CASE 1635: Mapenza Oil Co. application for exception to salt water disposal requirements of Order R-1224-A for State #1-A Well, 14-18S-37E.

Case No.

1635

Application, Transcript,
Small Exhibits, Etc.

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

IN THE MATTER OF:

Case No. 1635

TRANSCRIPT OF HEARING

APRIL 15, 1959

DEARNLEY - MEIER & ASSOCIATES
GENERAL LAW REPORTERS
ALBUQUERQUE NEW MEXICO
Phone CHapel 3-6691

BEFORE THE
OIL CONSERVATION COMMISSION
HOBBS, NEW MEXICO

IN THE MATTER OF:

Case No. 1635 Application of Mapenza Oil Company for an exception to the requirements of Order R-1224-A. Applicant, in the above-styled cause, seeks an order authorizing an exception to the salt water disposal requirements of Order No. R-1224-A for its State No. 1-A Well, located in the SE/4 SE/4 of Section 14, Township 18 South, Range 37 East, Hobbs Pool, Lea County, New Mexico.

Hobbs Auditorium
April 15, 1959

BEFORE:

Mr. A. L. Porter, Jr.
Mr. Murray Morgan
Governor John Burroughs

TRANSCRIPT OF HEARING

MR. PORTER: We'll call next Case 1635.

MR. PAYNE: Case 1635, "Application of Mapenza Oil Company for an exception to the requirements of Order No. R-1224-A."

Mr. Commissioner, we have received a communication from Mapenza Oil Company requesting that this case be continued to the regular hearing in May.

MR. PORTER: Any objection to the motion?

Case 1635 will be continued to the May regular hearing date.

That appears to complete the cases that we have had advance notice about that will be continued to some future date. We are going to have a ten minute recess and immediately after the recess, we'll take up the cases concerning Slim-hole completions and I understand that there will be a movement for consolidation of the three cases. At this time, we will have a ten minute recess.

(Short recess.)

STATE OF NEW MEXICO)
: ss
COUNTY OF BERNALILLO)

I, JERRY MARTINEZ, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Hearing were reported by me in Stenotype, and that the same was reduced to typewritten transcript by me and contains a true and correct record of said proceedings, to the best of my knowledge, skill and ability.

DATED this 18th day of April, 1959, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Notary Public

My Commission Expires:

January 24, 1962

TELEPHONES 3-3141
3-6323 - 3-6324

P. O. BOX 1628

MAPENZA OIL COMPANY
113 PETROLEUM BUILDING
HOBBS, NEW MEXICO

Case 1635

March 23, 1959

New Mexico Oil Conservation Commission
P.O. Box 871
Santa Fe, New Mexico

Attention: Mr. A. L. Porter, Jr., Secretary-Director

Gentlemen:

Mapenza Oil Company respectfully requests a hearing before the Oil Conservation Commission for the purpose of obtaining exception to Order R-1224-A, insofar as the order pertains to Mapenza Oil Company's Stanolind-State #1-A well located in SE/SE of Section 14, T-18S, R-37E, Hobbs Pool, Lea County, New Mexico.

Operator requests exception to that portion of the order requiring that oilfield produced water in amounts in excess of one half barrel per day be disposed of in a manner other than in unlined earthen pits. The subject well now produces 13 barrels of oil per day, with 33 barrels of water produced per day. Produced water has been and is being disposed of in unlined earthen pits.

Request is made for a hearing before the Commission in Santa Fe at the earliest possible date.

Yours very truly,

MAPENZA OIL COMPANY

J. W. Adams
Agent

JWA:jn

cc: Mr. Frank Irby
State Engineer Office
Santa Fe, New Mexico

Mr. R. F. Montgomery
Oil Conservation Commission
P.O. Box 2045
Hobbs, New Mexico

Case 1635

OIL CONSERVATION COMMISSION
P. O. BOX 871
SANTA FE, NEW MEXICO

COPY

March 26, 1959

Mapenza Oil Company
P.O. Box 1628
Hobbs, New Mexico

ATTENTION: J. W. Adams

Gentlemen:

Reference is made to your request that the Stanolind-State Well No. 1-A in the Hobbs Pool not be shut-in for non-compliance with Order No. R-1224-A, at least until such time as your application for an exception has been heard and an order entered. As we understand it the subject well makes some thirty to thirty-five barrels of oil field brines daily.

As you know, a factual determination was made in Case 1053 (Order No. R-1224-A) that surface disposal of oil field brines in unlined pits from wells producing in excess of one-half barrel of salt water per day constitutes a hazard to the fresh waters in the area of the Hobbs Pool, Lea County, New Mexico.

In view of this determination, there is a presumption that <u>every</u> well in the Hobbs Pool which daily produces salt water in excess of this amount constitutes such a hazard. This presumption must stand until rebutted by sufficient evidence to establish otherwise.

Accordingly, the Commission feels that it must deny your request that the subject well not be shut-in for non-compliance with the requirements of Order No. R-1224-A until such time as your request for an exception has been heard and an order entered.

Docket mailed 5-1-59 for May 13 hr. Bockil mailed 4-3-59 BP

Mapenze Oil Company
Hobbs, New Mexico

March 26, 1959

Your requested exception for the subject well has been docketed for the April regular hearing which will be held in Hobbs on April 15, 1959.

Very truly yours,

A. L. Porter, Jr.

ALP:bg

CC-Governor John Burroughs
Land Commissioner Murray Morgan
State Engineer's Office, c/o Frank Irby
Randall Montgomery

TELEPHONES 3-3141
3-6323 - 3-6324

P. O. BOX 1628

MAPENZA OIL COMPANY
113 PETROLEUM BUILDING
HOBBS, NEW MEXICO

March 23, 1959

Mr. A. L. Porter, Jr.
New Mexico Oil Conservation Commission
P.O. Box 871
Santa Fe, New Mexico

Dear Mr. Porter:

Attached is a request for a hearing before the Commission for exception to Order R-1224-A on our Stanolind-State #1-A lease in the Hobbs Pool. In line with request for hearing, we further respectfully request that you grant an indefinite extension to our company until such time as the hearing has been held and the Commission has given an order on the hearing. This extension is provided for in Order R-1224-A and we ask that this lease not be shut in after March 31, 1959, because in the event that hearing is set on the lease, that there will be something taking place toward compliance or exception.

Yours very truly,

MAPENZA OIL COMPANY

J. W. Adams
Agent

JWA:jn

cc: Mr. Frank Irby
State Engineer Office
Santa Fe, New Mexico

Mr. R. F. Montgomery
Oil Conservation Commission
P.O. Box 2045
Hobbs, New Mexico

No. 13-59

DOCKET: REGULAR HEARING APRIL 15, 1959

Oil Conservation Commission 9 a.m., Hobbs Auditorium, 1300 East Scharbauer

HOBBS, NEW MEXICO

ALLOWABLE: (1) Consideration of the oil allowable for May, 1959.

(2) Consideration of the allowable production of gas for May 1959 from six prorated pools in Lea County, New Mexico; also consideration of the allowable production of gas from seven prorated pools in San Juan and Rio Arriba Counties, New Mexico, for May 1959.

CONTINUED CASES

CASE 1573: Application of Southwestern, Inc. Oil Well Servicing for permission to make a "slim hole" completion. Applicant, in the above-styled cause, seeks an order authorizing it to utilize the "slim hole" method of completion for a well located in the SE/4 NW/4 Section 32, Township 16 South, Range 30 East, Square Lake Pool, Eddy County, New Mexico. Applicant proposes to utilize 2½ inch tubing as a substitute for casing in the above-described well in exception to Rule 107.

CASE 1600: In the matter of the application of M. A. Romero and Robert Critchfield concerning the operation of gas prorationing in the Blanco Mesaverde Gas Pool and the ratable taking of gas from said Blanco Mesaverde Gas Pool in Rio Arriba and San Juan Counties, New Mexico, as well as from the Choza Mesa-Pictured Cliffs Gas Pool in Rio Arriba County, New Mexico.

CASE 1526: Northwestern New Mexico nomenclature case calling for an order for the extension of an existing pool in San Juan County, New Mexico.

(h) Extend the Angels Peak-Dakota Pool to include:

TOWNSHIP 26 NORTH, RANGE 10 WEST, NMPM
Section 2: NW/4

TOWNSHIP 27 NORTH, RANGE 10 WEST, NMPM
Section 35: SW/4

TOWNSHIP 28 NORTH, RANGE 10 WEST, NMPM
Section 27: W/2
Section 28: E/2

CASE 1618: Southeastern New Mexico nomenclature case calling for an order creating a new pool in Lea County, New Mexico:

(e) Create a new oil pool for Devonian production, designated as the Crosby-Devonian Oil Pool, and described as:

TOWNSHIP 25 SOUTH, RANGE 37 EAST, NMPM
Section 21: SW/4

NEW CASES

CASE 1631: In the matter of the hearing called by the Oil Conservation Commission on its own motion to consider changing the date of the Regular Commission Hearing in June 1959 from the 17th to the 9th.

CASE 1632: Application of Humble Oil & Refining Company for permission to make a "slim hole" completion. Applicant, in the above-styled cause, seeks an order authorizing it to utilize the "slim hole" method of completion for its State "M" Well No. 14 to be located 1980 feet from the North line and 660 feet from the East line of Section 31, Township 22 South, Range 37 East, Eumont Gas Pool, Lea County, New Mexico. Applicant proposes to utilize 2-7/8 inch tubing as a substitute for casing in the above-described well in exception to Rule 107.

CASE 1633: Application of Humble Oil & Refining Company for permission to make a "slim hole" completion. Applicant, in the above-styled cause, seeks an order authorizing it to utilize the "slim hole" method of completion for its State "G" Well No. 19, to be located 580 feet from the South line and 1980 feet from the East line of Section 23, Township 21 South, Range 36 East, Eumont Gas Pool, Lea County, New Mexico. Applicant proposes to utilize 2-7/8 inch tubing as a substitute for casing in the above-described well in exception to Rule 107.

CASE 1634: Application of The Pure Oil Company for an order promulgating temporary special rules and regulations for the South Vacuum-Devonian Pool in Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order promulgating temporary special rules and regulations for the South Vacuum-Devonian Pool in Lea County, New Mexico, to provide for 80-acre proration units and well location requirements. Applicant further seeks permission to shut-in its South Vacuum Unit Well No. 3-35 located in the NE/4 NW/4 of Section 35, Township 18 South, Range 35 East, Lea County, New Mexico, and transfer the allowable to its South Vacuum Unit Well No. 1-35 located in the SW/4 NE/4 of said Section 35.

CASE 1635: Application of Mapenza Oil Company for an exception to the requirements of Order No. R-1224-A. Applicant, in the above-styled cause, seeks an order authorizing an exception to the salt water disposal requirements of Order No. R-1224-A for its State No. 1-A Well, located in the SE/4 SE/4 of Section 14, Township 18 South, Range 37 East, Hobbs Pool, Lea County, New Mexico.

CASE 1636: Application of The Atlantic Refining Company for an amendment of Rule 115 of the Commission Rules and Regulations. Applicant, in the above-styled cause, seeks an order amending Rule 115 of the Commission Rules and Regulations insofar as said rule is related to required pressure rating of wellhead equipment.

Docket No. 13-59

CASE 1637: Application of The Atlantic Refining Company for an order combining the Allison-Pennsylvanian and the North Allison-Pennsylvanian Pools in Lea and Roosevelt Counties, New Mexico, and for the promulgation of special rules and regulations therefor. Applicant, in the above-styled cause, seeks an order combining the Allison-Pennsylvanian and the North Allison-Pennsylvanian Pools in Lea and Roosevelt Counties, New Mexico, and providing for the establishment of 80-acre proration units in said combined pool.

CASE 1638: In the matter of the hearing called by the Oil Conservation Commission on its own motion to consider the establishment of a procedure whereby amendments to unit agreements may be approved administratively.

CASE 1522: Application of General Petroleum, Inc., for an amendment to Order No. R-1299. Applicant, in the above-styled cause, seeks an order amending Order No. R-1299 to provide that any merchantable oil recovered from sediment oil shall not be charged against the allowable for wells on the originating lease, which amendment would revise Rule 311.

CASE 1639: Southeastern New Mexico nomenclature case calling for an order creating new pools and extending existing pools in Lea and Eddy Counties, New Mexico:

(a) Create a new oil pool for Tansil production, designated as the Custer-Tansill Oil Pool, and described as:

TOWNSHIP 25 SOUTH, RANGE 36 EAST, NMPM
Section 7: NW/4

(b) Create a new oil pool for Pennsylvanian production, designated as the East Hightower-Pennsylvanian Oil Pool, and described as:

TOWNSHIP 12 SOUTH, RANGE 34 EAST, NMPM
Section 30: NE/4

(c) Create a new oil pool for Delaware production, designated as the Querecho Plains-Delaware Oil Pool, and described as:

TOWNSHIP 18 SOUTH, RANGE 32 EAST, NMPM
Section 25: NW/4

(d) Create a new oil pool for Abo production, designated as the West Warren-Abo Oil Pool, and described as:

TOWNSHIP 20 SOUTH, RANGE 38 EAST, NMPM
Section 17: SW/4

(e) Create a new oil pool for Connell production, designated as the Warren-Connell Oil Pool, and described as:

TOWNSHIP 20 SOUTH, RANGE 38 EAST, NMPM
Section 17: SW/4

(f) Extend the Atoka Pool to include:

TOWNSHIP 18 SOUTH, RANGE 26 EAST, NMPM
Section 13: E/2 NE/4

(g) Extend the Bishop Canyon-San Andres Pool to include:

TOWNSHIP 13 SOUTH, RANGE 38 EAST, NMPM
Section 10: N/2
Section 11: NW/4

(h) Extend the Crosby-Devonian Gas Pool to include:

TOWNSHIP 26 SOUTH, RANGE 37 EAST, NMPM
Section 4: NE/4

(i) Extend the Culwin Pool to include:

TOWNSHIP 19 SOUTH, RANGE 30 EAST, NMPM
Section 1: NE/4

(j) Extend the Drinkard Pool to include:

TOWNSHIP 22 SOUTH, RANGE 38 EAST, NMPM
Section 17: SW/4

(k) Extend the Eumont Gas Pool to include:

TOWNSHIP 20 SOUTH, RANGE 37 EAST, NMPM
Section 23: N/2
Section 24: SE/4 & N/2

(l) Extend the Justis Gas Pool to include:

TOWNSHIP 25 SOUTH, RANGE 37 EAST, NMPM
Section 13: SE/4

(m) Extend the Langlie-Mattix Pool to include:

TOWNSHIP 23 SOUTH, RANGE 36 EAST, NMPM
Section 4: NE/4

(n) Extend the Wilson Pool to include:

TOWNSHIP 21 SOUTH, RANGE 35 EAST, NMPM
Section 19: E/2
Section 20: SW/4

CASE 1640: Northwestern New Mexico nomenclature case calling for an order changing the designation of a pool and extending existing pools in San Juan and Rio Arriba Counties, New Mexico:

(a) Change the designation of the Otero-Graneros Dakota Pool in Rio Arriba County, New Mexico, to the Otero-Dakota pool.

(b) Extend the Tapacito-Pictured Cliffs Pool to include:

TOWNSHIP 27 NORTH, RANGE 4 WEST, NMPM
Section 29: E/2

(c) Extend the Blanco-Mesaverde Pool to include:

TOWNSHIP 31 NORTH, RANGE 13 WEST, NMPM
Section 25: S/2

(d) Extend the Angels Peak-Gallup Oil Pool to include:

TOWNSHIP 26 NORTH, RANGE 9 WEST, NMPM
Section 6: SW/4
Section 7: NW/4

TOWNSHIP 26 NORTH, RANGE 10 WEST, NMPM
Section 1: All
Section 2: NE/4

TOWNSHIP 27 NORTH, RANGE 10 WEST, NMPM
Section 28: SW/4
Section 29: S/2
Section 32: All
Section 33: W/2

(e) Extend the Bisti-Lower Gallup Oil Pool to include:

TOWNSHIP 24 NORTH, RANGE 10 WEST, NMPM
Section 2: SW/4

TOWNSHIP 25 NORTH, RANGE 10 WEST, NMPM
Section 19: S/2 S/2

(f) Extend the Horseshoe-Gallup Oil Pool to include:

TOWNSHIP 30 NORTH, RANGE 16 WEST, NMPM
Section 2: W/2 SW/4

TOWNSHIP 31 NORTH, RANGE 16 WEST, NMPM
Section 19: SW/4 & S/2 SE/4
Section 29: NW/4

(g) Extend the Verde-Gallup Oil Pool to include:

TOWNSHIP 31 NORTH, RANGE 14 WEST, NMPM
Section 16: SW/4 NW/4
Section 17: E/2
Section 20: E/2

(h) Extend the Angels Peak-Dakota Pool to include:

TOWNSHIP 26 NORTH, RANGE 10 WEST, NMPM
Section 3: N/2

TOWNSHIP 27 NORTH, RANGE 10 WEST, NMPM
Section 6: E/2 Section 9: W/2

TOWNSHIP 28 NORTH, RANGE 10 WEST, NMPM
Section 22: W/2

TELEPHONES 3-3141
3-6323 - 3-6324

P. O. BOX 1628

MAPENZA OIL COMPANY
113 PETROLEUM BUILDING
HOBBS, NEW MEXICO

April 10, 1959

Mr. A. L. Porter, Jr., Secretary-Director
New Mexico Oil Conservation Commission
P.O. Box 871
Santa Fe, New Mexico

Dear Mr. Porter:

This company respectfully requests that the Commission continue Case #1635 scheduled to be held in Hobbs, New Mexico, on April 15, 1959. The company will be prepared to have the hearing in Santa Fe at the regularly scheduled May hearing. The reason for the delay is that lengthy evidence and testimony will not be completed at the time of the Hobbs hearing. Thank you for your consideration in this matter.

Yours very truly,

MAPENZA OIL COMPANY

J. W. Adams
Agent

JWA:jn

Amended Notice
5-1-59

Case 1635

May 14, 1959

COPY

Mr. Robert L. Borton
Geologist
State Engineer Office
Roswell, New Mexico

Dear Bob:

I have just received a request from the Oil Conservation Commission.

Please forward to me at your very earliest convenience four complete sets of the twelve exhibits entered in Case #1635, Hapenny Oil Company which was heard yesterday. Also, please send one set of exhibits, excluding the photographs at the same time. I am aware that it will take a few days to get prints of the photographs made, particularly the colored ones and the printed material should not be held up pending the submission of the photographic exhibits.

Yours truly,

S. E. Reynolds
State Engineer

By:
Frank E. Irby
Chief
Water Rights Div.

FEI/ma
cc-Oil Conservation Commission
Mr. Charles D. Harris

No. 18-59

DOCKET: REGULAR HEARING MAY 13, 1959

Oil Conservation Commission, 9 a.m., Mabry Hall, State Capitol, Santa Fe

ALLOWABLE: (1) Consideration of the oil allowable for June, 1959.

(2) Consideration of the allowable production of gas for June, 1959, for six prorated pools in Lea County, New Mexico, and also presentation of purchasers' nominations for the six-month period beginning July 1, 1959; consideration of the allowable production of gas for seven prorated pools in San Juan and Rio Arriba Counties, New Mexico, for June, 1959.

CONTINUED CASES AND REHEARING

CASE 1615: (Rehearing)

In the matter of the rehearing requested by Malco Refineries, Inc. for reconsideration by the Commission of Case No. 1615, Order R-1363. Case 1615 was an application by Stanley Jones, et al, for an order requiring Malco Refineries, Inc. to purchase oil produced from wells in the Dayton-Abo Pool in Eddy County, New Mexico, under the provisions of the Common Purchaser Act. Case 1615 culminated in the entry of Order No. R-1363 which required Malco Refineries, Inc. to purchase all oil tendered to it which is produced from the Dayton Field in Eddy County, New Mexico.

CASE 1522: Application of General Petroleum, Inc. , for an amendment to Order No. R-1299. Applicant, in the above-styled cause, seeks an order amending Order No. R-1299 to provide that any merchantable oil recovered from sediment oil shall not be charged against the allowable for wells on the originating lease, which amendment would revise Rule 311.

CASE 1635: Application of Mapenza Oil Company for an exception to the requirements of Order No. R-1224-A. Applicant, in the above-styled cause, seeks an order authorizing an exception to the salt water disposal requirements of Order No. R-1224-A for its State No. 1-A Well, located in the SE/4 SE/4 of Section 14, Township 18 South, Range 37 East, Hobbs Pool, Lea County, New Mexico.

NEW CASES

CASE 278: Application of Farm Chemical Resources Development Corporation and National Potash Company for an extension of the Potash-Oil Area as set forth in Order R-111-A. Applicants, in the above-styled cause, seek an order extending the Potash-Oil Area as defined in Order R-111-A to include additional acreage in Townships 19, 20, and 21 South, Ranges 29, 31, and 32 East, Lea and Eddy Counties, New Mexico.

CASE 1668: Application of Phillips Petroleum Company for an order promulgating temporary special rules and regulations for the Ranger Lake-Pennsylvanian Pool in Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order promulgating temporary special rules and regulations for the Ranger Lake-Pennsylvanian Pool and certain adjacent acreage in Lea County, New Mexico, to provide for 80-acre spacing units and well location requirements, and such other provisions as the Commission deems necessary.

CASE 1669: Application of Pan American Petroleum Corporation for the promulgation of temporary special rules and regulations for the Atoka-Pennsylvanian Gas Pool in Eddy County, New Mexico. Applicant, in the above-styled cause, seeks an order promulgating temporary special rules and regulations for the Atoka-Pennsylvanian Gas Pool in Eddy County, New Mexico, to provide for 320-acre spacing units and for well location requirements.

CASE 1670: Southeastern New Mexico nomenclature case calling for an order creating new pools, deleting a portion of a pool, and extending existing pools in Chaves, Eddy, Lea and Roosevelt Counties, New Mexico.

(a) Create a new oil pool for Queen production, designated as the Chisum-Queen Oil Pool, and described as:

TOWNSHIP 11 SOUTH, RANGE 27 EAST, NMPM
Section 16: SW/4
Section 21: N/2

(b) Create a new gas pool for Yates production, designated as the Chisum-Yates Gas Pool, and described as:

TOWNSHIP 11 SOUTH, RANGE 27 EAST, NMPM
Section 13: SE/4

(c) Create a new oil pool for Delaware production, designated as the Loving-Delaware Oil Pool, and described as:

TOWNSHIP 24 SOUTH, RANGE 27 EAST, NMPM
Section 1: SW/4

(d) Create a new oil pool for San Andres production, designated as the Prairie-San Andres Oil Pool, and described as:

TOWNSHIP 8 SOUTH, RANGE 36 EAST, NMPM
Section 8: SW/4

(e) Delete a portion of the Square Lake Oil Pool described as:

TOWNSHIP 17 SOUTH, RANGE 29 EAST, NMPM
Section 3: W/2 NW/4

(f) Extend the Cave Pool to include:

TOWNSHIP 17 SOUTH, RANGE 29 EAST, NMPM
Section 3: W/2 NW/4

(g) Extend the Allison-Pennsylvanian Oil Pool to include:

TOWNSHIP 9 SOUTH, RANGE 36 EAST, NMPM
Section 14: NW/4
Section 15: NE/4

(h) Extend the Crosby-Devonian Gas Pool to include:

TOWNSHIP 25 SOUTH, RANGE 37 EAST, NMPM
Section 21: SW/4

(i) Extend the Dean Permo-Pennsylvanian Pool to include:

TOWNSHIP 16 SOUTH, RANGE 37 EAST, NMPM
Section 4: Lots 3, 4, 5, & 6

(j) Extend the Empire-Abo Pool to include:

TOWNSHIP 18 SOUTH, RANGE 27 EAST, NMPM
Section 2: NE/4
Section 3: SW/4

(k) Extend the Eumont Gas Pool to include:

TOWNSHIP 21 SOUTH, RANGE 37 EAST, NMPM
Section 29

(l) Extend the Gladiola-Wolfcamp Pool to include:

TOWNSHIP 12 SOUTH, RANGE 37 EAST, NMPM
Section 26: SW/4

(m) Extend the Jalmat Gas Pool to include:

TOWNSHIP 22 SOUTH, RANGE 35 EAST, NMPM
Section 2: SW/4

(n) Extend the Justis Blinebry Pool to include:

TOWNSHIP 25 SOUTH, RANGE 37 EAST, NMPM
Section 24: NW/4

(o) Extend the Justis Fusselman Pool to include:

TOWNSHIP 25 SOUTH, RANGE 37 EAST, NMPM
Section 13: NW/4

(p) Extend the Justis McKee Pool to include:

TOWNSHIP 25 SOUTH, RANGE 37 EAST, NMPM
Section 25: NE/4

(q) Extend the Leamex-Pennsylvanian Pool to include:

TOWNSHIP 17 SOUTH, RANGE 33 EAST, NMPM
Section 23: NW/4

(r) Extend the Maljamar Pool to include:

TOWNSHIP 17 SOUTH, RANGE 32 EAST, NMPM
Section 13: SE/4

(s) Extend the North Mason-Delaware Pool to include:

TOWNSHIP 26 SOUTH, RANGE 32 EAST, NMPM
Section 18: NE/4

(t) Extend the East Millman Queen-Grayburg Pool to include:

TOWNSHIP 19 SOUTH, RANGE 28 EAST, NMPM
Section 12: SE/4

(u) Extend the Milnesand-San Andres Pool to incluoe:

TOWNSHIP 8 SOUTH, RANGE 34 EAST, NMPM
Section 14: E/2

(v) Extend the Pearl-Queen Pool to include:

TOWNSHIP 19 SOUTH, RANGE 35 EAST, NMPM
Section 33: NE/4

(w) Extend the Saunders Pool to include:

TOWNSHIP 14 SOUTH, RANGE 33 EAST, NMPM
Section 28: SW/4
Section 29: SE/4

(x) Extend the South Sawyer-San Andres Pool to include:

TOWNSHIP 9 SOUTH, RANGE 38 EAST, NMPM
Section 28: SW/4 SW/4
Section 33: W/2 NW/4

(y) Extend the Shugart Pool to include:

TOWNSHIP 18 SOUTH, RANGE 31 EAST, NMPM
Section 25: W/2 SW/4
Section 26: SE/4

(z) Extend the North Shugart Queen-Grayburg Pool to include:

TOWNSHIP 18 SOUTH, RANGE 31 EAST, NMPM
Section 32: W/2
Section 29: SW/4

(aa) Extend the Shugart-Delaware Pool to include:

TOWNSHIP 18 SOUTH, RANGE 31 EAST, NMPM
Section 27: NW/4

(bb) Extend the Square Lake Pool to include:

TOWNSHIP 17 SOUTH, RANGE 29 EAST, NMPM
Section 9: S/2

(cc) Extend the Turkey Track Pool to include:

TOWNSHIP 18 SOUTH, RANGE 29 EAST, NMPM
Section 27: S/4

CASE 1671: Northwestern New Mexico nomenclature case calling for an order extending existing pools in San Juan, Sandoval and Rio Arriba Counties, New Mexico.

(a) Extend the Ballard-Pictured Cliffs Pool to include:

TOWNSHIP 23 NORTH, RANGE 3 WEST, NMPM
Section 17: All
Section 18: All
Section 20: All
Section 28: W/2
Section 29: N/2
Section 33: N/2
Section 34: N/2 & SE/4
Section 35: SW/4

TOWNSHIP 23 NORTH, RANGE 4 WEST, NMPM
Section 11: SE/4
Sections 12 thru 15 inclusive: All
Section 19: N/2

TOWNSHIP 24 NORTH, RANGE 6 WEST, NMPM
Section 21: NW/4

(b) Extend the South Blanco-Pictured Cliffs Pool to include:

TOWNSHIP 27 NORTH, RANGE 5 WEST, NMPM
Section 6: W/2
Section 19: W/2
Section 30: NW/4

(c) Extend the Chimney Rock-Gallup Oil Pool to include:

TOWNSHIP 31 NORTH, RANGE 17 WEST, NMPM
Section 5: SE/4 SE/4
Section 9: NE/4 NE/4

(d) Extend the Horseshoe-Gallup Oil Pool to include:

TOWNSHIP 30 NORTH, RANGE 16 WEST, NMPM
Section 4: W/2 SW/4
Section 6: NE/4 NE/4
Section 10: N/2 SW/4 & SE/4

TOWNSHIP 31 NORTH, RANGE 16 WEST, NMPM
Section 19: N/2 SE/4
Section 20: S/2 SW/4
Section 29: W/2 NE/4
Section 33: NW/4

TOWNSHIP 31 NORTH, RANGE 17 WEST, NMPM
Section 23: NE/4 SE/4
Section 24: NW/4

(e) Extend the Verde-Gallup Oil Pool to include:

TOWNSHIP 31 NORTH, RANGE 15 WEST, NMPM
Section 26: N/2 NE/4
Section 34: NE/4 & NW/4 SE/4

(f) Extend the Angels Peak-Dakota Pool to include:

TOWNSHIP 27 NORTH, RANGE 10 WEST, NMPM
Section 26: SW/4
Section 35: NW/4

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. 1635
Order No. R-1411

APPLICATION OF MAPENZA OIL
COMPANY FOR AN ORDER AUTHORIZING
THE SURFACE DISPOSAL IN UNLINED
PITS OF THE SALT WATER PRODUCED
FROM ONE WELL IN THE HOBBS POOL,
LEA COUNTY, NEW MEXICO, IN
EXCEPTION TO THE REQUIREMENTS OF
ORDER R-1224-A

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on May 13, 1959, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission."

