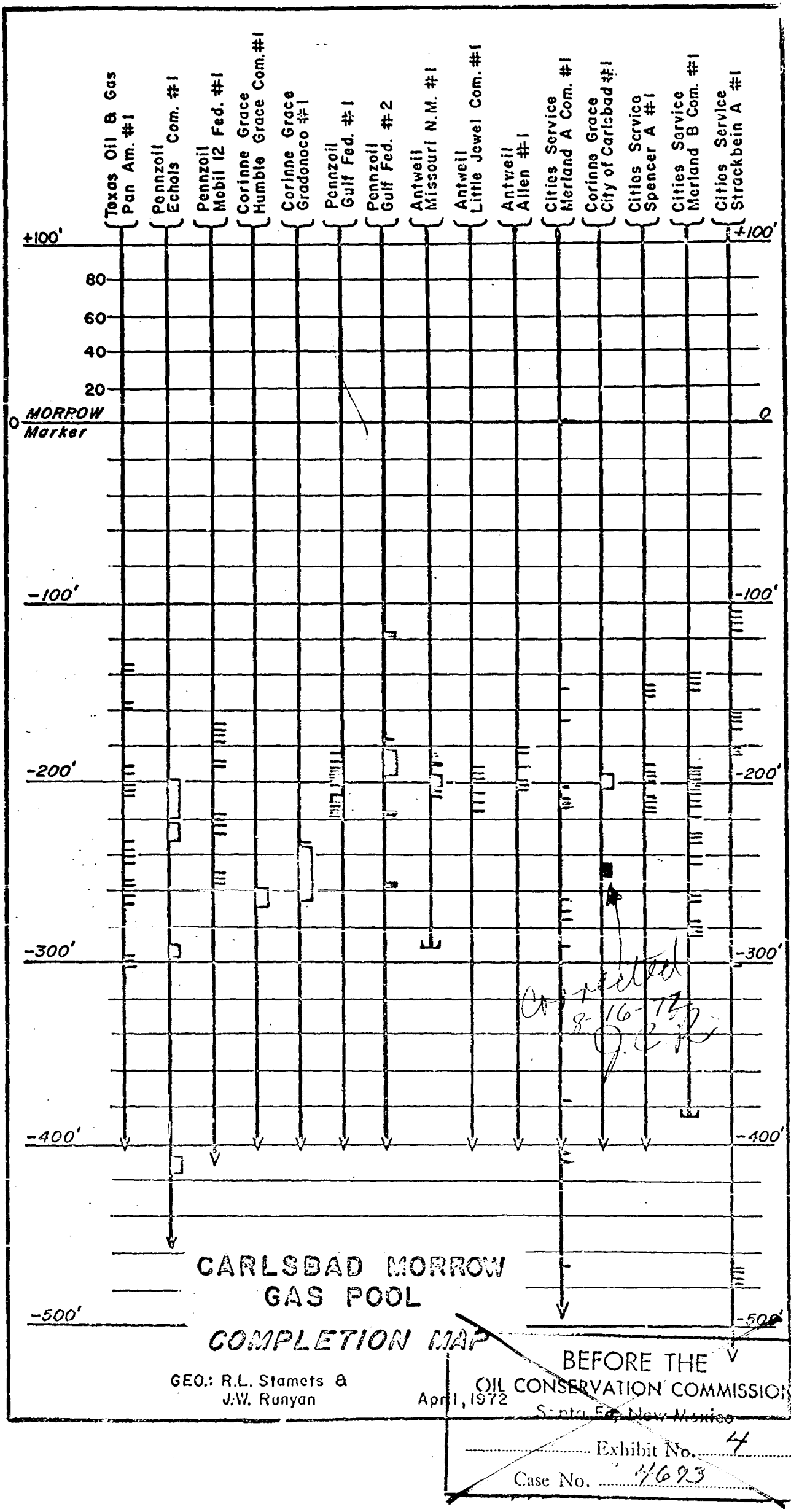
CERTIFIED SHORTHAND REPORTER

I N D E X

I N D E X (Continued)

E X H I B I T S

EXHIBIT	ADMITTED	OFFERED
Grace #1 - #7	36	35
Midwest Oil #1 - #9	116	116
Grace Amended #7	142	140
Pennzoil #1 - #5	156	156


Texas Oil & Gas
Pan Am. #1
Pennzoil
Echols Com. #1
Pennzoil
Mobil 12 Fed. #1
Corinne Grace
Humble Grace Com. #1
Corinne Grace
Gradonoco #1
Pennzoil
Gulf Fed. #1
Pennzoil
Gulf Fed. #2
Antweil
Missouri N.M. #1
Antweil
Little Jewel Com. #1
Antweil
Allen #1
Cities Service
Merland A Com. #1
Corinna Grace
City of Carlsbad #1
Cities Scrvice
Spencer A #1
Cities Sarvice
Merland B Com. #1
Cities Servlce
Strackbein A #1
+100'
80
60
40
20
0
MORROW
Marker
-100'
-200'
-300'
-400'
-500'
CARLSBAD MORROW
GAS POOL
COMPLETION MAP
GEO.: R.L. Stamets &
J.W. Runyan
April, 1972
BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Exhibit No. 4
Case No. 4693

M

WELL COMPLETION - MORROW

	OPERATOR	LEASE NAME	WELL NO. AND UNIT	S-T-R	PERFORATIONS - MORROW
1.	Antweil, Morris R.	Allen	1-J	31-22-27	2 shots @ 11,440, 443, 452, 459, 463
2.	Antweil, Morris R.	Little Jewell Com.	1-F	31-22-27	2 shots @ 11,441, 445, 448, 455, 462, 465
3.	Antweil, Morris R.	Missouri New Mex. Land Co.	1-O	6-23-27	1 shot @ 11,556, 557, 564, 565, 566, 567, 568, 571, 572, 574, 575
4.	Cities Service Oil Co.	Merland A Com.	1-O	19-22-27	1 shot @ 11,318, 320, 332, 366, 367, 379, 381, 383, 397, 399, 11,448, 454, 460, 476, 562, 563, 591, 595, 11,653, 654
5.	Cities Service Oil Co.	Merland B Com.	1-G	30-22-27	1 shot @ 11,340, 343, 345, 348, 388, 390, 392, 396, 397, 11,401, 403, 405, 407, 412, 420, 429, 431, 433, 441, 445, 463, 465, 477, 479, 482, 484
6.	Cities Service Oil Co.	Strackbein A	1-E	32-22-27	1 shot @ 11,400, 403, 406, 411, 457, 459, 461, 466, 475, 477, 480, 11,763, 765, 767, 769, 773
7.	Cities Service Oil Co.	Spencer A	1-O	30-22-27	1 shot @ 11,401, 404, 406, 446, 448, 450, 454, 463, 465, 468, 470
8.	Grace, Corinne	City of Carlsbad	1-O	25-22-26	2 SPF 11,566-572
9.	Grace, Corinne	Gradonoco Com.	1-H	2-23-26	2 SPF 11,656-686
10.	Grace, Corinne	Humble Grace Com.	1-P	2-23-26	1 SPF 11,680-690
11.	Pennzoil United, Inc.	Echols Com.	1-J	12-23-26	2 SPF 11,499-519, 11,523-533, 11,591-597, 11,703-716
12.	Pennzoil United, Inc.	Gulf Federal	1-K	1-23-26	1 shot @ 11,647, 652, 654, 656, 658, 660, 662, 664, 669, 670, 671, 672, 673, 675, 677, 679, 681, 683
13.	Pennzoil United, Inc.	Gulf Federal	2-L	6-23-27	2 SPF 11,397-400, 11,454-455, 462-477, 498-499, 11,537-39

