NM - 34

GENERAL CORRESPONDENCE

YEAR(S):

1994-1969

LAGUNA
GATUNA
INC.
Box 2158
Hobbs NM 88240
Telephone (505) 393-7544

May 31, 1994

Oil Conservation Division
Post Office Box 2088
Santa Fe, New Mexico 87504-2088

Attention: Mr. Roger Anderson

Re: Site Closure and Bond Release
Laguna Gatuna, Inc. Disposal Facilities

Gentlemen:

The closure plan that has been completed consists of the following items:

1. Removal of building
No building ever in place

2. Old tanks have been removed and disconnected and other hardware removed so that it is impossible for the site to be used as a disposal facility or treating plant. Some tanks and solar panels remain on the site for storage only as they have commercial value and are for sale.

3. One small intermittent seep is present on the South end of the pit area. We have completely contained this seep by a retaining wall so that it is physically impossible for the fluid to migrate to Laguna Gatuna. The fluid will be tested for the presence of hydrocarbons when necessary as to the volume contained behind retaining wall. We expect this seep will completely dry up in the near future, or will cease to have any evidence of hydrocarbons.

4. Contaminated soil in the pit area has been completely covered and capped to prevent fluids from migrating downward.

5. Pits have been backfilled and graded so that rain water flows off the area behind a retaining wall, making it impossible to escape into Laguna Gatuna. This water evaporates at this point.

6. Acquifer restoration is not necessary as none exists in this area.

7. Reclaiming of the general facility is completed and/or covered by another bond in place from Pronghorn S.W. Disposal, Inc. who purchased forty acres and our pipeline facilities.

The surface owner of this property is completely satisfied that all waste has been completely contained on this property and cannot possibly pose a threat to the environment.

Very truly yours

LAGUNA CATUNA, INC.

BY: Larry C. Squires, President

STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION
HOBBS DISTRICT OFFICE

ON DIVISION
IVED
'94 JU 5 AM 8 50

BRUCE KING
GOVERNOR

POST OFFICE BOX 1980
HOBBS, NEW MEXICO 88241-1980
(505) 393-6161

NMOCD Inter-Correspondence

To: Roger Anderson-Environmental Bureau Chief

From: Wayne Price-Environmental Engineer District I

Date: July 1, 1994
10:00 am

Reference: Bull Dog Tool Co.- DP # 067
2807 W. Ct. Rd.-Hobbs, NM

Subject: Site Inspection due to complaint of Illegal discharge.

Comments: Apparently an ex-employee complained that Bull Dog Co. was dumping waste on site.

Gary Wink and I visited site on June 30, 1994 and met with Barry Antweil. We reviewed his waste streams, looked at waste water sump inside of the building and looked at the outside waste water tank.

There were indications that discharges from this outside tank has occurred. I noticed dead vegetation and water flow erosion marks. Mr. Antweil indicated that this was due to a leaking valve which has been replaced. Gary Wink noted that they had sprayed for weeds, so this might be the cause of the dead weeds.

Mr. Antweil indicated it has been over a year since he has had this waste hauled off. A-A oilfield service is usually the transporter.

We concluded our inspection, Mr. Antweil indicated he had a permit from the NMOCD to discharge this water into a drain field on site. He wanted to know if he could use it?

We told him we would have to check with the Santa Fe Environmental Bureau because we don't have a copy of his discharge permit.

There was one drum of solid waste on site, it was primarily frac sand that comes off of the tools. It had a slight hydrocarbon smell.

Please find attached a sketch of the facility.

Recommendations:

I recommend that Bull Dog CO. classify the following noted solid waste streams as to whether they are exempt or non-exempt.

1. Waste water from sump that goes into outside waste water tank.
2. Sludge, oil-water mixture from sump.
3. Solid waste that is collected in drums.

If non-exempt then they should sample and test to determine if Hazardous.

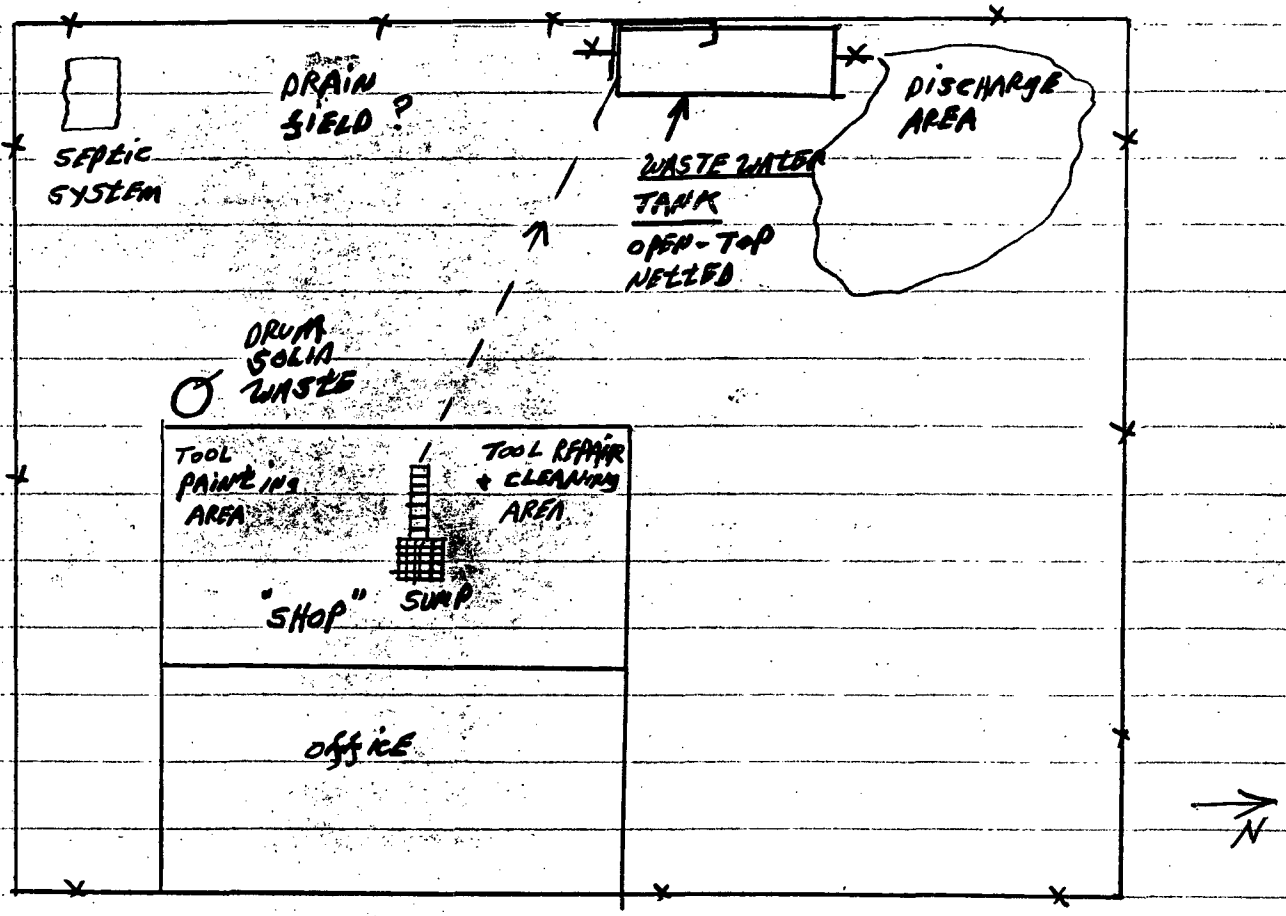
They should modify their discharge plan to indicate where they dispose of these materials.

The original discharge plan indicates that sand is carried to AA's facility. I believe this is a SWD not landfarm or landfill or 711 facility. Therefore Bull Dog should change their disposal practice.

Answer Mr. Antweil's question on using the drain field.

cc: Jerry Sexton-District I Supervisor
Gary Wink-District I Field Rep. II

Attachments-1



BULL DOG TOOL CO. DP# 067

2807

- WEST CR RD -

HOBBS, NM

7/1/94

LW PRICE

Law Office of
J. W. NEAL, P.C.
419 W. Cain • P.O. Box 278
Hobbs, New Mexico 88241-0278
Telephone 505-397-3614
Fax 505-393-7405

October 6, 1994

Energy, Minerls and Natural Resources Department
Post Office Box 2088
Snata Fe, New Mexico 87504

Attention: Ms. Diane Richardson

Re: $25,000 Treating Plant Bond
Laguna Gatuna, Inc., Principal
Reliance Insurance Co., Surety
Bond No. B 61 51 09

Gentlemen:

Your letter of September 27, 1994 has been handed to me for answer.

Please be advised that the treating plant is closed as stated in your letter. I do not understand your statement that the bond cannot be released until the clean up is satisfied by the Environmental Bureau. The company has completely complied with every request made by the Bureau as to clean up through Mr. Anderson and all requests have been completed. We request that you contact Mr. Anderson in order that he can advise you to release this bond.

We have gone to great expense in complying with the Department's request. The continuance of this bond also involves expense and we would appreciate your immediately releasing same.

Very truly yours

J. W. Neal

JWN/b

cc: Mr. Roger Anderson
cc: Laguna Gatuna, Inc.

Roger - You told me we couldn't release bond - what gives?

STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

September 27, 1994

BRUCE KING
GOVERNOR

ANITA LOCKWOOD
CABINET SECRETARY

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87504
(505) 827-5800

Reliance Surety Company
One Denver Highlands
10375 E. Harvard Avenue
Suite 400
Denver, Co. 80231

Attention: Marsha Crawford

Re: $25,000 Treating Plant Bond
Laguna Gatuna, Inc., Principal
Reliance Insurance Co., Surety
Bond No. B 61 51 09

Dear Ms. Crawford:

I am in receipt of your request for cancellation of the above-captioned treating plant bond. I have checked with our Environmental Department and they have advised me that while the treating plant itself is closed, they are in the process of cleaning the site. This bond cannot be released until the clean-up satisfies the Environmental Bureau.

If you would like more information regarding this clean-up, please contact Roger Anderson at (505) 827-5812.

Sincerely,

Diane Richardson

DIANE RICHARDSON
Administrator
Bond Department

cc: Laguna Gatuna Inc.
P. O. Box 2158
Hobbs, New Mexico 88241-2158

STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

NEW MEXICO OIL CONSERVATION DIVISION
2040 S. PACHECO
SANTA FE, NM 87505

(505) 827-7152
ROGER ANDERSON

#412381

LABORATORY SAMPLE RECORD

PROJ. NO.:

PROJECT NAME: LAGUNA GATUNA

SAMPLERS: (Signature) MARK ASHLEY / CHRIS EUSTICE

LAB ID	DATE	TIME	STATION LOCATION	NO. OF CONTAINERS	CATIONS & ANIONS	8020	Ca Mg Na K	CO3 + SO4 NO3 100			REMARKS
01	12/12/94	07:00	ASHLEY WELL	1	✓		✓	✓			9412120700
02	"	16:50	SEEP 30	2		✓					9412131650
03	"	16:45	SEEP 80	2		✓					9412131645
04	"	16:55	EAST SEEP	2		✓					9412131655

Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Mark Ashley	12/16/94 11:45A	
Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)
		D. Cutler

Date / Time: 12/16 1145

SEALS INTACT ☐ YES ☐ NO

: (Signature)

: (Signature)

Remarks: * Bottles Not preserved

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

ANALYSIS REQUEST FORM

Contract Lab ANALYTICAL TECHNOLOGY, INC Contract No. 95-521.07-040

OCD Sample No. 9412131650

Collection Date	Collection Time	Collected by—Person/Agency
12/13/94	16:50	CHRIS EUSTICE / MARK ASHLEY /OCD

SITE INFORMATION

Sample location LAGUNA GATUNA

Collection Site Description

WATER SEEP BELOW PITS

Township, Range, Section, Tract: 20S + 33E + + 07

SEND FINAL REPORT TO ENVIRONMENTAL BUREAU
NM OIL CONSERVATION DIVISION
PO Box 2088
Santa Fe, NM 87504-2088

SAMPLING CONDITIONS

☐ Bailed ☐ Pump
☒ Dipped ☐ Tap

Water level

Discharge

Sample type

pH(00400)

Conductivity (Uncorrected) μmho

Water Temp. (00010)

Conductivity at 25° C μmho

SAMPLE FIELD TREATMENT — *Check proper boxes*

No. of samples submitted:

☒ NF: Whole sample (Non-filtered)
☐ F: Filtered in field with 0.45 μ membrane filter
☐ PF: Pre-filtered w/45 μ membrane filter

☒ NA: No acid added
☐ A: HCL
☐ A: 2ml H_2SO_4/L added
☐ A: 5ml conc. HNO_3 added
☐ A: 4ml fuming HNO_3 added

FIELD COMMENTS:

LAB ANALYSIS REQUESTED:

ITEM	DESC	METHOD	ITEM	DESC	METHOD	ITEM	DESC	METHOD
☒ 001	VOA	8020	☐ 013	PHENOL	604	☐ 026	Cd	7130
☐ 002	VOA	602	☐ 014	VOC	8240	☐ 027	Pb	7421
☐ 003	VOH	8010	☐ 015	VOC	624	☐ 028	Hg(L)	7470
☐ 004	VOH	601	☐ 016	SVOC	8250	☐ 031	Se	7740
☐ 005	SUITE	8010-8020	☐ 017	SVOC	625	☐ 032	ICAP	6010
☐ 006	SUITE	601-602	☐ 018	VOC	8260	☐ 033	CATIONS/ANIONS	
☐ 007	HEADSPACE		☐ 019	SVOC	8270	☐ 034	N SUITE	
☐ 008	PAH	8100	☐ 020	O&G	9070	☐ 035	NITRATE	
☐ 009	PAH	610	☐ 022	AS	7060	☐ 036	NITRITE	
☐ 010	PCB	8080	☐ 023	Ba	7080	☐ 037	AMMONIA	
☐ 011	PCB	608	☐ 024	Cr	7190	☐ 038	TKN	
☐ 012	PHENOL	8040	☐ 025	Cr6	7198	☐	OTHER	

STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

ANALYSIS REQUEST FORM

Contract Lab ANALYTICAL TECHNOLOGY, INC Contract No. 95-521.07-040

OCD Sample No. 941221655

Collection Date	Collection Time	Collected by—Person/Agency
12/13/94	16:55	MARK ASHLEY/CHRIS EUSTICE /OCD

SITE INFORMATION

Sample location LAGUNA GATUNA

Collection Site Description

WATER SEEP BELOW PITS

Township, Range, Section, Tract: 20S 33E + 07

SEND FINAL REPORT TO

ENVIRONMENTAL BUREAU
NM OIL CONSERVATION DIVISION
PO Box 2088
Santa Fe, NM 87504-2088

SAMPLING CONDITIONS

☐ Bailed ☐ Pump
☒ Dipped ☐ Tap

Water level

Discharge

Sample type

pH(00400)

Conductivity (Uncorrected) μmho

Water Temp. (00010)

Conductivity at 25° C μmho

SAMPLE FIELD TREATMENT — *Check proper boxes*

No. of samples submitted:

☒ **NF:** Whole sample (Non-filtered)
☐ **F:** Filtered in field with 0.45 μ membrane filter
☐ **PF:** Pre-filtered w/45 μ membrane filter

☒ **NA:** No acid added
☐ **A:** HCL
☐ **A:** 2ml H_2SO_4/L added
☐ **A:** 5ml conc. HNO_3 added
☐ **A:** 4ml fuming HNO_3 added

FIELD COMMENTS:

LAB ANALYSIS REQUESTED:

ITEM	DESC	METHOD	ITEM	DESC	METHOD	ITEM	DESC	METHOD
☒ 001	VOA	8020	☐ 013	PHENOL	604	☐ 026	Cd	7130
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☐ 003	VOH	8010	☐ 015	VOC	624	☐ 028	Hg(L)	7470
☐ 004	VOH	601	☐ 016	SVOC	8250	☐ 031	Se	7740
☐ 005	SUITE	8010-8020	☐ 017	SVOC	625	☐ 032	ICAP	6010
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☐ 012	PHENOL	8040	☐ 025	Cr6	7198	☐	OTHER_____	

STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

ANALYSIS REQUEST FORM

Contract Lab ANALYTICAL TECHNOLOGY, INC Contract No. 95-521.07-040

OCD Sample No. 94121200700

Collection Date	Collection Time	Collected by —Person/Agency
12/12/94	07:00	CHRIS EUSTICE/MARK ASHLEY /OCD

SITE INFORMATION

Sample location LAGUNA GATUNA

Collection Site Description

WATER SEEP BELOW PITS

Township, Range, Section, Tract: 20S + 33E + 07

SEND FINAL REPORT TO ENVIRONMENTAL BUREAU
NM OIL CONSERVATION DIVISION
PO Box 2088
Santa Fe, NM 87504-2088

SAMPLING CONDITIONS

☐ Bailed ☐ Pump
☒ Dipped ☐ Tap

pH(00400)

Water Temp. (00010)

Water level

Discharge

Sample type

Conductivity (Uncorrected) μmho

Conductivity at 25° C μmho

SAMPLE FIELD TREATMENT — *Check proper boxes*

No. of samples submitted:

☒ **NF:** Whole sample (Non-filtered)
☐ **F:** Filtered in field with 0.45 μ membrane filter
☐ **PF:** Pre-filtered w/45 μ membrane filter

☒ **NA:** No acid added
☐ **A:** HCL
☐ **A:** 2ml H_2SO_4/L added
☐ **A:** 5ml conc. HNO_3 added
☐ **A:** 4ml fuming HNO_3 added

FIELD COMMENTS:

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☐ 012	PHENOL	8040	☐ 025	Cr6	7198	☐	OTHER	

STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

ANALYSIS REQUEST FORM

Contract Lab ANALYTICAL TECHNOLOGY, INC Contract No. 95-521.07-040

OCD Sample No. 9412131645

Collection Date	Collection Time	Collected by—Person/Agency
12/13/94	16:45	CHRIS EUSTICE / MARK ASHLEY /OCD

SITE INFORMATION

Sample location LAGUNA GATUNA

Collection Site Description

WATER SEEP BELOW PITS

Township, Range, Section, Tract: 20S 3BE + 07

SEND FINAL REPORT TO

ENVIRONMENTAL BUREAU
NM OIL CONSERVATION DIVISION
PO Box 2088
Santa Fe, NM 87504-2088

SAMPLING CONDITIONS

☐ Bailed ☐ Pump
☒ Dipped ☐ Tap

Water level

Discharge

Sample type

pH(00400)

Conductivity (Uncorrected) μmho

Water Temp. (00010)

Conductivity at 25° C μmho

SAMPLE FIELD TREATMENT — *Check proper boxes*

No. of samples submitted:

☒ **NF:** Whole sample (Non-filtered)
☐ **F:** Filtered in field with 0.45 μ membrane filter
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AnalyticalTechnologies,Inc.