NOW, on this 5th day of June, 1959, 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) That the applicant, Mapenza Oil Company, is the owner and operator of the State No. 1-A Well, located in the SE/4 SE/4 of Section 14, Township 18 South, Range 37 East, Hobbs Pool, Lea County, New Mexico.

(3) That the applicant seeks an exception to the salt water disposal requirements of Order No. R-1224-A for the said State No. 1-A Well.

(4) That at the time of the application for exception for the said State No. 1-A Well, it was producing approximately 33 barrels of salt water per day and approximately 13 barrels of oil per day.

(5) That oil production from said State No. 1-A Well is decreasing while salt water production is increasing.

(6) That according to the applicant's own testimony, the said State No. 1-A Well will produce some 113,000 additional barrels of salt water during the life of said well.

(7) That surface disposal of oil field brines in unlined pits of such a significant quantity constitutes a hazard to the fresh waters in the Lea County Underground Water Basin, which hazard increases as the volume of fresh water in said Basin is reduced.

(8) That in order to adequately protect the fresh waters in the said Lea County Underground Water Basin, the application for exception to the salt water disposal requirements of Order No. R-1224-A should be denied.

IT IS THEREFORE ORDERED:

That the application of Mapenza Oil Company for an exception to Order No. R-1224-A to permit the surface disposal in unlined pits of the salt water produced from the State No. 1-A Well, located in the SE/4 SE/4 of Section 14, Township 18 South, Range 37 East, Hobbs Pool, Lea County, New Mexico, be and the same is hereby denied.

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

JOHN BURROUGHS, Chairman

MURRAY E. MORGAN, Member

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

vem/

OIL CONSERVATION COMMISSION
P. O. BOX 871
SANTA FE, NEW MEXICO

COPY

June 5, 1959

Mr. John Adams
113 Petroleum Building
Hobbs, New Mexico

Dear Mr. Adams:

On behalf of your client, Mapenza Oil Company, we enclose a copy of Order No. R-1411 issued June 5, 1959, by the Oil Conservation Commission in Case No. 1635.

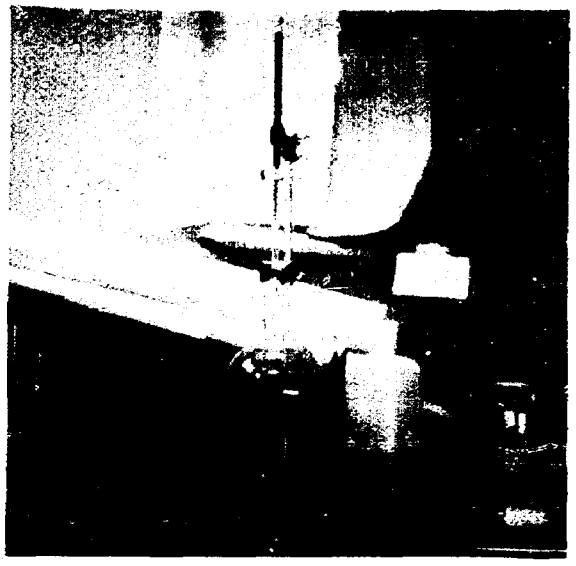
Very truly yours,

A. L. PORTER, Jr.
Secretary-Director

ir/

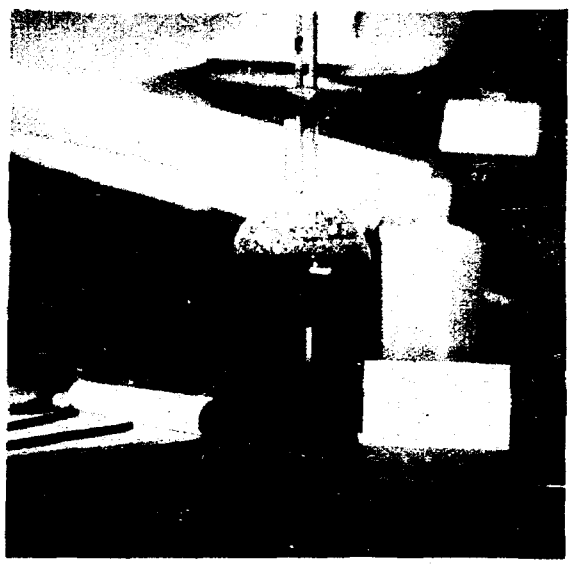
Enclosure

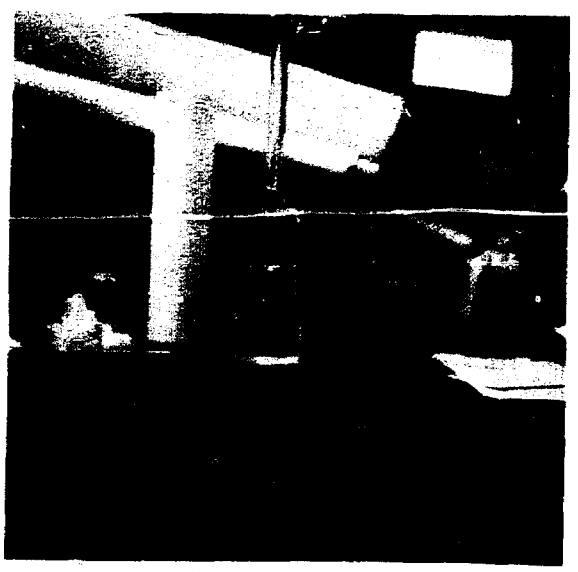
[illegible] experiment(III-)



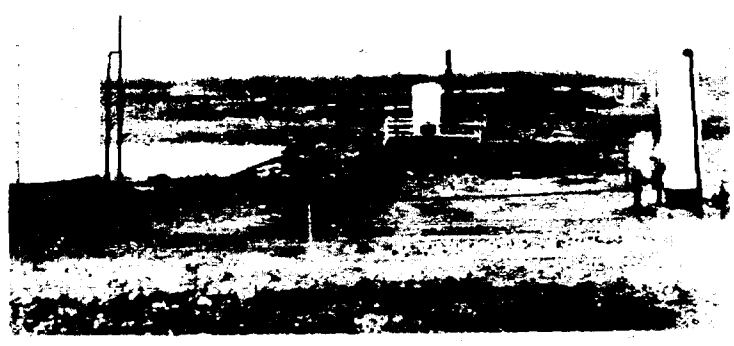
Pea-gravel and sand [illegible] and 24 hours, respectively, after [illegible] of blue barium bromide

[illegible] Interfacial [illegible] 20 ml [illegible] brine into 200 ml of Distilled water



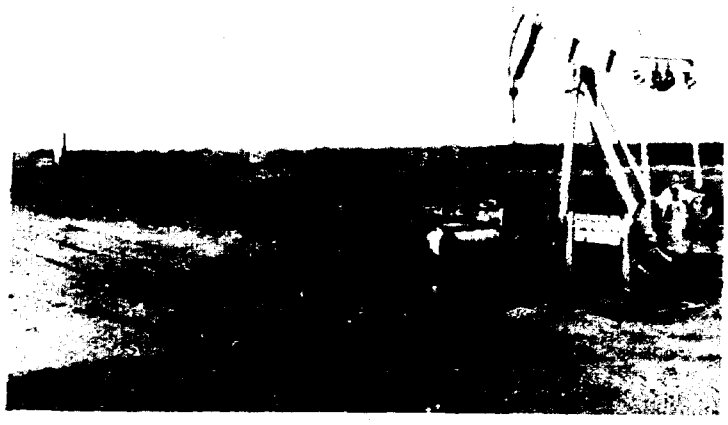


Mapenza 1-A State, looking northwest towards evaporation pit

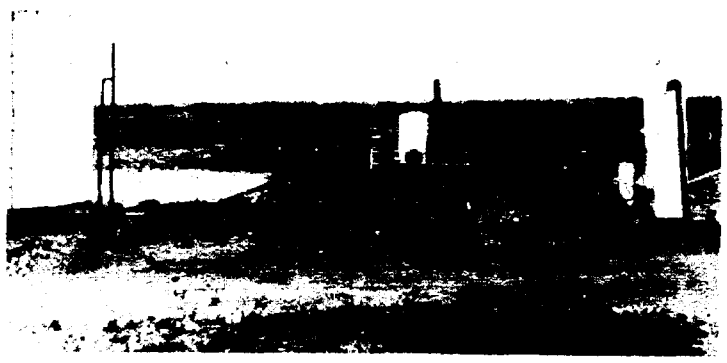


Mapenza battery and separators, looking north towards evaporation pit

Mapenza evaporation pit, located 18.37.14.440, looking northeast

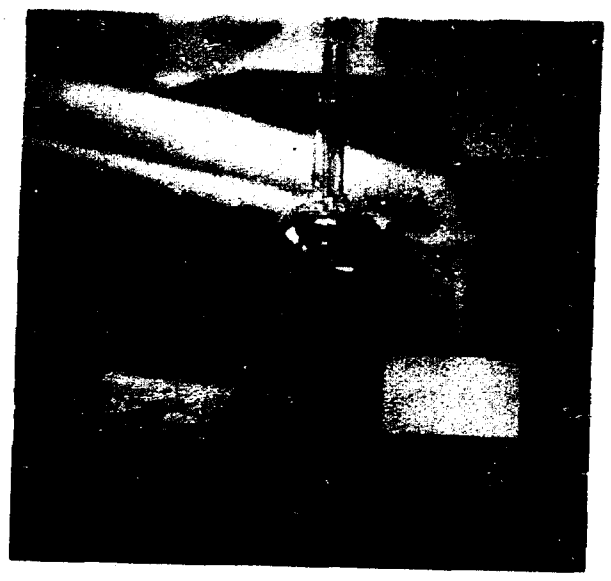


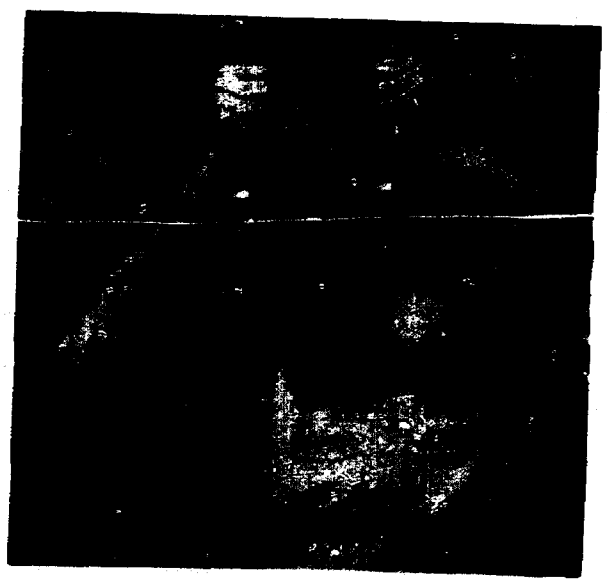
Mapensa 1-A State, looking northwest towards evaporation pit

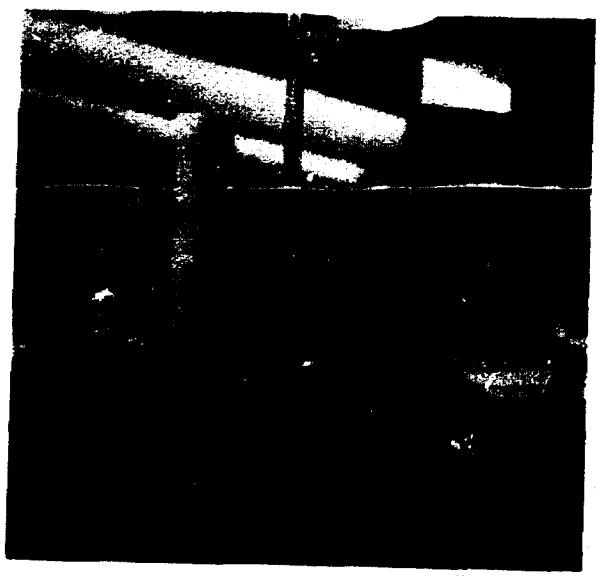


Mapensa battery and separators, looking north towards evaporation pit

Mapensa evaporation pit, located 18 37.14.440, looking northeast







Pea gravel and sand 20 hours and 44 hours, respectively, after introduction of bleaching powder

Introduction of 20 g of bleaching powder into 20% ml of distilled water

EXHIBIT #1-A - CASE 1635
BEFORE THE OIL CONSERVATION COMMISSION, REGULAR HEARING MAY 13, 1959

PRODUCTION STATISTICS RELATING TO EXHIBIT #1 - PRODUCTION DECLINE CURVE

YEAR	BARRELS OIL	BARRELS WATER
Cumulative to 3-1-59	56,300	14,600
Balance 1959	4,000	10,000
1960	4,000	13,000
1961	3,300	14,000
1962	2,500	14,000
1963	2,200	15,000
1964	1,800	15,000
1965	1,500	16,000
1966	1,500	16,000
Totals To Depletion	77,100	127,600

EXHIBIT #1-A - CASE 1635
BEFORE THE OIL CONSERVATION COMMISSION, REGULAR HEARING MAY 13, 1959

PRODUCTION STATISTICS RELATING TO EXHIBIT #1 - PRODUCTION DECLINE CURVE

YEAR	BARRELS OIL	BARRELS WATER
Cumulative to 3-1-59	56,300	14,600
Balance 1959	4,000	10,000
1960	4,000	13,000
1961	3,300	14,000
1962	2,500	14,000
1963	2,200	15,000
1964	1,800	15,000
1965	1,500	16,000
1966	1,500	16,000
Totals To Depletion	77,100	127,600

EXHIBIT #2 - CASE 1635
BEFORE THE OIL CONSERVATION COMMISSION, REGULAR HEARING MAY 13, 1959

MAXIMUM CONTAMINATION
(If All Water Produced is Placed in 40 Acres of Fresh Water Zone)

RECOVERABLE WATER RESERVE

40 Acres x 50' Net Sand = 2,000 Acre Feet Sand

2,000 Acre Feet x 30% Porosity = 600 Acre Feet Water

600 Acre Feet x 7,760 Barrels/Acre Foot - 4,656,000 Barrels Recoverable Water of 90 ppm Chloride Content

HOBBS FIELD WATER TO BE PRODUCED TO DEPLETION

Produced to April 1, 1959	14,600	Barrels
To be Produced to January 1, 1967	113,000	
Total placed in Pit, with 5,000 ppm Chloride Content	127,600	Barrels (16.4 Acre Feet of Water)

RESULTANT CONTAMINATION

127,600	x 5,000	=	638,000,000
4,656,000	x 90	=	419,040,000
4,783,600 Barrels Total Water			1,057,040,000 ppm Chloride Content

Resultant ppm Chloride in Reservoir - $\frac{1,057,040,000}{4,783,600}$ = 221 ppm *

* 250 ppm is accepted by all authorities as approved potable water.

EXHIBIT #3 - CASE 1635
BEFORE THE OIL CONSERVATION COMMISSION, REGULAR HEARING MAY 13, 1959

CONTAMINATION LESS OVERBURDEN CAPACITY

30' Surface Overburden x 40 Acres = 1,200 Acre Feet

1,200 Acre Feet x 10% Porosity = 120 Acre Feet Necessary to Fill Before Water Reservoir is Reached

IF ONLY 5 ACRES IS WET (UNDER 467' SQUARE) BY PERCULATION, THEN VIRTUALLY ALL 16.4 ACRE FEET OF HOBBS FIELD WATER IS CONTAINED IN THE OVERBURDEN - AND NO CONTAMINANT REACHES THE FRESH WATER.

EXHIBIT #4 - CASE 1635
BEFORE THE OIL CONSERVATION COMMISSION, REGULAR HEARING MAY 13, 1959

EXPECTED LOSS OF REVENUE TO STATE OF NEW MEXICO AND ITS AGENCIES
IF PREMATURE ABANDONMENT IS MADE

20,800 Barrels Oil (See Exhibit #1 and #1-A)

2,600 Barrels (1/8th) are State Royalty at $2.70

$ 7,020 - Loss to: Blind Asylum - 1/2 at $3,510
Deaf & Dumb School - 1/2 at $3,510

2,280 - Loss to State from Production Taxes
● 4.64% of (20,800 - 2,600) Barrels x $2.70

$ 9,300 - Total Loss to State and Agencies

EXHIBIT #5-A - CASE 1635
BEFORE THE OIL CONSERVATION COMMISSION, REGULAR HEARING MAY 13, 1959

ECONOMIC LIMIT OF PRODUCTION

90 BOPMo. @ $2.70		$243
Less 3/16th Royalty		46
		197
Less 4.64% Production Tax		9
		188
Less Lea County Property Tax		5
		$183
Less Lifting Costs:		
Labor	$ 50	
Overhead, Supervision	35	
Power Bill	50	
Oil & Water Chemical	15	
Rod Jobs & Pump Repair	33	
		183
Net Revenue Per Month		$000

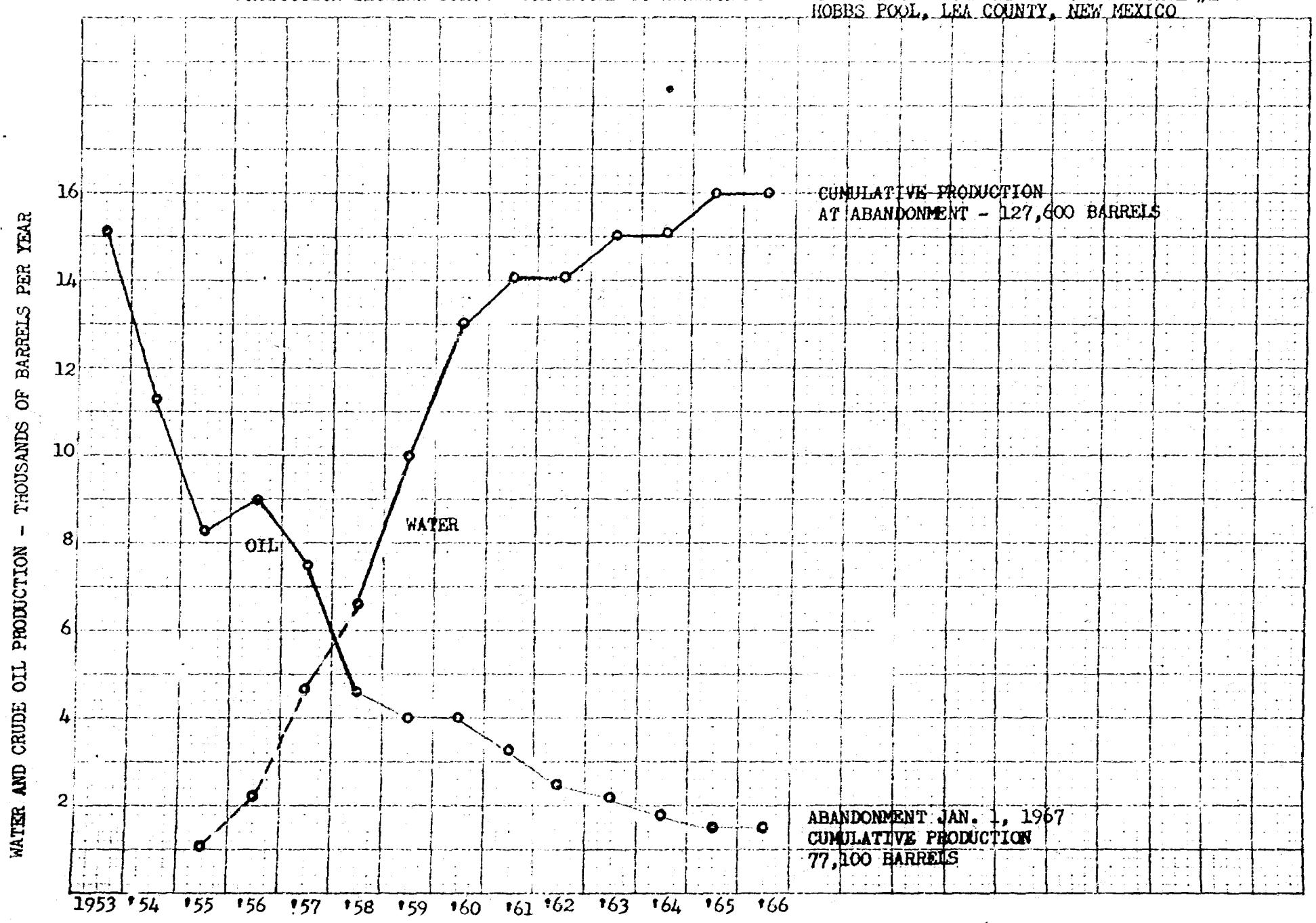
EXHIBIT #5 - CASE 1635
BEFORE THE OIL CONSERVATION COMMISSION, HEARING ON MAY 13, 1959

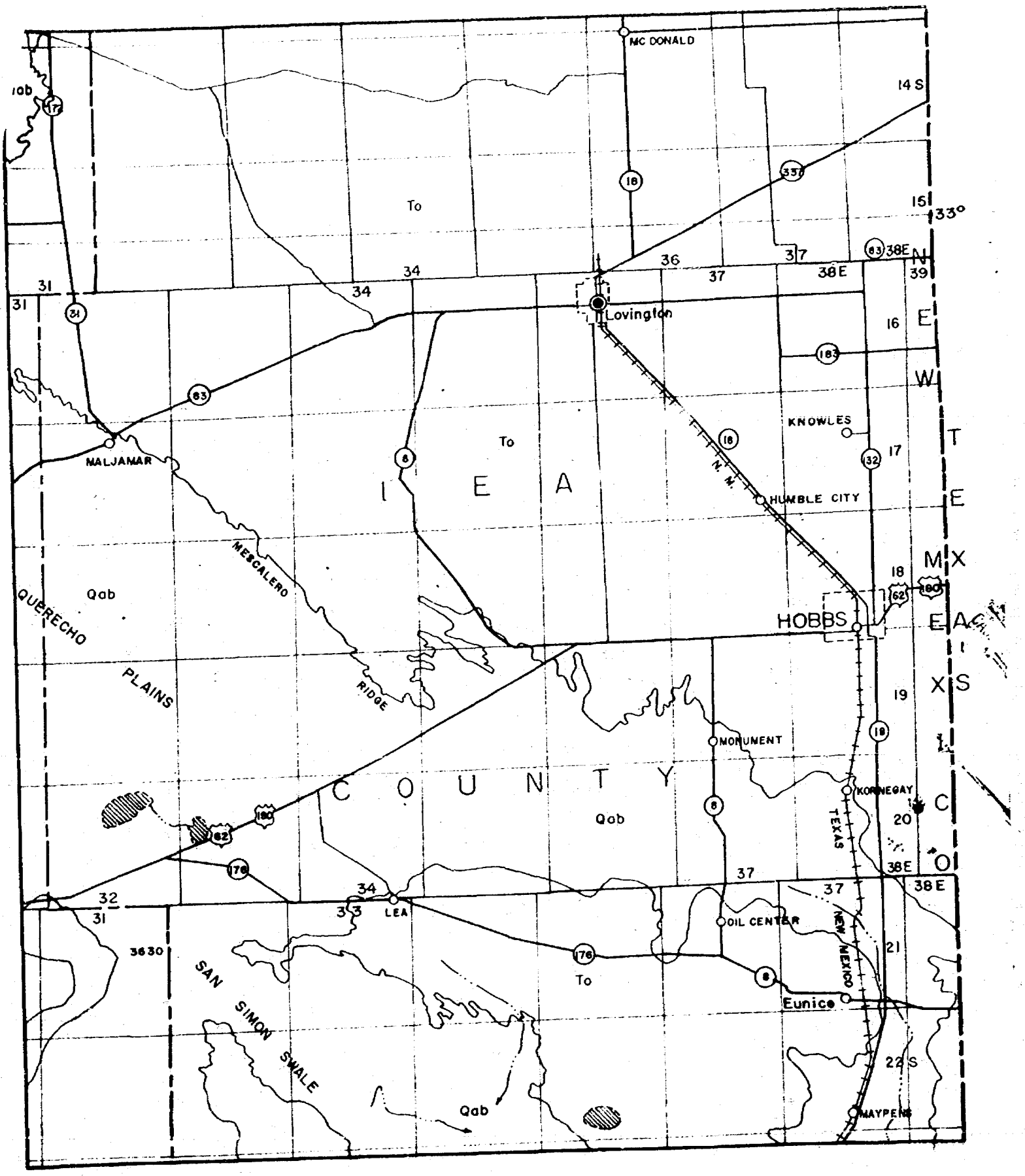
ECONOMIC ANALYSIS
PRESENT WORTH OF FUTURE NET REVENUE
(PARTICIPATING IN SALT WATER DISPOSAL SYSTEM)

	BALANCE 1959	1960	1961	1962	1963	1964	1965	1966	TOTAL
Projected Production - Barrels	4,000	4,000	3,300	2,500	2,200	1,800	1,500	1,500	20,800
Gross Value at $2.70	$10,800	$10,800	$ 8,910	$ 6,750	$ 5,940	$ 4,860	$ 4,050	$ 4,050	$56,160
Less:									
1/8th Royalty To State	1,350	1,350	1,114	844	743	608	506	506	7,021
1/16th ORR	675	675	557	422	371	304	253	253	3,510
Mapenza Gross Revenue	$ 8,775	$ 8,775	$ 7,239	$ 5,484	$ 4,826	$ 3,948	$ 3,291	$ 3,291	$45,629
Less:									
N.M. Production Taxes at 4.64%	407	407	336	254	224	183	153	153	2,117
Lea Co. Semi-Annual Production Tax @ 2%	176	176	145	110	96	79	66	66	914
Lea Co. Property Tax @ $60	60	60	60	60	60	60	60	60	480
Mapenza Gross After Above Taxes	$ 8,132	$ 8,132	$ 6,698	$ 5,060	$ 4,446	$ 3,626	$ 3,012	$ 3,012	$42,118
Less Lifting Costs As Follows:									
Labor	350	600	600	600	600	600	600	600	4,550
Overhead & Supervision	245	420	420	420	420	420	420	420	3,185
Power Bill	350	600	600	600	600	600	600	600	4,550
Oil & Water Chemicals	105	180	180	180	180	180	180	180	1,365
Rod Jobs & Pump Repair	231	396	396	396	396	396	396	396	3,003
Total Lifting Costs	1,281	2,196	2,196	2,196	2,196	2,196	2,196	2,196	16,653
Mapenza Net Revenue Subject to Salt Water Disposal Costs	$ 6,851	$ 5,936	$ 4,502	$ 2,864	$ 2,250	$ 1,430	$ 816	$ 816	$25,465
Salt Water Disposal Costs	4,000	200	500	250	250	800	300	300	6,600
Replacement of Equipment	-	3,000	-	3,000	-	-	-	-	6,000
Mapenza Net Revenue Subject to Federal Income Tax	$ 2,851	$ 2,736	$ 4,002	$ (-386)	$ 2,000	$ 630	$ 516	$ 516	$12,865
Federal Income Tax	428	410	600	-	300	95	77	77	1,987
Mapenza Net Revenue	$ 2,423	$ 2,326	$ 3,402	$ (-386)	$ 1,700	$ 535	$ 439	$ 439	$10,878
Present Worth Factor @ 6% Discount Compounded Annually	.967	.890	.840	.792	.747	.705	.665	.627	-
Mapenza Present Worth of Future Net Revenue	$ 2,343	$ 2,070	$ 2,858	$ (-386)	$ 1,270	$ 377	$ 292	$ 275	$ 9,099
Plus Salvage Value									1,540
Mapenza Present Worth of Future Net Revenue & Salvage									$10,639

EXHIBIT #1 - CASE 1635
BEFORE THE OIL CONSERVATION COMMISSION, REGULAR HEARING MAY 13, 1959

PRODUCTION DECLINE CURVE - PROJECTED TO ABANDONMENT - MAPENZA OIL COMPANY STANOLIND STATE #1-A
HOBBS POOL, LEA COUNTY, NEW MEXICO





taken from Preliminary Geologic Map of
the Southeastern Part of New Mexico
1958

U.S.G.S. Map-I-256

Extracted from

HIGH PLAINS, OR LLANO ESTACADO, TEXAS-NEW MEXICO

by Carl Gaum, United States Geological Survey

THE PHYSICAL AND
ECONOMIC FOUNDATION OF NATURAL RESOURCES

VOLUME IV
SUBSURFACE FACILITIES OF WATER MANAGEMENT AND
PATTERNS OF SUPPLY--TYPE AREA STUDIES

Interior and Insular Affairs Committee
House of Representatives, United States Congress
1953

GROUND WATER

The Water-Bearing Formation

In the Llano Estacado--as in most other parts of the High Plains--the story of ground water is linked closely with the history of the building and subsequent dissection of a vast piedmont alluvial apron east of the Rockies (see ch. 4). The Ogallala formation, comprising the materials of which this alluvial plain was built, is the dominating ground-water reservoir of the region (see fig. 6.8). The boundaries of this formation are essentially the boundaries of the reservoir, and indeed of the Llano Estacado. Over all the High Plains, wherever the Ogallala formation is thin or absent the prospects for obtaining large ground-water supplies are poor indeed.