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Exhibit No. 3
Case No. 4693

OPERATOR

14. Pennzoil United, Inc.

15. Texas Oil & Gas Corp.

WELL COMPLETION - MORROW

LEASE NAME	WELL NO. AND UNIT	S-T-R	PERFORATIONS - MORROW
Mobil 12 Federal	1-B	12-23-26	1 shot @ 11,453, 455, 457, 463, 473, 475, 503, 505, 508, 513, 535, 537, 539
Pan Am State Comm.	1-J	11-23-26	1 shot @ 11,615, 618, 635, 638, 639, 672, 676, 681, 684, 687, 713, 716, 723, 734, 739, 743, 746, 747, 776, 779, 780, 781

WELL DATA

OPERATOR	LEASE NAME	WELL NO. AND UNIT	S-T-R	ELEV.	TD	TOP STRAWN LIME	TOP MORROW MARKER	COMPLETION DATA (REMARKS)
Morris R. Antweil (dual-MS)	Allen 1980 FSL-1980 FEL	1-J	31-22-27	3204 KB	11,825	10,188 -6,984	11,258 -8,054	10-3-70
Morris R. Antweil (dual-MS)	Little Jewell Com 1980 FNL-1900 FWL	1-F	31-22-27	3206 KB	11,820	10,260 -7,054	11,250 -8,044	4-20-71
Morris R. Antweil	Missouri N.M. Land Co. 990 FSL-1980 FEL	1-O	6-23-27	3215 KB	11,660	10,407 -7,192	11,370 -8,155	5-8-70
Morris R. Antweil (Stn.)	Joell 660 FNL-1980 FWL	1-C	6-23-27	3211 KB	10,830	10,247 -7,036	---	2-2-71
Cities Service Oil Co.	Merland A Com 1400 FEL-660 FSL	1-O	19-22-27	3180 KB	11,750	10150 10,251 -7,071	11,171 -7,991	10-4-71
Cities Service Oil Co.	Merland B Com 1980 FNL-1980 FEL	1-G	30-22-27	3188 KB	11,760	10,184 -6,996	11,203 -8,015	7-24-71
Cities Service Oil Co.	Strackbein A 1980 FNL-660 FEL	1-E	32-22-27	3181 KB	11,841	10,363 -7,182	11,296 -8,115	12-17-70
Cities Service Oil Co. (dual-MS)	Spencer A 660 FSL-1980 FEL	1-O	30-22-27	3200 KB	11,820	10,310 -7,110	11,255 -8,055	6-29-71
Corinne Grace	City of Carlsbad 660 FSL-1980 FEL	1-O	25-22-26	3227 KB	11,970	10,302 -7,075	11320 11,372 -8,145	3-2-71
Corinne Grace	Gradunaco Com 2500 FNL-330 FEL	1-H	2-23-26	3263 KB	11,965	10,468 -7,205	11,421 -8,158	9-1-71
Corinne Grace	Humble Grace Com 990 FSL-660 FEL	1-P	2-23-26	3269 KB	12,011	10,463 -7,194	11,419 -8,150	6-20-71

By Stamets

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Exhibit No. 1
Case No. 4693

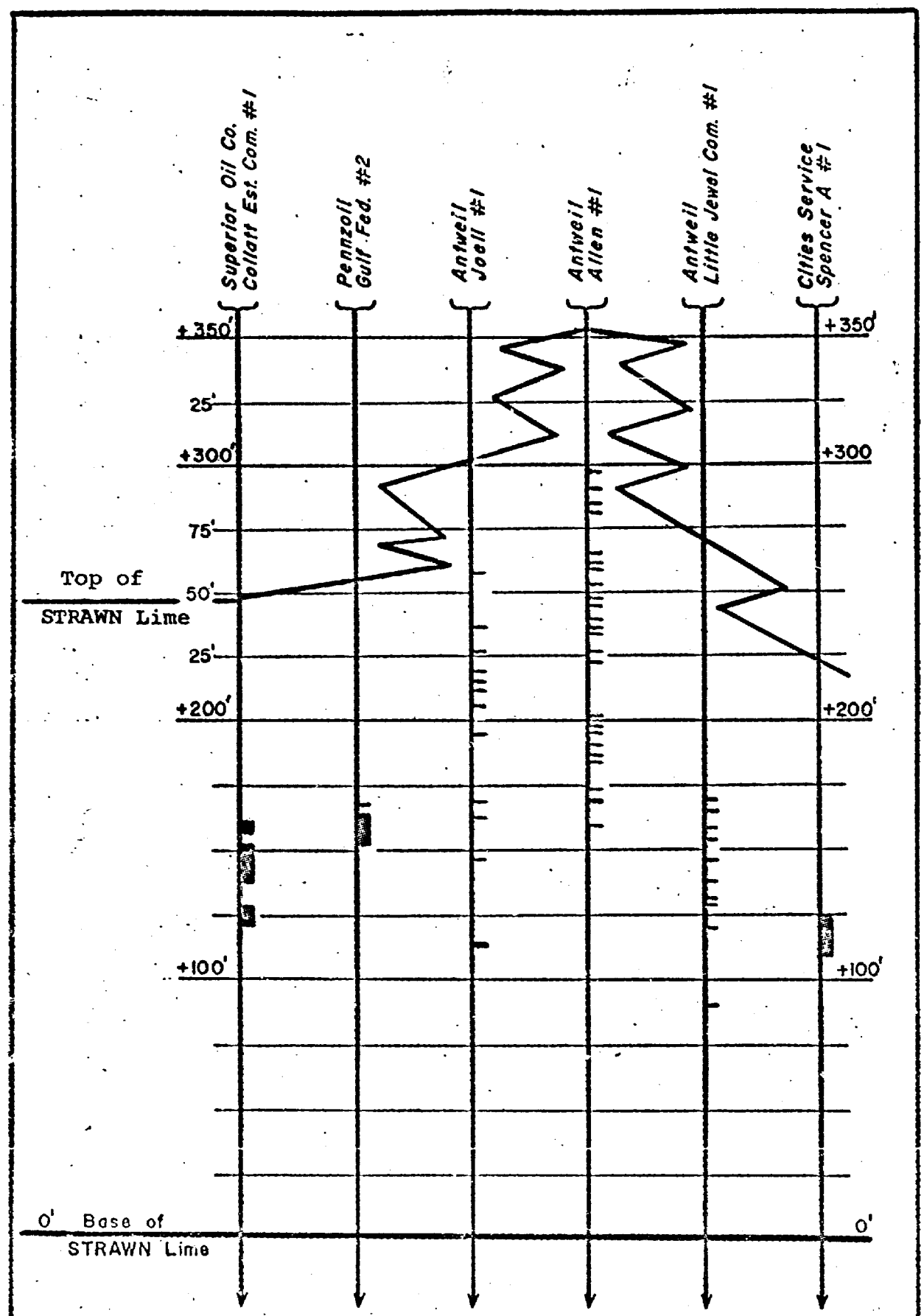
BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Exhibit No. A
Case No. 4694

WELL DATA

OPERATOR		LEASE NAME	WELL NO. AND UNIT	S-T-R	ELEV.	TD	TOP STRAWN LIME	TOP MORROW MARKER	COMPLETION DATA (REMARKS)
Corinne Grace	drlg.	Gopogo 1980 FNL-1980 FEL	1-G	25-22-26		12,990			WO Comp. ut.
Corinne Grace	drlg.	Gopogo 1980 FNL-1980 FEL	2-G	24-22-26					TD 2250 WORT
Corinne Grace	drlg.	Grace Carlsbad 1980 FSL-660 FEL	1-I	36-22-26					TD 11,875-Logging
Corinne Grace	drlg.	Panagra 990 FNL-1980 FEL	1-B	11-23-26		12,710			Shut-in