Dianne E. Cutler
Sample Control Technician

2709-D Pan American Freeway, NE
Albuquerque, NM 87107

(505) 344-3777
(505) 344-4413 FAX

AnalyticalTechnologies,Inc.

Letitia A. Krakowski, Ph.D.
Project Manager

2709-D Pan American Freeway, NE
Albuquerque, NM 87107

(505) 344-3777
(505) 344-4413 FAX

Law Office of
J. W. NEAL, P.C.
419 W. Cain • P.O. Box 278
Hobbs, New Mexico 88241-0278
Telephone 505-397-3614
Fax 505-393-7405

October 6, 1994

Energy, Minerls and Natural Resources Department
Post Office Box 2088
Snata Fe, New Mexico 87504

Attention: Ms. Diane Richardson

Re: $25,000 Treating Plant Bond
Laguna Gatuna, Inc., Principal
Reliance Insurance Co., Surety
Bond No. B 61 51 09

Gentlemen:

Your letter of September 27, 1994 has been handed to me for answer.

Please be advised that the treating plant is closed as stated in your letter. I do not understand your statement that the bond cannot be released until the clean up is satisfied by the Environmental Bureau. The company has completely complied with every request made by the Bureau as to clean up through Mr. Anderson and all requests have been completed. We request that you contact Mr. Anderson in order that he can advise you to release this bond.

We have gone to great expense in complying with the Department's request. The continuance of this bond also involves expense and we would appreciate your immediately releasing same.

Very truly yours

J. W. Neal

JWN/b

cc: Mr. Roger Anderson
cc: Laguna Gatuna, Inc.

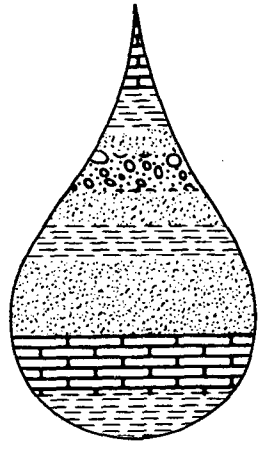
Roger: We sure need this bond released. Please help us bring this matter to a conclusion.
Best personal regards.

JWN

TECHNICAL RESPONSE TO ITEMS 5, 6, AND 7
ORDER R-8161-A
OIL CONSERVATION DIVISION
as pertains to Application for Permit by
PETRO-THERMO CORPORATION
by

Geohydrology Associates, Inc.

prepared for
POLLUTION CONTROL, INC.
and
SNYDER RANCHES, INC.



4015 Carlisle, N.E. • Suite A • (505) 884-0580
Albuquerque, New Mexico 87107

September 16, 1986

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Case No. 8781 Exhibit No. 14
Submitted by Snyder
Hearing Date 9/18/86

TECHNICAL RESPONSE TO ITEMS 5, 6, AND 7

ORDER R-8161-A

OIL CONSERVATION DIVISION

as pertains to Application for Permit by

PETRO-THERMO CORPORATION

by

GEOHYDROLOGY ASSOCIATES, INCORPORATED
Albuquerque, New Mexico

prepared for

POLLUTION CONTROL, INCORPORATED
and
SNYDER RANCHES, INCORPORATED

September 16, 1986

TECHNICAL RESPONSE TO ITEMS 5, 6, AND 7

ORDER R-8161-A

OIL CONSERVATION DIVISION

as pertains to Application for Permit by

PETRO-THERMO CORPORATION

The Petro-Thermo Corporation has submitted an application to construct a disposal facility for waste materials from oil and gas field operations, including produced salt water and solid wastes. This facility would be located on lands owned by the State of New Mexico in the SW/4 SE/4 NE/4 of Section 16, T. 20 S., R. 32 E., NMPM, Lea County, New Mexico (fig. 1).

At a hearing that was held on April 10, 1986, testimony was presented in behalf of Pollution Control, Inc. and Snyder Ranches, Inc., that there presently are insufficient data available to predict the effects of the Petro-Thermo Corporation's facility on Laguna Plata and lands adjoining the proposed site. This report addresses Items 5, 6, and 7 of Order R-8161-A and pertains to the inadequate monitor-well design and the need for additional subsurface information at the proposed site.

The location, design, and number of monitoring wells was outlined in a letter dated February 18, 1986, from R. L. Stamets, Director of the Oil Conservation Division, to Mr. John Weber of Hobbs, New Mexico. A copy of the letter is attached. This letter proposed that Petro-Thermo Corporation drill and complete three

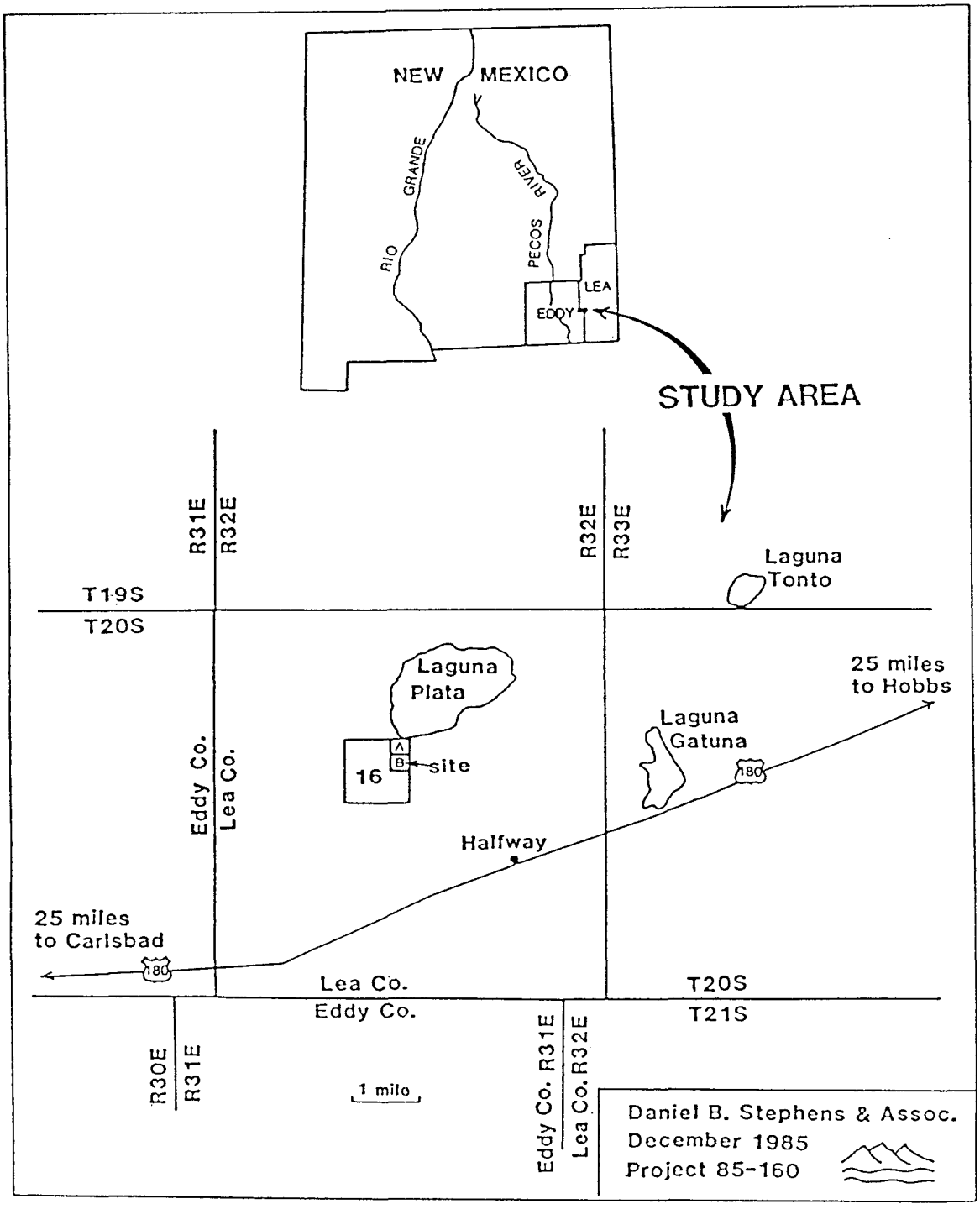


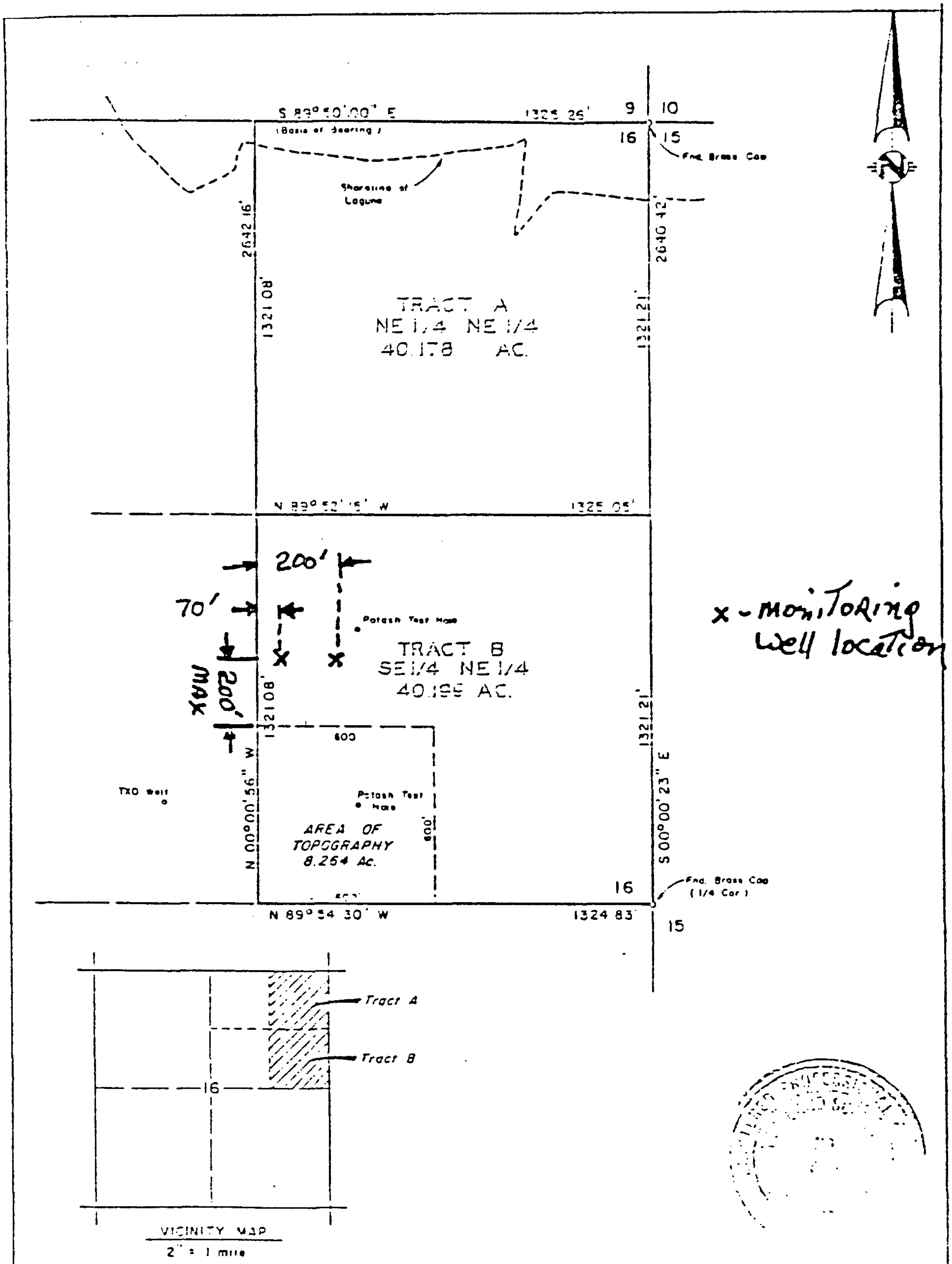
Figure 1 - Location Map

Daniel B. Stephens and Associates

monitoring wells north of Tract B at the proposed site (fig. 2). This letter also proposed a monitoring schedule and recommended specific analyses for each sample. It is the position of Pollution Control, Inc. and Snyder Ranches, Inc., that the recommendations of February 18 are insufficient to protect the fragile environment of Laguna Plata and the surrounding State lands.

Testimony has been presented by Petro-Thermo Corporation which assumes that the configuration of the "redbeds" is similar to that of the surface topography; they have further assumed that the water table in the alluvium slopes in the same direction as the surface topography. They have also assumed that Laguna Plata is located in a closed depression and that there is no outflow from Laguna Plata. Although all of these assumptions have been made in a report prepared by Daniel B. Stephens and Associates of Socorro, New Mexico, to Petro-Thermo Corporation, no supporting documentation has been presented to support these assumptions.

It is noteworthy that earlier testimony before the Oil Conservation Division does not support the assumptions of Petro-Thermo Corporation. In Case No. 4047 (March 19, 1969), documentation was submitted which shows that Laguna Plata is not a closed depression; rather there is outflow toward the west and into Nash Draw and the Pecos River. This study was made in February 1969 by Ed Reed and Associates. Further, detailed studies by Geohydrology Associtates, Inc., in 1978, 1979, and 1984 referred to by Petro-Thermo Corporation do not support these assumptions. In fact, Figure 3 of the 1984 report clearly shows that Laguna Plata is not a closed depression, and that the ground-water movement is different from that



I HEREBY CERTIFY THAT THIS PLAT WAS MADE FROM NOTES TAKEN IN THE FIELD IN A BONA FIDE SURVEY MADE UNDER MY SUPERVISION, AND THAT THE SAME IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF

JOHN W. WEST, N.M. P.E. & L.S. No. 676
TEXAS R.P.S. No. 1138
RONALD J. EIDSON, N.M. L.S. No. 3239
TEXAS R.P.S. No. [illegible]

[illegible]

Two tracts of land being the [illegible] and the [illegible] of Section 16, T 20 S, R 32 E, N.M.P.M., Lea County, New Mexico.

JOHN W. WEST ENGINEERING COMPANY
CONSULTING ENGINEERS HOBBS, NEW MEXICO

Scale [illegible]	Drawn By [illegible]
Date [illegible]	Sheet [illegible] of [illegible]

Figure 2

suggested by Petro-Thermo. This illustration and information were presented before the Division as Case No. 8292 on August 8, 1984.

Data presented at the April 9, 1986, hearing by Petro-Thermo indicated that a nearby spring was highly mineralized and therefore the site was justified. However, on September 4, 1986, a sample was collected from the same spring which indicates that potable water is present which has a total dissolved solids content of 1,618 mg/l (milligrams per liter). This analysis was made by Unichem, Inc.