At some places on the Llano Estacado the Ogallala formation is mantled by dune sand, by alluvium in stream channels, or by the clayey materials washed into the countless land-surface depressions. Some of these materials may contain sufficient water for domestic or stock use but, as surficial

materials, their principal function is that they determine the rate of infiltration and downward percolation of rainfall. A mantle of sand or gravel facilitates recharge to the underlying ground-water reservoir; clay and silt retard or even inhibit recharge.

At some places the Ogallala formation is thin or absent, and there the older rocks become critical to prospective ground-water users. Under most of the Llano Estacado the rocks immediately under the Ogallala are impermeable, or they contain mineralized water, so that generally they are not sources of usable water. In the southwestern part of the plain, however, the Ogallala is underlain in part by limestone and sand which are capable of yielding moderate quantities of water to wells, locally as much as 1,000 gpm.

The Ogallala formation is composed of silt and clay, sand, gravel, and caliche; commonly there is a wide variation in materials within short distances, both laterally and vertically. Commonly, though not universally as encountered in wells, the material is of coarser texture in the lower part of the formation, and predominately silt and clay in the upper part. From this it may be deduced that in the first stages of the alluvial-plain building the streams had greater carrying power but subsequently, as the mountains were worn down and the plains built up, they deposited finer material. Lateral variation in materials is believed to be related to distance from main channels of the depositing streams. For example, the thickest and most productive water-bearing sands are found in a wide strip roughly parallel to the present White River; outside this strip there are buried ridges and hills of older rocks.

Over the Llano Estacado the Ogallala formation ranges in thickness

from a feather edge to 600 feet or more. In the 7,000-square-mile irrigated area in Texas the average thickness is probably 300 feet, of which about 200 feet is saturated. Rough calculations indicate that the saturated zone under that area contains about 150 million acre-feet of water. This irrigated area covers somewhat less than one-fourth of the Staked Plain, and the saturated thickness there probably is greater than average. Allowing for these factors, a total storage of 400 million acre-feet under all the plain probably is conservative.

The water in the Ogallala has been used successfully for irrigation for many years. It is hard, commonly does not exceed 500 ppm (parts per million) of dissolved solids, and its "percent sodium" is less than 30. Wells that also penetrate into the underlying limestone and sand commonly yield water of poorer quality, with dissolved solids as great as 2,000 ppm.

Recharge, Movement, and Discharge of the Water

Recharge to the ground water reservoir in the Ogallala formation is by infiltration from rainfall, from depression ponds, or from streams. Recharge directly from rainfall can occur only when a storm provides more than enough water to satisfy any depletion in "field capacity" of the soil, so that some can penetrate through the soil zone to the ground water reservoir. The possibilities for such penetration v greatly. Most of the Staked Plain is underlain by sediments that are cemented by calcium carbonate to form caliche, which probably is permeable enough to permit some local penetration. Much less permeable are the widespread clayey subsoils of the "tightlands." By far the greatest opportunities for infiltration and penetration of rainwater are in the sandy soils, and particularly in the sand dunes which are of wide extent in some parts of the Llano Estacado. Recharge

of the ground-water reservoir in wet years is clearly recorded in wells in these sand-dune areas.

The numerous depression ponds are also sources of recharge to the ground-water reservoir, as shown by records from wells adjacent to them. Penetration probably is greatest when the pond level is highest, and then diminishes with declining pond level until at low stages the chief loss from the pond is by evaporation. Many depressions are floored by silty clay that greatly slows or stops penetration.

Infiltration from streams necessarily is a minor item of ground-water recharge, chiefly because the amount of streamflow is very small, but also because at many places the stream beds are relatively impermeable or are about at the level of the water table Nevertheless, there are some sandy channels several feet above the water table, where conditions are favorable for ground-water recharge whenever there is runoff.

All these methods of recharge are intermittent, and largely contingent on exceptionally heavy precipitation. Because of this, and because of the great extent and variability of facilities for recharge, direct quantitative determinations of recharge are well-nigh impossible. However, under natural conditions the average rate of recharge over a long period of time must be balanced by the natural discharge from the ground-water reservoir. Measurement of the natural discharge, which is comparatively uniform from year to year, thus provides also an estimate of average recharge.

Water in the Ogallala formation moves generally eastward, and is discharged by springs and seeps along the eastern escarpment. There is also some natural loss of ground water along the western escarpment and within the plains, wherever the water table is close to the land surface. In

particular, ground water is transpired by salt grass, marsh grass, sedges, and trees that occupy an aggregate area of thousands of acres, chiefly along stream channels.

According to studies made in 1938, the natural discharge along 75 miles of the eastern escarpment, and within a 9,000-square-mile area that includes the principal irrigated area in Texas, was about 30,000 acre-feet a year. This discharge may be equivalent to the average yearly recharge in approximately one-third of the Llano Estacado. Thus, average yearly recharge to the entire ground-water reservoir is considered to have been at least 75,000 acre-feet, and possibly as much as 150,000 acre-feet.

Since 1938 the position of the water table has not changed appreciably in the areas of natural discharge along the eastern escarpment, but it has declined several feet beneath the lowlands along stream courses. Thus it is likely that the natural discharge today is only slightly less than in 1938.

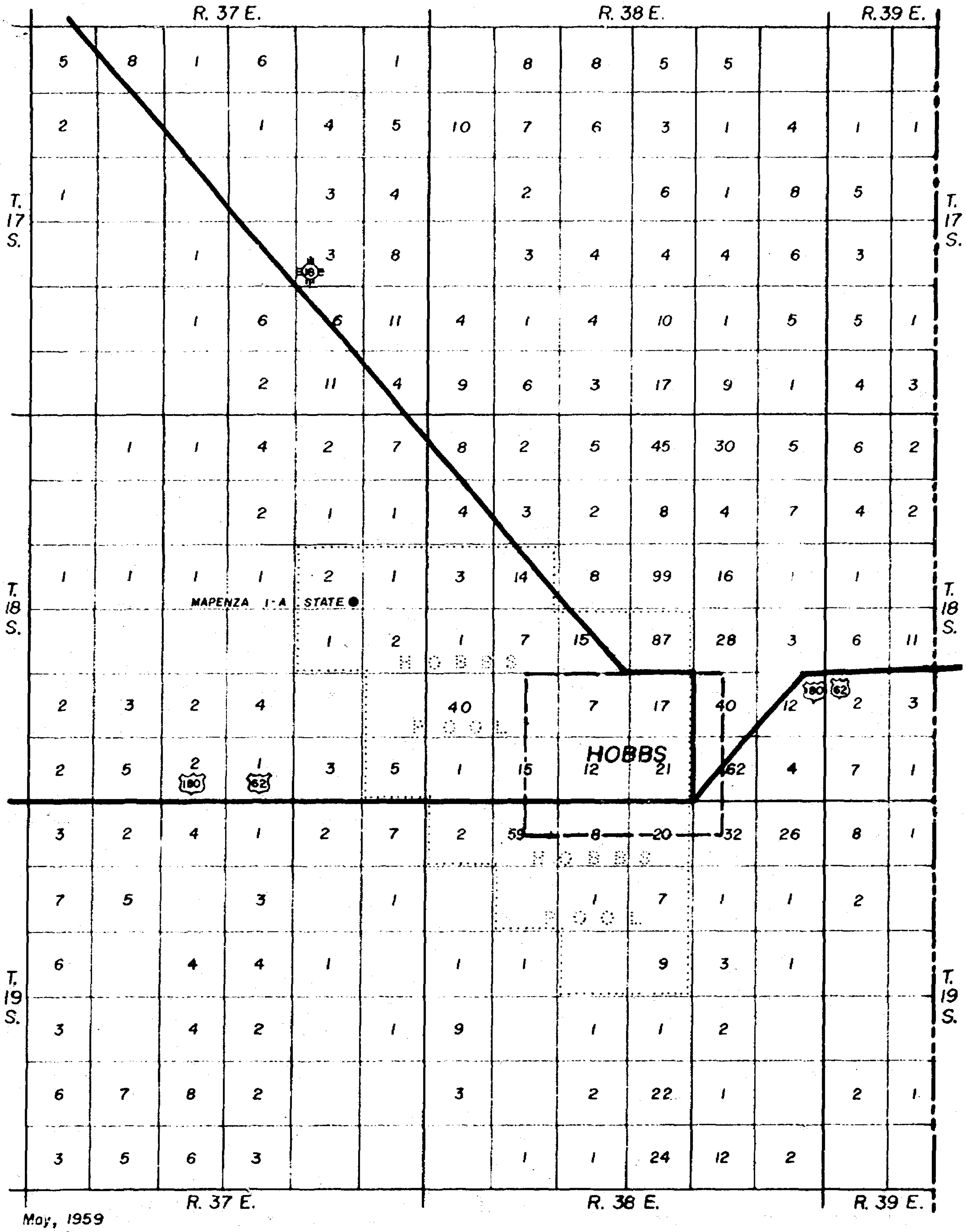
BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
EXHIBIT NO. 4
CASE 1635

Number of Applications to Appropriate Water

in Nine Townships, Lea County, New Mexico

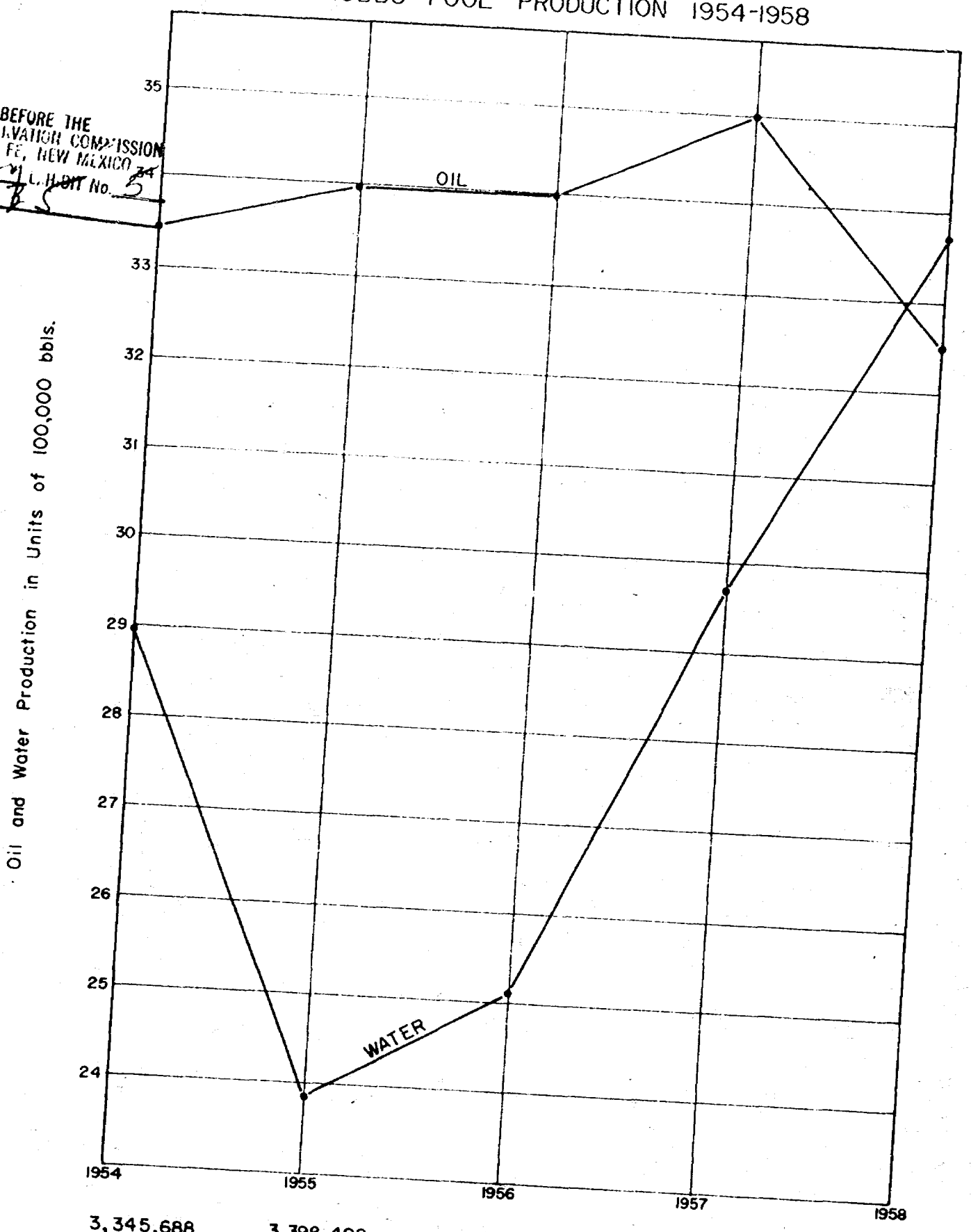
	R. 37 E.	R. 38 E.	R. 39 E.
T. 17 S.	91	165	23
T. 18 S.	58	635	45
T. 19 S.	100	253	14
Subtotal	252	1,053	82
Total	1,387		

May, 1959



Number of Applications to Appropriate Water,
Per Section, in Nine Townships,
Lea County, New Mexico

HOBBS POOL PRODUCTION 1954-1958



	1954	1955	1956	1957	1958
Oil Production	3,345,688	3,398,492	3,400,776	3,505,731	3,252,618
Water Production	2,895 094	2,385,838	2,512,476	2,972,749	3,369,929

Extracted from

OIL AND GAS PRODUCTION
by
Engineering Committee, Interstate Oil Compact Commission
University of Oklahoma Press
1951

p. 45 The Water-drive Reservoir

"The performance of water-drive reservoirs is typified by a slight decline in pressure, very little change in producing gas-oil ratios, and a steady increase in the volume of water produced per well. The first water production comes from those wells near the water-oil contact. As the reservoir is depleted, the water-oil contact moves up structure. Eventually water is produced from all wells in the structure."

Extracted from

PHYSICAL PRINCIPLES OF OIL PRODUCTION
by
Morris Muskat
McGraw-Hill Book Company, Inc.
1949

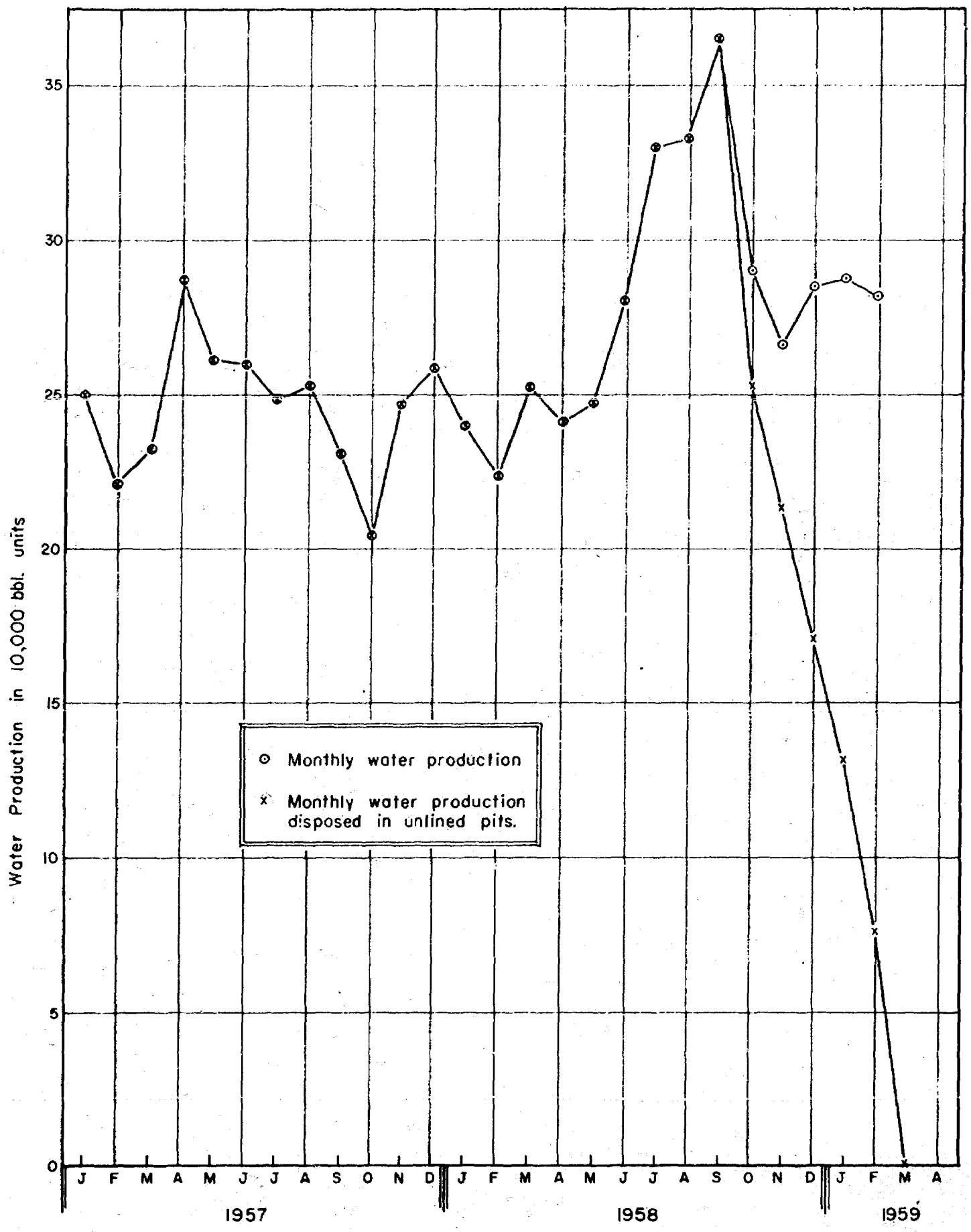
pp. 368-369

"There are commercially productive oil fields that are effectively sealed, throughout their producing life, from contact or interaction with water-bearing strata. However, the majority thus far discovered are bounded by and in fluid intercommunication with water-bearing reservoirs. The existence of such water reservoirs is usually established by the "dry" holes-generally water productive only-delineating the oil-productive area.. . . . Because of the lower compressibility of water its fractional expansion in volume on pressure release will be lower than for the oil. However, when a mobile contiguous water reservoir is present at all, its area will often be very much greater than that of the oil reservoir, so that in spite of its lower compressibility the total expansion volumes may exceed the whole of the original reservoir oil volume. Thus, whereas the great majority of known oil fields have areas less than 10 sq. miles,* water reservoirs extending over 1,000 sq. miles are not at all uncommon. Moreover, while there is little specific evidence on the subject, it may be anticipated that at least in some water reservoirs the decline in pressure may be followed by gas evolution, similar to that in the oil zone, and may thus result in an effective compressibility even larger than that of the bubble-point oil.

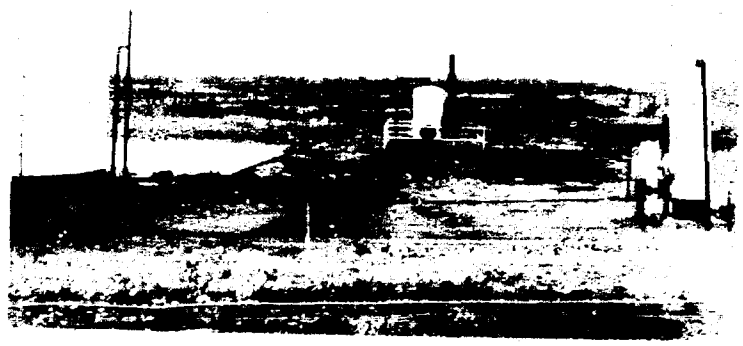
"In addition to the expansion in volume of the fluid content of a water reservoir due to pressure release, an additional source of water that may be available for ultimate entry into the adjacent oil-bearing reservoir is provided by the drainage of surface waters into exposed outcrops of the formation. In general, however, the contribution, if any, due to surface waters is very small as compared with the expansion volume of the original water content and may be neglected, except when otherwise it is known to be of significance."

*In fact a statistical analysis shows that in this county it is only in Pennsylvania and in the Texas Panhandle that a majority of the fields cover surface areas exceeding 1,000 acres.

DISPOSITION OF HOBBS POOL WATER PRODUCTION



Mapenza 1-A State, looking northwest towards evaporation pit



Mapenza battery and separators, looking north towards evaporation pit

Mapenza evaporation pit, located 18.27.14.440, looking northeast

CALCULATIONS OF EVAPORATION FROM MAPENZA 1-A STATE DISPOSAL PIT, HOBBS, NEW MEXICO

A. No oil film on water surface.

Estimated annual evaporation from land pan, Hobbs, New Mexico. Based on 10 year average at Portales, New Mexico, 91.10", multiplied by factor, 1.084, to correct for difference in evaporation rate due to difference in elevation. [a,c]	98.75"
Estimated annual evaporation of brine, Hobbs, New Mexico. [b]	59.25"
Annual average precipitation, Hobbs, New Mexico. Based on 32 year average. [c]	14.99"
Net annual evaporation, Hobbs, New Mexico.	44.26"
	= 3.688'

B. Oil film on water surface.

Estimated annual evaporation from land pan, Hobbs, New Mexico. Based on 10 year average at Portales, New Mexico, 91.10", multiplied by factor, 1.084, to correct for difference in evaporation rate due to difference in elevation. [a,c]	98.75"
Estimated annual evaporation from free water surface, Hobbs, New Mexico. [d]	69.13"
Estimated annual evaporation of oil field brine containing a small amount of oil. Preliminary experiments indicate oil field brine containing a small amount of crude oil evaporates one-third as fast as fresh water.	22.81"
Annual average precipitation, Hobbs, New Mexico. Based on 32 year average. [c]	14.99"
Net annual evaporation, Hobbs, New Mexico.	7.82"
	= 0.65'

Applying these figures to the Mapenza pit dimensions:

A. 80' x 80' x 3.688' = 23,603 cu.ft./yr.
= 4,204 bbls./yr.

B. 80' x 80' x 0.65' = 4,160 cu. ft./yr.
= 741 bbls./yr.

Annual water production Mapenza 1-A State	5,448 bbls.	
Annual evaporation, condition A	4,204 bbls.	
	1,244 bbls.	
Annual water production Mapenza 1-A State	5,448 bbls.	
Annual evaporation, condition B	741 bbls.	
	4,707 bbls.	

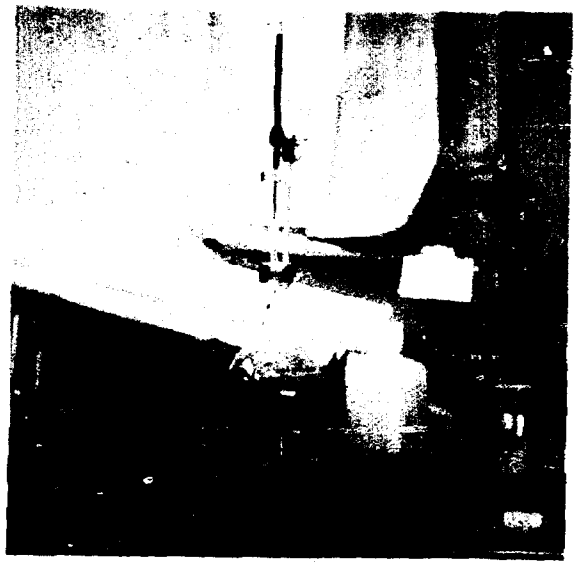
CALCULATIONS OF EVAPORATION FROM MAPENZA 1-A STATE DISPOSAL PIT, HOBBS, NEW MEXICO
(Continued)

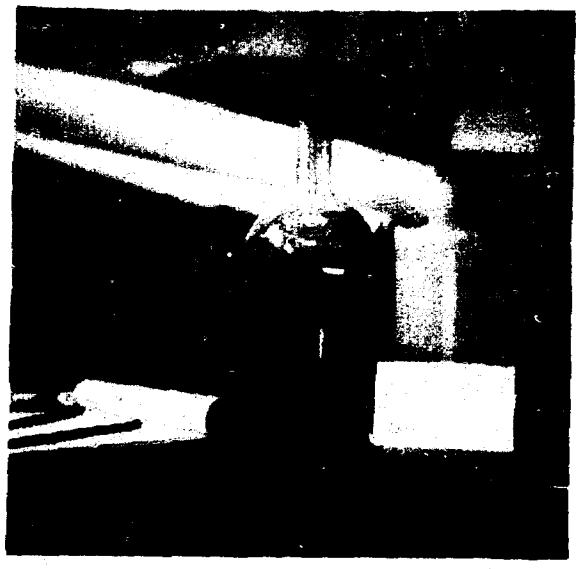
a. New Mexico A W R Coordination Committee, 1953, "Tenative Plans for Development of Land and Water Resources, New Mexico Portion, A W R River Basins", p. 54.

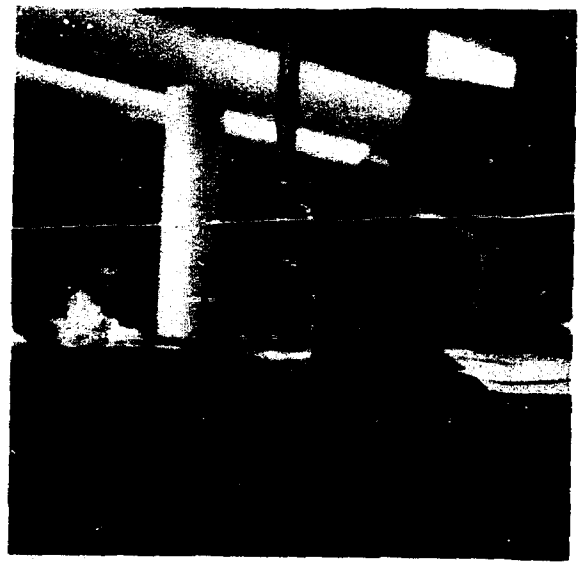
b. Hale, W. E., et al, 1954, "Possible Improvement of Quality of Water of the Pecos River by Diversion of Brine at Malaga Bend, Eddy County, New Mexico", Water Resources Division, U. S. Geol. Survey, p. 39.

c. State Engineer Office, 1956, "Climatological Summary of New Mexico", Tech. Rept. No. 6.

d. State Engineer Office, 1956, "Climatological Summary of New Mexico", Tech. Rept. No. 5.







Pea-gravel and sand ... hours, respectively, after ... of blue barium ...