WELL DATA

OPERATOR	LEASE NAME	WELL NO. AND UNIT	S-T-R	ELEV.	TD	TOP STRAWN LIME	TOP MORROW MARKER	COMPLETION DATA (REMARKS)
Pennzoil United, Inc. Disc. (Dual-M-A)	Mobil 12 Fed. 660 FNL-1980 FEL	1-B	12-23-26	3257 KB	11,850	10,340 -7,083	11,283 -8,026	1-8-69
Pennzoil United, Inc.	Echols Com 1980 FSL-1980 FEL	1-J	12-23-26	3252 KB	11,925		11,300 -8,048	2-20-71
Pennzoil United, Inc.	Gulf Fed. 1980 FSL-1980 FWL	1-K	1-23-26	3256 KB	12,068	10,518 -7,262	11,463 -8,207	6-24-70
Pennzoil United, Inc. (Dual-M-S)	Gulf Fed. 1980 FSL-990 FWL	2-L	6-23-27	3232 KB	11,833	10,290 -7,058	11,277 -8,045	1-29-72
Texas Oil & Gas Corp.	Pan Am State Com 1959 FSL-1980 FEL	1-J	11-23-26	3307 KB	12,140	10,552 -7,245	11,481 -8,174	10-1-70
Superior Oil Co. (Strawn)	Collatt Estate Com 1980 FSL-1980 FEL	1-J	1-23-26	3245 KB	11,950	10,366 -7,121	11,343 -8,098	11-27-69
Phillips Petroleum Co.	Drag A 660 FNL-1980 FWL	1-C	18-23-27					Drlg. below 5000'
Union Oil Co. of Calif.	T. Lee 660 FNL-1980 FWL	1-C	29-22-27					Drlg. Loc.



BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Exhibit No. F
Case No. 4694

N.M. OIL CONSERVATION COMMISSION

CARLSBAD STRAWN GAS POOL

COMPLETION MAP

GEO.; R.L. Stamets & J.W. Runyan

April, 1972

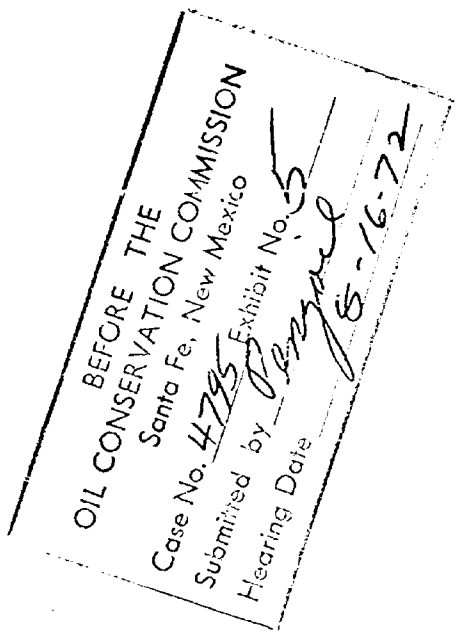
WELL COMPLETION - STRAWN

	OPERATOR	LEASE NAME	WELL NO. AND UNIT	S-T-R	PERFORATIONS - STRAWN
1.	Antweil, Morris R.	Allen	1-J	31-22-27	1 shot @ 10,238, 245, 252, 256, 272, 274, 277, 281, 289, 292, 297, 300, 303, 309, 311, 333, 337, 340, 344, 347, 352, 362, 366, 368, 375
2.	Antweil, Morris R.	Joell	1-C	6-23-27	1 shot @ 10,291, 311, 322, 329, 333, 337, 342, 353, 379, 386, 403, 433, 435
3.	Antweil, Morris R.	Little Jewell Com.	1-F	31-22-27	1 shot @ 10,362, 366, 371, 375, 382, 391, 400, 403, 410, 440
4.	Cities Service Oil Co.	Spencer A	1-O	30-22-27	1 shot @ 10,413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429
5.	Pennzoil United, Inc.	Gulf Federal	2-L	6-23-27	2 shots @ 10,375 & 2 PF 10,378-392
6.	Superior Oil Co.	Collatt Estate Com.	1-J	1-23-26	2 SPF 10,453-457, 462-76, 485-93

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Exhibit No. E
Case No. 4694

B.H.P. SUMMARY - MORROW

Well	Date	B.H.P.	Grad.	Cumulative Prod. MM	Remarks
Gulf Federal #1	6-19-70	4768	.086	20.0(Tstg.)	68 hrs. S.I.
	7-10-70	4660	.086	739.9	240 hrs. S.I.
	7-30-71	2148	.086	859.2	72 hrs. S.I.
	3-13-72	1416	.086	897.3	72 hrs. S.I.
	5-12-72	1454	.086	-	184 hrs. meas.
Mobil "12" #1	1-20-69	4897	.088	0	Day calc.
	9- 4-69	4930	.088	197	96 hrs. meas.
	1- 9-70	4439	.083	601	10 days calc.
	7-16-70	4204	.083	1465	78 hrs. calc.
	8- 9-71	3334	.059	1830	72 hrs. meas.
	2-28-72	3136	.059	2067	72 hrs. meas.
	7-13-72	2967		0	72 hrs. meas.
Echols #1	2- -71	4731		88.5	72 hrs. meas.
	6-14-71	4154		678.6	72 hrs. meas.
	3-10-72	4082		1070	72 hrs. meas.
	8- 1-72	3310			72 hrs. meas.
Phillips Drag #1-A	5- -72	5018	.08	0 (Morrow)	72 hrs. calc.
		4900	.08	0 (Atoka)	
Drag #1-B	8- -72	5171	.08	0 (Morrow)	



August 16, 1972

BEFORE THE OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION OF MICHAEL P. GRACE, II AND CORRINE GRACE FOR POOL CONTRACTION AND CREATION OF TWO NEW GAS POOLS IN THE SOUTH CARLSBAD MORROW AND THE SOUTH CARLSBAD STRAWN GAS POOL AREAS, EDDY COUNTY, NEW MEXICO.	No. 4795

CLOSING STATEMENT OF MORRIS R. ANTWEIL, OPERATOR, AND DELTA DRILLING COMPANY AND MABEE PETROLEUM COMPANY, NON-OPERATORS

Applicants in the hearing on this case held August 16, 1972, sought to show that their wells located in Section 25, T. 22 S., R. 26 E., and Sections 2 and 11, T. 23 S., R. 26 E., Eddy County, New Mexico, were separated from the South Carlsbad Strawn and Morrow Pools and thus should be set up in a separate field and not be subject to the rules and regulations of said pools, including the prorationing of gas in said pools.

As in any hearing Applicants have the burden of proof to show by a preponderance of the evidence that their factual assertions are correct and that their applications should be granted under the Statutes of the State of New Mexico and the Rules and Regulations of the New Mexico Oil Conservation Commission, in order to protect correlative rights and to prevent waste.

Antweil asserts that Applicants wholly failed in their presentation to prove their case in toto and as to the wells in Section 25, T. 22 S., R. 26 E., Applicants' testimony, along with the testimony of other operators in the field, definitely established that said Section 25 wells were not separate from the wells in the remainder of the South Carlsbad Strawn and Morrow Pools.