No subsurface data have been presented by the applicant to establish the assumption that all seepage from the proposed pits will migrate vertically before entering the water table. The alluvial sediments in the Laguna Plata area typically are very discontinuous and there is a great deal of intertonguing of lithic units. No subsurface data have been presented to show that there are no shallow clay units which would perch the seepage within the root zone of the vegetation and destroy the grass cover in the area and on adjoining lands.

Inasmuch as the Division has approved the proposed Petro-Thermo facility as described, the following recommendations are made which will provide data to supplement the assumptions on which the approval was granted. These recommendations will also help to protect the environment of Laguna Plata and the surrounding lands. These may also help to prevent hydrocarbons from ultimately entering Nash Draw and the Pecos River. In the event that contamination does escape from Laguna Plata, the monitoring wells could be used as part of a clean-up operation.

1. A total of eight (8) wells should be drilled around the perimeter of the proposed facility (fig. 3). Each of these wells should be located at a site not more than 40 feet from the nearest proposed facility. Drilling and completion of these wells should be done as soon as practical so that back-ground water levels and water-quality data can be obtained prior to installation of the facility.

2. All wells should be drilled with air from the surface to a minimum of five (5) feet below the top of the redbeds and completed as shown in Figure 3. Wrapped PVC screen with 0.050 slot should be set from a depth of four (4) feet to total depth.

3. Geophysical logs should be run in each hole in order to identify zones of porosity which will be likely paths for migration of contamination away from the site.

4. Each well should be tested to determine the production capability of the strata that have been penetrated. This may be done by conventional pumping methods or by slug-test techniques. Aquifer characteristics are needed in order to determine rates of ground-water movement and the production capacity in the event that the wells are eventually used for clean-up of a contamination plume.

5. Wrapped, PVC screen should be used for completion of the wells in order to reduce well loss and to improve efficiency in the event that clean-up is necessary.

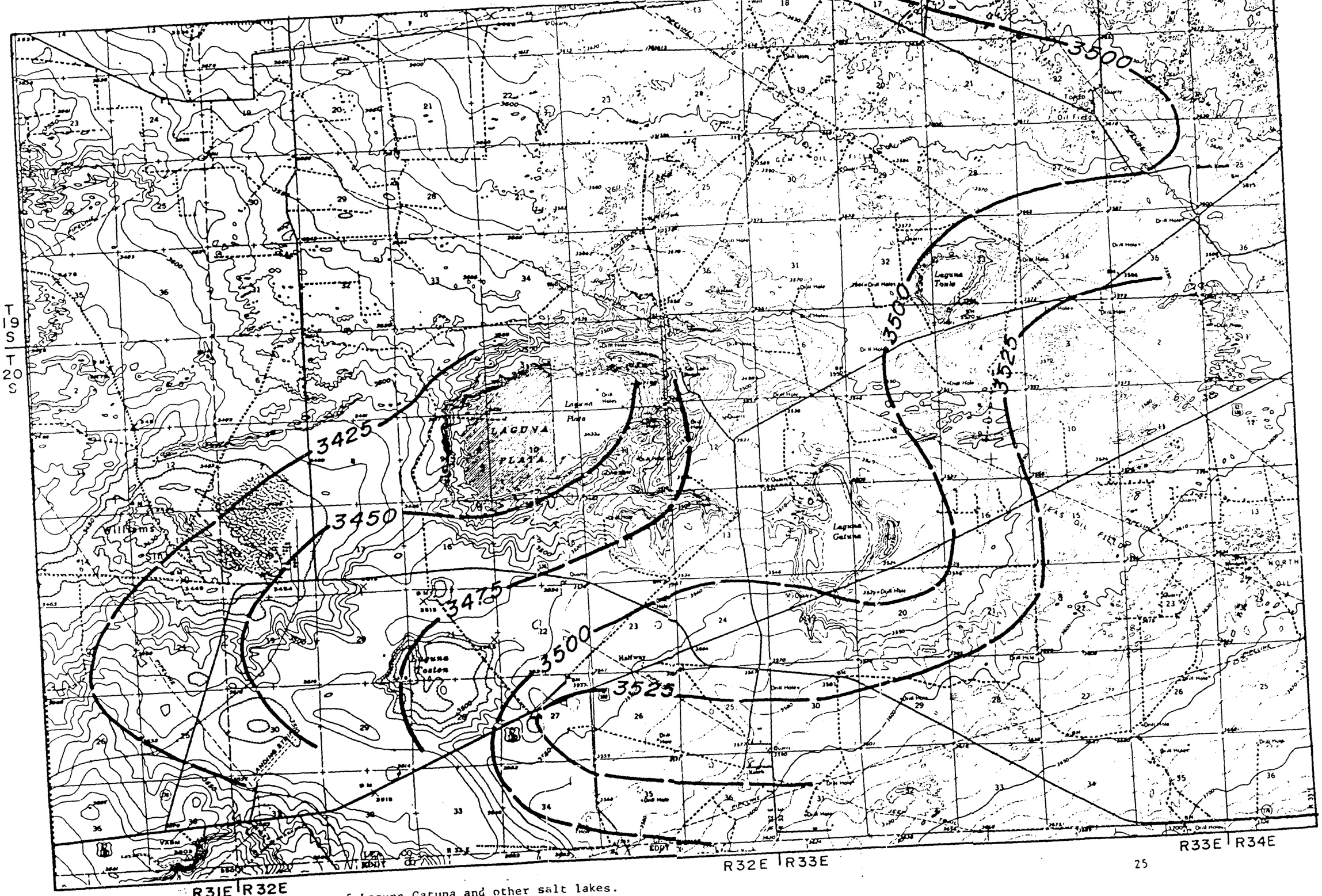


Figure 3.--Water-table contour map of Laguna Gatuna and other salt lakes.

6. All wells should be measured and sampled every three (3) months for the first two (2) years after installation. The Oil Conservation Division should be notified within ten (10) days after the measurements are made. If any well remains dry after 24 months, the measurements may be made semi-annually until fluids are again found.

7. All fluids produced from the monitoring wells should be sampled and analyzed in accordance with the February 18, 1986, letter. All analyses should be made by an Environmental Protection Agency approved laboratory with copies of the results being submitted to the Oil Conservation Division.

50 YEARS

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

1935 - 1985

TONEY ANAYA
GOVERNOR

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501
(505) 827-5800

February 18, 1986

Mr. John Weber
Maddox, Renfrow & Saunders
Attorneys at Law
P.O. Box 5370
Hobbs, NM 88241

Dear Mr. Weber:

In accordance with Paragraph 2 of Division Order R-8161, a plan for the installation and sampling of monitor wells at the proposed Laguna Plata Petro-Therm site has been discussed by Environmental Bureau Chief David Boyer, Petro-Therm Engineer James Thornton, and consultant hydrologist Dr. Daniel Stephens. Agreement has been reached that three shallow monitor wells will be installed prior to operation, inspected monthly for fluids, and sampled every six months if fluids are detected. The particulars of well location, completion and type of sampling are provided below:

1) Two monitoring wells shall be located at a distance no greater than 200 feet north of the north boundary of the 8.264 acre area within Tract B as shown on the attached plat map. These two wells shall be located at distances of approximately 70 and 200 feet east of the west boundary line of Tract B. The third well shall be installed within Tract B to the north of the first two wells at a location to be agreed to after further surface inspection of topographic and geologic features.

2) Monitoring wells shall be drilled through the alluvium with the base completed in the first clay, claystone or shale in the redbeds. The wells shall be constructed of 4-inch diameter PVC pipe which is slotted or perforated from a distance of 4 feet beneath the surface to total depth, and shall be adequately gravel packed or otherwise completed to allow fluids to enter the well for sampling, but to prevent silting. The wells shall have the upper four feet cemented to prevent surface fluid entry.

3) The wells shall be checked monthly for fluids and the results reported monthly to the Division's office in Santa Fe.

4) Upon detection of fluids in any of the monitoring wells, sampling of these fluids shall take place and be repeated at six-month intervals. Samples shall be analyzed for heavy metals and purgeable aromatic hydrocarbons as listed on the attached sheet. A copy of the results shall be submitted to the Division office in Santa Fe for review as to the nature and threat to human health, if any, of allowing such seepage movement to continue towards Laguna Plata. This review will take into consideration the fact that Laguna Plata is not, and does not have the potential to be, a drinking water source.

The plan described above will satisfy the requirements of Paragraph 2 of the above order. As provided for in the order, the Director of the Division may by administrative order rescind the authorization and/or require additional conditions be met if it is determined that such rescission or additional conditions would serve to protect fresh water supplies from contamination, assure the protection of human health or livestock, and the prevention of waste.

If you have any questions on the monitoring and sampling aspects of this order, please contact Mr. David Boyer at the above address or at 827-5812.

Sincerely,

R. L. STAMETS
Director

RLS/DB/dp

cc: David Boyer, OCD Santa Fe
Jerry Sexton, OCD Hobbs
Fran Cherry, BLM Carlsbad
Daniel Stephens, Socorro

PETRO - THERM ANALYSIS
OF WATER SAMPLES

Water samples from the monitoring wells shall be analyzed for the following dissolved hydrocarbons (BTX):

Benzene	o-xylene
Ethylbenzene	m-xylene
Toluene	p-xylene

The suggested method is EPA Method 602 which is a purgeable aromatic scan and costs less than the use of a gas chromatograph/mass sprectrometer. Minimum detection limit should be 10 ppb (or 0.01 mg/l). The standard sample is 40 ml collected in a glass vial with a teflon septum seal. No air should be trapped between the water and the seal.

Water samples should be analyzed using an inductively coupled argon plasma scan (ICAP) with a minimum detection limit of 100 ppb (0.1 mg/l). One scan provides concentrations for the following elements:

Aluminum	Lead
Barium	Magnesium
Beryluim	Manganese
Boron	Molybdenum
Cadmuim	Nickel
Calcium	Silicon
Chronimum	Silver
Cobalt	Strontium
Copper	Tin
Iron	Vanadium
	Zinc

In addition samples shall be analyzed for arsenic, and mercury using atomic adsorption methods. Minimum detection levels should be 10 ppb (0.01 mg/l) for arsenic and 1 ppb (0.001 mg/l) for mercury. A single one quart plastic container should be sufficient for all of the heavy metal analyses. Samples should be preserved with 5 ml of concentrated nitric acid.

The use of scans will provide much information on contaminants but is very much less time consuming and expensive than individual analyses. Your consultant can provide you with the names of several laboratories that will provide these services at a reasonable cost. The laboratory selected should also provide further information on sampling and preservation procedures. Contact the OCD or your consultant for the desired method of sampling to prevent false results from being obtained.

BEFORE THE

NEW MEXICO OIL CONSERVATION COMMISSION

Santa Fe, New Mexico

March 19, 1969

REGULAR HEARING

IN THE MATTER OF:

Application of Larry C. Squires for an exception to Order No. R-3221, as amended, Lea County, New Mexico.

Case No. 4047

BEFORE: A. L. Porter, Jr., Secretary-Director
Alex J. Armijo, Land Commissioner
George Hatch, Counsel

MR. HATCH: Case 4047, continued from the February 19, 1969 Regular Hearing, application of Larry C. Squires for an exception to Order No. R-3221, as amended, Lea County, New Mexico.

MR. KELLAHIN: If the Commission please, Jason Kellahin of Kellahin and Fox, appearing for the applicant.

MR. PORTER: At this time, I would like to call for other appearances.

MR. MATKINS: If it please the Commission, I am Jerome D. Matkins of Carlsbad, attorney for protestants, D. S. Harroun, Russel Haworth, and E. W. Douglass.

MR. PORTER: Are there any other appearances to be made in this case? If not, the Commission recognizes the hearing for the applicant.

MR. KELLAHIN: We have two witnesses I would like to have sworn.

MR. PORTER: You have two witnesses?

MR. KELLAHIN: Yes, sir.

MR. PORTER: Let's have those witnesses sworn at the same time.

MR. MATKINS: Do you want to swear my witnesses at this time, also? I have two witnesses, also.

MR. PORTER: We might as well swear them all at once.

Q Are you the manager of the W. M. Snyder Estate?

A Yes, sir.

Q Insofar as their ranching operations are concerned?

A General manager over everything.

Q Are you familiar with the area involved in this application, Mr. Squires?

A Yes, I have been familiar with it for quite some time.

Q Just what is it you are proposing to do here?

A Realizing the need for safe, economical, or inexpensive ways to put produced salt water in the area, it seemed to me a logical assumption that the salt lake would be a good place to put it, if it didn't endanger any fresh water supplies.

Of course, being in the ranching business, and we are very cognizant of what water means to us, and we sure don't want to hurt any of it, so I propose to find out or set out to find out if it would, in fact, harm any fresh water reserves in this area, or any other area. And I hired Mr. Ed Reed, a hydrologist from Midland to do some technical work, and give me an opinion on the area, and if there was any water there, and water that we didn't know about. Our water wells have been bad for a number of years, and have been abandoned in this area.

Q Do you presently have any fresh water supply in the vicinity of these lakes?

A No, sir.

Q Have you attempted or has an attempt been made in past years to develop water supplies in the area of these lakes?

A Well, we have some old wells there that were drilled many years ago, that have gone or are bad; and since the Potash Company has laid their water lines, we were able to stop using them. We have got a good water well three miles north of this area that we had piped from our water well down to the house. The house sets right between these two large lakes.

Q It is your testimony that there is no usable water within the vicinity of the lakes?

A No, sir.

Q There are three lakes involved here, Mr. Squires, Laguna Plata, that is being used for water disposal at the prese time.

A I understand that National Potash is putting brine in the lake now, yes.

Q And then Laguna Gatuna, that lake is not presently being used, is it?

A Not to my knowledge, no.

Q And then the third lake is Laguna Tonto, a small lake in Township 19 South, Range 33 East. Do you propose to use that lake for water disposal?

A No, I don't think so. It is the smallest of the three lakes, and we don't feel like it would ever be needed.

MR. PORTER: It is the northernmost lake, isn't it?

MR. KELLAHIN: That's correct.

THE WITNESS: Yes, sir.

Q Where will the water you propose to dispose of in these lakes come from, Mr. Squires?

A From produced oil wells in the area. It would be economical to get it there.

Q Would it be your intent to hold this open to any oil company for water disposal?

A Yes, sir, because many of us feel that the water should be put in a natural salt area instead of on the ground, and I think that some area needs to be provided for the oil companies in that area.

Q You are aware, are you not, Mr. Squires, that this Commission has approved continued surface disposal of salt water in the vicinity of Laguna Gatuna?

A Yes, sir, I am aware of this.

Q And you are aware, are you not, that the Commission has removed from the provisions of their salt water disposal order that portion of the land lying to the west of Laguna Plata?

A Yes, sir.

Q And it is not included in the requirements for salt ater disposal?

A Yes, sir.

MR. KELLAHIN: That is all I have on direct examination.

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

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Squires, did I understand you to say you didn't propose to use Laguna Tonto?

A Mr. Reed, I think can clarify this better than I can. We decided that it wouldn't really be needed.

Q Now, the application and the advertisement for the case were for the three lakes, Laguna Plata, Laguna Gatuna, and Laguna Tonto, and I was wondering if you were proposing at this time to dismiss the portion of the application and the case relating to Laguna Tonto?

A I just don't feel like we would probably ever use this lake. Mr. Kellahin can sure answer that better than I can.

MR. KELLAHIN: If the Commission please, it is not our intent to abandon our application for approval of the use of Laguna Tonto, although the chances are quite unlikely of it ever

being used. If the Commission wishes to eliminate it, why, there would be no serious objection from us. We did apply for it, however, and we would like to leave it in there.

Q (By Mr. Nutter) In studying the application and being somewhat familiar with the area involved here, I think that Laguna Tonto is structurally somewhat higher than the other two lakes, and it might simplify your case if this one particular lake were not included.

MR. KELLAHIN: I think we will cover that in the other witness's testimony.

A I don't pretend to be an expert on where this water goes, or anything. That is why I have Mr. Reed. He will be here in a minute.

MR. PORTER: Does that conclude your examination of the witness, Mr. Nutter?

MR. NUTTER: Yes, sir.

MR. MATKINS: I have a question or two.

CROSS EXAMINATION

BY MR. MATKINS:

Q Have you entered into any preliminary negotiations with any oil companies at this time to dispose of water on these lakes?

A No, sir.

Q You do not have any notion at this time of the amount of water that might be placed upon these lakes?

A I feel that I have a notion. I feel like it won't be very much.

Q What makes you say that?

A Because there is not much water produced in this area. But I would much prefer that, rather than this water being put on our ranch, it be put in this lake, and there is some being put in an open pit on our ranch adjacent to this one lake, and I think it is far better to put it in this lake than it is to put it in that open pit.

Q Do you feel if there is not much water to be placed on the lake, there is a real need for this additional storage area?

A I think that there is a possibility that there will be a much greater need in the years to come. I don't have a crystal ball.

Q You don't have any fee land within these lakes, do you?

A I do.

Q Which one?

A The one next to the highway, Laguna -- the lake in the middle.

Q Laguna Gatuna?