Introduction of 20 ml ... brine into 200 ml of distilled water

Extract From

GEOLOGY AND GROUND-WATER RESOURCES OF A PART OF SOUTH-CENTRAL KANSAS

WITH SPECIAL REFERENCE TO THE WICHITA MUNICIPAL WATER SUPPLY

By

Charles C. Williams and Stanley W. Lohman

University of Kansas Publications
Bulletin 79
July 1949
pp. 173-183

"Intrusion of Oil-field Brines"

"In the oil fields of the area considerable brine is produced with the crude petroleum, although the relative amounts of oil and salt water produced vary widely in different wells and in wells from different producing formation, and depend in part on the age of the oil field. Typical oil-field brines from this area contain from about 14,000 to about 145,000 parts per million of chloride (Schoewe, 1943, pp. 52-59).

"Schmidt and Devine (1929, p.8) list the following means by which the disposal of oil-field brines may be effected: (1) "evaporation" ponds, (2) evaporation for recovery of dissolved constituents, (3) diversion into surface streams, and (4) return to subsurface formations. In this area, as in most other parts of Kansas, oil-field brines have been disposed of mainly by methods (1) and (4), as method (2) generally is not practicable unless a sufficient quantity of rare salts can be recovered, and method (3) is prohibited by law.

"The disposal pond or so-called "evaporation" pond was the most commonly used means of handling salt water in the oil fields of the area until relatively recently, owing to the comparatively low initial and operating costs (Pl. 30). Such pits commonly have an area of from 500 to 10,000 square feet and a depth of from 1 to 15 feet (Pl. 31). In most parts of the area where such ponds are used, however, most of the brine escapes by seepage into the pervious surficial materials and thence into the ground-water reservoirs or the streams or both. The intrusion of salt water from "evaporation" ponds into ground-water reservoirs has been proven in many places by analyzing samples of water from nearby wells or test holes, and by experiments indicating that the rate of disappearance of the water is several times as great as it should be, based on an approximate average rate of evaporation for Kansas. Thus Wilhelm and Schmidt (1935, p. 18) computed that of the average daily production of 16,000 barrels of brine put into "evaporation" ponds in the Ritz-Canton oil field, in McPherson County, probably only about 1,720 barrels a day were evaporated, leaving about 14,280 barrels of salt water a day that either entered the fresh-water formations or the surface streams. Some of the resulting contamination of ground waters in

the Ritz-Canton area is shown on Plate 29, and has been described in detail by Wilhelm and Schmidt (1935).

"Through the efforts of the Kansas State Board of Health, most ponds are being replaced by safer means of disposal but large quantities of brine already have been allowed to enter bodies of fresh ground water through disposal ponds, by careless spilling of brine on pervious surficial materials (Pl. 31C), from leaky oil-well or disposal-well casings, or from improperly plugged holes. The most satisfactory means of disposal yet devised for inland areas is the return of brines to deep subsurface formations, either through abandoned oil wells, "dry" holes, or wells put down especially for disposal (Jones, 1945).

"INTRUSION OF OIL-FIELD BRINE IN THE BURRTON OIL FIELD. - The Burrton oil field, one of the most productive in the state, occupies a large area in the Arkansas River Valley in eastern Reno County, and extends about 1½ miles into western Harvey County. The field is underlain by beds of sand, gravel, silt, and clay to depth of 100 to more than 250 feet, which in turn rest upon shale of Permian age. The aluvium contains a large supply of ground water that is fresh except near Arkansas River, as described above, and where local salt-water intrusion from oil-field brines has taken place. Salt-water intrusion in this field is a potential hazard to the new well field of the City of Wichita situated 6 miles downstream and for this reason it has been given special attention by the State Board of Health and by the State and Federal Geological Surveys.

"The Burrton oil field was discovered in February 1931 before the widespread development of brine-disposal wells; hence for many years all the oil-field brine produced in this field was run into so-called evaporation ponds. Chloride surveys made by the State Board of Health indicated that salt-water intrusion was taking place, and that farm wells near the ponds yielded water high in chloride. Through the efforts of the State Board of Health the producers were encouraged to return the brine to subsurface formations by mean of disposal wells. According to Ogden S. Jones, Geologist in Charge of the Oil-Field Section of the Division of Sanitation of the State Board of Health, of an average of 44,047 barrels of brine produced daily in 1939, 34.7 percent was handled by deep disposal wells, 27.5 percent by disposal wells of shallow or intermediate depth, and 37.8 percent by brine ponds. Shallow disposal wells into the Wellington salt proved to be unsatisfactory, as the high pressure under which the brine was forced down these wells caused brine to escape to the surface around the casings of nearby wells, and thereafter efforts were made to eliminate the use of shallow disposal wells. According to Mr. Jones, the completion of additional deep disposal wells in this field by late 1944 allowed the return of about 95 percent of the brine through deep disposal wells, about 3 percent through disposal wells of intermediate depth, and only about 2 percent to brine ponds. As soon as possible, it is hoped that all brine can be conducted to deep disposal wells. When this goal is reached, salt-water intrusion in this field should virtually cease, except for occasional leaks in brine lines and disposal wells. During the years in which many evaporation ponds were in use, however, a large quantity of brine found its way into the ground-water reservoir.

"Studies made in the Burrton oil field by the State Board of Health have included periodic sampling of representative ground and surface waters;

[illegible]

[illegible] material containing discontinuous lenses or beds of impervious [illegible] silt, the brine may follow a "stair-step" course from one impervious bed to another, moving gradually downward and laterally.

"The results of surveys at two typical areas in the Burrton oil field that have suffered salt-water intrusion are given in Table 21, and the locations of the test wells are shown in Figures 27 and 28. In both areas tested the ground water moves in a general southwesterly direction (Pl. 1).

"It will be noted that there has been very little dilution of the brine within the distances sampled in survey B (Fig. 28) but considerable dilution has taken place at most of the points tested in survey A (Fig. 27), although the moving brine seems to have followed certain "pipes" or "veins" of more permeable material rather than having diffused uniformly. Thus the movement of brine from disposal pond B in Figure 27 seems to have been more directly toward test well 20, but in a general way toward test wells 20-23.

"The results given in Table 21 indicate that in most of the test wells the maximum concentration of chloride is found just above a relatively impervious stratum--generally one through which it was difficult to drive the well point. In some test wells, however, impervious strata served to separate relatively fresher water above from salty water below as in no. 7 at 37-39 feet, no. 9 at 14-31 feet, no. 13 at 38-40 feet, no. 27 at 19-31 feet, and no. 28 at 19-31 feet. In a few test wells, such as no. 4, the maximum chloride content was found just above an impervious stratum and fresher water was encountered just below this bed, suggesting that the salty water was unable to reach the lower water-bearing bed. In some test wells, such as no. 20, there was a surprisingly sharp separation between layers of fresh and salt waters, but in others, such as nos. 6, 21, 22, and 23, the chloride concentration increased gradually with increase in depth.

"Two of the test wells (4 and 23) put down in survey A were left cased so that further observations could be made; the rest of the test holes put

down in the two surveys were filled, pulled and plugged. The pipe in test well 4 was pulled back from an initial depth of 66.5 feet to 13 feet, but the pipe in test well 23 was left at the original depth of 59 feet. The periodic measurements of water levels and chloride determinations in these test wells through January 9, 1945 are given in Table 22. A rather gradual but noticeable increase in the chloride content took place in test well 23 throughout most of the period of record, but in test well 4 the significant increase did not occur until April 14, 1942 and later. As indicated in Table 22, the chloride content at a depth of 49 feet in test well 4 was 171 parts per million so that doubtless the chloride content at this depth by January 9, 1945 was considerably higher than 2,380 parts per million-- the value for a depth of only 13 feet.

Table 21.--Chloride content at given depths in test wells, in parts per million.

Depth (feet)	Chloride content	Depth (feet)	Chloride content	Depth (feet)	Chloride content
(Survey A)		Test well 5 (Cld.)		Test well 10 (Cld.)	
Test well 1		25-27	80	44-46	653
8-10	74	30-32	123	49-55	664
13-15	90	34-36	213	53-55	945
18-20	74	39-46	(b)	55-	(b)
23-25	69				
28-30	68	Test well 6		Test well 11	
33-35	71	21-23	58	16-18	107
38-40	71	26-28	57	21-23	92
43-45	71	31-33	63	26-28	137
48-50	69	36-38	121	31-33	152
50-52	67	41-43	342	36-38	272
52-	(a)	46-48	626	41-43	516
		50.5-52.5	398	46-48	470
Test well 2		52.5-	(b)	48-	(b)
9-11	108				
14-16	74	Test well 7		Test well 12	
19-21	68	12-14	56	23-25	97
24-26	68	17-19	(a)	28-30	142
29-31	71	22-24	49	33-35	177
30.5-32.5	71	27-29	60	38-40	362
32.5-	(a)	32-34	65	43-45	591
		37-39	(a)	48-50	691
Test well 3		40-42	216	50-52	(b)
11-13	74	42-44	416		
16-18	69	44-46	(b)	Test well 13	
21-23	68			28-30	152
26-28	69	Test well 8		33-35	182
31-33	72	15-17	136	38-40	446
36-38	97	20-22	156	40-42	501
41-43	115	25-27	101	42-	(b)
46-48	105	30-32	180		
48-	(a)	35-37	272	Test well 14	
		40-42	476	12-14	51
Test well 4		45-47	523	17-19	62
15-17	54	47-49	(b)	22-24	93
20-22	55			27-29	130
25-27	59	Test well 9		32-34	232
30-32	66	9-11	107	37-39	441
35-37	160	14-31	(a)	40.6-42.6	486
40-42	128	34-36 (c)	252	42.6-	(b)
42-44	136	36-38 (c)	307		
47-49	171			Test well 15	
52-62	(a)	Test well 10		11-13	70
62-64	55	9-11	382	14-16	31
64.5-66.5	53	14-16	63	19-21	(a)
		19-21	72	24-26	63
Test well 5		24-26	130	29-31	79
10-12	41	29-31	173	34-36	118
15-17	40	34-36	302	39-61	(a)
20-22	69	39-41	481	61-63	53

Table 21.---Chloride content at given depths in test wells, in parts per million--Continued

Depth (feet)	Chloride content
Test well 15 (Cld.)	
65-67	55
67-	(d)
Test well 16	
28-30	116
33-35	247
37.5-39.5 (c)	377
Test well 17	
24-26	84
29-31	86
34-36	255
39-41	272
44-46	142
48-50	216
50-51	(b)
Test well 18	
28-30	70
33-35	81
38-40	(a)
40-42	323
43-45	252
46-48	107
48-49	(b)
Test well 19	
20-22	71
25-27	71
30-32	83
35-37	97
40-42	91
42-44	85
44-	(d)
Test well 20	
28-30	69
33-35	69
38-40	71
43-45	70
47-49	2,240
49-50	(b)
Test well 21	
22-24	72
27-29	70
32-34	69
37-39	68
42-44	67
47-49	571
52-54	1,870
54-56	1,720
55.5-57.5	1,620
57.5-	(b)
Test well 22	
26-28	68
31-33	69
36-38	109
41-43	235
46-48	820
51-53	1,280
52-54	1,170
(Survey B)	
Test well 23	
18-20	77
23-25	75
28-30	69
33-35	84
38-40	203
43-45	342
48-50	701
50-52	741
53-55	1,430
56-58	1,690
57-59	(b)
Test well 24	
14-16	1,790
19-21	6,530
24-26	7,800
29-31	18,900
31-33	25,000
33-34	(b)
Test well 25	
24-26	21,500
29-31	43,400
34-36	41,500
36-38	49,000
38-39	(b)
Test well 26	
22-24	42,800
27-29	41,500
29-31	47,100
31-60	(b)
Test well 26 (Cld.)	
60-	(d)
Test well 27	
14-16	1,800
19-21	(a)
23-25	24,800
28-30	43,200
30-33	(b)
Test well 28	
14-16	630
19-31	(a)
33-35	17,900
38-40	42,200
40-42	(b)
Test well 29	
24-26	2,550
29-31	25,000
34-36	44,600
39-41	46,500
41-42	(b)
Test well 30	
26-28	28,400
31-33	46,500
35-37	47,100
37-38	(b)
Test well 31	
12-14	267
17-19	1,530
22-24	7,800
27-29	32,000
32-34	40,900
Test well 32	
32-34	14,200
37-39	39,500
39-40	(b)
Test well 33	
23-25	1,900
28-30	6,800
33-35	39,000
38-40	50,300
41-43	50,900
43-44	(b)

Table 21.--Chloride content at given depths in test wells, in parts per million --Concluded

Depth (feet)	Chloride content	Depth (feet)	Chloride content	Depth (feet)	Chloride content
Test well 34		Test well 35			
22-24	1,920	19-21	1,100		
27-29	8,500	24-26	7,820		
32-34	37,000	29-31	36,500		
37-39	45,900	34-36	39,600		
39-40	(b)	36-37	(b)		

(a) No water obtained; probably clay or silt.
(b) Drove hard, no water obtained; probably hard clay or silt.
(c) Drove hard, probably hard silty or clayey sand.
(d) Could not drive deeper.

Table 22.-- Water level and chloride content of water in test wells 4 and 23 from 1938 through 1944

DATE	Test well 4 (Depth 13 feet)		Test well 23 (Depth 59 feet)	
	Depth to water level (feet)	Chloride content (parts per million)	Depth to water level (feet)	Chloride content (parts per million)
Nov. 22, 1938	8.89	53	.....	.....
Dec. 23	.....	....	10.83	1,690
July 17, 1939	9.29	69	10.86	1,930
May 14, 1940	9.52	67	11.11	2,680
Dec. 5	10.35	72	11.92	1,770
Apr. 8, 1941	10.03	70	11.65	2,430
July 16	8.36	73	10.06	2,350
Oct. 20	9.25	86	10.90	2,510
Apr. 14, 1942	8.57	550	10.25	2,390
July 13	7.69	890	9.12	3,060
Oct. 7	4.80	1,170	6.59	3,400
Apr. 8, 1943	6.13	1,480	7.79	3,440
July 24	6.04	1,700	7.66	3,520
Oct. 12	8.17	1,870	10.05	3,900
Apr. 5, 1944	7.32	2,380	9.01	3,970
July 11	....	.....	7.27	3,640
Sept. 26	7.00	2,370	8.55	3,880
Jan. 9, 1945	7.57	2,380	5.14	4,070

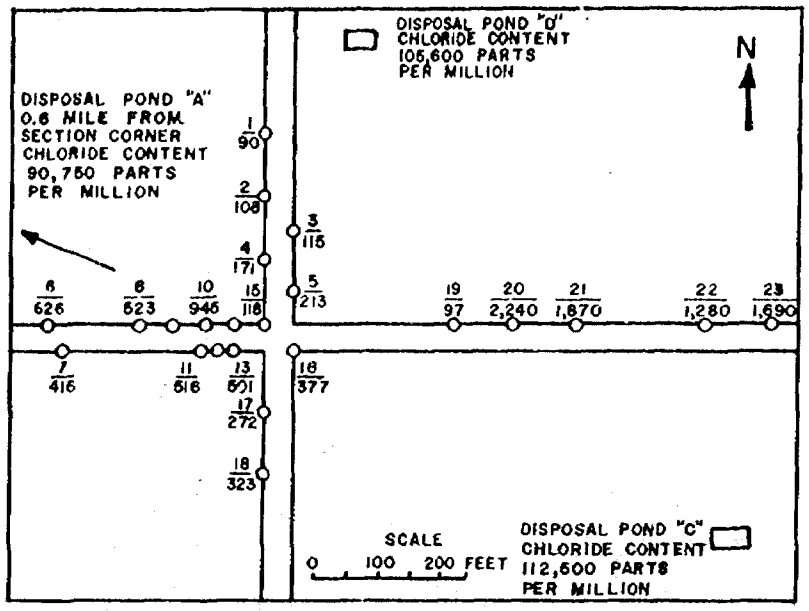


FIG. 27. Map of an area in the Burrton oil field showing location of test wells and brine-disposal ponds in survey A. Upper number corresponds to number of test well in Table 21; lower number is maximum chloride content of water, in parts per million.

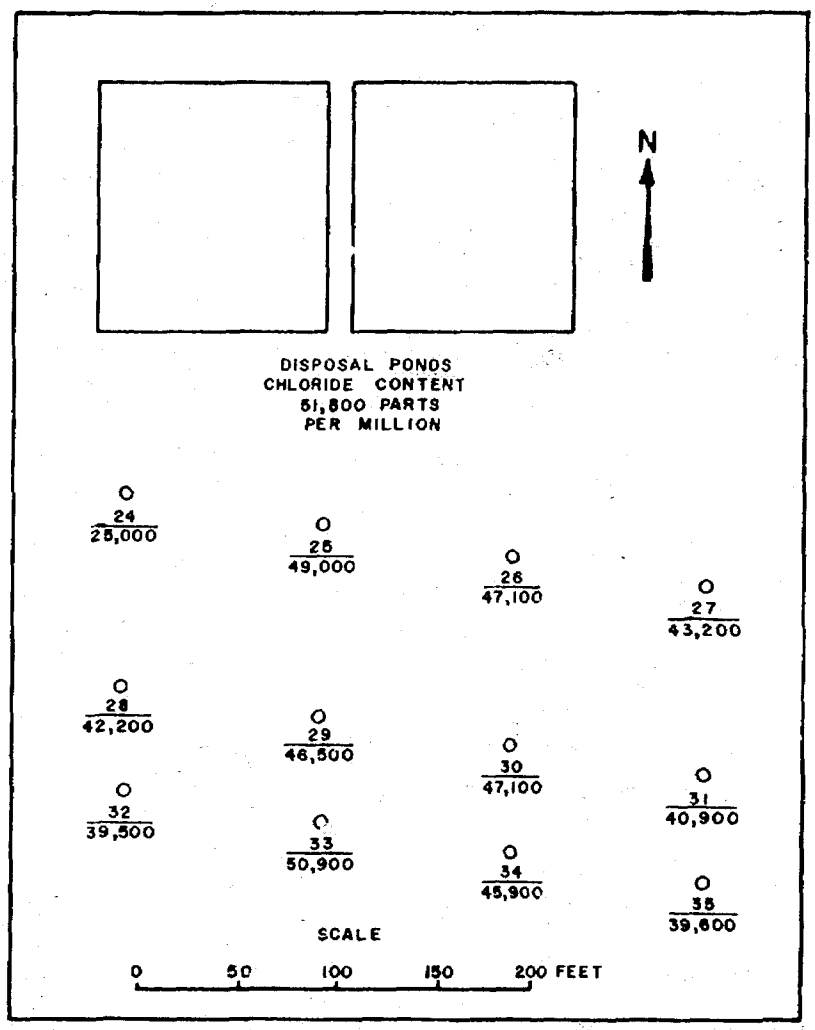


FIG. 28. Map of an area in the Burrton oil field showing location of test wells and brine-disposal ponds in survey B. Upper number corresponds to number of test well in Table 21; lower number is maximum chloride content of water encountered, in parts per million.

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
Stanolind EXHIBIT No. 12
CASE 1035

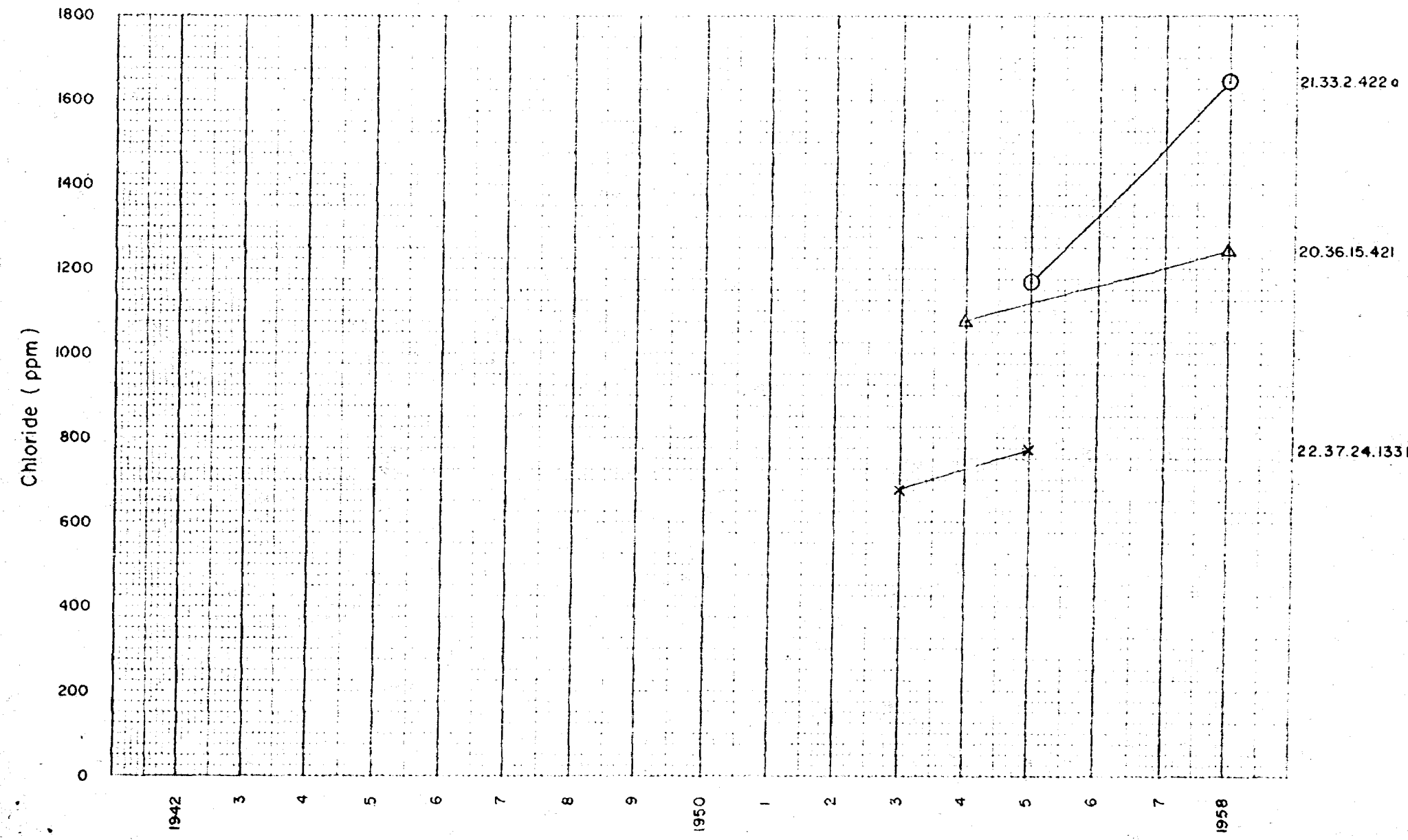
CHLORIDE CONTENT OF WATER FROM SELECTED WELLS

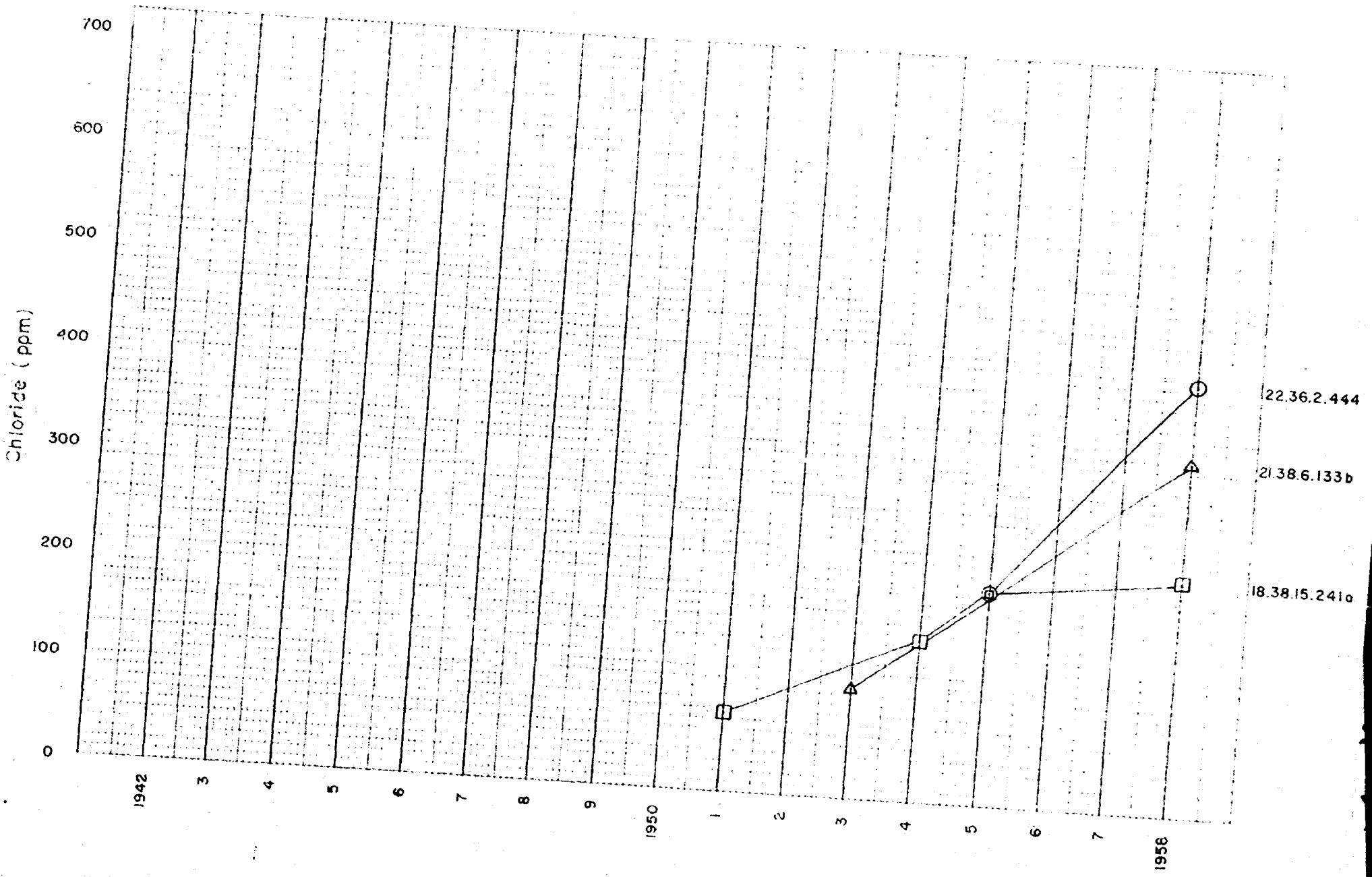
LEA COUNTY, NEW MEXICO

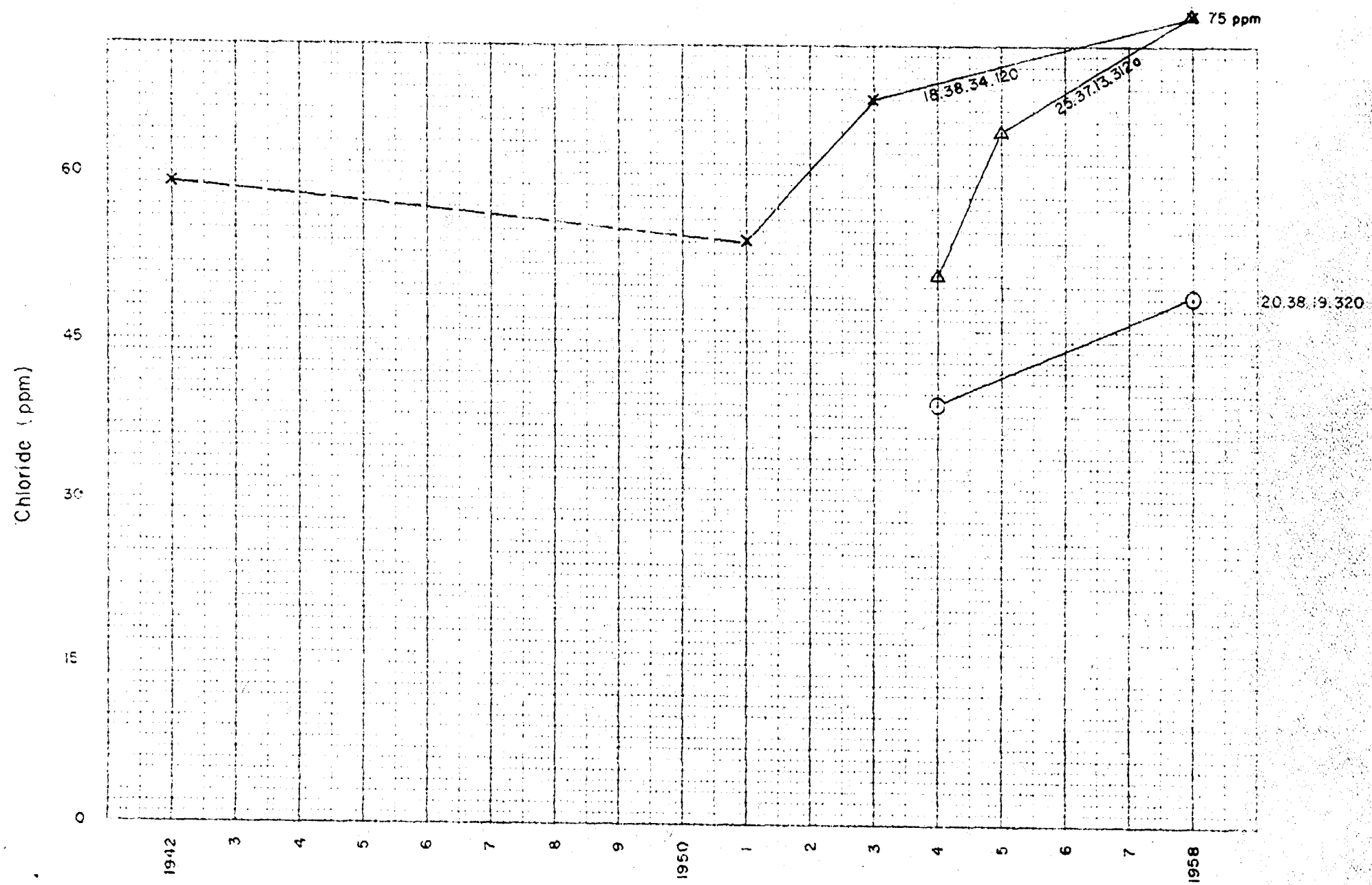
Analyses by Quality of Water Branch, U. S. Geological Survey

WELL LOCATION*	OWNER	CHLORIDE CONCENTRATION (ppm)					
		1942	1951	1953	1954	1955	1958
18.38.15.241a	G. Staley		75		152	206	225
34.120	City of Hobbs	59	54	67			75
20.36.15.421	H. Record				1,080		1,240
38.19.320	Continental Oil				39		49
21.33.2.422a	D. Berry					1,170	1,640
38.6.133b	---			105			340
22.36.2.444	---					205	415
22.37.24.133b	G. Sims			675		770	
25.37.13.312a	City of Jal				51	64	75

* According to U. S. Geol. Survey numbering system for New Mexico; numbers represent Township, Range, Section, and tract within a section.