Applicants attempted to prove separation on three bases, which are discussed as follows:

THE CONTENTION THAT APPLICANTS' WELLS IN SECTIONS 25, 2 AND 11 ARE SEPARATED FROM THE REST OF THE FIELD BY A FAULT

Applicants' expert witness, T. A. Baldwin, prepared a structure map showing a fault separating Applicants' wells in Section 25, 2 and 11 from the remainder of the field. Mr. Baldwin stated he found fault cuts in the Cisco Canyon formation, but stated that such fault cuts had "no pinpoint accuracy," that his was a "weak to fair interpretation," but that since he had found "fault cuts" in several wells that he considered the interpretation good. On cross-examination Mr. Baldwin stated no knowledge as to the Permian-Pennsylvanian contact, an unconformity, which might have been interpreted as the "fault cuts." He presented no evidence of these "fault cuts" in the form of electric logs, or any evidence as to their existence. No other geologist testifying about the field in this hearing or in the previous hearing in Case No. 4693, which initiated proration in the pools, found any evidence of fault cuts. Subsequent testimony by expert witnesses for Pennzoil and Midwest established that the Cisco Canyon Section formations were layed down with great lenticularity and that 50-100 feet of section could easily have been not deposited, accounting for the "fault cuts," supposedly found by Mr. Baldwin.

Mr. Baldwin stated that other geologists in the previous hearing, Case No. 4693, had submitted exhibits showing a fault in the same position. The map submitted by Cities Service at said hearing Case No. 4693, did show a fault, however, said fault ran northeast southwest between the two wells in Section 1 and not along the west side of Section 1 as shown by Mr. Baldwin's exhibit. The Cities Service fault was downthrown to the west as opposed to Applicants' fault being downthrown to the east. The Cities

Service fault was partially justified by the steep dip between the two wells in Section 1, a situation not obtaining in the wells bisected by the purported fault shown by Applicants. Further, the Cities Service expert witness in Case No. 4693 testified that said fault was not a "sealing" fault and thus would not separate the production of one well from another.

Applicants' other expert witness, Mr. R. W. Becker, testified that the fault as depicted by Mr. Baldwin lay substantially in the syncline as drawn by Mr. Becker in his Exhibit No. 4 in Case No. 4693. Upon cross-examination Mr. Becker corrected this misstatement, pointing out that his syncline lay to the west of the wells in Section 25 whereas Mr. Baldwin's fault lay to the east of the wells in Section 25. Mr. Becker further stated that based upon the geological interpretation submitted by him in Exhibit No. 4, Case No. 4693 that the wells in Section 25 should not be separated from the rest of the South Carlsbad Strawn and Morrow Pools as requested in this case, thus by the geologic interpretation and in the words of their own expert witness Applicants' request for separation should not be granted, at least as to the Section 25 wells.

In summary Mr. Baldwin's statements that said fault had "no pinpoint accuracy" and was a "weak to fair interpretation" must be considered to be his most cogent testimony when compared with all other interpretations by all other geologists in this case and Case No. 4693, and that in fact no fault exists to separate the wells.

THE CONTENTION THAT PRESSURES AND
OPEN FLOW POTENTIALS GIVE EVIDENCE OF SEPARATION

Mr. Baldwin's next Exhibit No. 3, an isobar map of surface shut-in pressures, was submitted to show additional evidence of

separation of the wells in Sections 25, 2 and 11 from the rest of the field. Of these surface pressures, Mr. Baldwin stated in direct testimony and upon cross-examination that the surface shut-in pressures were subject to many variables according to the amount of water any well might produce, the time taken, and the amount of production a well might have had prior to the taking of these pressures. Nonetheless, he attempted to show a separation in the field by drawing in his postulated fault as was shown on the structure map and discussing "pressure anomalies" in the Applicants' wells in Sections 2 and 11 and the Cities Service and Antweil wells in Sections 30 and 31. The "anomaly" he contended gave evidence of separation, yet his "anomaly" did not extend northward into the Section 25 wells thus destroying any validity to his contention that these Section 25 wells should be separate from the field.

Mr. Baldwin's Exhibit No. 4, an iso-productivity map, based upon the initial potential calculated absolute open flow of all wells was also accompanied by Mr. Baldwin's assertion that such data contained many unknowns and many variables. Yet, again he attempted to show similar "anomalies" as shown in the isobar map but again failed to show such anomalies to be present in the wells in Section 25, indicating their lack of separation from the field.

Cross-examination of Mr. Baldwin and direct testimony from Midwest and Pennzoil expert witnesses established the lack of reliability inherent in surface shut-in pressures and calculated absolute open flow potentials upon which Mr. Baldwin's second contention of separation was based.

CONTENTION THAT THE SECTIONS 25, 2 AND 11 ARE PRODUCING FROM A DIFFERENT SAND STRINGER THAN OTHER WELLS IN THE SOUTH CARLSBAD STRAWN AND MORROW POOLS.

Mr. Baldwin's Exhibit No. 6 consisted of two two-well cross-

sections, without measured footages on the electrical log curves sufficient to identify pay zones or thicknesses, and merely showed faults drawn in without identifying the "fault cuts" cited in his Exhibit No. 2. This exhibit proved nothing.

Exhibit No. 7 by Mr. Baldwin showed a sampling of wells in the southwest part of the field, did not purport to be a cross-section and failed to show perforations in other wells. This exhibit showed Mr. Baldwin's interpretation of porosity in the various wells and his contention that the porosity in the Sections 2 and 11 wells was in a different stringer from the other wells shown on said exhibit. Upon cross-examination he stated that no other wells shown upon the exhibit were perforated in the same interval as the Sections 2 and 11 wells. Upon cross-examination and direct testimony of the Midwest and Pennzoil expert witnesses it was shown that one of the wells on Mr. Baldwin's Exhibit No. 7, the Pennzoil Mobil-Federal No. 1, was, in fact, perforated in the same sand stringer as perforated by the wells in Sections 2 and 11. The testimony and exhibits of the Midwest Oil Company expert witness conclusively established that the perforated intervals in the wells in Sections 2 and 11 and the perforated interval in the well in the south half of Section 25 (regardless of which perforations subsequent evidence actually reveals to be correct) were producing in wells producing throughout the field. Subsequent cross-examination of the Midwest and Pennzoil expert witnesses by Applicant failed to show that the Sections 25, 2 and 11 wells were perforated in a zone or stringer separate and distinct from all other wells perforated in the field.

CONCLUSION

The first two contentions of Applicants to the effect that the fields were separate are at best properly described by Applicants' first expert witness in the words he used: "no

pinpoint accuracy," "weak to fair interpretation," "data subject to many variables," "many unknowns and many variables". Cross-examination and direct testimony of other witnesses established that these descriptions are possibly too generous, that the conclusions drawn by Applicant therefrom are, in fact, invalid. Applicants' third contention that the Sections 25, 2 and 11 wells are producing from a separate sand stringer was directly refuted conclusively by cross-examination of Applicants' expert witnesses and direct testimony of other expert witnesses.

Applicants have failed to carry the burden of proof that their wells in Sections 25, 2 and 11 should be separated from the South Carlsbad Morrow and Strawn Pools, and the testimony established, conclusively, that such a separation would actually impair correlative rights, in that such a separation would allow unprorated production in said wells to the detriment of other wells in said pool which are to be prorated as of September 1, 1972. On the basis of the testimony and the conclusions adduced at this hearing Applicants' request for separation of the wells in Section 25, T. 22 S., R. 26 E., and Sections 2 and 11, T. 23 S., R. 26 E., Eddy County, New Mexico, should be denied.

Respectfully submitted,

MORRIS R. ANTWEIL, OPERATOR
DELTA DRILLING COMPANY AND
MABEE PETROLEUM COMPANY, NON-OPERATORS

By Donald G. Stevens
DONALD G. STEVENS
ATTORNEY FOR MORRIS R. ANTWEIL

BEFORE THE

OIL CONSERVATION COMMISSION OF NEW MEXICO

IN THE MATTER OF THE APPLICATION OF
MICHAEL P. GRACE II AND CORINNE GRACE
FOR POOL CONTRACTION AND CREATION OF
TWO NEW GAS POOLS, EDDY COUNTY, NEW MEXICO.