A Catuna. It is land that is bought by the W. M. Snyder on a State purchase contract.

Q You have it under purchase contract at this time?

A From the State, yes.

Q The vast majority of this land is either federal or state lease land, isn't that right?

A That's correct.

MR. MATKINS: That is all I have.

MR. PORTER: As I understand, we have three different ownerships in this area, federal, state, and fee.

MR. KELLAHIN: May I ask a couple of questions?

REDIRECT EXAMINATION

BY MR. KELLAHIN:

Q Mr. Squires, have you made application from the Bureau of Land Management for a special use permit for the federal land involved here?

A Yes, I have.

Q And have you made an application to the State of New Mexico, Public Land Commissioner, for a business lease on the State lands located within these lakes?

A Yes, I have.

Q What information did you get from the Bureau of Land Management in regard to your application?

A They told me to go ahead and file a special land use permit. I told them what I wanted to do, and they said that whatever the Oil Conservation Commission said, that it was fine with them.

Q You haven't as yet received the permit, is that correct?

A No, sir, it is pending the outcome of this hearing, as I understand it.

MR. KELLAHIN: That is all.

MR. PORTER: Does anyone else have a question? The witness may be excused.

ED L. REED

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q State your name, please.

A My name is Ed L. Reed.

Q What business are you engaged in, Mr. Reed?

A I am a consulting hydrologist.

Q Where are you located?

A Midland, Texas.

Q Have you done hydrological work in the State of New

Pollution Control Salt Water Disposal

Laguna Gatuna

Broadmoor Bldg
Hobbs N.M.

11/1/78

Post
11/31/79

W

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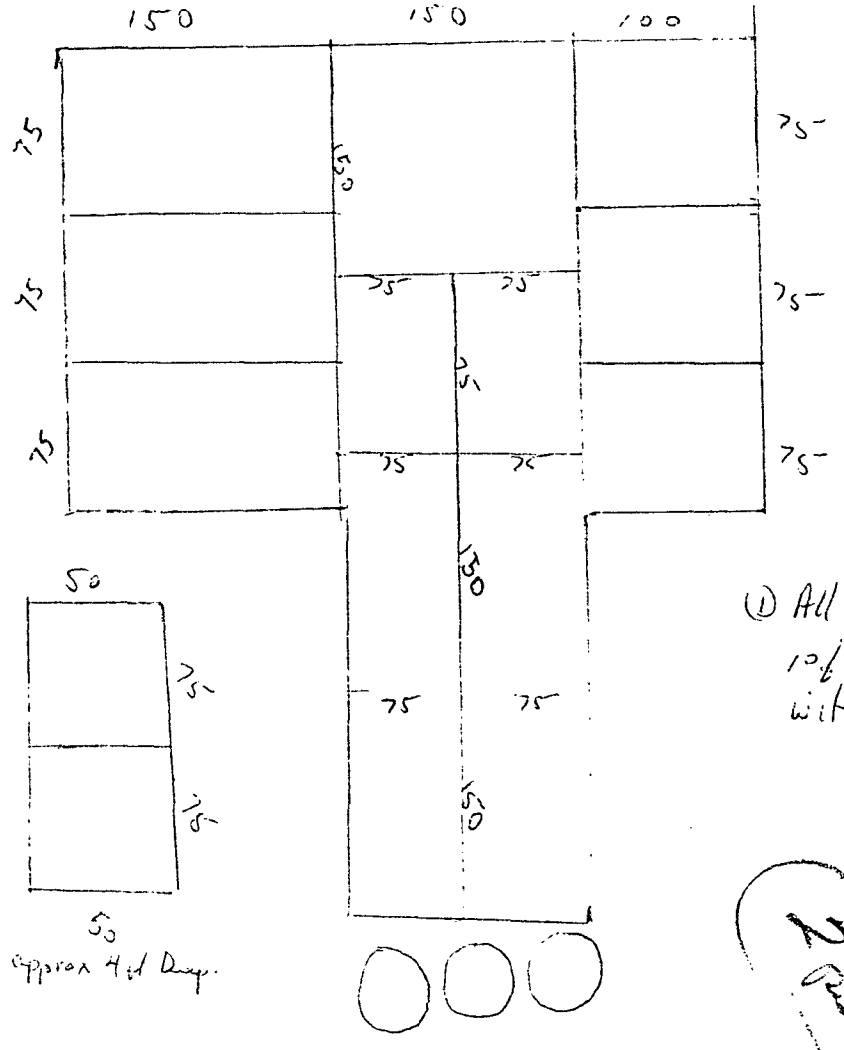


1) Location + Pits Kept in good Shape; No spills or mess.
2) Located Sec 18 T 20 R 33
3) Approx ¼ mile south is located a large Salt lake.
4) Named Laguna Gatuna

1) All Pits approx 10 ft deep with H_2O + B.S.

2 Pits

N

THE REPRODUCTION OF

THE

FOLLOWING

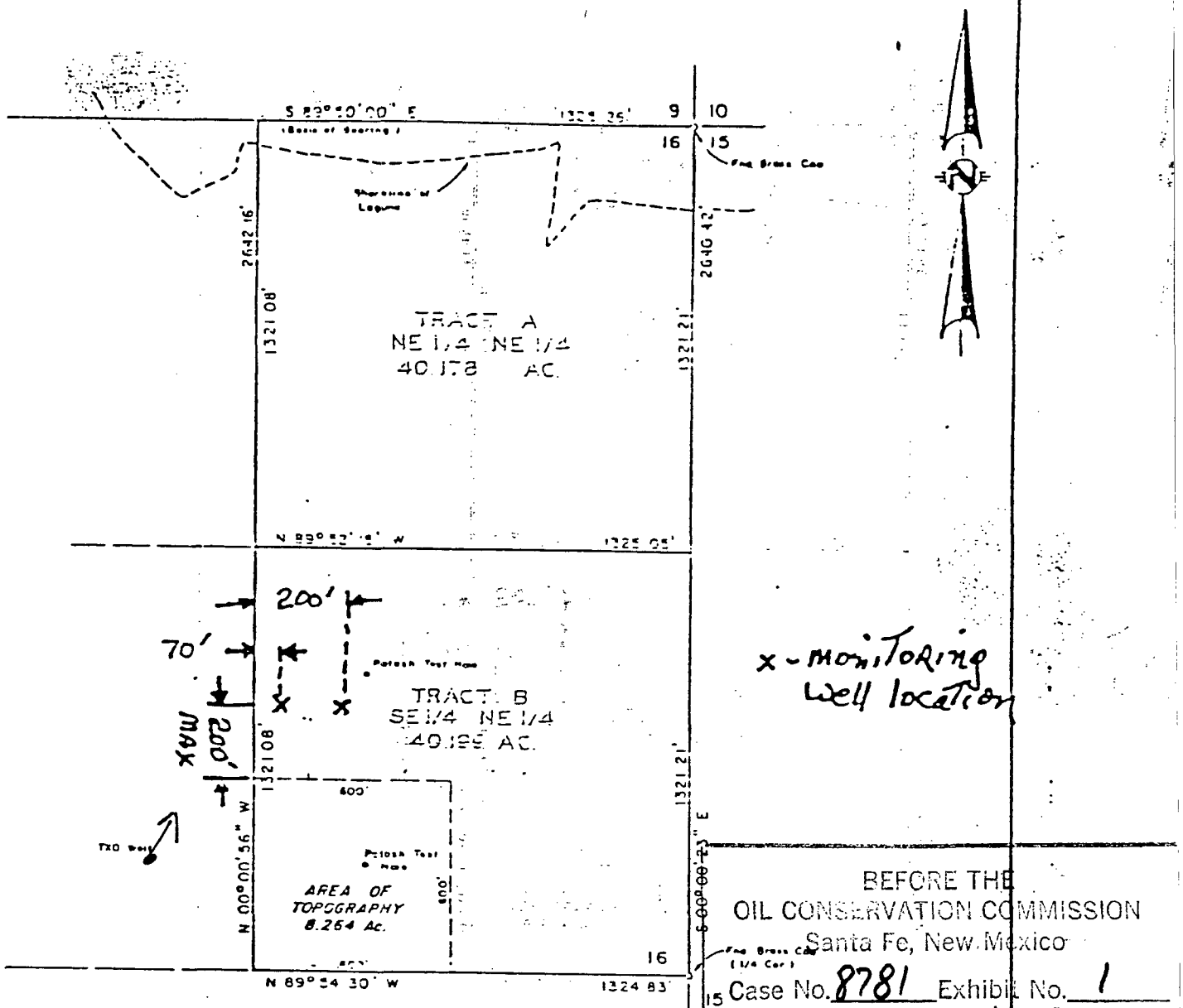
DOCUMENT (S)

CANNOT BE IMPROVED

DUE TO

THE CONDITION OF

THE ORIGINAL



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JOHN W WEST, NM PE & LS No 676
TEXAS R P S No 1128
RONALD J EIDSON, NM L S No 3239
TEXAS R P S No 443

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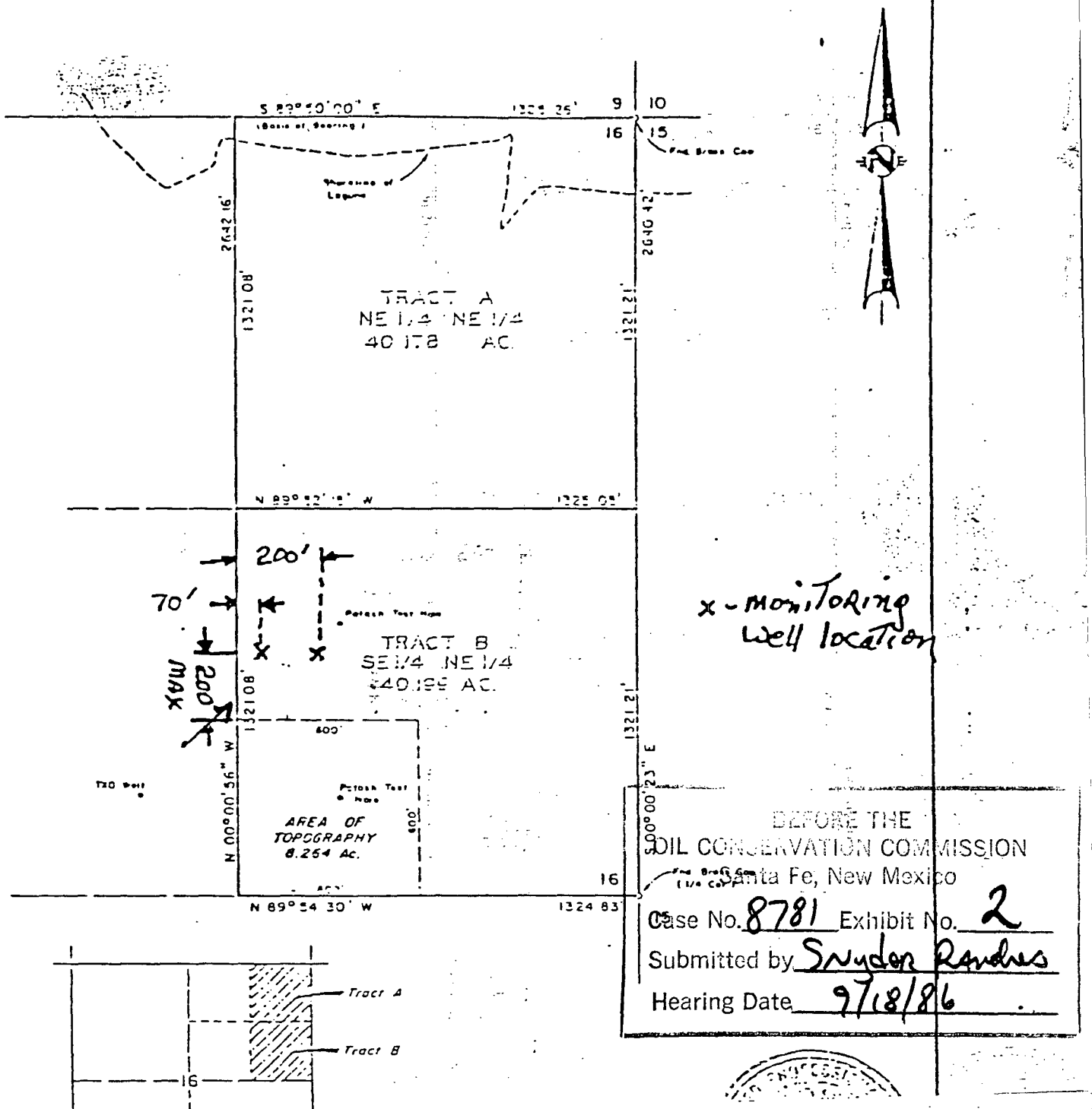

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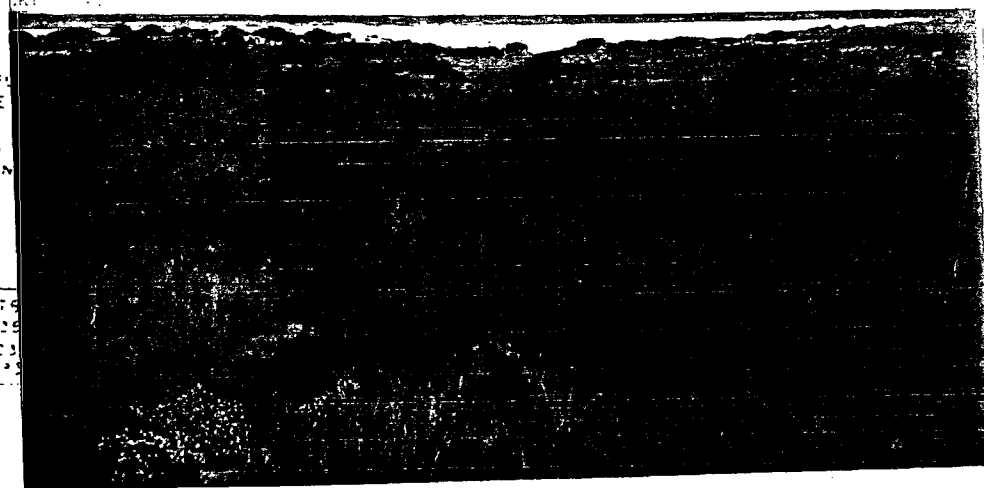
JOHN W WEST, NM PE & LS No 67
TEXAS RPS No 11
RONALD J EIDSON, NM LS No 3
TEXAS RPS No

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Case No. 8781 Exhibit No. 2
Submitted by Snyder Ranches
Hearing Date 9/18/86



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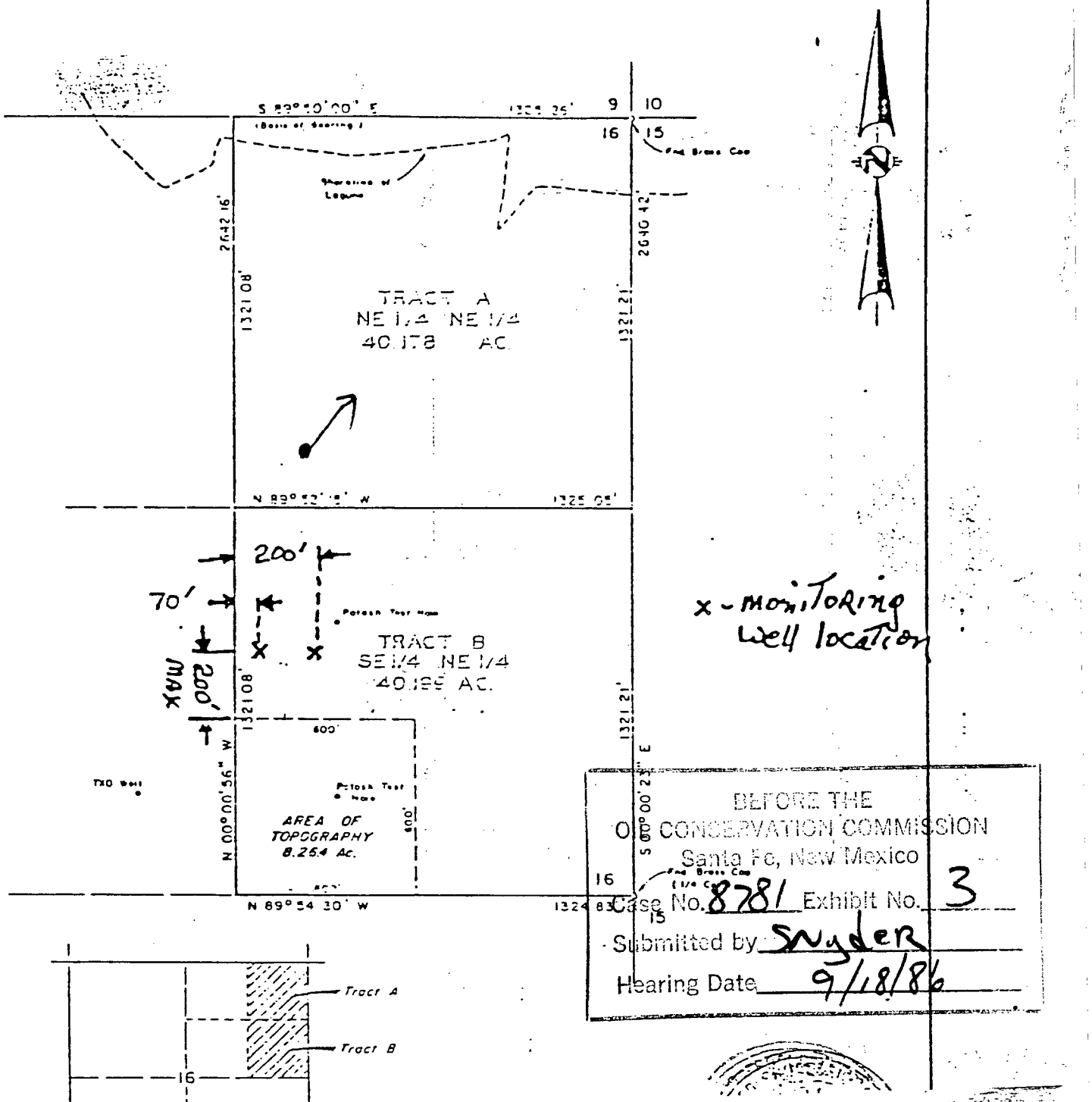