700
600
500
400
300
200
100
0
Chloride (ppm)
1942
3
4
5
6
7
8
9
1950
1
2
3
4
5
6
7
1958
22.36.2.444
21.38.6.133b
18.38.15.241a



CHLORIDE CONTENT OF WATER FROM SELECTED WELLS

LEA COUNTY, NEW MEXICO

WELL LOCATION*	OWNER	CHLORIDE (ppm)	DATE	REMARKS
12.38.19.230	R. Houston	1,470	1957	Anal. by Halliburton potable until 1957
18.38.20.112	W. Jackson	494	1957	Anal. by Shell Oil
30.223	G. Goins	343	1957	do
19.38.4.121	Phillips Pet.	327	1957	do
20.37.4.111	J. Cooper	450	1954	Anal. by U.S.G.S.; rept. potable before 1953.
22.36.1.333	Gulf Oil	1,750	1953	Anal. by U.S.G.S.; rept. potable until 1951.
25.37.15.223	Sun Oil	610	1953	Anal. by U.S.G.S.

* According to U. S. Geol. Survey numbering system for New Mexico; numbers represent Township, Range, Section, and tract within a section.

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

IN THE MATTER OF:

CASE 1635

TRANSCRIPT OF HEARING

May 13, 1959

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
MAY 13, 1959

IN THE MATTER OF:

CASE 1635 Application of Mapenza Oil Company for an exception to the requirements of Order No. R-1224-A. Applicant, in the above-styled cause, seeks an order authorizing an exception to the salt water disposal requirements of Order No. R-1224-A for its State No. 1-A Well, located in the SE/4 SE/4 of Section 14, Township 18 South, Range 37 East, Hobbs Pool, Lea County, New Mexico.

BEFORE:

Mr. Murray Morgan
Gov. John Burroughs
Mr. A. L. Porter

TRANSCRIPT OF PROCEEDINGS

MR. PORTER: We will take up next Case 1635.

MR. PAYNE: Case 1635. Application of Mapenza Oil Company for an exception to the requirements of Order No. R-1224-A.

On behalf of the Commission, I would like to make this statement prior to proceeding with this case. As you can tell from the style, the applicant is asking for an exception to the requirements of the salt water disposal requirements of Order R-1224-A. The basic findings contained in that Order are not an issue in this case. Accordingly, the testimony will be limited to matters deal-

ing with the effect or possible effect of the surface disposal on unlined pits of the salt water produced from the State No. 1-A Well, which is located in the SE/4 SE/4 of Section 14, Township 18 South, Range 37 East, Hobbs Pool, Lea County, New Mexico. The Commission would, therefore, like to caution the interested parties to keep this fact in mind during the presentation of this case.

MR. PORTER: Any questions concerning the statement made by Mr. Payne? Does anyone have any questions concerning the statement just made by Mr. Payne?

At this time I would like to ask for appearances in this case.

MR. ADAMS: My name is John Adams. I represent Mapenza Oil Company in this case. I am a petroleum engineer and consultant from Hobbs, New Mexico.

MR. PAYNE: Mr. Adams, do you intend to represent yourself in this case as an individual?

MR. ADAMS: Myself as an individual as well as others.

MR. PAYNE: Is Mapenza Oil Company incorporated?

MR. ADAMS: It is not. It is a New Mexico partnership.

MR. PAYNE: Are you one of the partners?

MR. ADAMS: I am not one of the partners. I am their agent.

MR. NEWMAN: Kirk Newman of Roswell, New Mexico, representing Pan American Petroleum Corporation.

MR. HARRIS: Charles Harris of Roswell, representing the State Engineer.

MR. PORTER: Anyone else want to make an appearance in this case?

Mr. Adams, do you intend to present testimony yourself?

MR. ADAMS: Yes, I do.

MR. PORTER: Will you stand and be sworn, please?

MR. ADAMS: Mr. Payne, could I make a brief opening statement before being sworn?

MR. PAYNE: Yes.

MR. ADAMS: Actually, my opening statement is only to the extent of informing the Commission and other interested parties as to how I intend to conduct this case. I want to point out the actual ultimate importance of this case in the fact that it is the first request for an exception to Order R-1224-A. Now then, the manner in which I am going to proceed is just as Mr. Payne said. I want to show the Commission that there is no serious hazard in the disposal of these waters produced from the State No. 1-A Well, insofar as contamination to the Ogallala fresh water reservoir. I will attempt to prove this on two basis, or rather I should say on one broad basis, and then with the consideration of actually, after proving that this contamination will not be serious, after the ultimate consequences, if the exception is not granted, the method that I intend to use; that no serious contamination will occur, and that I can project the total number of

barrels of salt water to be disposed of until depletion, and show that this will not contaminate the underground waters. And secondly, that in the event that exception is not granted, and it becomes necessary to allocate funds for the disposal of this water, that this lease immediately becomes economically unsound as far as continuation of operation is concerned. It has reached its economic limit at that point. If it is prematurely abandoned, then waste will certainly occur.

I am ready to be sworn, Mr. Payne.

(Witness sworn)

JOHN ADAMS,

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

DIRECT EXAMINATION

BY MR. PAYNE:

Q Will the witness please state his name and position?

A My name is John Adams. I am a petroleum engineer and consultant from Hobbs, New Mexico, representing Mapenza Oil Company in this case.

Q Mr. Adams, have you previously testified before this Commission as a petroleum engineer?

A Yes, sir, I have.

MR. PAYNE: Are the witness' qualifications acceptable?

MR. PORTER: They are.

Q Please proceed with your presentation of the case, Mr. Adams.

A Thank you. I have handed to the interested parties here a group of exhibits. They are numbered 1, 1-A, 2, 3, 4, 5, and 5-A. As these are explained and discussed, I take it that the Commission will then decide if at that time they will be entered.

I call your attention to Exhibit No. 1, which is a production curve showing the oil and water production from this lease since it first began producing in January of 1953. The solid black line shows the annual crude oil production and the annual water production in thousands of barrels per year. Now then, you'll notice that the dotted line is for water, the solid line for oil, and the last plot is 1958; this in effect gives the production rate until, or the average for the twelve months of 1958. I have projected the amount of oil to be produced to depletion, that is an economic limit, the economic limit which I have fixed at 3 barrels per day, or a thousand and ninety-five barrels per year.

Now, you will notice on this curve that from this point out the oil decreases in amount and that amount is the amount of increase in water production. The definite point to this remark is this: As I said, the well has been producing some six years and has produced to date fifty-six thousand barrels of oil. I estimate an additional twenty thousand, eight hundred barrels of oil will be produced until its abandonment in January, 1967, some seven and a half years from now. This lease can certainly be

considered economically as nothing more than a marginal lease. Some people refer to these things as submarginal or nearmarginal or things to that effect, but a marginal lease to me is one that you have to be very very careful about your expenditures or else you are going to show a loss on it, so the revenue from this lease is small. This actually precludes any expensive measures to increase the production of oil. If an operator is satisfied that he can get this amount of production in the future by continuing with his present methods -- I am speaking actually of this: If the operator were to decide to put a large pumping unit on the lease, larger electric motor for lifting,a larger string of rods, a larger tubing and all the other necessary things that you need to buy to increase the amount of oil and water production from this lease, an expenditure, necessary expenditure, including salvage of your present equipment,would probably run in the range of ten or eleven thousand dollars. By looking at this estimate of expected future recovery, we see that we don't expect to recover twenty thousand barrels of oil to depletion. So I say to you that if I am not going to increase the mechanical means of lifting oil and water on this lease for the next seven and a half years, I'm limited in the amount of water that I am going to produce until the lease is abandoned by pump capacity.

Now then, at the present time the lease is making thirteen barrels of oil along with thirty-three barrels of water. This is forty-six barrels per day of total fluid. In projecting increasing

amounts of water to displace the amount of decrease in oil production, I find that I expect to produce an additional one hundred and thirteen thousand barrels of water. The well has already produced fourteen thousand, six hundred barrels, as shown in Exhibit 1-A, and so that -- I estimate that the total amount of water to be placed in the earthen unlined pit on this lease will be one hundred and twenty-seven thousand six hundred barrels to depletion.

I call your attention to Exhibit 2, but before -- Mr. Porter, I will ask that these Exhibits, Exhibits 1 and 1-A, be placed in the record, if it is acceptable at this time.

MR. PORTER: Mr. Adams, I would suggest that you wait until the end of your testimony and move to make -- to enter the Exhibits at that time.

A All right, sir. That will be satisfactory.

MR. MORGAN: Mr. Adams, so that I will understand what you are saying for sure, -- I wasn't able to keep up with your figures exactly. You say that the life of the well, you think you will produce about twenty thousand barrels of oil?

A Yes, sir, in the remaining life of the well.

MR. MORGAN: In the remaining life?

A Yes, sir.

MR. MORGAN: You can add up these figures on this chart, I mean the total life of the well what --

A Actually, in explanation for that, Mr. Morgan, Exhibit 1-A is a tabulation from which the chart Exhibit 1 was

plotted. It shows in barrels of oil a cumulative figure to March 1 of this year, and then the projection of the balance of 1959, and each year in the total amount of oil per year that plot is placed on this chart.

Q (MR. MORGAN:) That is your figure, up to March of '59, that you have?

A Yes.

Q What is the total oil up to that point?

A Fifty-three thousand, nine hundred barrels has been produced up to March.

Q Give me a figure on water at that similar period.

A Fourteen thousand, six hundred barrels.

Q Fourteen thousand, six hundred barrels?

A Yes.

Q That's up to March, '59?

A Yes, sir.

Q And you would say that you are going to produce twenty thousand more barrels of oil and one hundred two --

A No, sir, from -- now, the oil figure you mentioned is correct. The water figure would be one hundred thirteen thousand barrels.

Q From now on --

A Yes.

Q -- one hundred twenty-seven thousand six hundred would be total --

A Total to depletion placed essentially on the ground. Exhibit 2 shows the maximum possible contamination that is estimated in the Ogallala formation, if all one hundred and twenty-seven thousand barrels of water were placed in 40 acres underneath this lease. In showing the factors that I have used in getting to this maximum contamination, if you will follow on the Exhibit, I will explain them. The recoverable water reserve is calculated as 40 acres times 50 feet of net sand, resulting in two thousand acre feet of sand reservoir at thirty percent porosity, giving six hundred acre feet of recoverable water. Translated to actual barrels underneath the 40 acres, it would be four million, six hundred and fifty-six thousand barrels of recoverable water. This would exclude any production of water to date.

Now, the Hobbs Field water to be produced to depletion has been discussed here, and is listed as one hundred twenty-seven thousand, six hundred barrels. A resultant contamination, if the salt water to be produced is placed in the Ogallala is then calculated to be two hundred and twenty-one parts per million. Now, actually two hundred fifty parts per million chlorides is accepted by all authorities that I know of, both federal and state, as potable water fit for human plant, and animal consumption and for industry. Now, the basic presumption that I have made here is that I do not take the stand that anything happens, but that all of this water is placed in the fresh water reservoir, as far as this Exhibit is concerned. I believe that all of the water will not go

down there, but still the assumption is made that it all will and that this will be resultant contamination. It seems to me if this is potable water, that there is actually no danger in disposing of this salt water on this 40 acres.

Exhibit 3 considers the actual route that this water will have to travel in order to get from the bottom of the pit to the water reservoir. There is at least a thirty foot overburden to the Ogallala, and calculated on a basis of 40 acres having ten percent effective porosity whether or not this porosity be actually in the matrix or this porosity be in fraction or fibers in the overburden, that actually there is a total of one hundred twenty acre feet of space necessary to fill before any water will get to the fresh water zone. Now, if only five acres of this forty acres would be wet, and by that I mean contained this disposed water, then virtually all of the sixteen acre feet or one hundred twenty-seven thousand barrels of water that we intend to dispose of would be contained in the overburden, and none of this contaminant or a very small portion of it here would show to be left to get into the reservoir. If this did actually exist as it is estimated, then we would not ever expect that the formation, the fresh water formation would be contaminated to the point of two hundred and twenty-one parts per million; it would be indeed a figure far less than that.

These first 3, 4 Exhibits that is -- are all the Exhibits that I have to offer regarding my figures on why I believe that the

practice of disposal in the unlined earthen pit on this forty-acre lease would not constitute a serious hazard to the Ogallala fresh water zone.

I would like now to show you the balance of these Exhibits from the standpoint that I believe that I have shown conclusively that no danger exists, but that in the event that I do not find relief in the granting of an exception, we must examine what then is going to happen. Now, if this twenty thousand eight hundred barrels of oil is not recovered to the operator and the other interested parties, then underground waste is going to occur. Now, I said if this oil is not recovered, and by that I mean, that if it is necessary for this operator to make an immediate expenditure of around four thousand dollars to join the walt water disposal unit presently operating in the Hobbs Pool, that in examining his future position so far as the present worth of his future net revenue from this lease is concerned, the operator will find that he would actually be ahead to go ahead and sell his lease to him and get his future money rather than to join this salt water disposal unit.

Now, Exhibit 5 -- for the moment I won't refer to Exhibit 4 -- in Exhibit 5, I have prepared an economic analysis of this present worth of future net revenue. I beg the Commission's indulgence in presenting testimony of a purely dollars and cents nature. I intend to develop this evidence to a point that this is a hazard in the operation that all operators must face, that is,

are we going to make money. If we are not going to make money, then we have to abandon. If we have to abandon, then how much oil are we leaving? If we leave a substantial amount of oil that could be recovered, then we are going to be creating some waste. Now, in examining this Exhibit, I've taken from Exhibits 1 and 1-A the amount of oil to be produced to depletion, valued it at two dollars seventy cents per barrel, which is what the operator gets for his oil on this lease. I have deducted from that 1/8th royalty to the State, a 1/16th overriding royalty, and arrived at a gross revenue to Mapenza Oil Company. I call your attention to the fact, at this point, that if this lease were prematurely abandoned, the State of New Mexico would lose in revenue seven thousand dollars. I point this out especially if this lease is prematurely abandoned for no good cause. When you arrive at Mapenza's gross revenue here, you must deduct the New Mexico production taxes at four point six four percent, Lea County semi-annual production taxes at two percent, Lea County property taxes which was sixty dollars on the lease last year.

In recapping briefly to depletion, the twenty thousand eight hundred barrels will bring in a gross value of fifty-six thousand one hundred and sixty dollars, from which will be deducted seven thousand dollars as royalty, and for the State of New Mexico thirty-five hundred dollars and its overriding royalty; twenty-one hundred dollars, New Mexico production taxes, nine hundred and fourteen dollars to Lea County, semi-annual production taxes, and four

hundred and eighty dollars as Lea County property tax, so that the -- at this point, the sale of the oil has brought in approximately fifty-six thousand dollars, and at this point after payment of royalty overriders and taxes, local taxes, Manpenza has reached forty-two thousand dollars. Out of this Mapenza must lift this oil, the lifting cost is projected, all of these items are standard items. I think that the Commission and the interested parties will approve of the total here. Actually, last year our expenditures were higher than the figure that I have projected. After this figure of seventeen thousand dollars is reached in the seven and one half years for lifting cost, then Mapenza is down to twenty-five thousand dollars from this lease. This is subject to salt water disposal cost and replacement of equipment. I have projected total salt water cost at sixty-six hundred dollars to depletion. This is based on four thousand dollars original hook-up to the unit, plus annual changes billed monthly by the operator of the salt water disposal unit. And I have placed to assessment figures over the years here, which allow for maintenance of equipment by the salt water disposal unit company, as well as additions in the way of capacity to dispose. Replacement of equipment of six thousand dollars comes from the figure that the lease has produced some six and a half years. The tanks that are on the lease are going to wear out; they are indeed in bad shape at the present time. So will the flow tank, the separator, the flow lines become corroded and eventually will have to be replaced.

This figure of six thousand dollars would buy new tanks and a heater treater and would install them. This would, of course, enhance the value of the lease as far as salvage is concerned for a brief time later. Now, the figure it now leaves is thirteen thousand dollars that Mapenza will receive over the seven and a half years, which is subject to Federal income tax. Many people consider that an operator should figure that his net profit is net profit, and then there is a Federal income tax. I am told by a Certified Public Accountant that the United States Government actually recognized Federal income tax as a cost of doing business. I am treating it in that nature here. The figures that I have used are these: They are fifty percent of the net subject to tax times a thirty percent tax bracket. I dare say this is very conservative because I feel sure that some of the owners of the lease are in tax brackets higher than that. We can only consider this lease standing on its own feet, so we cannot project a tax picture on this lease into an overall operation of an interested party.

Now then, we come to the figure that there will be after deduction of Federal income tax. There will be a figure of ten thousand eight hundred seventy-eight dollars, which Mapenza will receive to depletion in dollars as they are received.

Now, to compare the present worth of this future net revenue, we have to discount it at a rate of six percent compounded annually. This is the economic theory which shows that a person with money to invest should be able to actually earn six percent discount

annually compounded, and if he is going to wait for some money to come in, if its present worth is desired to be calculated, he must discount this future revenue. So we now come up to a final figure of the future net revenue to Mapenza, discounted to its present worth. This figure is nine thousand and ninety-nine dollars, and the salvage expected in January of 1967 discounted back to its present worth is fifteen hundred and forty dollars, which brings in a total, which adds to the previous figure, and brings a total of ten thousand six hundred thirty-nine dollars that is the present worth of this lease.

Now, I can sell this lease to many for the value -- for a value of about eight thousand dollars. I have a bona fide offer for seventy-five hundred dollars for the lease as it. Now, if the situation arises that it becomes necessary to join the salt water disposal unit, I recommend to the operator that he abandon the lease. If this abandonment does take place prematurely and for what I consider no reasonable cause, I call your attention to Exhibit 4, now, whereby the actual loss in barrels of crude oil in dollars and cents is tabulated. This shows that twenty-six hundred barrels of this oil actually belong to the State. At two dollars and seventy cents, this is worth seven thousand and twenty dollars. Now, the loss actually is divided in two. The State royalty underneath this lease is distributed to the accounts of the Blind Asylum one half, and the Deaf & Dumb School one half. These are State land supported institutions, and this amounts to

thirty-five hundred dollars each; that if this premature abandonment is caused, that these institutions will be deprived of this money to the extent that the money will have to be raised elsewhere, and then, further, the State of New Mexico in its production taxes will lose twenty-two hundred and eighty dollars for a total loss to the State of New Mexico of some ninety-three hundred dollars.

Now, that is about all I have to say in the way of and to present in the way of evidence and testimony. I wish at a later date, if the Commission please, to make a closing statement, but that is all I have at the present time.

MR. PORTER: You mean at a later hour, I hope, Mr. Adams?

MR. ADAMS: Today, excuse me, Mr. Porter.

MR. PORTER: Any questions of Mr. Adams? Mr. Payne?

. DIRECT EXAMINATION (Continued)

BY MR. PAYNE:

Q Mr. Adams, could you tell me the interval on the perforations of this well?

A This well is completed in the open hole. That is casing set on top of the pay, and the oil and gas enter the production string from the open hole, not through perforations.

Q So you have no possibility of squeezing off, of course?

A No, sir. Actually, the method of completion was that

the well was drilled, shot with nitroglycerin and cleaned out. This would preclude the possibility of a successful workover.

Q Now, referring to your Exhibit No. 1-A, this definitely shows that the oil production is declining and the water production is increasing, --

A Yes, sir.

Q -- is that not correct?

A That is correct.

Q Now, this total loss to the State assumes that there will be no further production from this lease, does it not?

A Yes, that is correct.

Q Now, I believe you stated you had a bona fide offer of some seventy-five hundred dollars?

A Yes, sir.

Q Rather than abandon this lease, isn't it true that you would sell it?

A I would sell the lease, and to what use the buyer made of the lease would be no concern of mine.

Q It would seem a reasonable assumption, would it not, that someone would not give seventy-five hundred dollars for a lease and then abandon it without having any production from that lease?

A Yes, sir. I speak of a salvage figure, Mr. Payne. It comes from the evaluation of the recoverable casing which can be cut and pulled from the well, used in another well at a cost

reduction of running new pipe plus the pulling of the tubing and the rods that are in use, the subsurface pump, the wellhead and the pumping unit, an electric motor, as well as the value derived from the use to the purchaser of two two hundred and fifty barrel tanks, a flow tank, a separator, and a heater, plus the flow line on the lease.

Q Now, assuming that you were unable to sell this lease, and assuming also that you have to spend four thousand dollars to join the salt water disposal system, and assuming further that your figures are correct here on it, on what Mapenza would realize out of this well, I believe that figure, now, this ten thousand six hundred thirty-nine dollar figure, that is assuming you are going to sell it now, isn't it?

A No, the ten thousand six hundred thirty-nine dollar figure actually comes from this supposed situation. If Mapenza would join the salt water disposal unit and produce this well to its economic limit, then the present worth of this future net revenue to depletion is ten thousand six hundred and thirty-nine dollars.

Q All right, sir. Now, assuming that you could not sell this lease, do you feel that it would be an economic venture to spend four thousand dollars in order to get ten thousand, six hundred and thirty-nine?

A Well, sir, in that case, if I spend four thousand, now, to get ten thousand six hundred thirty-nine dollars, this

would be a sixty-six hundred dollar profit on the site, but if I can get seventy-five hundred dollars for the lease tomorrow, it seems to me that that would be the course that I should pursue. Actually, -- one moment, sir. Your assumption actually is invalid insofar -- if I could not sell the lease because I can sell the lease.

Q Doesn't it seem reasonable to assume that whoever purchases the lease would produce oil from it?

A Actually, if my figures are correct, a person paying -- a person in our position can't afford to produce it. I don't see how anyone can pay seventy-five hundred dollars and produce it.

Q They would offer you the seventy-five hundred?

A Yes, for salvage. At least the bona fide offer is from a company that is in the oil field salvage business. I presume that they are going to salvage the well.

Q What I am getting at is this. It seems to me that your figures here, all of them are based on the assumption that there will be no further production from this lease?

A No, sir, on the contrary. Actually, this Exhibit 5 is based on the assumption that the operator joins the unit and goes ahead and --

Q Your loss figures is what I am speaking of.

A Yes, the loss figures are based on the assumption that if it is necessary for the operator to spend the four thousand dollars tomorrow and join the unit, and he decides then that

this is not an economic venture in which he wants to engage himself, that he will then sell the well and that it will be salvaged and no more production will come from the lease.

Q Once again, now, assume that you can't sell this lease, would you recommend to the partners that they abandon this lease tomorrow and take whatever is salvageable?

A Yes, sir, I have so recommended to the partners.

Q Even though by joining the disposal unit you could realize some six thousand dollars?

A Mr. Payne, as I pointed out before, this -- if we spent four thousand dollars tomorrow and received ten thousand six hundred and thirty-nine dollars, over a seven and a half year period, we would actually only be getting sixty-six hundred dollars, but if we sold it tomorrow, we would be getting seventy-five hundred dollars.

Q But I am asking you to assume that you can't sell it.

A Well, sir, I don't believe that is a valid assumption because I can sell the lease.

Q Why do you think that someone would offer that much money for it?

A Because it has been offered to me.

Q But do you have any reason to believe that they would buy it and abandon it?

A As I stated before, it is no concern of this operator what the purchaser does with the lease because we have satis-

fied ourselves that on an economic basis we cannot continue, if it is necessary to join the salt water disposal system. I only presume that the operator -- that the prospective purchaser would salvage the lease. This would be the pulling of the pipe, the tubing and so on, the removal of all physical assets from the lease.

Q What is the present salvage value of this lease?

A The present salvage value of this lease is calculated --

Q Is that fifteen hundred and forty dollars?

A No, sir, that's the salvage value of the lease some seven and a half years from now. I have here the actual present salvage value if I can find it. Here it is. I can make these figures available to the Commission if you desire them. The salvage value of the lease in May, 1959 is calculated as follows: A total of ninety-nine hundred and twenty-five dollars less the plugging expense of two thousand dollars, which will be enough money to satisfy the Oil Conservation Commission that this well is plugged properly according to the rules and regulations. This leaves actually a calculated salvage value of seventy-nine hundred and twenty-five dollars. This is the figure that I came up with and I asked for a bid on the lease. When I got a bid of seventy-five hundred dollars, then I figured that this is what the lease is worth as far as the salvage is concerned.

Now, the separate items are broken down. I will read them briefly, not all the dollars and cents; but three thousand feet of 5½ inch casing; thirty-nine feet of 2 inch tubing; thirty-nine feet of

three and a quarter inch socker rod; a pumping unit; an electric motor; two bolted tanks; a separator; a flow tank and heater; and six hundred feet of flow line and connection. These figures, evaluated at their salvage value total the ninety-nine hundred and twenty-five dollars.

Q Refer to your Exhibit No. 2. Where did you get this chloride content figure?

A Just a moment, sir. Mr. Payne, which chloride?

Q The 90?

A The 90? This figure I got from the fact that I have seen an analysis of Hobbs fresh water presented that ranged anywhere from 60 to 120, and I took the middle figure of 90. Actually, on this particular lease, I do not have the information as to what the parts per million chloride are. This is an average figure.

MR. PAYNE: Thank you. That's all for right now.

MR. PORTER: Mr. Adams, I just have one question.

CROSS EXAMINATION

BY MR. PORTER:

Q I believe you testified that the only offer that you have had for the lease came from the firm or an individual who is in the salvage business?

A Yes, sir.

MR. PORTER: Anyone else have a question?

MR. HARRIS: Yes.

MR. PORTER: Mr. Harris.

QUESTIONS BY MR. HARRIS:

Q Mr. Adams, where do you get your thirty percent porosity figure?

A This, again, is an average figure. I am told that core analysis from fresh water shallow zones show average porosities that range from fifteen to up as high as thirty-five percent. I chose to use a middle figure of twenty-five percent.

Q Now, what does porosity mean?

A Porosity means -- actually, is defined as the fluid holding capacity of any formation, and further defined as that percent of the total volume of the formation that will hold fluid.

Q That isn't the specific yield, then, is it?

A No, sir. I assume here that virtually all of the underground water that is held in the Ogallala will be produced because it is shallow; lifting costs are at a minimum because of the shallow depth and the relative permeability in water formations of that percentage porosity is generally quite high, and that recovery -- percentage recovery is virtually a hundred percent.