CASE NO. 4795

STATEMENT OF PENNZOIL COMPANY

The following statement is presented on behalf of Pennzoil Company, formerly Pennzoil United, Inc., a participant in the above captioned case, and operator of four wells in the South Carlsbad-Morrow Gas Pool, and one well in the South Carlsbad-Strawn Gas Pool.

Pennzoil Company is opposed to the deletion of the proposed area from the subject pool and the creation of new pools to be known as the West Carlsbad-Morrow and West Carlsbad-Strawn Gas Pools. This opposition is based upon the fact that all of the wells in the respective pools are producing from a common source of supply, as to the Morrow and as to the Strawn formations.

At this point it might be well to point out that the applicant offered no testimony, and no information on the basis of which the South Carlsbad-Strawn Gas Pool could be divided into two pools. All of the testimony offered related to, and was based upon information from the South Carlsbad-Morrow Gas Pool.

Applicant attempted to show separation, apparently based upon a fault, as shown by differences in completion depths, and differences in pressures and productivity of the various wells. As the witness for Pennzoil showed, and as supported by the testimony of other expert witnesses,

there are various lenses or intervals within the total Morrow formation which is approximately 600 feet thick, a matter agreed to by applicants' witness on cross examination. Yet, with some 600 feet of thickness, the applicant attempted to find complete separation of two reservoirs based upon a difference in depths of from 70 to 100 feet. On cross examination, it was brought out that the same completional-interval differences exist on the other side of the reservoir, and wholly within the portion the applicants would propose to leave in the South Carlsbad-Morrow Gas Pool. In addition, the corrected Grace Exhibit No. 7 shows that the producing zones are continuous across the reservoir, and there is, in fact, no separation.

The Graces agreed to furnish the Commission the perforation record on one of their wells. If this has not been furnished, it should be required before any order is entered in this case, and on failure to furnish this information, the application, should, in our opinion, be denied for the reason there is conflicting testimony in the record of this case, and the previous hearings on prorationing in the South Carlsbad-Morrow Gas Pool, presented by the applicant, as to the completion interval of this well.

Mr. R. W. Becker, Roswell, consulting geologist for the Graces, concluded, as he had on a previous occasion, that a low exists where Mr. T. A. Baldwin, the other witness for the Graces, found a fault. The Becker testimony is in agreement with that presented by Pennzoil, and by the witness for Midwest Oil Corporation, Mr. Frank L. Schatz.

On the question of pressures, Mr. Baldwin was using surface wellhead pressure information, acknowledging that

a number of conditions could affect accurate measurement of surface pressures, rendering such a surface pressure map meaningless. Likewise gas well potentials, which he also attempted to use to show separation, which he admitted could vary greatly for many reasons other than pool separation.

Using the cross-section prepared by the Oil Conservation Commission Staff for presentation at the April 19, 1972 prorationing hearing, the witness for Pennzoil pointed out that this exhibit, with which he fully agreed, showed that the perforations or completion intervals are in a common reservoir, and in some instances, the wells are completed in the same lens or interval. Because of the time differences in the completions and the amount of production from the Morrow formation from the various wells in the area, it was his opinion that the use of the currently available pressure data, whether from drill stem test or shut-in bottom hole pressure data, would prove inconclusive in determining if there are separate reservoirs, or separate common sources of supply.

It should further be pointed out that if a separate pool is created unless it can be conclusively determined that there is separation, waste will possibly occur, and the new pool, unless prorated, would violate correlative rights of the offset lease owners, because it would result in capacity flow from wells at unorthodox locations without the tool of prorationing to protect those rights.

The sum of the testimony presented to show separation fails wholly to support separation. It merely supports finding No. 70, contained in the Commission's Order R-1670-L, entered in case 4693, where the Commission stated:

"That production from the Morrow formation in the subject pool is from many separate stringers which vary greatly in porosity, water saturation, and thickness, both within individual stringer and between stringers."

If there is any separation, which we do not believe, it is separation between individual stringers within the Morrow formation,

It would be wholly impractical for the Commission to attempt to define pools on such a basis.

We respectfully submit that the applicant has failed to establish with any certainty that their leases are separated from other wells in the South Carlsbad-Morrow Gas Pool, or the South Carlsbad-Strawn Gas Pool. We urge the Commission to deny the application.

Respectfully submitted,

PENNZOIL COMPANY

By Jason W. Kellahin

KELLAHIN & FOX
P. O. Box 1769
Santa Fe, New Mexico 87501

Attorneys for Pennzoil Company

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STUART D. SHANOR
C. D. MARTIN
PAUL J. KELLY, JR.

J. M. LITTLE

August 25, 1972

A. L. Porter, Jr.
Secretary
Oil Conservation Commission
Box 2088
Santa Fe, New Mexico 87501

Dear Mr. Porter:

We enclose herewith Statement of Midwest Oil Corporation in connection with Case No. 4795 filed by Michael Grace and wife for pool contraction of the South Carlsbad-Morrow Gas Pool.

Yours very truly,

HINKLE, BONDURANT, COX & EATON

BY

CEH:Cs
Enc.
cc: F. L. Schatz

BEFORE THE OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

Case No. 4795

APPLICATION OF MICHAEL P. GRACE II AND CORINNE GRACE FOR POOL CONTRACTION AND CREATION OF TWO NEW GAS POOLS, EDDY COUNTY, NEW MEXICO. APPLICANTS, IN THE ABOVE STYLED CAUSE, SEEK THE CONTRACTION OF THE HORIZONTAL LIMITS OF THE SOUTH CARLSBAD-MORROW GAS POOL, EDDY COUNTY, NEW MEXICO BY THE DELETION THEREFROM OF THE FOLLOWING:

Township 22 South, Range 26 East
Section 25 - S½

Township 23 South, Range 26 East
Section 2 - All
Section 11 - All

APPLICANTS FURTHER SEEK THE CREATION OF TWO NEW POOLS FOR THE PRODUCTION OF GAS FROM THE STRAWN AND MORROW FORMATIONS WITH THE HORIZONTAL LIMITS OF EACH POOL TO COMPRISE THE FOLLOWING:

Township 22 South, Range 26 East
Section 24 - All
Section 25 - All
Section 35 - All
Section 36 - W½

Township 23 South, Range 26 East
Section 2 - All
Section 11 - All

STATEMENT OF MIDWEST OIL CORPORATION

At the conclusion of the above case all interested parties were advised that they might file statements with the Commission on or before August 28.

The following statement is presented by the undersigned attorneys on behalf of Midwest Oil Corporation which participated in the hearing. At the hearing Mr. F. L. Schatz, District Exploration Manager for Midwest Oil Corporation, appeared as a witness on behalf of said corporation, and in connection with his testimony there were nine exhibits introduced including five cross-sections in several directions through the wells situated in the South Carlsbad-Morrow Gas Pool as it is presently constituted.

Midwest's interest in this case is due to the fact that it has part interest leases in Sections 34 and 35, Township 26 South, Range 26 East and in Section 3, Township 23 South, Range 26 East and at at the present time is engaged with Apache Corporation and Cities Service Oil Company in drilling the No. 1 State "W" in Section 3.

The testimony produced by the Graces through Thomas A. Baldwin indicated faulting along the west part of the pool and in a position which, if present, could possibly separate part of the S½ Section 25, Township 22 South, Range 26 East and portions of Sections 2 and 11, Township 23 South, Range 26 East from the other portions of the pool. Mr. Baldwin interpreted the presence of the fault based on missing stratigraphic sections in 5 or 6 wells. Testimony of Mr. Schatz, based upon his comprehensive study and the five cross-sections presented, was to the effect that he found nothing which would indicate the presence of a fault. The gist of all testimony was to the effect that a geophysical survey had not been conducted and such a study would probably be the best way to determine the existence of a fault if it were of any consequence.