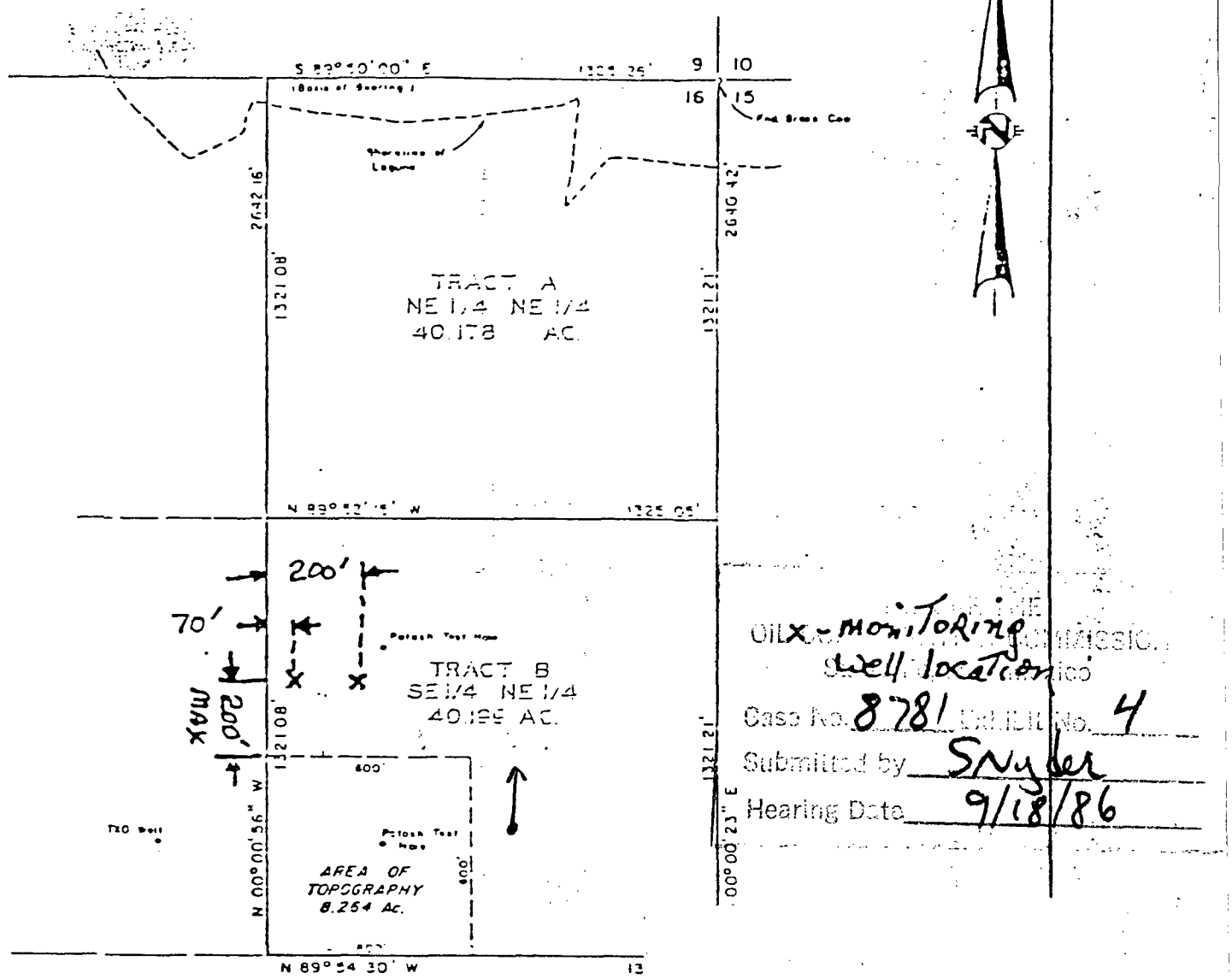
x - monitoring well location

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Case No. 8781 Exhibit No. 3
Submitted by Snyder
Hearing Date 9/18/86

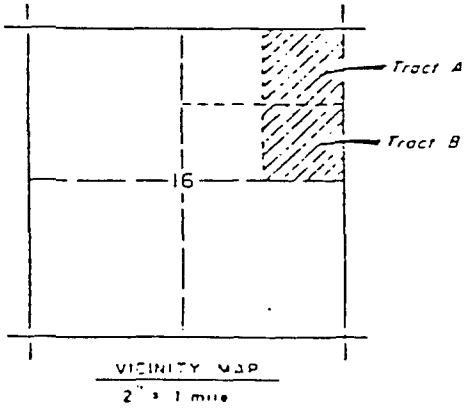
I HEREBY CERTIFY THAT THIS
WAS MADE FROM NOTES TAKEN IN
A BONA FIDE SURVEY MADE UNDE
SUPERVISION, AND THAT THE SAME
AND CORRECT TO THE BEST OF MY
EDGE AND BELIEF

JOHN W WEST, NM PE & LS No 6
TEXAS RPS No
RONALD J EIDSON, NM LS No
TEXAS RPS No

Figure 2.



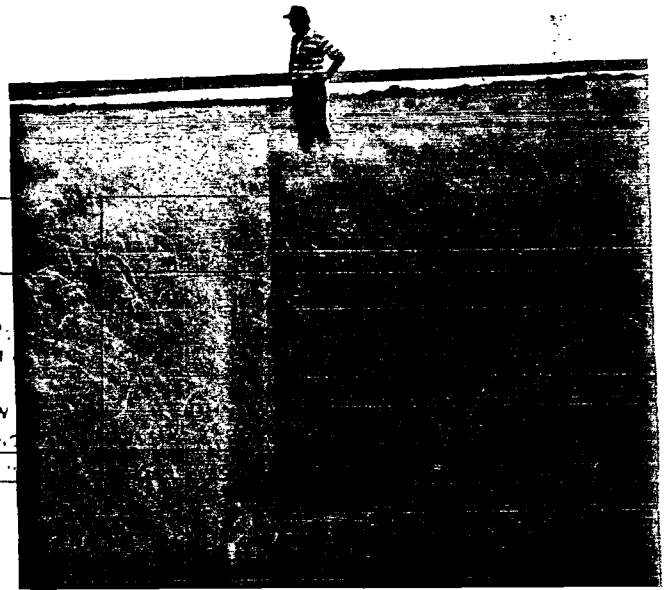
OIL CONSERVATION DIVISION
X - MONITORING
Well Location
Case No. 8781 Exhibit No. 4
Submitted by SNYDER
Hearing Date 9/18/86



VICINITY MAP
2" = 1 mile

I HEREBY CERTIFY THAT THIS PLAT WAS MADE FROM NOTES TAKEN IN THE FIELD & A BONA FIDE SURVEY MADE UNDER MY SUPERVISION, AND THAT THE SAME IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

JOHN W. WEST, NM PE & LS No 676
TEXAS RPS No 1128
EDWARD J. GIDSON, NM LS No 3239
TEXAS RPS No 937



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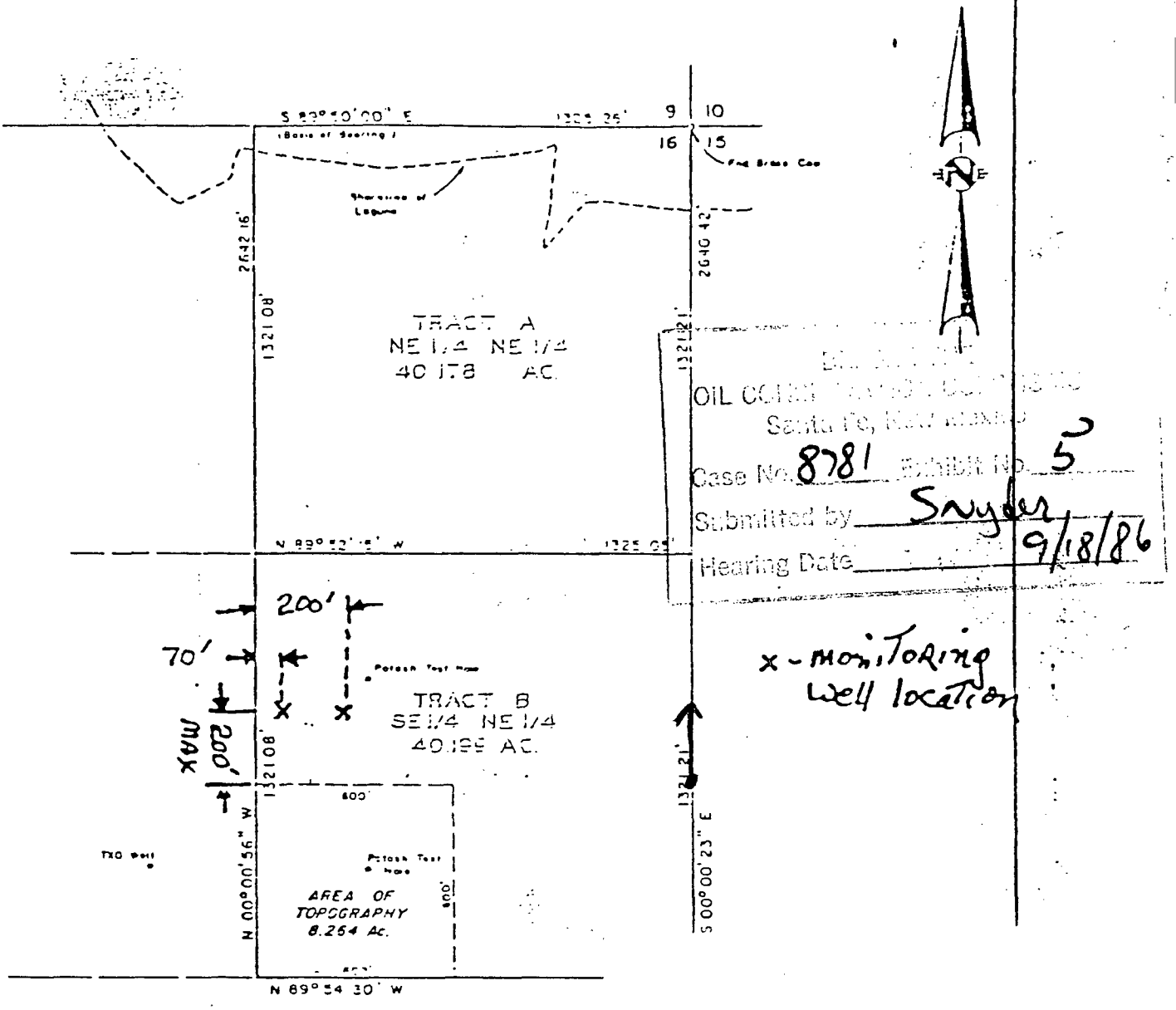
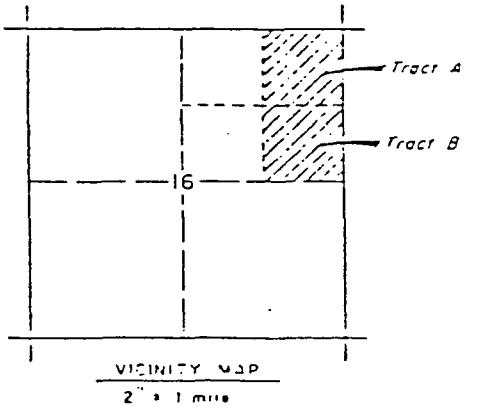


OIL CONSERVATION DIVISION
Santa Fe, New Mexico
Case No. 8781 Exhibit No. 5
Submitted by Snyder
Hearing Date 9/18/86

x - monitoring well location



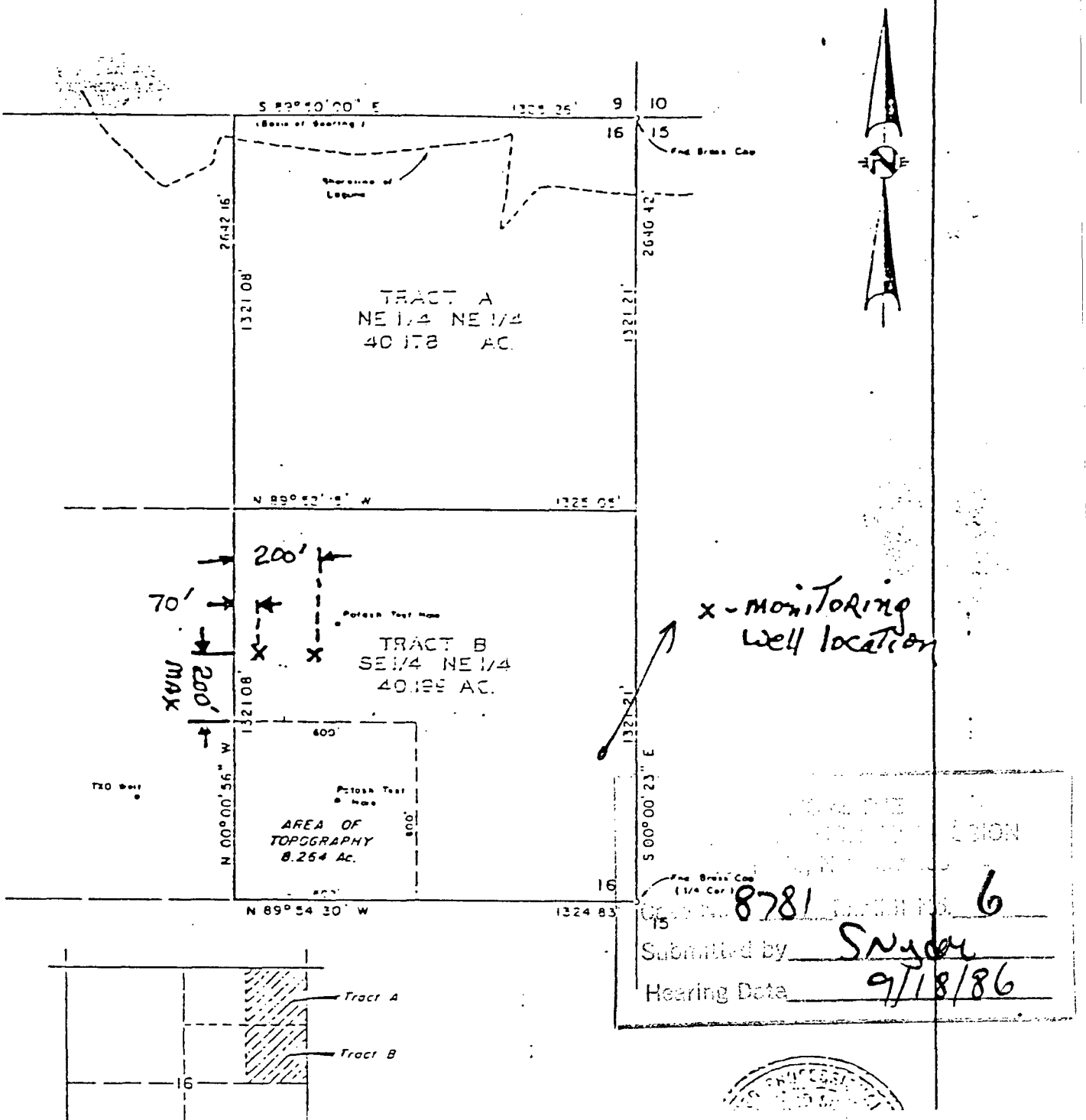
VICINITY MAP
2" = 1 mile

I HEREBY CERTIFY THAT THIS PLAT WAS MADE FROM NOTES TAKEN IN THE FIELD IN A BONA FIDE SURVEY MADE UNDER MY SUPERVISION, AND THAT THE SAME IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF

JOHN W WEST, N M P E & L S No 676
TEXAS R P S No 1128
RONALD J EIDSON, N M L S No 3239
TEXAS R P S No 1641

JOHN

Figure 2.