Q On what do you base that opinion?

A Actually, it's based on nothing more than general knowledge. I made that statement from no reference.

Q And you don't know of your own knowledge, then, what percentage of water there can be recovered?

A No, sir, I do not know. Actually, --

Q On your Exhibit No. 2, Mr. Adams, have you considered

the appropriation of water under this 40-acre lease?

A I didn't understand your question.

Q Have you considered the appropriation of water under these forty acres?

A I don't understand what you mean by appropriation.

Q The taking of water, the mining of water, the recovery of water under the forty acres?

A Actually, Mr. Harris, I have not considered that because it seems to me that what we are to decide today is whether or not I can contaminate the water that is in place on the lease.

Q Mr. Adams, the State Engineer has administered the Lea County underground basin on the basis that there will be water available for appropriation for a period of forty years, and at the end of forty years, the water will be depleted. If that is correct and based upon the assumption of a forty-year depletion, then, during the life of your lease there will be an appreciable lowering or taking water out of place to probably twenty percent for your leases before you have exhausted your oil under your figure of 1967, and that would mean that you would be having an increase in the amount of chlorides because there wouldn't be as much water in place, isn't that correct?

A No, sir, that is not necessarily correct, because when I am disposing of the water, first of all, let us say, into the hundred percent capacity of this forty acres, as you mentioned, it is true that water is being withdrawn, but as it is being with-

drawn, and we have assumed that this contaminant is entering it, then that particular contaminant will also be produced out with the fresh water.

Q Where will that go, that contaminant?

A Well, that contaminant will go wherever this fresh water is produced.

Q It will go back to the surface of the land if it is irrigation?

A That's correct.

Q And if it is recharge it will go right back down?

A That's correct.

Q As a matter of fact, all studies have shown that the more water is used, the more it is contaminated, regardless of how it is used?

A I think that's right.

Q So that you don't get rid of any of the chlorides by pumping fresh water?

A No, you don't get rid of any of the chlorides. Actually, I will agree with you on that. The point that I am making here is that if I contaminate the fresh water reservoir with all the water that I intend to produce, the contaminant that -- this resultant contamination is at a point less than that value which is approved as potable water.

Q If you have half that much water, you will have twice as much contaminant, isn't that correct? You have to assume what

is happening to the fresh water aquifer, don't you, Mr. Adams?

A Oh, yes,you have to assume,most always.

Q And when half of that water is gone, there will be twice as much chlorides. That would be true whether or not you take any -- you put any contaminants in the ground or not. And isn't it true, Mr. Adams, as an engineer, that the -- or do you know that the only source of recharge to the underground basin in Lea County is from precipitation and water on the surface to the ground?

A I am so told that.

Q And that it is -- approximates one-fourth of recharge per year to the atmosphere?

A If that is the case, I agree.

Q And that water has to come from the top of the ground down to the water-bearing sands?

A Yes.

Q Now then, you have talked about the overburden capacity; that is the capacity of the sand above the water table, is that correct?

A Yes, that's correct.

Q As a matter of fact, eventually that water -- any salt above the water table has to eventually get down to the water table whether it takes five years, ten years or fifty years?

A That's correct.

Q So, actually, you cannot consider the overburden at

all, can you, over the long term life of Lea County?

A Oh, I say this, I say this to you. There is a certain amount of void space above this fresh water reservoir, and this must be filled at some time in order that this contaminant reaches the reservoir.

Q If we have any recharge at all, it has to come from the surface to the water table, and it will have to take any chlorides that were in place between the surface of the land and the water table?

A That's correct.

Q So that eventually any chlorides placed above the water table would eventually have to reach the water table?

A Over an extremely long period I assume that is correct.

Q Well, we in New Mexico expect to have people there fifty to sixty years from now, Mr. Adams, and we have to consider what is going to happen then, too, don't we?

A I would like to point this out, too Mr. Harris, there are a number of cities larger than Hobbs that at the present time are consuming water, actually drinking water, that is far in excess of two hundred fifty parts per million.

Q But if in fifteen years from now this becomes five hundred parts per million, and in forty years from now this becomes a thousand parts per million, it is going to be pretty expensive to treat that water, is it not?

A Upon what do you base your assumption that it will be five hundred and one thousand? Have you calculated this amount?

Q In twenty years from the time the basin established the calculations in 1954, half the water in Lea County basin will be depleted. That would mean that the chloride content would be doubled. And in thirty years, it would be four times as much?

A Actually, the City of Roswell consumes water that is virtually four times this amount in parts per million chloride.

Q And that hasn't assumed the return flow from irrigation which will also deposit the chlorides on the surface of the ground?

A No.

Q And that will be appreciable as the chloride content goes up?

A I assume so.

Q On your resultant chloride reservoir of two hundred twenty-one parts per million, has that been added to the 90 parts per million chloride content presently in the water?

A No, sir, that is the result of contamination. 90 was the contamination figure, resulting in two hundred twenty-one. You start out with 90, this is the resultant.

Q And that hasn't any -- figured any lowering at all on the water table itself?

A No, sir, it has not.

Q And another thing. You have assumed that this water

will be -- this chloride will be uniformly distributed through the fresh water aquifer?

A Yes, I have assumed that to this extent; that there are forty acres underneath this lease, and this operator is actually obligated to the State of New Mexico and its citizens that this forty acres not be contaminated above the level of potability. And, so then, I say that we must assume that we are going to place this contaminant in forty acres, that's what we are responsible for.

Q Why did you assume that it would be uniformly distributed through the entire aquifer?

A Actually, I only assumed that it would be distributed under forty acres.

Q Okay, uniformly under the forty acres. Why did you assume it would be uniformly distributed?

A Because that's the way, I believe that that's the way the contaminant will travel in a fresh water reservoir.

Q And on what do you base that belief?

A Well, I base that belief on no more than that general practice. I think it has been exhibited any number of times before regulatory bodies and, indeed, courts of law that this is a logical assumption.

Q You have no knowledge at all that the contaminant will be uniformly distributed?

A No, I have no knowledge of that. The only knowledge

that I have is this: that I am obligated to not contaminate forty acres of reservoir.

Q Then, your entire Exhibit -- if your assumption or premise that the chlorides will be uniformly distributed under the forty acres of your lease, if that assumption is erroneous, then this entire Exhibit is not correct, is that correct?

A I can't agree with your choice of words in making this question. Actually, when I say forty acres, I do not necessarily mean this particular forty acres. I am responsible for this particular forty acres, but where this contaminant goes, if it goes, if it is fifty feet wide and however many miles long that it takes to make forty acres, then this is no obligation of mine whatsoever. I am obligated not to contaminate forty acres of water reservoir legally. I presume that it would be the forty acres that we have a lease on, but where this water goes, I have no control.

Q I might state, Mr. Adams, that I can't disagree with you more. I think you are obligated not to contaminate any water wherever it is.

A Yes, I agree. I am obligated not to contaminate any water beyond the potable limits.

Q Now, if we can get back to this and your assumptions. You have assumed that you are going to have a uniform distribution of chlorides and some water, whether it is that forty acres or some other forty acres?

A Yes.

Q And if it does not, if it isn't uniformly distributed and if that chloride does go towards the corners of depletion caused by pumping, then those wells that receive it will have a higher concentration of chlorides, is that correct?

A Yes, sir, that's correct.

MR. HARRIS: No further questions.

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

QUESTIONS BY MR. NUTTER:

Q Mr. Adams, according to my calculations and according to your Exhibit No. 1 here, you are expected to abandon this well if produced at fifteen hundred barrels of oil per day -- I mean per year, and sixteen thousand barrels of water, is that correct?

A Actually, the economic limit that I have calculated is three barrels of oil per day, which is a thousand and ninety-five barrels of oil per year. But the last point shown on the chart is the year in which the well will produce four barrels a day. In other words, I don't want to produce it that next year when I will receive no profit.

Q However, for the average of last year's production, you have fifteen barrels of oil and sixteen thousand barrels of water?

A Yes, that's correct. Yes.

Q Now, what pool is this well?

A It is in the Hobbs Pool.

Q What is the source of reservoir energy in this Pool? Is it a water drive?

A I believe that is generally considered to be true.

Q Assuming that you abandon the well with an average production rate in that final year of 4.1 barrels of oil per day and 44 barrels of water, is this typical to abandon a well in a water drive pool where the ratio of water to oil is only ten to one?

A Well, actually, it's a matter of pure economics. I can show you the gross revenue lease, the deduction necessary in doing business, and show that it is not possible to produce a three barrel well, that is this well, economically.

Q Less than three barrels per day?

A Yes, sir, that is right.

Q What you mean is, whether this is accurate to assume when you are producing three barrels of oil per day you are only going to be producing forty barrels of oil?

A Well, the point there, Mr. Nutter, is that I am actually limited in the amount of water that I am going to produce by pump capacity. This water will not flow. It must be pumped.

Q Yes, sir, I realize that.

A And the pump capacity at the present time is forty-six barrels per day.

Q And you haven't given any thought to replacing the

pump with a larger size pump?

A Yes, I have given thought to that, and I found that it would cost a great deal of money to increase the size of equipment, probably to the extent of ten or eleven thousand dollars.

Q Are any wells producing in the Hobbs Pool today which produce three barrels of oil per day and forty or fifty barrels of water per day?

A Yes, sir. I had that figure. I don't have it with me. It can be taken immediately off of the latest production report. It seems to me that there are at least two or three wells in the Hobbs Pool that produce less than a hundred barrels per day of oil.

Q Less than a hundred barrels of oil?

A Excuse me, per month, per month.

Q And what is the rate of production of water in those wells?

A I don't know.

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

MR. PORTER: Does anyone else have a question of the witness? Mr. Utz?

QUESTIONS BY MR. UTZ:

Q Mr. Adams, referring to your Exhibit No. 5, the figure at the bottom of the page, "Mapenza Present Worth of Future Net Revenue & Salvage," does that include your cost of disposing of salt water?

A Yes, sir, the entire statement assumes that.

Q What would that figure be without disposing of the salt water?

A That figure would have sixty-six hundred dollars added to it, and it would result in a figure of seventeen thousand two hundred and thirty-nine dollars.

Q Referring to your salvage value, did I understand you to say that the seventy-five hundred dollars, in your opinion, that you have been offered for this lease was salvage value of the lease, the present salvage value of the lease?

A Yes.

Q That would mean the casing, the equipment and so forth?

A Yes, sir.

Q And this fifteen forty salvage value that you figure here, that would be eight years hence?

A Actually, one must entirely revalue the salvage value at the end of the seven and a half years because by that time, actually, the value of the casing to be recovered would be lower, its value would be lower insofar as that could not be re-sold, or used as a fixed sum you would get today. The same would hold true for the tubing, the rods, the pump motors. Now then, in this figure of fifteen hundred and forty dollars, this figure is actually much higher in dollars as such, but it must be discounted back to present worth in that year, to arrive at this

fifteen hundred dollars.

Q In other words, depreciation on the salvage value would be 6,000?

A In today's value, yes.

MR. PORTER: Anyone else have a question? Mr. Adams, I believe you indicated earlier that you would like to formally introduce your Exhibits?

A Yes, sir.

MR. PORTER: Would you like to do so at this time?

A I would like to ask that all of the Exhibits discussed here, which are Nos. 1, 1-A, 2, 3, 4, 5 and 5-A, be introduced.

MR. PAYNE: Were these Exhibits prepared by you or under your direction, Mr. Adams?

A Yes, sir.

MR. PORTER: Is there objection to the admission of these Exhibits? They will be admitted.

(Whereupon,

MR. PORTER: The witness may be excused, and the hearing will recess until one-fifteen.

(Witness excused)

MR. NEWMAN: Kirk Newman of Roswell. I would like to make a statement on behalf of Pan American Petroleum Corporation.

MR. PORTER: Are you not coming back, will you not be here after --

MR. NEWMAN: Yes.

(Recess)

MR. PORTER: Mr. Harris, do you have testimony to offer in this case?

MR. HARRIS: May it please the Commission, in my opinion, the testimony so far does not justify an exception, and I feel that the Commission without further testimony could deny the motion for the exception. However, we do not want to be in a position of making the motion, leaving it to the Commission, because we are willing to furnish information that the State Engineer can to help the Commission formulate the right decision. In that point, I would like to make the State Engineer's position clear, that it is the Engineer's position that this is a problem primarily and under the jurisdiction of the Commission, and the State Engineer merely wants to help in any way that that office is technically qualified to do, furnish any information it can to the Commission, and, therefore, we do have -- Mr. Barton has prepared some Exhibits and is prepared to testify in this case. I wonder if you want me to proceed before Mr. Newman makes his statement.

MR. PORTER: I believe he had a closing statement to make.

MR. HARRIS: I see.

MR. PORTER: Mr. Harris, the Commission would like for you to proceed with your testimony.

MR. HARRIS: Mr. Barton, would you come around?

(Witness sworn)

ROBERT L. BARTON,

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

DIRECT EXAMINATION

BY MR. HARRIS:

Q You are Robert L. Barton, age thirty-six and a resident of Roswell, New Mexico?

A Yes, sir.

Q You are employed by the Technicial Division, State Engineer's office in Roswell, with position as geologist?

A Yes, sir.

Q Mr. Barton, would you tell us what academic degrees you have?

A I graduated in 1950 with a B. S. in geology from the University of New Mexico, and received a Master's degree and M. S. in 1952 from the University of New Mexico.

Q And since that time you have been employed as a geologist with the Texas Company, one year in Louisiana, and as

a geologist with the Carter Oil Company, nine months in Colorado?

A Yes, sir.

Q And since May of 1954 you have been a geologist with the State Engineer's office?

A Yes, sir.

Q Could you tell the Commission some of the projects you've worked on while you have been a geologist with the office of the State Engineer?

A I've been working in, part of my time has been spent in working with the salt water encroachment problem in the Roswell area. Recently, a good deal of it has been spent over in Lea County in cooperative study of the need for brine disposal in some of the pools over there. I've worked in the area around Alamogordo as far as salt water or saline water studies are concerned with Municipal Water Supplies in Santa Rosa and Springer, New Mexico. I think that covers a good deal of my work.

Q In connection with your duties with the office of the State Engineer, have you had an occasion to make a study of the Mapenza Oil Company's application here today?

A Yes, I have.

Q And you have made an investigation and made a study of the salt water disposal from the Mapenza lease in Lea County?

A Yes, sir.

Q Would you go ahead and summarize your work, and you might start out, Mr. Barton, with just a short summary of the

general geology involved and give the Commission any Exhibits that you have prepared in connection therewith?

A I have a number of Exhibits. I'll offer them to the Commission as we progress. I'll try to make this as brief as possible. I realize time is important, and I have it more or less -- my information more or less summarized here, so I will give it to you as quickly as I can.

The Lea County portion of the Southern High Plains, which includes the Hobbs Pool area, is directly underlain by the Ogallala formation. This Ogallala formation is of Tertiary age, that is Miocene Pliocene age, and it is composed of sands, silts, gravels and caliche, and these strata of varying lithology vary greatly in thickness in a lateral extent in Lea County.

The Ogallala varies up to three hundred feet in thickness. It dips generally one or two degrees to the southeast in that area. It -- the Ogallala formation rests upon -- rests unconformably upon a thick section of Triassic rocks which are considered to be relatively impermeable. The errosion surface on that Triassic bed rock surface also dips generally to the southeast.

Q Have you prepared -- have you taken -- you have a geological map of the Southern --

A Yes, I forgot to mention it. I have here a map of the eastern portion of the State of New Mexico, published by the United States Geological Survey in 1958. It shows the area encompassed in the Southern High Plains of New Mexico. This western

border is this irregular line here. Northeast of that line is the Southern High Plains. Hobbs Pool lies in this general area here. This area is completely underlain by the Ogallala formation, too.

Q I think that we will ask that they be admitted at the same time, if it pleases the Commission. Describe the groundwater occurrence in Lea County, that Lea County portion of the Southern High Plains.

A Yes, sir. The main source of groundwater in this area is the Ogallala formation which I have just described. Shallow groundwater occurs throughout this area under water table conditions. The saturated thickness of sediments within the Ogallala formation varies from 25 to 225 feet. The water table which forms, of course, the top of the saturated zone dips to the southeast at approximately 75 feet per mile, which is also the direction of groundwater movement.

Q Do you have a --

A Excuse me. The Ogallala is an isolated groundwater reservoir underlying the Southern High Plains, and I have an Exhibit here which shows a cross section, a northwest southeast cross section, prepared by Mr. Carl Guam of the United States Geological Survey which shows the Ogallala formation to be a completely isolated reservoir, that is, it is terminated on all sides by escarpments, cliffs. I would like --

Q Will you mark that as Exhibit 2, Mr. Barton? What else does your Exhibit No. 2 show?

A I don't know whether you would want me to read from this Exhibit or not, but I can tell you and I will read it, if necessary, that recharge to the Ogallala of the Southern High Plains is by precipitation and other waters which percolate from the land surface downward into the water table. I think I will read the sentence. It reads a little better than mine. It is from Page 3.

> "Recharge to the groundwater reservoir in the Ogallala formation is by infiltration from rainfall, from depression ponds, or from streams."

Precipitation over the Southern High Plains varies somewhat, but in the Hobbs area it is approximately fifteen inches per year. Of that amount, about one quarter to one half an inch per year penetrates to the water table. Qualitywise, the water in the Ogallala formation is very good, although it is somewhat hard. Total dissolved solids.- - Mr. Gaum refers to the quality of water of the Ogallala in the Ogallala formation, and he says that it does not exceed five hundred parts per million total dissolved solids. I have here some, what are thought to be representative samples.

Q Just a minute. Before you go to that Exhibit, your Exhibit 2 is an extract from the study by Carl Gaum?

A Gaum.

Q Gaum, yes, sir. And it is on file with the United States Geological Survey and with the office of the State Engineer?

A Yes, sir.

Q And it is a part of the official record of the office of the State Engineer's?

A Yes. Not in Roswell but in Santa Fe; they have a copy of it.

Q And this is a general description of the ground water conditions in Lea County?

A It's a description of the ground water conditions in the Southern High Plains of New Mexico and Texas, of which Lea County is, of course a part.

Q Now then you were going to refer to another Exhibit?

A Yes, I was going to refer to Exhibit No. 3 in which five chemical analyses of water from Tertiary deposits in Lea County,New Mexico are tabulated.

Q What does this Exhibit show?

A This analysis bears out Mr. Gaum's statement, in effect, in that for these five wells total dissolved solids only in one case are above five hundred parts per million. In the other cases they are in the four hundreds.

Chlorides, you will note, are low. In one well, which was located in 12 South, 36 East, it was 81 parts per million. In the rest of the wells the range was from 34 to 54 parts per million, and these wells are located in the southern part of Lea County. I think it is interesting to note that these analyses -- the water from which these analyses were made, were collected in -- by the United States Geological Survey in 1930, prior to any extensive development of irrigation water, and soon after the Hobbs Pool was discovered. In other words, I believe these analyses represent,

you might say, Ogallala water under virgin conditions before it had been disturbed in any way.

Q Would you say that the water generally would be harder or softer, would have more or less solids now than it did in 1930?

A It would depend on where you are talking about. The Ogallala water that these tabulations represent is presently being used for domestic, municipal, irrigation and industrial and stock watering purposes. And I have prepared an Exhibit to show the extent of its utilization in the Hobbs area.

Q Would you mark that please.

(Whereupon, State Engineer's Exhibit No. 4 was marked for identification.)

A The name of this tabulation is the Number of Applications to Appropriate Water in Nine Townships, Lea County, New Mexico. And the tabulation, the first page of it shows the number of wells located within these nine townships in Lea County, New Mexico. In other words, in 17 South, 37 East, there are 94 applications to appropriate water. In 17, 38 there are 165, and so on. The total number of applications to appropriate water in these nine townships is 1387.

Q You don't know whether or not that represents 1387 wells, do you?

A As a matter of actual fact, it probably doesn't because this tabulation is current until May, '59, and recent appli-

cations, those numbered in the Lea County file up to 4000, were, for instance, just filed maybe two weeks ago, and it takes some time for the applications to be fulfilled. In other words, for the person to contact the well driller, drill the well, file proof of completion of work. But I would estimate that at least eighty percent of this figure represents wells which are currently in existence and being used.

Q And do any of those applications -- could any of those applications represent more than one well in case of supplemental wells?

A Yes, they could.

Q So some of those would have more than one well?

A That's true.

Q Now then, on the second page there, you have --

A On the second page I have these applications to appropriate water broken down according to number per section within these nine townships.

Q And do you have the location of the Mapenza Lease located on the Township map?

A Yes, sir, I have it located here in the southwest, or southeast, southeast of Section 14, 18, 37 East; 18 South, 37 East. I also have the outline of the Hobbs Pool as it is carried in the New Mexico Oil and Gas Engineering Committee and also their description of the location of the field.

Q You have located that by dotted lines around the

words "Hobbs Pool," in dotted lines?

A Yes, sir. The area enclosed by those dotted lines is the Hobbs Pool.

Q And you have also located the City of Hobbs in that Township map?

A Yes, sir.

Q Showing the relation between the Hobbs Pool and the City of Hobbs, and the Mapenza Lease?

A As you can see, there is quite a concentration of wells north of Hobbs, and, well, in that whole Township containing Hobbs, 18, 18 South, 38 East.

Q Is it correct to say there are 635 wells in that Township?

A Yes, sir, there are 635 applications to appropriate water in that Township.

Q That's approved permits, is it not?

A Yes, sir.

Q Approved applications?

A Yes, sir.

Q Is there anything else you want to say about Exhibit 4, Mr. Barton?

A I believe that's all, sir.

Q Would you go ahead with your testimony?

A I thought I would give a brief description of the Hobbs Pool as far as I have been able to get the information.

It is located in the southeast portion, and I will refer to that map. It is located in the southeast portion of 18 South, 37 East, southwest portion of 18 South, 38 East, and approximately the northern third of 19 South, 38 East. It was discovered in 1928. It has approximately three hundred, I think three hundred and nine producing wells. It's anticlinal structure, and it has an active water drive reservoir. According to the New Mexico Oil & Gas Geological -- New Mexico Geological Society, Symposium on Oil Fields of Southern New Mexico, the formation water in the Hobbs Pool runs about, I think it was ten thousand; ten thousand, eight hundred parts per million chloride, and twenty-one thousand five hundred and sixty-six total dissolved solids. Oil and water production in the Hobbs Pool I have grafted up for the years 1954 to '58-- through '58.

Q Could we have that Exhibit marked as Exhibit No. 5?

(Whereupon, State Engineer's Exhibit No. 5 was marked for identification.)

A This graph shows oil and water production, with time versus production in the unit, of one hundred thousand barrels. The individual production for the years 1954 through '58 is tabulated at the bottom of the graph. As you can see, water has drastically risen since 1955. The production of oil in barrels on the other hand has maintained itself and dropped off since 1957 until at the present time there is more oil--more water than oil being produced for the Hobbs Pool. This is to be expected in a

water drive reservoir such as the Hobbs Pool, and this -- I cite two extracts by the Engineering Committee of the Interstate Oil Compact Commission and Morris Muskat in his Physical Principles of Oil Production in which it is stated that such is the case, that is over a period of time water production increases in a water drive reservoir in relation to oil.

Q Could we have those marked as Exhibits, please?

(Whereupon, State Engineer's Exhibits Nos.6 and 7 were marked for identification)

A Is it necessary to read these extracts --

Q No, you could summarize what they say.

A I have done that, I believe.

Q This first extract, what Exhibit number is that?

A This is No. 6.

Q Is it a part of the official records of the New Mexico Oil & Gas Commission?

A Yes, sir.

Q Where did you get these extracts?

A These are the Physical Principles of Oil Production part of the State Engineer's library.

Q And also part of the Oil & Gas Commission's official records, is it not?

A I really don't know. I think it is. As a matter of fact, I think it is introduced by Mr. Spigel sometime ago. Water production, the disposal of the water production in the Hobbs Pool

has been grafted by me for the years 1957 through March of 1959. With reference to this graph, which is time versus water production in ten thousand barrel units, it can be seen that monthly water production and the monthly water production disposed of in unlined pits was the same until September of 1958 when --

Q What was the total amount of water at that time --

A The total amount of water at that time was --

Q -- disposed in unlined pits?

A It was three hundred and fifty thousand barrels, or -- yes, three hundred fifty thousand barrels.

Q Water per month?

A Yes, for that month of September.

Q That was September 1958?

A Yes, sir.

Q Go ahead.

A Beginning at that date water was initiated, or that is, they initiated putting oil field water from the Hobbs Pool into deep disposal wells so that the amount of production which was produced in unlined pits, of course, dropped off, and it dropped off rapidly until in March of 1959 all water production from the Hobbs Pool with the exception of the water produced on the Mapenza Lease was being disposed of in deep disposal wells, or was being evaporated in approved lined pits. Either that or the wells produced less than one half barrels of water per day.

Q Where did you get the information to prepare this

graph, Mr. Barton?

A This was prepared from the New Mexico Oil & Gas Engineering Committee Monthly Reports.

MR. HARRIS: I wonder if the Commission would have any questions about the first seven Exhibits?

MR. PAYNE: About whether they are admissible or not?

MR. HARRIS: I think I am going to offer them in evidence.

MR. PORTER: Any cross examination on this?

MR. HARRIS: If the Commission would like to ask any questions on this. I thought I would break it up rather than wait until I have all the Exhibits in. At this point I would like to offer the first seven Exhibits in evidence.

MR. PORTER: Mr. Harris, I believe it is better to go ahead with all the Exhibits you have and then offer them at the close of your testimony.

MR. HARRIS: Very well.

Q (By Mr. Harris) What is the next thing that you have prepared in connection with your investigation of Mapenza Lease?

A I was going to give a brief description of the well and pit site as I found them in April. While I was there, I took some pictures of the area which I have here.

(Whereupon, State Engineer's Exhibit 8 was marked for identification)

Q Would you tell us, what has been marked as Exhibit 8,

what that purports to show?

A The top photo is the Well Mapenza 1-A State looking northwest towards the evaporation pit. which doesn't show up very well, unfortunately. The second picture from the top shows the Mapenza battery and separators, looking north towards the evaporation pit. The bottom picture shows the Mapenza evaporation pit located in 18 South, 37 East, Section 14. SE SE corner, viewed to the northeast.

I found the pit to be an earthen pit, unlined, eighty by eighty feet, containing salt water. I noticed no salt encrustation on the bottom of the pit or on the side. There was an oil scum on the northwest portion of the field. It was pretty windy that day, and it was all pushed over to that corner. Let me see what my field notes have to say here. Would you like to have me read the pertinent part of these field rules?

Q Yes.

A The pit walls were about a foot to two and a half feet above line surface datum, as you can see from this picture, of course, I didn't make enough copies. The pit is divided into two portions. There is a larger square portion in the southwest corner, and there is a larger "L" shaped pond surrounding it. These two are connected by about a four inch pipe, so the water in the two pits is interconnected. I measured the pit dimensions with a steel tape. I believe that's all I have in the way of description on the pit. As far as production to the pit goes, the

New Mexico Oil & Gas Engineering Committee lists no water production from the Mapenza Well, which was drilled in 1953. They list no production for the years of 1954, '55, '56, or '57, but on all of '58 production was listed. And this production figure was, and I will give water first and oil second;for August, 1958 it was 465 barrels of oil, 401 barrels --first figure was for water, 465 barrels of water, 401 barrels of oil. September of '58, 450 water 239 oil. 465 barrels of water in October of 1958 to 409 of oil. For November, 450 to 282. For December, 465 to 350. For January of 1959, 465 barrels of water to 600 of oil. And in February of '59, 420 of water to 332 barrels of oil.

Q Did you make --

A On the basis of this seven month record and extrapolating those figures to a twelve month period, you come up with 454 barrels of water per day, or 5,444 barrels per year being produced by the Mapenza 1-A State.

Q That's assuming that your water production will remain constant or fairly constant?

A That takes that seven month period, averages on for the months, multiplied by twelve and you get the yearly production. However, according to Mr. Adams' letter to the Oil Conservation Commission of March 23rd, 1959, Mapenza Well produces at the rate of 13 barrels of oil and 33 barrels of water. Using that figure, you come up with 2.54 barrels of water per barrel of oil. And if that figure is applied to the 1958 oil production,

you come up with 11,790 barrels of salt water being produced for the year 1958. Surely that -- I believe that well must have produced some water prior to August of 1958. Started out with 465 barrels in August of 1958. There must have been -- must have worked up to that number of barrels per month. It just didn't start in producing oil in August of '58, I don't believe.