The testimony of the Graces presented by Mr. Baldwin indicated that there might possibly be separation of the Graces' acreage from other acreage in the pool by reason of the structural condition existing in the area and which was shown by the structural map referred to by Mr. Becker and which we understand was also introduced at the original hearing. On cross-examination, Mr. Becker admitted that if the separation followed the sincline shown on the structure, it could not possibly separate the S½ of Section 25 from the other acreage. Furthermore, the testimony of Mr. Schatz and others indicated that in almost every instance in Southeastern New Mexico the accumulation of hydrocarbon substances in the Morrow formation is through stratigraphic traps and is very seldom dependent upon structural condition.

Some of the testimony of the Graces presented by Mr. Baldwin was for the purpose of showing that surface wellhead pressure might indicate field separation. Mr. Baldwin acknowledged that a number of conditions could affect accurate surface pressure readings, rendering such a surface pressure map meaningless. Likewise, gas well potentials can vary greatly because of so many factors that isopotential maps cannot be seriously considered as valid evidence for separate field designation. Mr. Schatz pointed out in his testimony that bottom hole pressure studies could meaningfully aid in an accurate analysis of the reservoir, but Mr. Baldwin stated that this had not been done.

The claim that a different unit was producing in only the wells requested for deletion was disproved by the corrected Grace Exhibit No. 7. At least one other well is shown on their cross-section to be producing from the reservoir they ask to have put into a new pool. As the testimony of Mr. Schatz and his exhibits pointed out, the producing zones in the field are continuous over wide areas and are not limited to the Grace wells. This is also confirmed by the Oil Conservation

Commission exhibit prepared for the previous hearing on the field, which shows the producing intervals in most of the wells are widespread in the field.

We respectfully submit that the Graces have failed to establish with any degree of certainty that their leasehold interests in the S½ Section 25 and Sections 2 and 11 are separated from other wells in the pool. The evidence is clear that there are four producing zones or sections of the Morrow involved in the South Carlsbad-Morrow Gas Pool. This is usually the case in most Morrow pools. If the Commission undertook to treat each zone or stringer as a separate pool, it is obvious that it would lead to many difficult problems and would be almost impossible of administration. We, therefore, urge the Commission to deny the application.

Respectfully submitted,

HINKLE, BONDURANT, COX & EATON

By _____
Attorneys for Midwest Oil Corporation
P.O. Box 10
Roswell, New Mexico

Dated: August 25, 1972

Case 4195

TETRA TECH, INC.
630 NORTH ROSEMEAD BLVD.
PASADENA, CALIFORNIA 91107
TELEPHONE (213) 448-6400

SOUTH CARLSBAD GAS FIELD

AUGUST, 1972

THOMAS A. BALDWIN

TETRA TECH, INC.
630 NORTH ROSEMEAD BLVD
PASADENA, CALIFORNIA 91107
TELEPHONE (213) 449-6400

August 10, 1972

Mr. Michael P. Grace
P. O. Box 1418
Carlsbad, New Mexico 88220

SUBJECT: South Carlsbad Gas Field Study

Dear Sir:

You have retained Tetra Tech, Incorporated to investigate the structure, stratigraphy, and reservoir characteristics of the South Carlsbad Gas Field and in particular of the "Morrow Pool" (so designated at present). You have asked us to determine:

1. Whether your wells collectively or individually are in producing communication with the wells of the main pool or,

2. Whether (as you believe) your wells produce from a zone or zones not in communication with the wells of the main pool but actually from a new pool physically separated from the main pool.

At Tetra Tech we have collected all available well logs and pertinent data and have prepared the following exhibits:

1. A structural contour map at the top of the Strawn formation. This map is similar to maps prepared by other companies and geologists. It indicates the broad and gentle South Carlsbad anticline. An irregular structural low trend separates the main producing area from all of your wells (with the exception of Grace No. 1 Grace-Carlsbad). A fault extending along this low trend and interrupting the structure is normal, down-to-the-east and hading easterly. The fault throw ranges from 50 to 100 feet. Please note that the subsea position of Pennzoil No. 1 Gulf-Federal (-7252 at top of Strawn) is anomalously low to the Grace Gradonoco, Humble-Grace and Panagra wells. This anomaly is best explained by faulting.

2. A structural contour map at the top of the Morrow formation. Regionally the South Carlsbad anticline is somewhat sharper at this deeper horizon. The Pennzoil No. 1 Gulf-Federal and the Grace No. 1 Grace-Carlsbad wells are anomalously low to the various wells on the west side of the fault. On this map fault cuts are indicated by the symbol "f" with a subsea value. In general the fault observations are rated "Fair" to "Fairly Good". Six fault cuts are recorded and therefore the possibility of a fault causing a physical separation between most of the Grace wells and the easterly wells of the field is considered "Excellent-Reliable". Therefore, all but one of the Grace wells are physically separated from the main pool.

3. An Isobar map illustrating by contours the shut in pressures on the wells producing from the Morrow. This map, based upon data filed with the Oil Conservation Commission, State of New Mexico considers the surface pressure records from wells shut in for 24 hours or longer. Various factors which can affect such recordings have not been observed or are not available (past history of water production, fluid level if fluid was present etc.). Even in the absence of such data it is apparent that the pressure records contour to a discrete and predictable form similar in shape to the structural anticline. The Grace, No. 1 Humble-Grace, and No. 1 Gradonoco record pressures higher than would be anticipated. This pressure anomaly combined with anomalously high calculated atmospheric open hole productivity of the Humble-Grace well indicates from reservoir characteristics that the Grace wells are not producing from a reservoir which communicates with the wells to the east.

4. An index map showing the locations of cross sections A and B and indicating a group of five wells which have been studied with a detailed correlation chart.

5. Cross sections A-A' and B-B', horizontal scale 1" - 1000', vertical scale 1" - 250'. These sections were drawn to illustrate the high quality of gross correlations in the area and to study the nature of the "Grace" fault previously referred to. In the Grace wells, Panagra No. 1 and City of Carlsbad No. 1 about 100 feet of the section is cut out as compared to Pennzoil Federal 12-1 and City Service Marland 1-B.

6. Correlations in the Morrow formation. No horizontal scale, vertical scale 1" - 40 feet. This section is referenced to a stratigraphic datum, the top of the Morrow formation (It should be noted that in a strict academic sense the Morrow is a Biozone, not a formation and as such was originally identified as an interval carrying a particular suite of fusselinid foraminifera. Long oil field subsurface usage has identified Morrow as a stratigraphic section lying between readily identified electric log markers. Other geologists in studies of the area use Morrow picks that vary about 20 feet above or below the pick used by Tetra Tech. Our selection is arbitrary but can be found readily in every well and is so sharp it can be picked to the nearest foot on large scale logs.

   The base of the Morrow (top of the Mississippian Chester Shale) is penetrated by many wells in the area and is a distinct lithologic unit picked in cuttings as well as an excellent electric log marker.

   A calcareous sandstone with a highly recognizable electric signature is indicated in blue about 100 feet below the Morrow top. A dashed line correlates the top of a portion of the Morrow with a sand count (from cuttings) in excess of 65%. About 125 feet above the base of the Morrow a calcareous sandstone break is correlated on the base of an individualistic gamma ray signature traceable throughout the field. Many other readily recognized electric log markers could be indicated on this section. The quality of correlation is rated as "Fully Reliable".