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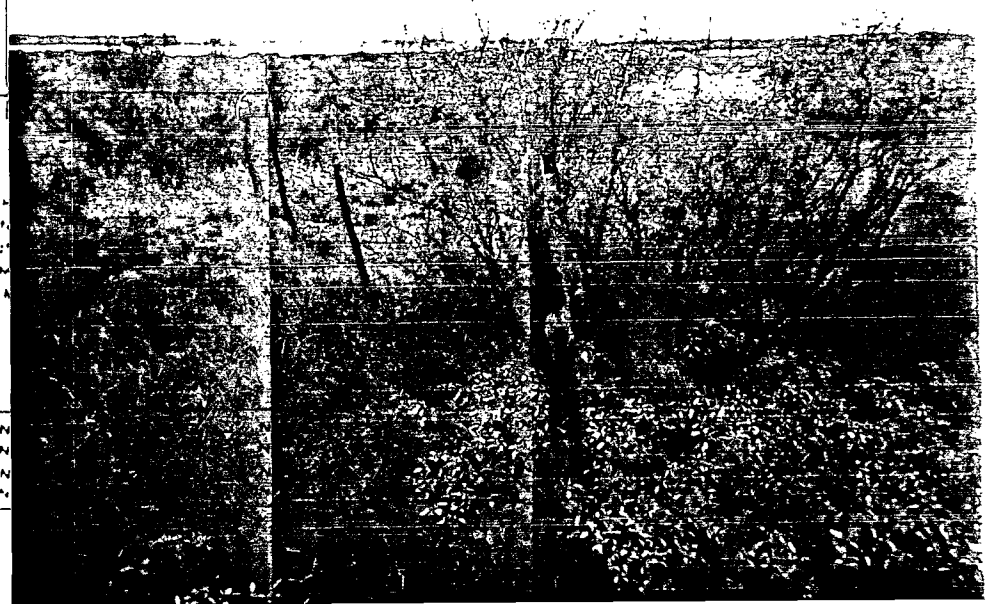

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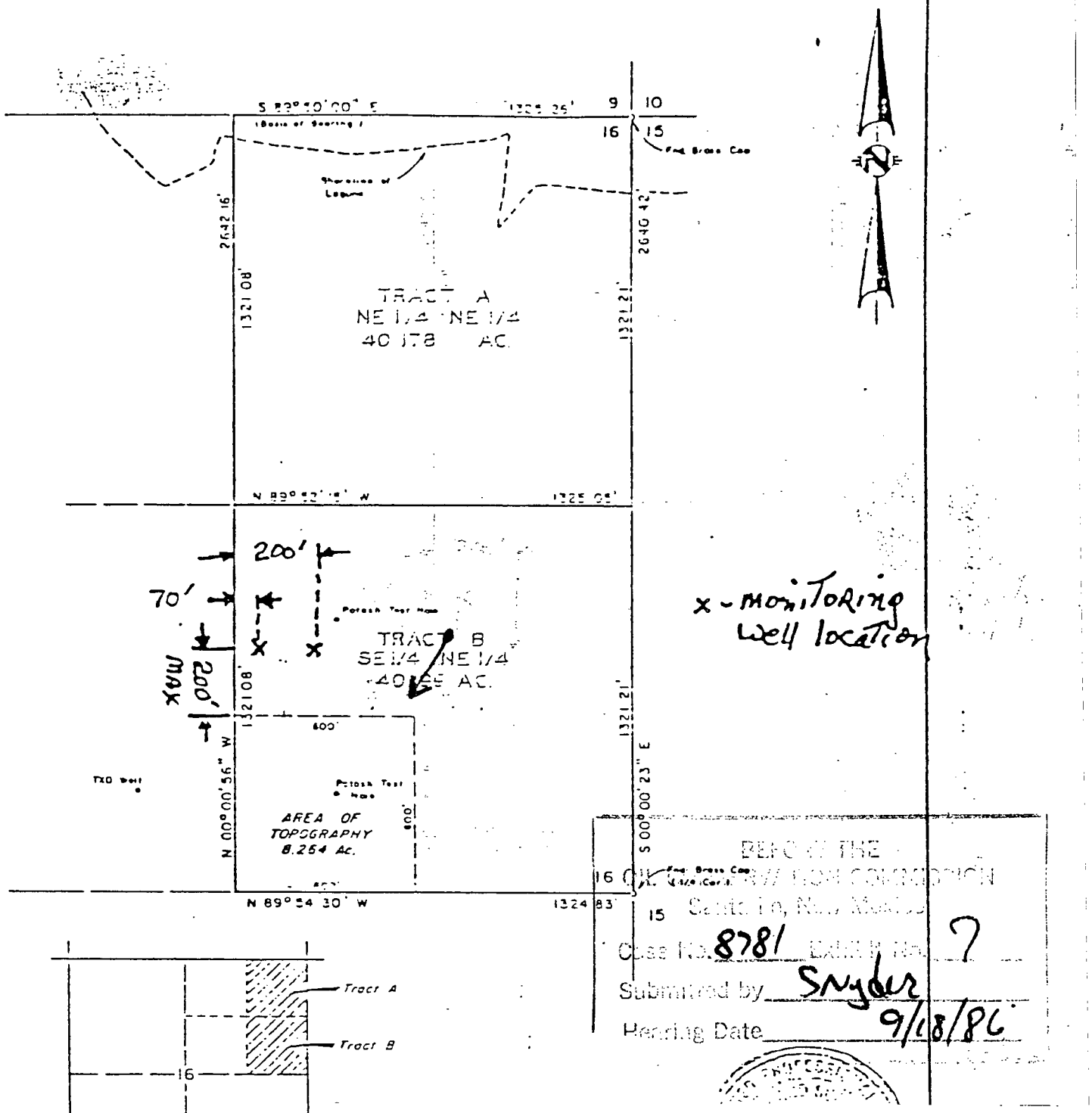

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Case No. 8781 Exhibit No. 7
Submitted by Snyder
Hearing Date 9/18/86

I HEREBY CERTIFY THAT THIS
WAS MADE FROM NOTES TAKEN IN
BY A BONA FIDE SURVEY MADE UNDER
SUPERVISION, AND THAT THE SAME
AND CORRECT TO THE BEST OF MY
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JOHN W WEST, NM PE & LS No
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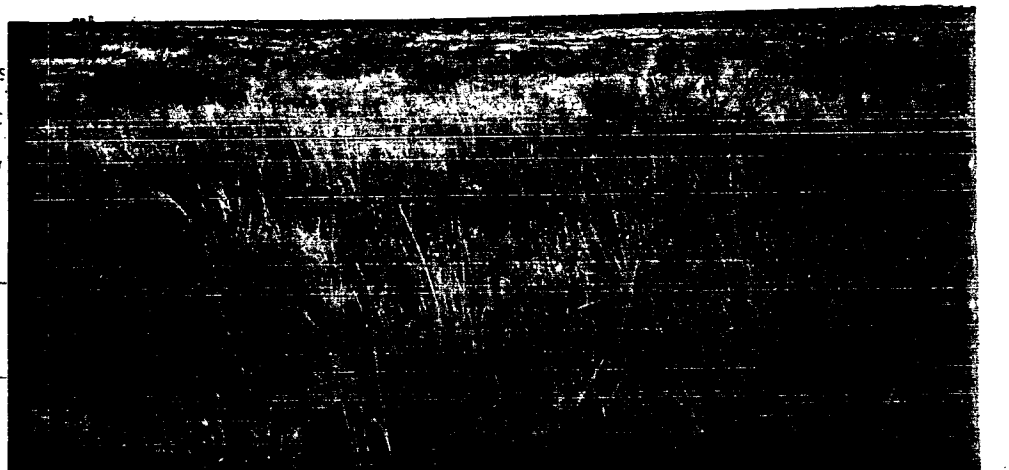
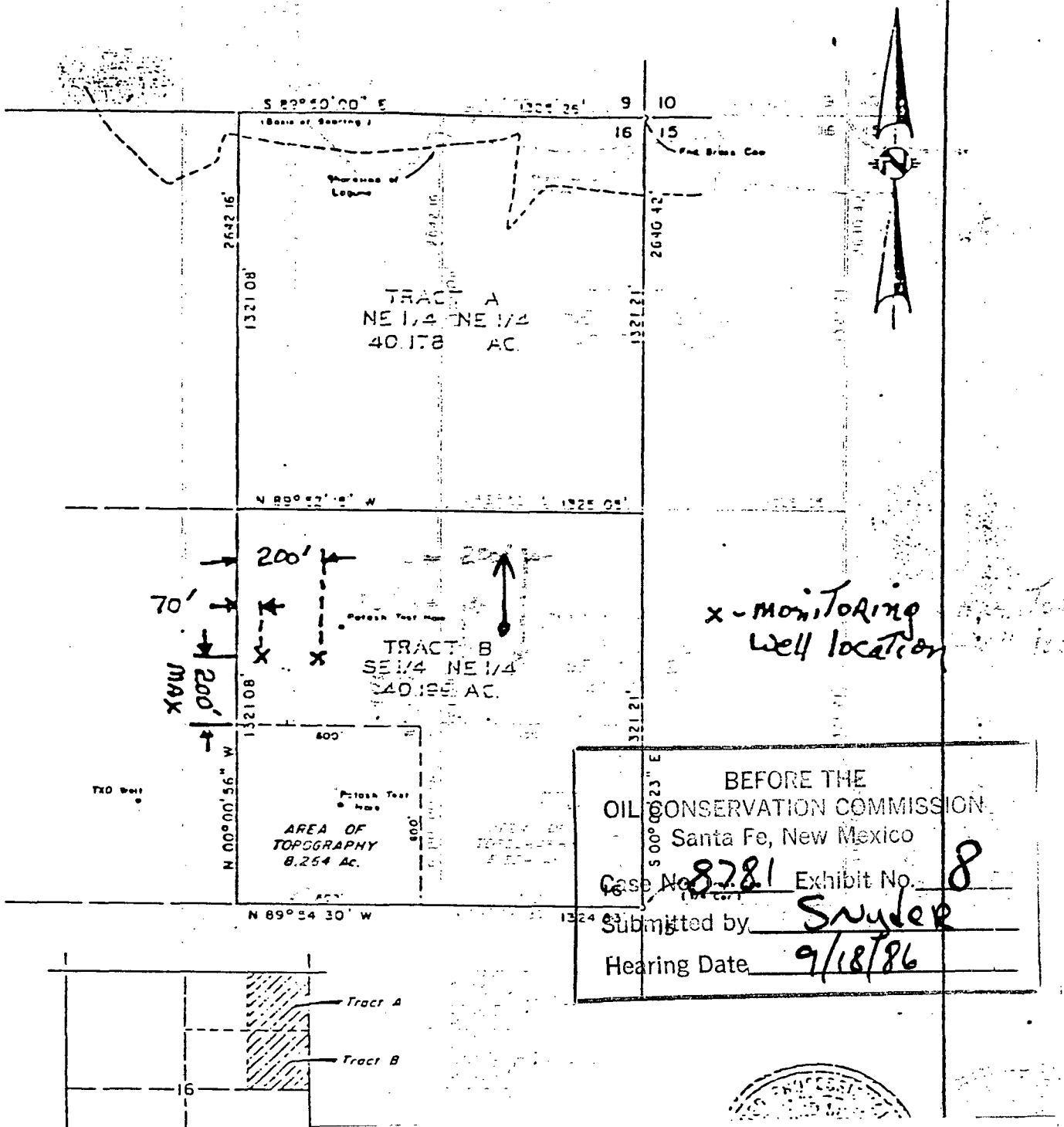
TEXAS RPS No

Figure 2.





BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Case No. 8781 Exhibit No. 8
Submitted by Snyder
Hearing Date 9/18/86

I HEREBY CERTIFY THAT
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JOHN W WEST, NM PE & LS
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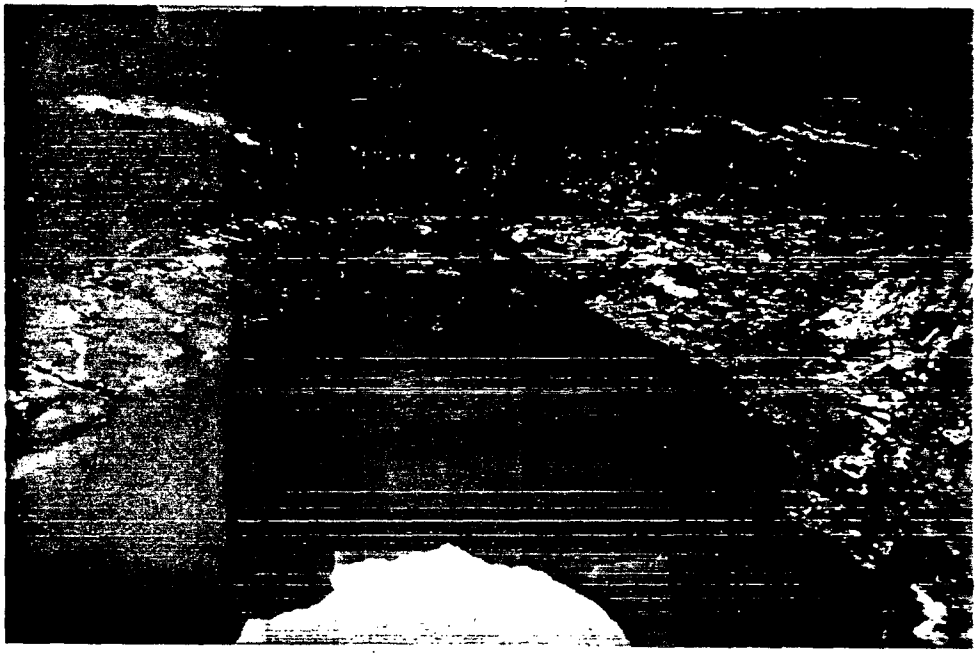
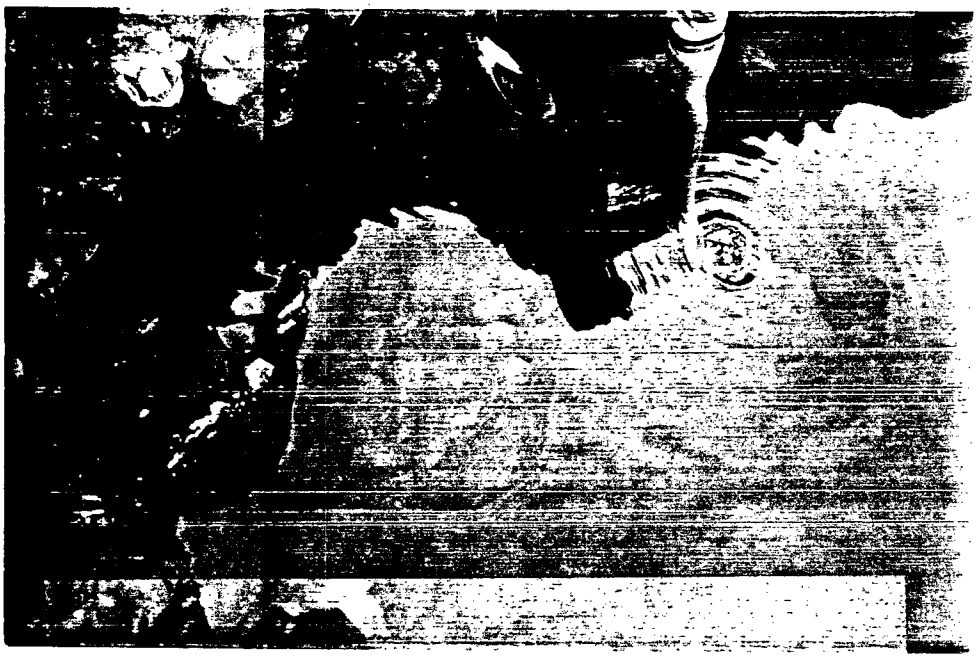
RONALD J EIDSON, NM LS
TEXAS RPS

Figure 2.

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Case No. 8781 Exhibit No. 9
Submitted by SNYDER
Hearing Date 9/18/86



BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Case No. 8781 Exhibit No. 10
Submitted by: Snyder
Hearing Date: 9/18/86



8781 12
Snyder
9/18/86

UNICHEM
INTERNATIONAL

Home Office 707 N. Leech, P.O. Box 1499 / Hobbs, NM 88240 / Ph. 505/393-7751, TWX 910/986-0010

September 10, 1986

Snyder Ranches
Box 726
Lovington, NM 88260

Attention: Larry Squires

Dear Mr. Squires:

Enclosed please find our water analysis report on the sample submitted to our laboratory on September 4, 1986.