Q Have you calculated the amount of evaporation from the Mapenza pit?

A Yes, I have. There are two possibilities as far as evaporation from the Mapenza pit is concerned, and I have prepared an Exhibit to show this.

(Whereupon, State Engineer's Exhibit No. 8 was marked for identification)

Q Referring to what has been marked as Exhibit No. 9, tell us what this Exhibit purports to be.

A This is more or less a balance sheet of Evaporation From the Mapenza 1-A State Disposal Pit, Hobbs, New Mexico. As I said, there are two possibilities for determining evaporation rate on an evaporation pit. One is in the instance where there is no salt, where there is no oil film on the top of the water. The other is where there is an oil film on the top of the water. In case A with no oil film on the water surface, the estimated annual evaporation from the pan -- I will explain these figures here -- the estimated annual evaporation from the pan in Hobbs, New Mexico, based on a ten years' average of Portales, New Mexico, which

was 91.10 inches multiplied by a factor, 1.084 to correct for the difference in evaporation rate due to difference in elevation, is determined to be 98.75 inches.

Q Is that the acceptable method of determining the amount of evaporation, Mr. Burton?

A Yes. You see, there is no evaporation station in Hobbs. Therefore, you have to bring the evaporation rate from the nearest town in the High Plains area that has an evaporation station, and that is at Portales. It is on the High Plains as is Hobbs, so it seemed logical to bring that evaporated reading down from Portales to Hobbs, and when you do that, there is lowering of elevation; therefore, an increase in evaporation, and that factor is represented by 1.084 to represent the difference in elevation; therefore, the difference in evaporation. When you multiply that times the actual precipitation in Portales, you come up with 98.75, which is the extrapolated evaporation rate.

Q The factor there is a generally recognized factor that can be used by --

A Yes, sir. This method was taken from the New Mexico AWR Coordination Company entitled "Tentative Plans for Development of Land and Water Resources, New Mexico Portion, AWR River Basons" on Page 54. It has a diagram showing evaporation rate versus elevation.

Q Go ahead with your explanation of this Exhibit.

A The estimated annual evaporation of brine in Hobbs,

New Mexico by referring to Hale, et al, 1954, the publication entitled "Possible Improvement of Quality of Water of the Pecos River by Diversion of Brine at Malaga Bend, Eddy County, New Mexico, in which they determined that evaporation for brine in a free water surface compared to the evaporation rate for a land pan was point 6. Therefore, multiplying .46 times .9875, I found out that the estimated annual evaporation of brine at Hobbs, New Mexico would be 59.25 inches. The average precipitation at Hobbs, New Mexico based on the 32 years average is 14.99 inches. That information is from the "Climatological Summary of New Mexico" Technical Report No. 6 published by the State Engineer's office. Subtracting 14.99 from 59.25, we found that the net annual evaporation of brine in the Hobbs Pool area New Mexico is 44.26 inches, or 3 feet, or 3.88 feet, without an oil film.

Now, the figures for the site when there is an oil film on the water surface are mentioned in Case B. Evaporation, as I explained before, the 98.75 percent inches, that figure is the same as in Case A. Now, the estimated annual evaporation from a free water surface in Hobbs, New Mexico is 69.13 inches. That information is from Reference D, entitled "Climatological Summary of New Mexico," Technical Report No. 5, in which they established that to convert evaporation rate from a land pan to the evaporation rate for free water surface, you multiply by a factor of .7. That gives us 69.13. Preliminary evaporation rate is determined by studies by the U.S.G.S. ground water branch in Albuquerque, New

Mexico, indicates that brine containing a small amount of crude oil evaporates at approximately one-third the rate of fresh water. And one-third of 69.13 is 22.81 inches or, and subtracting the annual average precipitation in Hobbs, which is 14.99 inches, we get for an evaporation pit with an oil film on it, an evaporation rate of 7.82 inches a year, or 0.65 hundredths of a foot.

Now, applying these figures as I have done here at the bottom, applying these figures to the Mapenza pit dimensions, we come up with -- the pit is 80 feet in size, so it is 80 times 80 in the first case, 3.688 feet per year, or 23,603 cubic feet per year of salt water is evaporated, or 4,204 barrels per year.

In the second case, the evaporation per year with an oil film is 741 barrels per year. Subtrating these figures from Mapenza production rate, you can see that there is a discrepancy of 1,244 barrels to 4,707 barrels of percolation below the pit -- salt water percolation below the pit. And if you use the figures that we derive from Mr. Adams' letter to the Oil Conservation Commission, in which we -- I determined that 11,790 barrels of salt water was being produced per year, or at least in 1958, you would have to conclude that from 7,586 barrels to 11,409 barrels was seeping below the surface beneath Mapenza pit.

Q Regardless of the amount of evaporation that takes place, Mr.Burton, is it true that none of the chlorides or salts are evaporated?

A That's right.

Q In any case, they would remain in the pit --

A Yes, sir.

Q -- and would be part of that that is seeping below the surface?

A Yes. I also wanted to point out that my conclusions -- that there was that amount that I just mentioned of percolation from the pit to the water table and that is strengthened by the fact that I noted no salt precipitate in the pit. That would be the case if evaporation were operative and the salt water was being concentrated by evaporation, there would be a precipitated salt. Secondly, --

Q You noted no precipitated salt?

A I noted none. Secondly, the water in the pit -- I sampled it and ran the chlorides myself, and it varied. It was five thousand parts per million in the "L" pit, I believe, and six thousand parts per million in the -- what I call the "S" pit, the square pit. The "L" shaped pit, it varied from five to six thousand parts per million in the pit, which indicates that there had been no concentration by evaporation either, in that case.

Q So, based upon that, it is your opinion that the water that is going into that pit is going -- is seeping downward with the salt concentrates in it?

A Yes, sir. Thirdly, I could find no evidence of the Mapenza pit overflowing. If this pit were lined, and the only way to rid the pit of fluid was by evaporation, the pit wouldn't be

large to accommodate the water that had been produced. But I could find no evidence of a breakthrough of the walls to indicate that that was the case. Therefore, I concluded also that there was percolation below the bottom of the pit.

Q Now, Mr. Barton, would you tell the Commission what happens to the salt water that is placed in this unlined pit in the Mapenza pit?

A Of course, some evaporates. We have pointed out that there is a certain amount of evaporation. Unfortunately, it is rather small. The remaining portion of the salt water placed in the pit percolates downward. It wets the dry upper portion of the Ogallala, and then enters the water saturated part of the formation where it continues its downward migration to the bottom of the formation. Its movement, then, is mainly governed by the dip or slope of the relatively impermeable underlying Triassic bed rock, which is generally to the south and east. I visualize a rather sinuous path both vertically and horizontally for this migration of salt water. This is due to variations in the lithology of the Ogallala formation. In other words, the movement down of the salt water would be deflected by, for instance, an impervious bed of clay. It would hit the clay, it would no doubt pass along the surface of the clay until it came to the edge of the -- where it ended, it might be two feet, it might be twenty feet, it might be two hundred. It is hard to say, but in any event, it finds -- it continues its downward percolation around that clay lease.

It may be deflected by local zones of cementation within the formation. There are zones which are fairly well cemented within the Ogallala that would serve to deflect the downward migration. Difference in permeability would orient the flow of the salt water. gravel. Channels, for instance, in the Ogallala formation would, of course, allow preferential movement along the gravel bed because it is more permeable, but in any event, it would eventually go down and reach the bottom of the Ogallala formation, and it could go no further because of the impermeable nature of Triassic beds at the base, and then its movement would be governed by the slope of the red beds which is generally to the south and east, and by the movement of ground water.

Q Now, you say that it will reach the bottom of the Ogallala formation. Now, would you explain further what you mean by that, Mr. Barton, and if you have conducted any experiments on the movement of brine water, would you tell the Commission what they are?

A Well, I have performed two separate experiments to illustrate the path of salt water when it is placed in a disposal pit. In the first experiment, I filled a one thousand milliliter flask half full of sand, clean sand, and I saturated that with distilled water, then I filled -- approximately filled the flask with dry sand by means of a Burette and glass tubing. I slowly introduced five milliliters of barium bromide, which is five times as heavy as fresh water. I introduced that five milliliters of

barium bromide at the sand air contact just as if like it were salt water in a pit, just let it in -- seep in real slowly. The first five milliliters of barium bromide took five minutes to percolate to the bottom of the flask where it first appeared in the center of the bottom of the flask as a small blue spot mask. Did I mention that the barium bromide was dyed blue? In five minutes it showed about a quarter size shape in the bottom of the flask. The saturated portion of the sand did not change color, it remained colorless, or the color of the sand. I then introduced another five milliliter of barium bromide, and within ten minutes of the beginning of the experiment you could see plainly a layer of blue barium bromide at the bas -- at the bottom of the flask, and the water above it remained colorless.

Q Now, did you take color photos of your experiment?

A I have color photos here which I took of the experiment. They are not too good. The film was rather old, I found out, but it is still plain.

Q Could we have those photos marked as Exhibit No. 9?

(Whereupon, State Engineer's Exhibit No. 9 was marked for identification.)

A I performed this same experiment, or a very similar experiment with pea gravel. The effect was the same except there was a smaller lapse of time. In this lower left-hand picture, you can see the pea gravel and the sand. Twenty-six hours and four and a half hours respectively after the introduction of the blue barium

bromide, you can see segregated on the bottom of the formation, so to speak. You can't pick out the water level in the sand flask, unfortunately. You can see it in the upper right picture, but you can see it segregated. The barium bromide has segregated itself at the bottom of the formation with the fresh water lying over it, and fresh water, of course, is colorless.

My second experiment: In it I introduced twenty milliliters of concentrate brine solution. I took at home a small glass and put some salt in it, put some water in it, shook it up for about twenty minutes until I could -- until it accepted all the salt that it would. I then filtered off the water and introduced twenty milliliters of concentrate salt solution into two hundred milliliters of distilled water very slowly, and I mean slowly. It took seventy-five minutes for me to introduce that salt water into the distilled water. I let that beaker which contained the salt water and the fresh water sit over the week end. I did perform this experiment on Friday, I believe it was. Let it sit in my office over the week end, and on Monday morning, sixty-two hours later, I drew with a pipette a sample off the top of the water, and a sample off the bottom of the water and analyzed those two samples for chloride content. The top sample tested ninety-two hundredths parts per million chloride, the bottom sample tested eighteen thousand four hundred parts per million chloride. And I conclude from these two experiments that segregation, according to density, has occurred in both of these experiments.

Q What is your conclusion on the case here at bar? What conclusions can you make from these experiments as far as the movement of brine water?

A Well, of course, the purpose of the experiment was to show that the heavier salt water does pass through fresh water relatively undisturbed to find its way to the bottom of whatever formation or container holds the fresh water. It seeks -- being heavier than fresh water, it seeks its own level according to gravity, and that there is not complete diffusion by any manner or means through the formation.

Q In other words, you are saying that the salt water when it reaches the ground water basin in Lea County will not diffuse completely throughout the fresh water aquifer, but will go through the bottom bed rock?

A Yes, sir.

Q Do you have anything else or any other information which would substantiate your conclusions here? In other words, Mr. Barton, do you know of any situation or investigation in actual fields to show that the salt water will go to the bottom of the fresh water aquifer?

A A rather extensive investigation of the Burrton Oil Field area in Kansas near Wichita, with respect to oil field brine intrusion of fresh water supplies was made in 1938 by the State of Kansas and the Federal Geological Survey in cooperation with the State Board of Health and the City of Wichita. If you don't mind,

I would like to read -- I had intended to read a portion of the extract from Bulletin 79 of the University of Kansas publication, which describes this situation, but I can read these important facts out of the contents if you don't mind. The geological framework and the time element also are remarkably parallel to the situation in the Hobbs Pool, and by being parallel, I mean that they were -- both pools were discovered about the same time, Hobbs in 1928, Burrton in 1931. The Hobbs Pool has 18,560 acres within its producing area, I believe, and the Burrton has 11,550. Hobbs has 309 producing wells, and Burrton has 253. It is approximately the same depth to the producing zone, about 4,000 feet. The surface formation below the two fields is, of course, in the Hobbs Pool it is the Ogallala formation; in the Burrton Field it is the McPherson formation. The thicknesses even tie in quite well. The thickness of the McPherson formation under the Burrton Field is 260 feet, approximately, and under the Hobbs Pool it is about 300. The lithology is comparative, that is to say, the Ogallala formation is composed of sand, silts, gravel and caliche. The McPherson formation, according to this bulletin, is composed of sand, silts, gravel, clay and volcanic ash. The movement of ground water is similar. They both move to the southeast. And the method of brine disposal, of course, Hobbs has been changed, but at this time they were both originally water from the formation, formation water was originally produced in unlined pits in the Burrton Pool also.

Q Have you prepared an Exhibit showing the results of

the Kansas experiment?

A Yes, I have. I have here an extract from the Geology and Ground Water Resources of a part of southern central Kansas with special reference to Wichita Municipal Water Supplies by C. C. Williams, and S. W. Lohman, who are both United States Geographic Survey geologists and engineers. I don't know which is which.

Q Is it among geologists and hydrologists -- would such an experiment or investigation that took place in Kansas, would it be relevant to the Hobbs Oil Field?

A Well, I think it would, yes, sir. As I pointed out, the conditions were very similar in both fields.

Q And geologists generally would recognize that this investigation would be relevant to have disposal of salt water brine in the Hobbs Field?

A I think so, yes, sir.

Q Go ahead, Mr. --

A As I said, I don't know whether Mr. -- how Mr. Porter feels about this. I was prepared to read more than you probably want me to read. I will be glad to break it down into sentences, if you would like.

Q Well, the general conclusion from that is, isn't it true that there is generally a larger increase of chlorides the deeper the well?

A They point out in here the -- that chlorides -- there is an increase with depth in chloride -- there is an increase in

chloride with depth and in time both. In other words, a well in an area of a salt water pit, if it was sampled seven years in a row -- I mean this is strictly my own fabrication here of an example, but if, in this area if it were sampled seven years in a row it was found that the chlorides did increase over that seven year period. On the other hand, they augered thirty-five holes in the vicinity of brine disposal pits in this area and they determined in a goodly number of these augered holes that chlorides also increased with depth, chloride concentration. For instance, a test well 12 went from 97 to 142, to 177 to 362, to 591 to 691 parts per million with an increase in depth. There are more interesting examples than that. Here is test Well No. 29. It went from 2550 to 25,000, to 44,000, to 46,000, increasing in depth from 24 feet to 41 feet. Test well 33 went from 1900 to 6,800 to 39,000, to 50,300, to 50,900, showing an increase in depth -- I mean increase in chloride content with depth. They also came to the conclusion that -- I'll read this sentence if it is all right.

> "It was found in general that the brine, being heavier than fresh water, sinks with surprisingly little diffusion or dilution until it encounters an impervious stratum. It then flows laterally in a relatively thin layer on top of this impervious stratum. In material containing discontinuous lenses or beds of impervious clay and silt, the brine may follow a "stair-step" course from one impervious bed to another, moving gradually downward and laterally."

Q Your experiments that you refer to in Exhibit 10 bear this out?

A I think they correlate quite well with this.

Q Do you have other instances of chloride concentration increase with time and depth, Mr. Burton?

A Well, I have some -- I have tabulated some from Lea County, New Mexico.

Q You have prepared those in Exhibit form?

A Yes, I did. Would you like me to explain this tabulation?

Q Yes, explain the tabulation insofar as the Lea County situation is concerned.

A These tabulations here show a chloride concentration in parts per million from selected wells in Lea County, New Mexico. All of the analyses were by the United States Geological Survey ground water branch in Albuquerque, New Mexico. In instances they were also collected by the United States Geological Survey. The 1958 samples were collected by me. I have tabulated here the well location according to the United States Geological Survey number-system for New Mexico, and that numbering system is explained on the back. I have it attached there, I believe. As you can see, the well location in 18 South, 38 East, Section 15, in the NW of the SE of the NE, belonging to, formerly to Glen Staley, increased from 75 parts per million in 1951 to 225 parts per million in 1958. I won't bother to read all these off. They are all tabulated here for your inspection. These chloride increases have been graphed on the accompanying sheets and their location cited there.

I also have another tabulation without any graphs, mainly

because there is only one chemical analysis for these wells, so there is nothing to graph, but they are assumed to be instances of chloride increase.

Q Before you testify from that, let's ask the Reporter to -- is that another Exhibit?

A This should be part of that.

Q Should be attached to it?

A Yes, sir.

MR. PORTER: Part of Exhibit 12?

A Yes, sir. For instance, on this well that's identified as belonging to Mr. R. Houston in 12 South, 38 East, Section 19, SE of the NE, we assume the chloride increase there inasmuch as he said that he has been using that well and water from that well since 1916 when the well was drilled until 1957, when it became too salty for use. He then collected a sample from it and took it to Halliburton for analysis, and he was told that it was a 1470 parts per million. The next three wells were analyzed by Shell Oil Company in their laboratory in Odessa, Texas. These analyses were part of the cooperative ground water study in the Hobbs area performed in 1957, and they were kind enough to offer their services to analyze these waters collected by the cooperative committee. The last three analyses, those of J. Cooper and Gulf Oil and Sun Oil were analyzed by the United States Geological Survey, and the first two were reported as being potable before 1953 and 1951 respectively. The last one analyzed by the United States Geological

Survey, I have no idea of what the chloride content was prior to 1953 when the analysis was made, but it is well above what you would expect the chloride content in Ogallala water to be.

Q Now, do you have any other Exhibits that you have prepared in connection with your investigation and study of the Mapenza brine water disposal, Mr. Burton?

A I have only conclusions and recommendations. I have no more Exhibits.

Q Would you summarize your testimony and show just in plain language -- summarize it and show what the relevancy is to the Mapenza salt water disposal? Would you just summarize your testimony in a few words, Mr. Burton?

A From my personal observation and and experiments and knowledge of field studies of other workers, I am of the opinion that the disposal of oil field water into unlined evaporation pits in the Hobbs area, in fact, in the Southern, Southern High Plains area, constitutes a definite threat to the quality of the shallow ground water resources of the area. I believe that the most satisfactory means of disposing of large quantities of oil field waters is by placing the water in permeable zones well below the fresh water aquifers. And much research and study has been devoted to this method of disposal, and I have here a partial list of pertinent references to the subject which I think would be an addition to my testimony. That is all I have.

Q Now, from the Mapenza pit, let's get down to the cases

there and going back to the previous testimony, there was some mention of what Mr. Adams called overburden, that is, salts that are held between the -- as I understand -- between the surface of the land and the fresh water table. Do you have any comment to make about that? Will it stay above the suspension on the water table?

A I believe it will gradually migrate downward, according to -- by gravitation, it will not stay suspended in the formation. A certain amount of it will be retained on the surface of the sand and gravel and clay as what they call attraction water, water that is attracted to the surface of the sand grains, and it will not move from that, but what will not adhere to the particles will look downward.

Q Normally, in Lea County, you don't get too much recharge to ground water table, do you, Mr. Burton?

A I think I testified that it was. Dr. Tice says -- has determined that approximately one quarter to one half inch per year is added to the ground water reservoir.

Q And is it true that most of that water -- that most recharge comes in years of large rainfall? Ground water?

A Ground water that is added to the water?

Q Table?

A To the water table by natural means, yes.

Q Comes in large numbers of years, like 1941?

A Yes.

Q Tell me, on the salt water that is gradually perco-

lating down and has not reached the water table because there is not enough water for it to saturate the distance between the surface and the ground water, what happens to that when you have a large rainfall or a year with a large rainfall, such as 1941?

A Well, it would, of course, then be carried farther than it had advanced by the large amount of rainfall.

Q And will that act to flush the salt out of the ground above the water table?

A Oh, yes, it would confine itself downward, migration.

Q Is there anything else that you would like to add to the testimony, Mr. Burton?

A I don't believe so.

Q Then, it is true that your general conclusions are that the salt water will go down to the bed rock and it will migrate from the bed rock, is that correct?

A Migrate along the bed rock, you mean, sir?

Q Yes, sir.

A Yes, sir, I think it will migrate eastward and southward as,you might say, as a layer .

Q And it is also your conclusion that the wells that are pumping water, fresh water, as they pump from the bottom of the aquifer, they will get more and more concentration of salt water, is that correct?

A Well, I believe the water table lowers in Lea County,

and people consequently have to lower their pumps so that they will gradually begin to encounter that layer of salt water on the bottom, yes.

Q And when the water table does lower, is it your opinion that you will have continually increased concentration of chlorides in the water that is pumped in Lea County?

A Well, of course, the water wouldn't be concentrated any more as it exists in the formation, but the water that they will pump will be higher in chlorides, yes, the deeper they go in their pump.

MR. HARRIS: I think that concludes our testimony, if it please the Commission.

MR. PORTER: Do you wish to offer any or all of your Exhibits?

MR. HARRIS: We wish to offer all of our Exhibits, 1 through 12, in evidence.

MR. PORTER: Is there objection to the admittance of these Exhibits?

MR. ADAMS: John Adams with Mapenza Oil Company. We were admonished at the beginning of this hearing that there would be testimony taken and evidence offered relative to this particular forty acres. I find that in some of these Exhibits, some of these Exhibits are of a general nature and are very informative. Others are of a specific nature and relate to wells scattered from Tatum to Jal. I wonder if it's the Commission's intention to allow this

particular testimony as being directly applicable to this particular forty acres.

MR. HARRIS: May it please the Commission, in order to advise the Commission, we had to use some general information because there is no information, on lots of cases, no information directly applicable to that exact location. We do feel, and I think that the witness has shown that all of the information has a direct bearing on this particular unlined pit, and every bit of the information and every bit of the testimony reflects directly upon this one pit.

MR. ADAMS: The point I was making, Mr. Harris, was that we were told that the testimony should be restricted to the forty acres.

MR. PORTER: The Commission has decided all of these Exhibits will be admitted as offered for whatever value they may have. They will be studied, and if it is found that any of the information is not relevant, then it will not be considered in any decision that the Commission may make.

Let's take a ten-minute recess.

(Recess)

MR. PORTER: The hearing will come to order, please. It appears now that this hearing has possibilities, at least, of running into tomorrow. I would like to announce that we will hold tomorrow's session in the Auditorium at the Highway Department out on Cerrillos Road, beginning at nine o'clock.

Anyone have any questions of the witness? Mr. Adams?

CROSS EXAMINATION

BY MR. ADAMS:

Q Mr. Burton, there are several questions I have to ask you regarding your testimony. First, I want to compliment you and the entire staff of the State Engineer's office in preparing a very comprehensive case, one that required a great deal of time and effort, and I want to compliment you personally in your handling of testimony. Of course, there is some of it with which I disagree, and that I will question you about. Now then, you testified that the saturated thickness in the Ogallala varied from 25 feet to 225 feet, is that not so?

A That's true.

Q Then, with the Exhibit 2 that I presented before the Commission, the figure used in calculating underground reserves in the Ogallala should certainly be considered conservative, should it not?

A I believe your figure was noted as net sand?

Q Yes.

A Lithology which could contain water, in other words?

Q No, this is net sand from which water will be commercially produced.

A That's what I am getting at. In other words, if you had a section fifty feet thick, and there was ten feet of shale and ten feet of shale, you would subtract the twenty feet of shale

from your fifty feet, and come up with thirty feet of sand, for instance, that would be your net sand?

Q Yes, net sand.

A Well, that may be a conservative -- I would have to examine the logs of wells in that area to determine what the sand percentage would be in that particular area.

Q Yes. But from your investigations generally in the Hobbs area, you would say that fifty feet of effective net producible sand was a conservative figure to use in calculating Ogallala reserves under that forty acres?

A I think so.

Q There is a likelihood that there is actually a great deal more sand that might --

A Like I say, it depends on where you drill your well.

Q But to your direct knowledge, you do not know how much net sand thickness there is underneath that forty acres, but you would say that my figure was certainly conservative if you were called upon to estimate the reserves?

A Yes, I think so.

Q I asked you this question because I was asked where I got the figure in the testimony. I said that I assumed the figure, and here you are agreeing that this assumption --

A I am agreeing that it is a conservative figure.

Q Now then, I used an initial figure of 90 parts per million as the present chloride content of water which can come from

this forty acres. In your opinion, since certain testimony was presented which showed parts per million chlorides less than this, and more than this, would you consider this a conservative figure?

A You are talking about the figure for right at that particular -- in that particular area; would I consider 90 parts per million to be a conservative figure?

Q Yes.

A I think it depends on what -- on a situation -- I mean, like I pointed out in my testimony, I had one well there which was located in 18 South, 38 East, which was sampled in 1930 and it ran, I believe, 38 parts per million. Now, that is what Ogallala, I assume that Ogallala water should be if there had never been any oil field disposal of brine, and I think that's what it would be now if there hadn't been an oil field there. I think there has been that much of an increase.

Q So then it would be reasonable, then, to assume that fresh water from the well dug on this forty acres probably would analyze 90 parts per million?

A I think that would be roughly right, from 72 to 90, 62 to 90 parts.

Q Thank you. Now then, your Exhibit 5 shows the relative oil and water production from the Hobbs Pool from 1954 to 1958. Your conclusion was, of course, properly drawn that the oil production had declined, the water production had increased to a point where it is greater now than the oil production. I wish to

point this out. Do you consider that this Exhibit is applicable in this case to the extent that it applies to this forty acres since I pointed out in my testimony that there was a mechanical limitation on the amount of water that I would produce from this lease to depletion?

A I don't quite follow your question, Mr. Adams, but I just wish to point out that my only reason for my construction of this graph was to show that Hobbs Pool, being a reservoir, was behaving like one. That's my only purpose in it.

Q Well, your purpose here is good, it certainly is valid, but the point that I wish to make here is this. In a case where a well would go with the water drive and move all available fluids that could mechanically be moved, then your point here is that as time goes on that water increases and the oil would decrease, or that is, the water-oil ratio would greatly increase, but if this practice -- mechanical practice is limited and only so many barrels per day can be lifted, then this particular Exhibit, to me, becomes inapplicable in this case.

A I am really not qualified to comment on what you say. I will point out that it roughly correlates with yours, your Exhibit of the same situation.

Q We are agreed as to amounts, but only as to applicability?

A Yes, sir.

Q Now then, we have talked, you have talked, all of us

have, about the fact that the Commission has a rule that practice of disposal in unlined earthen pits should be discontinued. That is the rule, and so everybody has to go to some alternative method of water disposition. The vast majority of the people have joined the Hobbs salt water disposal. Others have lined earthen pits with what has been approved as being impermeable and that the water has no place to go but stay up, it cannot go down. Now then, as a geologist and hydrologist, would you consider that an earthen pit would be properly sealed if crush salt were placed in the bottom of the pit and rolled and then fresh water or oil field water placed in it? And then would this method constitute a method which the State Engineer Department, in your opinion, might approve as to the construction of a pit on a State Lease from which waters could be disposed?

A Mr. Adams, I don't know whether I am qualified to answer this or not. I do know, or let's put it this way, I have heard of instances where farmers constructed reservoirs in that manner, and as far as I know, they were successful; that is to say, they formed a relative -- the construction of a reservoir in that manner did make a relative impermeable barrier to the passage of water. As to the increase in chlorides in the ground water underlying such a reservoir, I don't know -- I don't see how the two could be -- how they could both occur, that is to say, I don't see how the salt could stay there and form a barrier.

Q To your knowledge, have there been any earthen pits

constructed in, let us say, the Hobbs area the general vicinity of this lease, whereby crushed salt has been placed on the bottom of these pits for the express purpose of sealing them in order that water cannot go down?

A I heard that that was the case when I was over in Hobbs taking pictures of your well and pit. I heard from a friend of mine that that was the case. Now, whether it is true or not, I don't know. It was a pretty reliable source; I suspect it was true.

Q Now then would you consider that if there had been such a pit dug and if there had been several hundred thousand pounds of salt placed in this pit and then fresh water run on top of it, and if the pit were filling or had filled, that this would constitute some proof that there actually would have been a sealing effected by this crushed salt if it had previously -- if there had been previous attempts made to just run water into the ground and it went down?

A And you lined it up with the salt and held water?

Q Yes.