   The producing intervals of the various wells are indicated in red. The Grace wells No. 1 Gradonoco and No. 1 Humble-Grace are completed in an interval centered about 370 feet below the top of Morrow. The Pennzoil wells, No. 1 Gulf-Federal, No. 1 Mobil Federal "12", and No. 1 Echols are completed in an interval centered about 300 feet below the top of the Morrow.

The interval (Morrow +370) produced in the Grace wells does not exhibit any porosity or gas saturation in the Pennzoil wells. The interval (Morrow +300) produced in the Pennzoil wells does not exhibit any porosity or gas saturation in the Grace wells.

As shown on the index map the Pennzoil wells referred to, lie in a north-south alignment which forms, in effect, a fence separating the Grace wells from the rest of the field.

Stratigraphically, it is clearly established that these Grace wells are not in producible communication with the rest of the field.

SUMMARY

Structurally, stratigraphically, and in reservoir characteristics it is established that your wells (with the exception of the No. 1 Grace-Carlsbad) are not producing from the South Carlsbad Morrow Pool but from a separate accumulation.

Thomas A. Baldwin
Chief Geologist, Tetra Tech, Inc.

Certified Geologist #310, A. I. P. G.
Registered Geologist #175, California
Registered Petroleum Engineer #789, Calif.
Active Member A. A. P. G.
Active Member S. E. G.
Fellow G. S. A.

Also Ex 3-A

TAB:dd

CITIES SERVICE OIL COMPANY
LEGAL DIVISION

Cities Service Building
Box 300
Tulsa, Oklahoma 74102

August 28, 1972

AIR MAIL

Oil Conservation Commission
State of New Mexico
P. O. Box 2088
Santa Fe, New Mexico 87501

Subject: South Carlsbad - Morrow Gas Pool - Case No. 4795

Gentlemen:

Attached are two copies of the closing statement of Cities Service Oil Company in the subject Case.

Very truly yours,

Robert F. LeBlanc
Senior Attorney

RFL:nji
Attachments (2)
cc: Mr. George Hatch w/attach.
General Counsel
Oil Conservation Commission
State of New Mexico
P. O. Box 2088
Santa Fe, New Mexico 87501

Mr. William J. Cooley w/attach.
152 Petroleum Center Bldg.
Farmington, New Mexico 87401

Mr. Clarence Hinkle w/attach.
P. O. Box 10
Roswell, New Mexico 88201

Mr. Jason Kellahin w/attach.
P. O. Box 1769
Santa Fe, New Mexico 87501

Mr. Donald G. Stevens w/attach.
P. O. Box 1797
Santa Fe, New Mexico 87501

BEFORE THE OIL CONSERVATION COMMISSION

OF THE STATE OF NEW MEXICO

SOUTH CARLSBAD-MORROW)
GAS POOL - CASE NO. 4795)

In the Matter of the Hearing on the Application of Michael P. Grace II and Corinne Grace for an Order Deleting Certain Acreage from the South Carlsbad - Morrow Gas Pool, and for the Creation of Two New Pools to be Known as the West Carlsbad - Strawn and West Carlsbad - Morrow Gas Pools, Eddy County, New Mexico

Hearing Held in Santa Fe, New Mexico on August 16, 1972

STATEMENT OF CITIES SERVICE OIL COMPANY

TO THE HONORABLE NEW MEXICO OIL CONSERVATION COMMISSION:

Cities Service Oil Company ("Cities Service") owns extensive leasehold interests in the South Carlsbad Field. It operates four Morrow gas wells, owns a working interest in a fifth Morrow well and operates one Strawn well. Because of its interests and in order to protect the correlative rights of all parties in the field, Cities Service participated in the hearing.

After considering all of the evidence presented at the hearing, Cities Service recommends that the application be denied. Except for the testimony on behalf of the applicant, the testimony of all other parties at the hearing was that there is no physical separation of the South Carlsbad Morrow Field and therefore it should not be broken into two fields.

With reference to the testimony of the applicant, applicant's witness stated that his opinion that separation existed was based on three criteria: first, there was separation due either to a fault or a syncline and in his opinion there was separation due to a fault, second that the isobaric map indicated separation, and third, that the wells do not produce from the same interval.

Examining in order each criterion separately, applicant's witness admitted that his fault cuts constituted a weak interpretation. Second, with reference to the isobaric map, applicant's witness stated that surface shut-in pressures, on

which the map was based, are subject to many variables and that some pressures are probably not valid pressures. Third, with reference to the last criterion that all wells do not produce from the same interval, the Commission has already made a formal finding that production from the Morrow Formation in the subject Pool is from many separate stringers which vary greatly in porosity, water saturation, and thickness, both within individual stringers and between stringers (see Finding No. 70 in Order No. R-1670-L). Applicant's witness stated that he had no new data since that Order but was merely presenting his own interpretation of the same data. Further, the record will show that applicant's two geological witnesses presented basically differing structural interpretations. If used as a basis to divide the field, the two different interpretations did not place the same wells in the same fields.

One further point should be mentioned with reference to applicant's testimony. Applicant's witness testified that he saw no fault cuts at Morrow depth. The only fault cuts he stated he found were some 2,000 feet above Morrow depth. He further testified that the throw of his fault was about 75 feet and the thickness of the Morrow Formation was about 600 feet. Cities Service submits that even if the witness's fault does exist, it cannot be sealing so as to separate the Morrow Formation into two fields.

In conclusion, Cities Service recommends that due to the extremely weak and inconclusive evidence submitted by applicant as compared with the testimony of the other parties at the hearing, this Commission should deny the application.

Respectfully submitted,

CITIES SERVICE OIL COMPANY

By Robert F. LeBlanc
Robert F. LeBlanc
Senior Attorney

August 25, 1972

BEFORE THE OIL CONSERVATION COMMISSION

OF THE STATE OF NEW MEXICO

IN THE MATTER OF	)	
	)	
APPLICATION OF MICHAEL P. GRACE II	)	NO. 4795
AND CORINNE GRACE FOR POOL CONTRACTION	)	
AND CREATION OF TWO NEW GAS POOLS,	)	
EDDY COUNTY, NEW MEXICO.	)	

CLOSING STATEMENT OF APPLICANTS
MICHAEL P. GRACE II AND CORINNE GRACE

The question as to whether contiguous producing areas comprise one or more common sources of supply is admittedly difficult, if not impossible to resolve with absolute scientific certainty. When, however, such a question is presented, the Commission must nevertheless make a decision. Any such decision must be based solely upon the preponderance of scientific evidence in the record, irrespective of the number of operators who have taken a position on either side of the question. In other words, the Commission must decide, based solely upon the evidence in the record whether it is more probable than not that the areas presently designated as the South Carlsbad-Morrow and South Carlsbad-Strawn gas pools are in fact divided into two separate common sources of supply.

In support of the proposition that the areas in question are in fact geologically separated into two isolated producing areas, Mr. Baldwin, the chief expert witness for the applicants, approached the problem from an objective and scientific standpoint. First, Mr. Baldwin collected all data available in the Oil Conservation files with respect to the existing wells in the pools in question. This data was then collated, evaluated and interpreted by Mr. Baldwin and his associates. It then became apparent that there

were three possible fields in which the available data could be classified, tested and compared in order to arrive at a conclusion as to whether the wells on the west side of the South Carlsbad area are effectively separated geologically from those to the east, i.e.,

1. Structural analysis,
2. Comparison of producing characteristics, and
3. Stratigraphic correlation.

The structural analysis by Mr. Baldwin consisted of contour maps on top of both the Strawn and Morrow formations. Each of these maps showed an anomaly trending from north-northeast to south-southwest across the western portion of the producing area. It is noteworthy that each of the other geologists who testified in the case likewise observed the same anomaly in the same area. The only difference is that Mr. Baldwin interprets the anomaly as a syncline with a fault running along the bottom, while the other geologists, including the applicants' other expert witness, interpret the anomaly as a syncline without a fault. It is agreed by all that the anomaly in question must of necessity be one or the other.