If you have any questions or require further information, please contact us.

Sincerely,

Sharon Wright
Laboratory Technician

SW/ce

cc: Harold McCullough

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Case No. 8781 Exhibit No. 13
Submitted by Snyder
Hearing Date 9/18/86

UNICHEM INTERNATIONAL

707 NORTH LEECH P.O.BOX 1499

HOBBS, NEW MEXICO 88240

COMPANY : SNYDER RANCHES
DATE : 9-10-86
FIELD,LEASE&WELL : RANCH 376
SAMPLING POINT: SNYDER RANCH
DATE SAMPLED : 9-4-86

SPECIFIC GRAVITY = 1
TOTAL DISSOLVED SOLIDS = 1618
PH = 7.72

		ME/L	MG/L
CATIONS			
CALCIUM	(CA)+2	2.5	50.7
MAGNESIUM	(MG)+2	3.8	47.2
SODIUM	(NA),CALC.	21.1	485.
ANIONS			
BICARBONATE	(HCO3)-1	1.4	85.4
CARBONATE	(CO3)-2	0	0
HYDROXIDE	(OH)-1	0	0
SULFATE	(SO4)-2	3.1	150
CHLORIDES	(CL)-1	23	800
DISSOLVED GASES			
CARBON DIOXIDE	(CO2)	NOT RUN	
HYDROGEN SULFIDE	(H2S)	NOT RUN	
OXYGEN	(O2)	NOT RUN	
IRON(TOTAL)	(FE)		.7
BARIUM	(BA)+2	0	0
MANGANESE	(MN)	NOT RUN	

IONIC STRENGTH (MOLAL) =.032

SCALING INDEX	TEMP
	30C
	86F
CARBONATE INDEX	.555
CALCIUM CARBONATE SCALING	LIKELY
CALCIUM SULFATE INDEX	-17.
CALCIUM SULFATE SCALING	UNLIKELY

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE SUITE 1200
DALLAS TEXAS 75202-2733

OCT 10 1991

RECEIVED
OCT 17 1991
CARPENTER CROUT & OLMSTED

Michael R. Comeau, Esquire
Stephenson, Carpenter, Crout & Olmstead
P.O. Box 669
Santa Fe, New Mexico 87504-0669

Dear Mr. Comeau:

On August 13, 1987, EPA Region 6 advised you that Laguna Gatuna, a playa in Eddy County, New Mexico, did not appear to be a "water of the United States" subject to EPA jurisdiction under the Clean Water Act, 33 U.S.C. §1251 et seq. On March 26, 1991, EPA Region 6 advised the New Mexico Environmental Improvement Division that Laguna Gatuna now appeared to be such a water of the United States. Your client, Laguna Gatuna, Inc. and its predecessor, Pollution Control, Inc. have discharged produced water derived from onshore subcategory oil wells to Laguna Gatuna since 1969. Because Onshore Subcategory NPDES permits Region 6 issued earlier this year prohibit discharges of such produced water to waters of the United States, Laguna Gatuna, Inc. is understandably concerned about the March 26, 1991, opinion and has asked that EPA clarify its position.

Both of EPA's advisory opinions were correct as a matter of law; their different conclusions are attributable to differences in the information on which they were based. The 1987 opinion was in part based on an assertion that Laguna Gatuna "supports no wildlife...of any kind," which was itself apparently based on a lack of migratory bird sightings at the playa. The 1991 opinion was primarily based on assertions by the Bureau of Land Management (BLM) and the United States Fish & Wildlife Service (USF&WS) that migratory shorebirds and raptors (including several endangered species) use Laguna Gatuna for loafing, breeding, and feeding. These assertions were apparently based on field observations at nearby playas the BLM and USF&WS regarded equivalent to Laguna Gatuna.

Currently, we regard the limited facts before the agency insufficient for drawing firm conclusions. We are unsure, for instance, whether the lack of migratory bird sightings at Laguna Gatuna results from (1) the discharge of produced water for over 20 years (2) a lack of purposeful observation or (3) some other factor unique to Laguna Gatuna. At a meeting with Region 6 staff on July 24, 1991, you took the latter position and submitted a memorandum to that effect. After reviewing that memorandum and the information attached thereto, we remain undecided.

The USF&WS is currently planning to study several playas in the area and would welcome an opportunity to include Laguna Gatuna in that study. We believe the information generated would be of assistance in resolving this matter one way or the other and thus urge that you contact Richard Roy in the Albuquergue USF&WS field office. Mr. Roy's telephone number is (505) 883-7877. EPA may also wish to examine Laguna Gatuna at some time in the future, in which case we will contact you to arrange access.

We appreciate the cooperative attitude your client has demonstrated in this matter and encourage it to continue in the same vein. Should we ultimately determine Laguna Gatuna is a water of the United States, such cooperation will be considered in subsequent Agency decisions affecting your client's facility. If you have any questions in this matter, please call Assistant Regional Counsel Pat Rankin at (214) 655-2106.

Sincerely yours,

Kenton Kirkpatrick
Acting Director
Water Management Division

cc: Mr. Richard Roy
USF&WS

MEMORANDUM

TO: **EPA Region VI**
Water Enforcement Branch

FROM: **Michael R. Comeau**
Counsel for Laguna Gatuna, Inc.

DATE: **July 24, 1991**

RE: **The Facts Concerning Whether Laguna Gatuna is a "Water of the United States"**

I. INTRODUCTION

A. The Fish and Wildlife Service asserts that Laguna Gatuna is a water of the United States because it is "used" by migratory birds.

B. The question under 40 C.F.R. § 122.2 is whether Laguna Gatuna is a "playa lake ... the use, degradation, or destruction of which would affect or could affect interstate commerce." EPA's criteria for assessing interstate commerce includes waters "which are or would be used as habitat" by migratory birds or endangered or threatened species. The Corp of Engineers' version of that criterion was invalidated in *Tabb Lakes, Ltd. v. United States*, 715 F. Supp. 726 (E.D. Va. 1988), *aff'd* 885 F.2d 866 (4th Cir. 1989), and is under attack in *Leslie Salt*, 700 F. Supp. 476 (N.D. Cal. 1989), *rev'd* 896 F.2d 354 (9th Cir. 1990), but we will assume its validity for the purpose of showing that it does not control the Laguna Gatuna situation in any event.

C. This Memorandum summarizes the factual evidence demonstrating that Laguna Gatuna is not conceivably within the scope of the Clean Water Act or 40 C.F.R. § 122.2. In sum, Laguna Gatuna is not a "playa," it contains no "lake" or any appreciable water, it is absolutely isolated from any body of water or waterway, it pollutes nothing, it has no connections with interstate commerce, and, most significantly, it does not provide any habitat whatsoever for any qualifying wildlife.

D. References

1. Knight I. The 6-13-91 letter from Dr. James E. Knight to Michael Comeau, attached hereto as Exhibit A.

2. Knight II. The July 17 letter from Dr. James E. Knight to Michael R. Comeau, attached hereto as Exhibit B.

3. Kelly. The affidavit of T. E. Kelly of Geohydrology Associates, Inc., attached hereto as Exhibit C.

4. Report. The 1984 Report of Geohydrology Associates, Inc., entitled "Hydrologic Assessment of the Salt Lakes Area, Western Lea County, New Mexico." This Report has previously been submitted to EPA.

5. Squires. Affidavit of Dr. Larry Squires, of Laguna Gatuna, Inc., attached hereto as Exhibit D.

6. NMOCD. 8-20-84 Order of the Division. This Order has previously been submitted to EPA.

II. LAGUNA GATUNA IS NOT A "PLAYA"

A. In the geologists' lexicon Laguna Gatuna is a "sinkhole," not a "playa." Kelly.

B. Playas are formed by wind erosion or buffalo wallows; Laguna Gatuna was formed by erosion of a salt structure and subsequent collapse. Id.

C. Hydrological characteristics differ. Id.

III. LAGUNA GATUNA IS NOT A "LAKE"

A. No stream empties into it. Report.

B. No stream drains out of it. Kelly.

C. The saline seeps are ephemeral.

1. Most water evaporates before reaching the surface. Kelly.

2. After heavy rains, only "damp spots" are observable. Kelly.

D. The depression is dry for the great majority of the year except for the brine discharge. Squires, Kelly.

E. Some runoff enters the depression after heavy rainfall.

1. This is a desert, with average rainfall of about seven inches per year, so runoff events are rare.

2. Total runoff is estimated to be about 8,000 gallons per year. Report, at 29.

a. Runoff evaporates in a matter of days if not hours. Kelly, Squires.

b. The amount is *de minimus*, probably less than a faucet drip.

3. All brine and runoff is evaporated; none ever leaves the property except as water vapor. Kelly.

IV. LAGUNA GATUNA HAS ABSOLUTELY NO CONNECTION WITH ANY BODY OF WATER

A. The nearest stream is the Pecos River, about 40 miles away. Report.

B. There are no surface or groundwater connections between Laguna Gatuna and the Pecos River or any other water body. Kelly.

C. Laguna Gatuna is "unique." Knight I, Kelly.

1. Some intermittent lakes in New Mexico are hydrologically connected to each other and to waterways; Laguna Gatuna is not. Kelly.

2. Unlike many such areas, it is not a party of any water system. Kelly.

3. Other lakes are bigger, have standing water and wildlife populations. Knight I, Kelly.

V. THE BRINE DISPOSAL OPERATION AT LAGUNA GATUNA DOES NOT POLLUTE ANY WATERWAY OR WATER BODY

A. The brine is separated from hydrocarbon constituents before evaporation. NMOCD, Squires.

B. Evaporation is total; discharge has never exceeded and rarely approached the OCD's capacity estimates. NMOCD.

VI. THE USE OF LAGUNA GATUNA DOES NOT AFFECT INTERSTATE COMMERCE (self-evident)

A. No boating.

B. No fishing or fish.

C. No beaver or other water-based wildlife.

D. No wetland vegetation.

E. No water-based recreation.

F. No bird observation or study.

G. Not navigable in law or fact.

H. No drinking.

I. No. irrigation.

J. No industrial or commercial appropriation.

K. No related connection with any of these factors.

VII. LAGUNA GATUNA DOES NOT PROVIDE HABITAT FOR MIGRATORY BIRDS OR ENDANGERED OR THREATENED SPECIES.

A. Larry Squires has lived in the area for many decades and has a degree in biology. He states:

1. No nesting in the Laguna Gatuna watershed.

2. No tracks.

3. No feeding from the depression.

4. Quail and doves are found in the sandy uplands outside of the Laguna Gatuna watershed.

5. No federal or state wildlife officer has ever made a biological survey of the Laguna Gatuna watershed.

B. Dr. James E. Knight is a professor of wildlife science and is actively involved in playa wildlife preservation. In his first report, Dr. Knight states:

1. His professional opinion is that "Laguna Gatuna does not support any wildlife other than possible intermittent brine shrimp populations." In a later visit, Dr. Knight established that no brine shrimp populations existed at Laguna Gatuna. Knight II.

2. Generalities about playa lakes and their wildlife do not apply to Laguna Gatuna because it is unique.

3. The occasional water "is of no use to satisfy water needs of land dwelling animals."

4. It "could certainly support no waterfowl."

5. Nesting cover is absent.

6. There is no food source for nesting shorebirds.

7. Resting for short periods of time "certainly does not constitute support of waterfowl."

8. Even if brine shrimp existed (they do not), they would never reach the size necessary to be a food source.

9. "Aplomado falcons do not occur in New Mexico other than as occasional stragglers," and habitat at Laguna Gatuna is wholly unsuitable.

10. Snowy plovers are not jeopardized in New Mexico.

C. The wildlife-related conclusions of the Fish & Wildlife Service are inapposite because they were based on inferences from inapplicable generalities.

1. The Fish & Wildlife Service has never surveyed Laguna Gatuna or its watershed.

2. Instead, it interpolated sightings from other areas.

   a. The falcon was "documented" (by whom unknown) "in the area near" Laguna Gatuna.

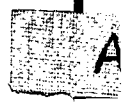
   b. One person apparently saw "nesting activity" of the snowy plover "near" Laguna Gatuna.

   c. No support of any kind was offered for the Fish & Wildlife Service conclusion that Laguna Gatuna is used by migratory birds for feeding, loafing and nesting.

   d. All of these interpolations are directly contradicted by the wildlife scientist who actually studies the area. Knight I.

3. The "possibility" that contaminated brine shrimp could poison feeding birds is conclusively negatived by the facts that Laguna Gatuna contains no brine shrimp (Knight II) and that birds do not feed in the depression. Squires, Knight I.

MRC:cyc
Attachments


A

COOPERATIVE EXTENSION SERVICE

NEW MEXICO STATE UNIVERSITY

BOX 3AE, LAS CRUCES, NEW MEXICO 88003-0031
COLLEGE OF AGRICULTURE AND HOME ECONOMICS

June 13, 1991

Mr. Michael R. Comeau
Carpenter, Crout, and Olmsted
P.O. Box 669
Santa Fe, New Mexico 87504-0669

Dear Mr. Comeau:

I visited the Laguna Gatuna playa lake on June 7, 1991, to form an opinion of its value to wildlife, especially those which were indicated to be of concern by the U.S. Environmental Protection Agency (EPA) in their letter dated March 26, 1991. After inspecting the area and consulting with my colleagues who are considered experts in endangered species and related matters, it is my professional opinion that Laguna Gatuna does not support any wildlife other than possible intermittent brine shrimp populations and, therefore, under EPA's definition (40 CFR 122.2) it should not be considered "waters of the United States."

I need to preface my explanation by emphasizing the importance of playa lakes to the ecosystem and the resultant tendency of resource managers to protect them using rather far fetched concerns. I am a member of the Playa Lakes Joint Venture subcommittee. This is a multi-agency team working on the preservation of playa lakes in the Great Plains area. I am fully aware of the efforts being made to ensure the protection of playa lakes, and I fully support these efforts. As a professor of wildlife at New Mexico State University, I continually caution our students on the importance of protecting our natural resources while maintaining professional credibility. This means wildlife professionals must give complete and accurate assessments when making recommendations about the effects of human activities on wildlife.

In my opinion, generalizations which may be true on nearby playa lakes have been applied to Laguna Gatuna. Laguna Gatuna is a unique playa and its use by wildlife and what it can support cannot be assumed to be the same as other playa lakes.

My first impression when I heard about Laguna Gatuna was that, like most playa lakes, it must be important to wildlife. After visiting the site and reviewing hydrologic reports, my view has changed. The water is very brackish, because of

naturally occurring highly mineralized springs, and it is of no use to satisfy water needs of land dwelling animals. Because it only holds water for a few days after even heavy precipitation, it could certainly support no waterfowl. The playa contains no aquatic nor shoreline vegetation, so nesting cover is absent. Only those shorebirds which lay their eggs directly on the ground and build no nest could possibly use the area for nesting. But with the absence of water for any length of time there would be no food source for nesting shorebirds, thus eliminating these from being supported by Laguna Gatuna. After heavy rains, waterfowl might use the water for resting for short periods of time, but this certainly does not constitute support of waterfowl.

I consulted with Dr. Richard Cole, a fisheries faculty member in the Department of Fishery and Wildlife Science at New Mexico State University about brine shrimp. Dr. Cole explains that brine shrimp are able to withstand long periods of dry conditions and their eggs will hatch when precipitation does occur. Even desert conditions having low spots which hold water only a few days each year can have populations of these kinds of animals. There was not enough water in Laguna Gatuna when I visited the site to sample for brine shrimp, but I have no doubt they could exist there. Because of the few days each year the playa holds water, and because of the 1-3 weeks necessary for the brine shrimp to reach a size that could be caught by shorebirds, I see no possible way the brine shrimp could be considered a food source that would support shorebirds.

I need to comment on the concerns about the Aplomado Falcon and the Snowy Plover. My previous comments explain why Laguna Gatuna could not be considered as an area that could support these species. The mention of them is apparently an unscrupulous effort to inappropriately involve the Endangered Species Act to achieve a goal.

Because he is considered by most wildlife professionals to be the leading authority on endangered species in New Mexico, I visited with Dr. John Hubbard of the New Mexico Department of Game and Fish. I asked Dr. Hubbard about reports of sightings of the Aplomado Falcon in New Mexico. Dr. Hubbard stated, "Hard evidence indicates Aplomado Falcons do not occur in New Mexico other than as occasional stragglers." As we were discussing the potential for Aplomado Falcon reintroduction in New Mexico, Dr. Hubbard explained that the nearest viable population was in Vera Cruz, Mexico. The area in which they occur is savannas and occasionally wet forest. Dr. Hubbard pointed out it is hard to see anything in southern New Mexico which looks like that.

I also talked to Dr. Hubbard about the Snowy Plover. He explained that this bird is not on the threatened and endangered species list but is a category 2 candidate. This means that evidence suggests there may be reason to list this species but

further investigation is necessary before threatened or endangered status can be determined.