A There is only about one conclusion you could come to. Incidently, I believe that this is a fairly successful way of lining a pit. Now, it couldn't stay lined and water move if the salt went into the solution. I don't believe so I have an idea that it probably stays as a layer or is mixed with clay, I believe. It has been a long time since I read about this, but I believe as salt is

mixed in the clay, it causes the clay to fluctuate forming a barrier. I think that's the theory behind it, and I am not certain chloride would be carried downward by water contained in the reservoir.

Q It would be safe, then, to assume logically that if such a pit were to fill, that predominantly oil from the water placed in it was being --

A It would seem that way.

Q Well then, in your position as a geologist for the State Engineering Department, if this operator would ask for the concurrence of the State Engineer in actually lining earthen pits on this pit with crushed salt at a relatively minimum cost, in your opinion, could or would this system be approved?

MR. HARRIS: If it please the Commission, I think that that entire line of testimony, while interesting, is not relevant and the witness has testified that he doesn't know, and certainly I think he couldn't prejudge an application before the -- before this Commission until the application were presented. He isn't qualified to testify what the State Engineer would do even.

MR. ADAMS: If the Commission please, I am getting to a point, if slowly, in that -- in that we are discussing here the percolation of waters downward, and the fact that it is not possible by rules and regulations now to dispose of it in unlined pits. I am asking the opinion of the geologist for the State Engineers as to whether or not what I am just saying might be ap-

plicable here.

MR. PORTER: Mr. Adams, the witness, I believe, gave you his opinion that he didn't know. Now, I realize that as a geologist he couldn't give you an opinion to your last question which might or might not state the views of the State Engineer's office. However, I feel that this line of questioning is a little outside of what should be considered in this case. Actually, it can be determined outside this hearing as to what would be acceptable as a lined pit, what would constitute a lined pit. So your objection is sustained.

Q (By Mr. Adams) Mr. Burton, in your testimony involving evaporation, you will notice in my Exhibits that I am making reference to the ultimate contamination of the reservoir. I neglected evaporation entirely as a beneficial method of reducing the total parts per million chlorides, isn't that true? I did not discuss evaporation at all?

A That's true.

Q I did not?

A You did not belabor that point at all.

Q And do you believe that evaporation would be a factor at all in reducing ultimate parts per million chloride at all?

A Only if evaporation proceeded to do it.

Q And, actually, evaporation here is of no concern essentially?

A Unless it is to line, then it is of great concern.

If you don't take it to dryness, you merely concentrate it and then allowed to seep in.

Q May I ask your purpose in introducing evidence regarding evaporation?

A Well, the purpose in bringing it in -- of course, I brought out that there wasn't very much occurring, for one thing. That's the main point that I wanted to bring out, that it was the larger part of the water that I felt that you produce was going down into the water table.

Q As to your laboratory experiments in the downward movement of the contaminant, do you consider that you can, under laboratory conditions similate very closely what you will find in this overburden on the forty acres within the call of this hearing?

A If you, as you say, want to similate very closely in the laboratory the conditions that are obtained in the field, it would be quite difficult to -- like you say, closely, I just approximated the conditions. I established the water table, I put some dry sand over it, that is just the general situation.

Q Yes.

A I neglected any shale beds, any caliche layers, any sinuous gravel deposits. That's impossible in my office to do that.

Q Well, you did --

A In fact, I messed the office up as it was, doing what I did.

Q You did testify that the downward percolation of the waters to the Ogallala would be in a somewhat sinuous pattern --

A That's correct.

Q -- because of these intervening permeability conditions?

A Yes.

Q If you --

A If those conditions prevail. Now there, no doubt, are conditions in the Ogallala where there is no shale, there is no caliche, there is no relatively impermeable or unpermeable, permeable beds to deflect the downward migration, and in that instance I see it going essentially straight down;where these barriers exist, I see a deflected path.

Q Well then, in your opinion, would there be underneath this forty acres from essentially the grass roots down to the bottom of the Ogallala the seal which you mentioned, the bed rock, in your opinion, on this forty acres, would such a series of beds be reasonably expected, that is, these particular shale breaks, these gravel variations, these geological phenomena which would cause the deflection of this water and its movement laterally as well as vertically?

A Are you asking me if --

Q Yes.

A -- it is likely that they will be present there?

Q Yes.

A Oh, yes, I think so, in some degree, at least.

Q Well then, in allowing waters to percolate downward from the bottom of the pit to the base of the Ogallala, then this spot that you observed in your laboratory test translated to this bed rock on the bottom of the Ogallala could be reasonably assumed to be spread over quite an area in the event it reached the bottom, as you say, sinuously?

A Yes, it would form a layer -- a thin layer on the bottom of the Ogallala on top of Triassic bed.

Q You think the contaminant will be --

A It will spread out and move down-dip according to the ground water movement, and to the dip of the bed rock forming a streamer effect down-dip.

Q Now then, if this is true, you spoke of the depletion of the reservoir in that you would gradually have to deepen your wells, and that the chloride content would probably get higher and higher, and actually right at the bottom this water would probably be contaminated to such an extent it couldn't be used?

A That's the way I conceive it.

Q Now, then, according to an Exhibit that an absolute maximum amount of water that I was going to place on this acreage lease, this figure came up to something like sixteen acre feet or thereabouts, is that not correct?

A I don't have your testimony; I guess I can refer to it.

Q I believe Exhibit 2.

A I will take your word for it. I think that's the right figure.

Q Now then, if these were strewn out evenly over this bed rock, then sixteen acre feet, and spread out evenly, as you say, then there should be an actual ultimate depth of some four-tenths of a foot on the bottom that is contaminated with all of these parts per million chloride, is that not true?

A I don't believe I stated that diffusion didn't occur. As I showed you in that salt water, introduction into the distilled water, there was some diffusion. The top was nine thousand, the bottom was eighteen thousand, but I did point out that with the depth -- in other words, there had been some segregation. The nine thousand part on top showed that there had been some diffusion, so it's a sort of a white to grey to black sort of a situation. There is a transition.

Q Now then, further in your experiments, you were very careful to maintain an undisturbed condition in your experiments; that is, you very slowly contaminated your fresh water, you very slowly poured this dye into the aggregate, or prepared formation. In your opinion, is there any movement of the water in the Ogallala underneath this forty acres?

A Oh, yes.

Q There is?

A Yes.

Q Then, if this contaminant that I would be placing in the Ogallala filtered down through, then, if there was movement both from a regional standpoint, a dip standpoint, plus the withdrawal of waters from the vicinity, then there would be actually some disturbing influence in the formation as the contaminant entered?

A That is true in this respect. Water in the Ogallala does move slowly, and you are right. There would be a deflection of the downward path. If you will want to assume that the Ogallala is just one sand body, the pits here,you establish more or less sort of a column of salt water migration straight down if there is no movement. But since there is movement in the Ogallala, I assume that if we put our water level here, the pits up here, the water goes down straight below the pit, and then when it hits the water table when there is movement,I visualize there will be a bending of the columns, so to speak, to the southeast,a slight bending.

Q You might refer to it as a dispersal?

A The movement is so slow in the Ogallala I don't visualize any turbulent -- turbulence at all. It will be very inconsequential, I think. It would only serve to deflect it, not to mix it. I don't recall, I think it's agreed by Tise and a number of workers who have studied in the Plains that the Ogallala water moves about maybe two feet a day or something like that. It is two or three feet a day, something like that.

Q You presented testimony derived from a field in Kansas,

which you pointed out quite directly was somewhat similar to the Hobbs Pool. This pool was several hundred miles away?

A Oh, yes, it certainly is. That's being lenient.

Q Did it produce waters and oil from a different formation than does the Hobbs Pool?

A As I pointed out in my testimony, the producing formation in the Burrton Field is from the Mississippian Pool. The Hobbs is from the Permian. The age of the aquifer in Oklahoma is the McPherson formation. Here in Hobbs it's the Ogallala. I think that's a matter of previous record.

Q Yes, and you also pointed out then, that actually the waters, the potable waters were closer to the surface than they were in the Hobbs, did you not?

A I don't believe they are.

Q Well, they are, are they not?

A In the Hobbs Pool, in that area, I believe the water is about -- it's about forty feet. The water is forty-five in the Burrton. I believe it depends on where you are. It tends to be rolling more than at Hobbs. I believe it is in the order of twenty-five to thirty feet, the water. So there is a difference, you are very correct there, it's not much.

Q So actually, although I can appreciate a similarity, anyone can?

A That's all I wanted to point out.

Q But numerous factors would not be directly applicable

to those forty acres?

A Inasmuch as the lithology is essentially the same, I think there is every reason to be able to assume that the same conditions would apply in both places regarding brine disposal and migration, and that's the only thing that I wanted to compare.

Q In a very general way?

A I think it is even closer than general. I don't know how you could come much closer in nature.

Q I see. Mr. Barton, have you ever heard of the practice of controlled contamination in ground waters?

A No, sir, I am not acquainted with it. It is an intriguing phrase. I am not acquainted with it at all.

MR. ADAMS: If the Commission please, might I define controlled contamination in order that the geologist here may give me an opinion.

MR. PORTER: What do you hope to develop by pursuing this matter?

MR. ADAMS: My point, Mr. Porter, is actually I have been, with my Exhibits, advocating controlled contamination, and I wanted the geologist's opinion.

MR. PORTER: The Commission has no objection to your asking the witness his opinion on the hypothetical definition.

Q (By Mr. Adams) Mr. Barton, I've actually defined controlled contamination in my contention previously that the Ogallala would not be contaminated sufficiently to make it unpotably

unfit for any use. I have said that my belief is that it will be contaminated, the entire reserves underneath would be contaminated to the point of about 221 parts per million. Now, controlled contamination, this practice is actually the injection of contaminants in fresh water zones. The reason for it is that it is a storage for waters which may later be recovered if contaminated through -- from their original condition and place, but not to the degree that it is unfit for use. Now, in your opinion, would it be possible to actually run a controlled contamination on this lease?

A You mean would it be possible for you?

Q Would it be possible?

A Well, in the first place, you, when you mentioned your two hundred and ten parts per million chloride, you assume complete diffusion of your formation water, --

Q Yes, in some --

A -- which, of course, I don't go along with.

Q Yes, but in some forty acres, whether or not it be three inches thick or whether or not it be two hundred and twenty-five feet thick.

A How would you go about this controlled contamination?

Q Well, actually, by what I am doing right at the time, putting the water in the unlined pit and let it percolate downward into the reservoir. This actually is recharging your water basin.

A It is true, but we don't need the salt water.

Q I know, but you can still use it, you can still use it.

A In high concentrations. I don't know what we will do with it. We can't put it in our land and can't drink it.

Q If this contamination is along this level of less than a foot in the bottom of the reservoir, you're not contaminating much of it. I seriously doubt that you could commercially produce the last foot.

A The last foot of water in that Ogallala formation is going to be very important some day.

Q By this particular time, do you suppose that it is possible that other methods of converting waters would be economically sound to the extent that this would be of no consequence at that time?

MR. HARRIS: May it please the Commission, I don't think that this witness should go into speculation here, and I object to the question on the ground that it asks for a speculation answer by the witness.

MR. ADAMS: I asked him an opinion, Mr. Porter.

MR. MORGAN: We have gone into the stage now of holding a seminar on this. We have laid a lot of basis for mutual understanding, and I think we should stick pretty well to the points pertinent to this case.

MR. ADAMS: All right, Mr. Morgan. That was the last

question I had.

MR. PORTER: Anyone else have a question of the witness?

CROSS EXAMINATION

BY MR. PAYNE:

Q Mr. Barton, when salt water evaporates, does the salt evaporate also, any of it?

A No.

Q The salt all remains in the pit, say?

A Remains in the remaining liquid.

Q Now, in your physical examination of the Mapenza Lease, was there an oil film on the water in the pit?

A As I testified, there was a strong breeze blowing that day, and there was an oil film, yes, in the northwest corner of the square pit and the "L" pit where it had been driven by the wind.

Q You didn't check it later when the wind wasn't blowing?

A It was not only blowing, but it was raining, and I left as quickly as I could, before I got struck.

Q Did you return another day? I want to determine if this oil film or something is generally present in that water.

Q Well, Mr. Payne, it just so happened that I did return on another day,and I will be perfectly frank with you, I didn't notice, I was too busy with other problems at the time. I

didn't look.

Q Well, let's assume that there is no film zone on this pit, or if there is a physical way of eliminating the film. According to the figures on your Exhibit No. 9, I believe, it is -- it looks to me if this pit were increased by about one quarter in size, according to the figures on your Exhibit 9, all the produced salt water from this well would evaporate.

A If you are confining yourself to the figures on this tabulation, that is true. I think I pointed out that I think the amount of salt water produced is higher than shown here.

Q But in any event, by increasing the size of the pit, even assuming the produced salt water is greater, you could produce the size of the pit to the point where all of it would evaporate?

A Yes, you could if you lined it.

Q Well, I was assuming that these figures you have here are what would evaporate now.

A That will evaporate all right, but while evaporation is being -- is going on, of course there is seepage going on at the same time. Just by the token of evaporation doesn't stop water from seeping down. Of course, it is a simultaneous operation unless the pit is lined.

Q The annual evaporation figure is listed here. If the annual production was 4,240 barrels, then how is it seeping down? It should all be evaporating, shouldn't it?

A Well, that might be true, except evaporation is a very

spotty thing. In the winter there is hardly any, in the summer there is lots.

Q Even during the hours of the day?

A That's right.

Q It is not a steady rate?

A That's right. It is very erratic. In fact, people who construct their pits properly, take this into account because they know they are going to have to store a certain amount over the period. When evaporation is practically nill, they are going to have to store it at that time.

Q Now, Mr. Barton, do you have any direct evidence that the disposal of this some fourteen thousand, six hundred barrels of produced salt water in this well up to the present time has increased the chloride content of Ogallala water?

A Any direct evidence?

Q Yes, or are you looking at this thing as a broad --

A I have presented all the evidence I have here, sir.

Q And that is more or less of a general nature, is it not? It is dealing with the Hobbs Pool and the Ogallala formation?

A Inasmuch as there is no water well on that forty acres, I don't know how you would prove it.--

Q Now, that brings me to another point.

A -- on that forty acres.

Q These water wells that you tested, which showed an increase in salt water content, are any of them offset wells to this

oil well, are they on an adjoining forty acres?

A Mapenza is in 18, 37, 14, I believe. The closest wells I have tabulated here are Glen Staley, City of Hobbs, W. Jackson, G. Goins, Phillips Petroleum. None of them are on an adjacent forty acres.

Q Did you take a sample of the salt water that it produced from this well in question?

A No, I didn't, not from the well itself. I took it from the evaporation pit.

Q And what was the result of that analysis?

A I believe I mentioned before that -- and I might as well get this out here so that we will have it right. Is it going to make any difference to you where the sample was taken from? That is, I took one from the square pit and one from the "L" shaped pit. One of them was 5,000 parts per million, and the other one was six, and I don't recall which one went to which.

Q That's all right. That's all I was searching for. Is that lower or higher than the produced salt water generally in the Hobbs Pool?

A According to the figures that I have, and I took them from the New Mexico Geological Society's Symposium, Southeastern New Mexico Oil Field, they say that the formation water from the Hobbs Pool runs 10,800 parts per million chloride.

Q Now, I believe you testified that the downward flow of the salt water will eventually reach the Ogallala formation, is

that right?

A Yes. It will -- it's being, if the pit is constructed in the Ogallala formation.

Q Yes.

A It will eventually reach the water table, is that what you meant to say?

Q It goes down to the bottom?

A Bottom of the Ogallala.

Q Well now, on the same line of questioning that Mr. Adams had in mind there, while some of it is diffused, according to your testimony, the greatest portion does form a layer on the bottom of the aquifer, does it not?

A I think that is true.

Q The water that is extremely high in chloride content?

A I think so.

Q Now, this Ogallala aquifer, what is the estimated life of that, is that forty years, is that --

A I believe Mr. Spigel testified to that. Yes, it was, forty years is what they have considered to be a reasonable life for it.

Q Now, the water wells that are producing, say, from the upper and middle portions of Ogallala formation, would this water still be potable even if the produced salt water from this Mapenza Well were disposed of in unlined surface pits, all of it for the life of the well?

A I would like to hear that again. I missed it some way.

Q If all of the salt water produced from this well during its entire life through 1967, is produced in unlined surface pits, will the water wells in the upper and say the middle portion of the Ogallala formation, will that water be contaminated so as to be nonpotable?

A Which wells?

Q Any of them, any of them in the Ogallala?

A Well, of course, I can't very well say that those Ogallala wells in Tatum, for instance, would be contaminated?

Q Would any wells be contaminated, would any of them not be, would any of them be?

A I think it would be reasonable to think that you would have to define contamination for one thing, but I think the wells down-dip, down slope on the water table, both might well be raised in their chloride content.

Q Is this because of the diffusion, the part that doesn't settle along the bottom aquifer?

A I didn't mean to say -- you limited it to the -- to the upper and middle part of the formation. I don't conceive of there being too much effect on these wells downdip in the upper portion of Ogallala.

Q Now, when we get to the depletion stages of this Ogallala aquifer, and we reach this point where the high chloride

content is present, will those water wells be able to pump that water?

A Will they be able to pump?

Q We've got a layer at the bottom of the aquifer that is extinct in chloride content. When we get to that point, will the well -- the water wells be able to produce that water?

A You mean will it be able to raise it that high, is that your point?

Q That's right, to get it out of the ground?

A Oh, I think so. There are wells from Curry County that produce water from three and four hundred feet.

Q Well now, how is this layer going to be on the bottom of the aquifer, assuming that all of Mr. Adams' water is disposed of in an unlined surface pit?

A I haven't made any calculations along that line, Mr. Payne.

Q Say there were only, say six inches of water along the entire bottom. Could the well produce that remaining water, the water well?

A A water well that is completed above that thin layer that you are talking about, the mere pumping of that well -- well, it depends on how fast it is pumped and how fast it penetrates the water-bearing formation, but it will suck it up. The well doesn't have to be completed in the salt layer for the well to pump salt water; it will be sucked up. Like I say, depending upon gallons

per minute of pumpage and how far the water penetrates the aquifer.

Q What do you call potable water, Mr. Barton, in your opinion?

A I have no recourse but to go along with the United States Bureau -- it isn't the Bureau of Standards, but it is the Bureau of, well, Health Standards. In any event, they mention 250 parts per million is the top chloride content for potability.

Q I see. In summing up your testimony, you stated that you felt that the surface disposal of this produced salt water from the well in quest ion constituted a threat to, I believe you said quality of the water. Do you believe that this surface disposal will increase the chloride content of the water in this aquifer above 250 parts per million?

A I think that my concluding statement was, I am of the opinion that the disposal of oil field water into unlined evaporation pits in an area constitutes a definite threat to the quality of tne underground water resources in the area. I made no definite allusion to the Mapenza 1-A.

Q Well, could you tell me,if this water is produced in this unlined surface pit, if it, in your opinion, will make the water unpotable by the standards adopted by the United States Bureau of Standards?

A The water underneath the lease --

Q No, let's just say --

A -- a mile away?

Q In the whole aquifer?

A I believe that in that particular -- like I said, I visualize it going down in a sinuous band and forming a sinuous meandering migration at the bottom of the aquifer. I think that right in that particular area, yes, it would be unpotable.

Q It would finally migrate, it would make the water unpotable at that point?

A I believe it would.

MR. PORTER: Anyone have a question?

QUESTIONS BY MR. MORGAN:

Q Assuming the character of the water that is being produced in the subject well, is there any proportion of that that could be participated by evaporation or otherwise would be safe, wouldn't contaminate measurably the potable waters --

A You mean could you evaporate --

Q -- or any amount of this water of that nature, being produced by the subject well that could be disposed of in the manner that Mr. Adams proposes?

A When you evaporate, of course, you concentrate it, and it gets worse rather than better by evaporation.

Q Well, I am referring to, say half a barrel. Could it have as much as half a barrel a day, or more or less be disposed of in unlined pits?

A Well, administratively they have set the limits, ac-

cording to Order 1224-A, to one half barrel a day. Anything over that they consider a serious threat.

Q Do you agree that there is no flexibility in that formula?

A Certainly isn't.

Q There shouldn't be, you mean?

A I don't know as I am qualified whether to say whether it should or shouldn't be.

Q Any flexibility?

A That's right.

MR. HARRIS: May it please the Commission, I think this witness has been cautioned not to infringe upon the ultimate decision to be made by the Commission since that is the ultimate question.

MR. MORGAN: The Commission is holding its own seminar. That's all.

MR. PORTER: Anyone else have a question?

MR. BUSHNELL: If the Commission please, I would like to ask one question.

MR. PAYNE: Are you associated with resident counsel Mr. Bushnell?

MR. KELLAHIN: Jason Kellahin of Kellahin & Fox, Santa Fe, representing Amerada.

MR. BUSHNELL: Let me say one more thing, Mr. Payne. I am not even a party interested in this suit. Maybe I am out of

place asking the question. If I am, I will not ask it. Am I out of place?

MR. PAYNE: I would think not.

QUESTIONS BY MR. BUSHNELL:

Q You did testify about, before in your testimony and also in answer to cross examination questions from Mr. Payne, about this figure recommended by the United States Health Department of 250 what?

A 250 million parts per chloride.

Q Chloride or sodium chloride?

A Chloride.

Q You are sure it is chloride and not sodium chloride?

A Sure.

MR. BUSHNELL: That's all.

A That's incidently a desirable limit. And that is for interstate carriers.

MR. PORTER: Mr. Stamets, do you have a question?

QUESTIONS BY MR. STAMETS:

Q Mr. Barton, do you know of any wells in this general area that are completed completely through the Ogallala bearing sands? In other words, they are producing from the total thickness of sand?

A From first hand knowledge, I don't. I have heard that there are certain of the Hobbs City wells that are completed that way. Whether this is true or not, I am not sure.

MR. STAMETS: That's all.

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

QUESTIONS BY MR. FISCHER:

Q Mr. Barton, is it your opinion that throughout the life, or throughout the proposed life of the Ogallala water producing sand, that any well that is meant to continue producing water, that these fresh water wells will eventually have to be deepened to the bottom of the Ogallala sand?

A I think as times goes on and water level declines, Mr. Fischer, that that will be necessary.

Q That's what I mean, if an owner of a water well wants to keep that well producing throughout the life of this Ogallala water producing sand?

A He is going to have to drop with the water level.

Q Will he eventually deepen his well to where it will be down in the bottom and be completed in the entire section of the Ogallala sand?

A Yes, sir.

MR. PORTER: Anyone else have a question? The witness may be excused.

(Witness excused)

MR. PORTER: Anyone else have testimony to present in this case? Any further testimony? Any statements?

MR. NEWMAN: I am Kirk Newman of Roswell, New Mexico. On behalf of Pan American Petroleum Corporation, we would like to

state that we do not wish on our not cross examining these witnesses and not putting on any contradictoryevidence to be construed as being in complete accord with all of the testimony of the two witnesses. We didn't feel that the particular scope of this hearing as an exception to Rule R-1224-A required our presenting testimony or going too deep into the testimony which has been presented. And we would like further to state that it is the opinion of Pan American that salt water produced from the Hobbs Pool should not be disposed of in unlined pits, and we, therefore, object to the exception requested.

MR. PORTER: Anyone else have a statement to make in this case? Mr. Adams?

MR. ADAMS: Mr. Porter, I have a brief closing statement. I think it has been shown that harmful contamination underneath these forty acres cannot occur, at least, this is my opinion. The total amount of water projected to be produced until abandonment cannot physically contaminate the Ogallala water reservoir to the point that it is unfit for human or plant or commercial use.

It has been shown that if it is necessary to join the salt water disposal unit to be rid of produced water, then the Operator would be economically correct in selling this lease for salvage at the earliest possible date, and not to join the unit. This would result in premature abandonment of the lease and preclude the recovery of 20,800 barrels of crude oil, thus constituting waste of a natural resource. This Commission is charged with the prevention

of wasteful practices insofar as oil and gas production is concerned. It has always hued to this line and dealt with special cases in an open and fair minded manner. The Commission realizes, I am sure, that it is virtually impossible to write an order creating rules and regulations whereby any section of a state, or any pool, or indeed, any well, can be treated in exactly the same manner. For this reason exceptions may be granted to rules where the Commission feels they are justified.

I have called to the Commission's attention that this case today is a "test case" whether or not we like to refer to the situation in that exact language. I might expand the word "test" to say that this is the first instance in which an exception to a salt water disposal order has been heard before the Commission. You will doubtless hear requests for other exceptions regardless of your decision in this case. I feel that there are probably other individual cases which have as much merit in asking for an exception as does this case. However, we are not concerned today with those cases, except to be aware that they most certainly will be forthcoming, and we all must be aware of the gravity of your decision in this case because of a potential loss in current revenue to the State of New Mexico and its public lands' supported institutions, if the nearly 2000 wells in Lea County that are marginal producers should be prematurely abandoned. I have classified marginal wells as those that make 5 barrels per day or less. A simple calculation will show that if these wells are unnecessarily forced

to dispose of produced water and the resultant expenditure is not forthcoming, then premature abandonment will occur, and that as much as $410,000 per year would be lost in production taxes alone. If no more than 300 of these wells are on State leases, an additional $180,000 per year in royalty to public land's institutions would be lost. So that, gentlemen, we are speaking of a decision to be made here upon which a temporary precedent is set. You must realize that if the State is deprived of $590,000 per year unnecessarily, that other means must be sought to replace those monies, a task certainly extremely difficult. And finally, I do not believe that the Commission will make a decision which will result in waste by virtue of unrecoverable crude oil, which would surely be the case if it should be decided that this Operator should unnecessarily be forced to join a salt water disposal unit.

MR. PORTER: Anyone else have a statement or comment in this case? Take the case under advisement and proceed next to Case 278.

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, J. A. Trujillo, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Proceedings before the New Mexico Oil Conservation Commission was reported by me in Stenotype and reduced to typewritten transcript by me, and that the same is a true and correct record to the best of my knowledge, skill and ability.

WITNESS my Hand and Seal this, the 27th day of May, 1959, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Joseph A. Trujillo
NOTARY PUBLIC

My Commission Expires:

October 5, 1960

Chemical Analyses of Water from Tertiary Deposits*

In November, 1929, samples of water from the Tertiary deposits were taken from 15 representative wells in various parts of the area for partial chemical analysis. They were analyzed by W. L. Lamar, of the United States Geological Survey, and the results were published in the previous report. On July 31 and August 1 and 2, 1930, samples of water from the Tertiary deposits were taken from 5 representative wells in different parts of the area for complete chemical analysis. These results are given in the table.

Analyses of Water from Tertiary deposits in Lea County, New Mexico

(Parts per million. Analyzed by L. A. Shinn, U. S. Geological Survey.)

	1	2	3	4	5
Silica (SiO_2)	52	44	43	57	57
Iron (Fe)	.04	.12	.1	.12	.12
Calcium (Ca)	93	88	79	70	68
Magnesium (Mg)	20	13	12	13	12
Sodium (Na)	65	46	41	35	33
Potassium (K)	2.9	3.4	3.8	3.5	3.8
Carbonate (CO_3)	0	0	0	0	0
Bicarbonate (HCO_3)	178	210	207	215	212
Sulphate (SO_4)	187	117	100	70	63
Chloride (Cl)	81	54	41	34	35
Nitrate (NO_3)	3.8	1.8	4.5	2.1	1.0
Total dissolved solids	624	485	435	404	403
Total hardness as $CaCO_3$ (calculated)	314	273	247	228	219
Date of collection, 1930	Aug. 2	Aug. 1	July 31	July 31	July 31

1. Well, 53 feet deep in NW¼NW¼, Sec. 28, T. 12 S., R. 36 E., owned by J. E. Whip.
2. Well, 102 feet deep, in NW¼SE¼, Sec. 35, T. 13 S., R. 36 E., owned by J. P. McClish. Temperature 64 degrees F.
3. Well, 142 feet deep, in NW¼NW¼, Sec. 10, T. 16 S., R. 36 E., owned by Southern Union Gas Co. Temperature 65 degrees F.
4. Well, 60 feet deep, in NW¼SW¼, Sec. 30, T. 17 S., R. 38 E., owned by G. S. Pruett. Temperature 64 degrees F.
5. Well, 120 feet deep, in central S½ of Sec. 34, T. 18 S., R. 38 E., owned by Hobbs Water Co. Temperature 68 degrees F.

*Nye, S. S., Progress Report on the Ground-Water Supply of Southern Lea County, New Mexico; State Engineer of New Mexico Tenth Biennial Report, 1930-32, p. 240.