Mr. Baldwin supports his faulted syncline interpretation by detailed log analysis of all wells in the pool. He observed the occurrence of six fault cuts in basicly a straight line correlative to the strike of the structural anomaly referred to above. Mr. Baldwin was quick to say that each fault cut that he observed was "weak" to "fair" in terms of quality on an individual basis. He concluded, however, that since the only fault cuts found in the

pool occurred in the six wells which formed basicly a straight line correlative to the structure, the reliability of their actual occurrence was much improved and qualified as "good" in terms of quality. There is no question but what Mr. Baldwin observed a substantial thinning (75 to 100 feet) of the Cisco Canyon section in the six wells in question and that no such thinning occurred in any other well in the producing area. It should also be noted at this point that Mr. Baldwin is the only geologist testifying in this case who actually made a well by well log examination of the Cisco Canyon section in an effort to determine whether fault cuts did or did not appear.

Mr. Schatz, testifying on behalf of Midwest Oil Co., admitted that he had not examined the Cisco Canyon section of any of the logs in the field (Tr. 121), but he nevertheless questioned Mr. Baldwin's postulation of fault cuts in that section based upon his assertion of extreme variations of thickness in these units. Mr. Schatz would explain the anomalous thinning of the Cisco Canyon section in only six wells which form a straight line correlative to the structure in the area by postulating an elongated lenticular deposition in the Cisco Canyon section. Mr. Schatz explained on cross-examination that the elongated lenticular depositions to which he referred would cause thickening of the Cisco Canyon section rather than thinning and postulated that the thinning of the section observed by Mr. Baldwin in the six wells along the west side of the field could be caused by their being situated just off the west flank of such a lens. He further testified, however, that the elongated lenses to which he referred were characteristically

quite narrow - "one or two locations wide and that is all, in other areas, it could expand to a mile wide." (Tr. 118). Analyzing the postulations of Mr. Schatz, it would seem that if the thinning on the west were in fact caused by being off the west flank of a narrow lens, one should then reasonably expect to once again encounter such thinning off the east flank of such lens, within at least a mile or two to the east of the six wells in question. The fact is, however, that no such thinning occurs to the east, even though the pool extends several miles in that direction.

Thus, it is submitted that based upon the evidence in this record it is more probable that the thinning of the Cisco Canyon section observed by Mr. Baldwin in the six wells in question is in fact attributable to faulting rather than elongated lenticularity.

At this point we should, however, remind ourselves that the issue in this case is not the presence or absence of a fault, but the presence or absence of effective geological separation of the two areas in question. In this connection, it should be noted that although the other petroleum geologist who testified on behalf of the applicants, Mr. Becker, did not interpret the structural anomaly on the west side of the field as a fault, he did interpret it as being a "steep syncline". Mr. Becker further testified that the structural feature which he had interpreted, very probably constituted a structural interruption and an effective communication barrier between the two sides of the syncline as he portrayed it. (Tr. 187-188). I would also like to point out that according to Mr. Baldwin's interpretation the Grace City of Carlsbad No. 1 well falls on the west side of the structural barrier, while according to Mr. Becker's

geological interpretation of the area the City of Carlsbad well falls on the east side of the structural barrier. As Mr. Baldwin pointed out, there is under most circumstances a considerable area within which two competent and honest geologists might disagree, since much of their work is of necessity interpretive. This, however, does not detract from the fact that all geologists who have mapped the area in question have portrayed a structural anomaly along approximately the same line, and it is the unqualified testimony of Mr. Baldwin and Mr. Becker that this structural anomaly very probably constitutes, for one reason or another, an effective communication barrier which separates the wells to the west of that feature from those on the east. Accordingly, if the Commission should conclude that the City of Carlsbad No. 1 well is on the east side of the communication barrier rather than on the west, this fact does not militate against separation of the two isolated producing areas into two separate pools. It simply dictates a slight revision in the delineation of the two pools of that proposed by the applicants. Additional development in the area to the west of the City of Carlsbad well, including the completion of the presently drilling Grace Go-Pogo no. 2 well, will undoubtedly shed forth light on the precise delineation of the two producing areas in that area, and the Commission will of course be free to adjust that delineation from time to time based upon such new and additional evidence.

The comparisons of producing characteristics that were prepared and presented by Mr. Baldwin consisted of an iso-bar map and an iso-productivity map of the South Carlsbad-Morrow pool. While Mr.

Baldwin was again quick to point out all of the uncontrollable factors that could and probably had caused error in the precise presentation of such data, he, like the other experts dealing with the problem, was constrained to do the best he could with the data he had to work with. Despite the many areas of possible error in surface pressure data, Mr. Baldwin noted that the iso-bar map of calculated absolute open flow pressures of the various wells in the pool did lend itself to a discreet and predictable form which conformed generally to the structure in the area. More importantly, the pressure anomalies noted on the iso-bar tended to confirm the existence of the communication barrier that was indicated by his structural analysis.

Likewise, the iso-productivity map, although subject to all the frailties and possible areas of error which were called to your attention by Mr. Baldwin, still tended to conform to the general structure of the pool and indicated anomalies which could best be explained by the existence of an effective communication barrier along the general line indicated by Mr. Baldwin.

The producing characteristics of the field cannot be ignored simply because they are not as detailed or as accurate as we would like for them to be. The fact remains that these producing characteristics do tell us something, and the distinct differences in the producing characteristics of the wells on the west side of the communication barrier portrayed by Mr. Baldwin must be given some weight in deciding whether these wells are in fact in a different common source of supply.

The final test in comparison conducted by Mr. Baldwin was a

stratigraphic correlation between the two Grace wells in Section 2 with the three Pennzoil wells to the east (Grace Exhibit 7, as corrected). This exhibit was prepared on large scale and portrays an extremely precise correlation between several readily identifiable electric log markers, permitting absolute correlation of log intervals. The net effect of this study is to conclusively show that the Grace wells in Section 2 are producing from a completely different interval than that from which the Pennzoil wells are producing. The Grace productivity interval is not productive in the Pennzoil wells, and conversely the Pennzoil productivity interval is not productive in the Grace wells. Furthermore, there is approximately 30 feet of separation between the two productive zones with intermittent shale stringers which constitute an effective barrier to vertical communication. Accordingly, there is no physical possibility of inner communication or drainage between the Grace wells and the Pennzoil wells. Furthermore, the Pennzoil wells stand as a fence-like barrier between the Grace wells and the remainder of the South Carlsbad-Morrow pool to the east. Accordingly, it must necessarily follow that there is no possibility of inner communication between the Grace wells and any other wells drilled in the main body of the South Carlsbad-Morrow gas pool.

In summary, there has been shown a structural anomaly which, standing alone, very probably constitutes an effective communication barrier at or near the point indicated by Mr. Baldwin in his exhibits. The producing characteristics of the wells in the field tend to support the pool separation indicated by structural analysis. Finally, the stratigraphic correlation independently confirms the

fact that the Grace wells in Section 2 are not in communication with the Pennzoil wells to the east. Thus, by virtue of the overwhelming preponderance of the evidence in the record in this case, it has been established that the area presently designated as the South Carlsbad-Strawn and South Carlsbad-Morrow gas pool in fact encompasses two separate and distinct common sources of supply, and that the Commission should so treat and designate them.

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By William J. Cooley
William J. Cooley
Attorneys for Applicants

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after Xmas

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Continued indefinitely