Dr. Hubbard told me there are more Snowy Plovers in new Mexico now than there were historically. In other parts of their range, Snowy Plovers are declining and therefore the bird is a candidate species. Implications in some agency reports are that the species is in jeopardy in southeastern New Mexico. The opposite is true.

In summary, any wildlife professional who visited Laguna Gatuna should be able to see this playa does not support wildlife. Wildlife could occur here, but are certainly not supported here.

Although it may not be related to the immediate needs of Laguna Gatuna, Inc., I do have some professional concerns related to this situation. I am distressed that there are some resource management professionals who are using the Endangered Species Act as leverage rather than for the purposes originally intended by the Act. Doing this weakens those cases where the Act is appropriately used to protect threatened and endangered species. As past-president of the New Mexico Chapter of the Wildlife Society, the professional organization of wildlife biologists, I stressed the importance of conscientious decisions. When this importance is overridden by personal agenda, the integrity of the profession suffers.

I have been on the wildlife faculty at New Mexico State University for 11 years. I have received numerous honors and awards by my colleagues including Professional of the Year. I have been vice-president of The New Mexico Wildlife Federation and have served on numerous state and national committees involving wildlife management. I am truly concerned about wildlife. The Laguna Gatuna situation is the first time in my career that I see a situation where absence or non-use by wildlife is in the best interest of someone being criticized by agencies who have the role of helping wildlife.

Industry, agencies, and landowners usually contact me to find out how they can improve wildlife habitat or wildlife populations. If Laguna Gatuna, Inc. had contacted me 5 years ago seeking practices to improve cover or other habitat around their holding ponds, these practices could have resulted in a situation that would be used against them today. Some of the work I am doing with the Playa Lake Joint Venture Committee involves persuading landowners to voluntarily improve habitat around their playas. Some landowners are pumping water into the playas to make them usable by wildlife even during dry periods. The Clovis sewage treatment plant is pumping treated water into a playa which has become very attractive to many wildlife species. I hope these landowners do not face allegations in the future because their activities are perceived as detrimental to the wildlife they are responsible for helping.

I sincerely hope Laguna Gatuna Inc. is not discouraged from doing good things for wildlife because of current actions being taken by agencies. Hopefully land management agencies, wildlife management agencies and environmental management agencies will see the benefits of making practical decisions that are within the intent of laws and which have as an ultimate goal, the long-term well-being of our wildlife and other resources.

If you have any further questions, please contact me.

Sincerely,

James E. Knight
Professor
Wildlife Science

JEK/pb

c
Mr. J.W. Neal
Mr. Larry C. Squires, D.V.M.

B

DR. JAMES E. KNIGHT, PH.D.
Rt. 1, Box 808
La Mesa, New Mexico 88044

July 17, 1991

Mr. Michael R. Comeau
Carpenter, Crout, and Olmsted
P.O. Box 669
Santa Fe, New Mexico 87504-0669

Dear Mr. Comeau:

I revisited the Laguna Gatuna playa lake on July 8, 1991, to determine whether brine shrimp were present. I felt that because brine shrimp would be the only attraction to any shorebirds that might occur at the playa, the presence or absence of the brine shrimp was important.

According to Dr. Larry Squires, it had rained approximately 4 inches in the week prior to my visit. This would have allowed at least 4 days for the shrimp to hatch and grow to a size that could be sampled. Dr. Paul Turner, a fisheries faculty member in the Department of Fishery and Wildlife Science at New Mexico State University, concurred that this time period for hatching and growth would be sufficient. He advised me that if the brine shrimp were present, dragging a fine screen net a short distance would be an adequate sampling technique.

I waded through the mud and began dragging the sampling net as soon as I reached standing water. I pulled the net approximately one-half mile. This is much further than Dr. Turner had recommended. I sampled three different areas in the playa. I collected no aquatic life of any kind. There was absolutely no indication that any species of brine shrimp occur in Laguna Gatuna.

I also waded through the mud along the shoreline to see if I could see tracks of any wildlife. I covered approximately one-fifth of the shoreline at different areas and did not see a single track of any animal.

I am glad I had the opportunity to look more closely for wildlife sign at the playa. I now feel confident that Laguna Gatuna does not support any wildlife.

If you have any further questions, please contact me.

Sincerely,

J. E. Knight

James E. Knight, Ph.D.
Professor, Wildlife Science

JEK/pb

c
Dr. Larry Squires

AFFIDAVIT OF TIM KELLY

STATE OF NEW MEXICO)
) ss.
COUNTY OF _____)

TIM KELLY, being first duly sworn and upon oath hereby deposes and states:

That the report attached hereto was prepared by him and the statements contained therein are true and correct to the best of his knowledge, information and belief.

FURTHER Affiant sayeth naught.

S/
Tim Kelly

SUBSCRIBED, SWORN TO AND ACKNOWLEDGED before me this _____ day of July, 1991, by Tim Kelly.

_____
Notary Public

My Commission Expires:

_____

Since 1968 I have had the opportunity to conduct a number of hydrologic investigations in southeastern New Mexico, the majority of which involved the region including Laguna Gatuna and Nash Draw. In all of these studies I acted as the sole investigator or as the principal investigator. Some of the reports resulting from these studies included, but are not limited to, the following:

1. Saline ground water resources of the Ric Grande drainage basin--a pilot study: Office of Saline Water, 1970
2. Reconnaissance investigation of ground-water resources of the Rio Grande drainage basin: U.S. Geological Survey, 1974
3. Collection of hydrologic data, Eastside Roswell Range EIS Area, New Mexico: Bureau of Land Management, June 1978
4. Ground-water study related to proposed expansion of potash mining near Carlsbad, New Mexico: Bureau of Land Management, June 1978
5. Water-resource study of the Carlsbad potash area, New Mexico: Bureau of Land Management, July 1979
6. Aquifer tests in H-6b, H-4b, and WIPP-15 wells near Carlsbad, New Mexico: Sandia National Laboratories (WIPP Project, 1980
7. Hydrologic assessment, Lindsey Lake Area, Eddy County, New Mexico: Michael Grace, 1982

8. Hydrologic assessment of the Salt Lakes Area, western Lea County, New Mexico: Pollution Control, Inc., 1984

9. Hydrogeologic investigation in the area of Mimosa Ride and estimation of ground-water contamination in Nash Draw: Sandia National Laboratories, 1987

As a result of these and other investigations, I have appeared as an Expert Witness before various courts of law and administrative bodies, including the State Engineer Office, Water Quality Control Commission, Oil Conservation Commission and Environmental Improvement Division of the Health and Environment Department.

Although potash is now the principal source of potassium used as fertilizer, its development in the 1940's was for use as explosives and it was classed as a "strategic mineral". As a result, the U.S. Geological Survey conducted a number of studies which laid the geologic groundwork for the region. Many of these reports were classified documents; however, the earlier reports were summarized by James D. Vine (1963) in Geological Survey Bulletin 1141-B entitled, "Surface geology of the Nash Draw Quadrangle, Eddy County, New Mexico." Equally important was the New Mexico Bureau of Mines Ground-Water Report No. 6 entitled, "Geology and Ground-Water Conditions in southern Lea County, New Mexico," by Nicholson and Clebsch (1961). Most recently there has been a wealth of documentation published by the Sandia National Laboratories related to the Waste Isolation Pilot Plant (WIPP)

which is located a few miles south of Laguna Gatuna. All of these reports have been studied extensively during the course of investigations made by myself and Geohydrology Associates, Inc.

In their definition of "water of the United States", the EPA identified "All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, 'wetlands', sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters..." All of these types of waters have clearly distinct definitions, as given in the Glossary of Geology, 2nd Edition (1980) by Bates and Jackson, American Geological Institute. Appropriately these are included with "water of the United States" because they are occasionally joined by intermittent streams which could be part of a larger stream system. However a "sink", by definition, is never part of a stream system, and it is appropriate that sinks are not included in the EPA's definition of "water of the United States." It is my opinion that Laguna Gatuna is a "sink", and not a "playa lake" or "playa" as those terms are commonly understood by geologists and hydrologists.

The terms "playa" and "playa lake" are commonly used to describe shallow depressions, some of which contain ephemeral lakes. on the High Plains of Texas and New Mexico. In Spanish, the word "playa" means beach or shoreline, but in the vernacular it also refers to a wide, open space with interior drainage. The vernacular definition has been adopted in the U.S., and shallow

depressions with interior drainage are often called "playas". Other terms commonly used in Texas and New Mexico are "buffalo wallows" and "blowouts", both of which refer to the accepted origin of the so-called "playas".

Studies conducted by myself for the City of Midland, Texas, verify that the playas of west Texas are typically dry. However they may become integrated into an intermittent stream system during periods of heavy rainfall. This is a fact accepted by the Corps of Engineers and was utilized by GAI and myself in preparation of a report for the Corps entitled "Hydrologic and hydraulic analysis of Jal and Midland Draw watersheds for the 100 year storm event."

Although there is a surficial resemblance of Laguna Gatuna to a playa of the High Plains, there also are a number of obvious differences which are listed below:

1. Laguna Plata is considerably deeper than a typical playa
2. It has very steep banks caused by collapse and movement along fault zones
3. There are salt seeps not typical of playas
4. It fails to hold water even after intense rainfall events
5. There is virtually no vegetation on the periphery of the depression
6. Laguna Gatuna is associated with geologic features of similar collapse origin, i.e., San Simon Swale and sink, Nash Draw, Lagunas Plata, Toston and Tonto

A detailed geohydrologic evaluation of Laguna Gatuna was described in my report, "Hydrologic assessment of the Salt Lake Area, western Lea County, New Mexico" (1984).

The origin of Nash Draw as a collapse structure or sink has been described in detail by Vine (1963, page B2).

> "Normally flat-lying strata are tilted, warped, and locally distorted at the surface by hydration and solution of the evaporite rocks in the subsurface. Nash Draw, a depression 4 to 6 miles wide and about 18 miles long, has resulted from the solution of salt in the Rustler and Salado formations and collapse of the overlying relatively insoluble rocks."

Prior to development of the potash industry in Nash Draw, there were a number of closed depressions which were occupied by ephemeral lakes following periods of heavy runoff. The largest of these was Salt Lake, also called Laguna Grande de la Sal, which is located at the south end of Nash Draw near the Pecos River. Initially the level in Salt Lake was maintained in part by discharge of Surprise Spring which had a uniform discharge of about 115 to 125 gpm (gallons per minute), according to Robinson and Lang's study in 1938. Subsequently potash refineries began discharging vast quantities of water into Nash Draw, and in a study conducted by myself and others in 1978, three (3) refineries were discharging approximately 8,860 acre-feet of water per year into Nash Draw. This discharge greatly exceeds the evaporation

potential for the closed depressions on the flow of the Draw. As a result, an integrated stream system was created which emptied into Salt Lake. The series of lakes along this drainage system have been named in Spanish as Lagunas Uno, Dos, Tres, and Quatro. Lindsey Lake and Tamarisk Flat are also part of this drainage system. Laguna Gatuna is not part of this or any other connected drainage system. Laguna Gatuna is geologically and topographically distinct from this drainage system, being located several miles outside (east) of Nash Draw and 20 miles from the Laguna Uno which is closest to Laguna Gatuna.

In summary, Laguna Gatuna is not a "playa" or "playa lake" but rather is different from playas of west Texas and eastern New Mexico. By definition, a playa is a shallow surficial depression of interior drainage which may be part of an intermittent drainage system following periods of heavy rainfall. As a sink, Laguna Gatuna was formed by the collapse of surface deposits into voids created by the natural solution of salts at depth. There is no surface drainage, either perennial or ephemeral, associated with Laguna Gatuna.

AFFIDAVIT OF LARRY SQUIRES

STATE OF NEW MEXICO)
) ss.
COUNTY OF LEA)

LARRY SQUIRES, being first duly sworn and upon oath hereby deposes and states:

1. I hold a B.S. degree in Biological Sciences and I am a Doctor of Veterinary Medicine.

2. I have personal knowledge of the matters and things set forth in this Affidavit.

3. I am President of Laguna Gatuna, Inc., and President of Snyder Ranches, Inc. Laguna Gatuna, the geological structure into which Laguna Gatuna, Inc., discharges produced oil field brines is located on lands previously owned and leased by Snyder Ranches, my family ranching operation, from 1932 through 1990. Because of my association with Snyder Ranches, Laguna Gatuna, Inc., and its predecessor company, I have had occasion to personally visit and observe Laguna Gatuna on hundreds, if not thousands, of occasions over the last twenty-five years.

4. Based upon my education, training, experience and personal observation of Laguna Gatuna over a great many years, I would testify to the following facts and opinions:

a. Laguna Gatuna is not now, nor has it ever been, a natural habitat for any wildlife, including migratory birds.

b. I have never observed or heard reports of any nesting activity in the Laguna Gatuna watershed.

c. I have never observed or heard reports of any tracks of birds or observed any birds feeding in the Laguna Gatuna watershed.

d. In some years, I have observed doves and scaled quail in the sandy uplands outside of the Laguna Gatuna watershed.

e. So far as I am aware, no federal or state wildlife professional has ever made a biological survey of the Laguna Gatuna watershed.

f. The brine discharged into Laguna Gatuna is separated from any hydrocarbon constituents prior to discharge. Except for the discharge, Laguna Gatuna is dry the vast majority of the time. The only exception to this is from run-off after heavy rains. In that event, the run-off ordinarily evaporates in a matter of hours, or at most a few days.

FURTHER Affiant sayeth naught.

Larry Squires

SUBSCRIBED, SWORN TO AND ACKNOWLEDGED before me this _____ day of July, 1991, by Larry Squires.

Notary Public

My Commission Expires:

_____

VISCO Water Analysis

Prepared for RICE ENGINEERING
HOBBS, NEW MEXICO

WESTENBURG, ELDON R.
NALCO Chemical Company
Date 12/7/90

Well Number : DAMSON
Water Source : SOUTHERN CAL. FED.

>>> Oil Field Water Analysis <<<

DISSOLVED SOLIDS

Cations		mg/l	meg/l			mg/l
Sodium	Na+	61963.4	2694.1	as	NaCl	
Calcium	Ca++	32000.0	1600.0	as	CaCO3	80000
Magnesium	Mg++	4860.0	400.0	as	CaCO3	20000
Barium	Ba++	1.2	0.0	as	CaCO3	2
Strontium	Sr++			as	CaCO3	
Total Cations		98824.6				

Anions						
Chloride	Cl-	163890.0	4621.7	as	NaCl	270000
Sulfate	SO4=	2805.4	58.4	as	Na2SO4	4150
Carbonate	CO3=	0.0	0.0	as	CaCO3	
Bicarb.	HCO3-	854.0	14.0	as	CaCO3	700
Total Anions		167549.4				
Total Solids		266374.0				

METALS

Total Iron, Fe	0.0	as	Fe	
Acid to Phen,CO2	0.0	as	CaCO3	

OTHER PROPERTIES

pH		6.6
Specific Gravity		1.1
Turbidity		
Oxygen, as O2	ppm	
Sulfide as H2S	ppm	
Temperature	F	55

VISCO Water Analysis

Prepared for	RICE ENGINEERING HOBBS, NEW MEXICO	WESTENBURG, ELDON R. NALCO Chemical Company Date 12/7/90
Well Number :	DAMSON	
Water Source :	SOUTHERN CAL FED	

>>> Oil Field Skim Grindouts <<<

COMPONENT	PERCENT
OIL	70
PARAFFIN	20
WATER	10

VISCO Water Analysis

Prepared for RICE ENGINEERING
HOBBS, NEW MEXICO

WESTENBURG, ELDON R.
NALCO Chemical Company
Date 12/7/90

Well Number : PHILLIPS
Water Source : USK DEEP

>>> Oil Field Water Analysis <<<

DISSOLVED SOLIDS

Cations		mg/l	meg/l			mg/l
Sodium	Na+	44240.6	1923.5	as	NaCl	
Calcium	Ca++	51200.0	2560.0	as	CaCO3	128000
Magnesium	Mg++	486.0	40.0	as	CaCO3	2000
Barium	Ba++	3.5	0.1	as	CaCO3	6
Strontium	Sr++			as	CaCO3	
Total Cations		95930.1				

Anions						
Chloride	Cl-	157820.0	4450.5	as	NaCl	260000
Sulfate	SO4=	2933.8	61.0	as	Na2SO4	4340
Carbonate	CO3=	0.0	0.0	as	CaCO3	
Bicarb.	HCO3-	732.0	12.0	as	CaCO3	600
Total Anions		161485.8				
Total Solids		257415.9				

METALS

Total Iron, Fe	0.0	as	Fe
Acid to Phen,CO2	0.0	as	CaCO3

OTHER PROPERTIES

pH	6.5
Specific Gravity	1.1
Turbidity	
Oxygen, as O2 ppm	
Sulfide as H2Sppm	
Temperature F	55

VISCO Water Analysis

Prepared for	RICE ENGINEERING HOBBS, NEW MEXICO	WESTENBURG, ELDON R. NALCO Chemical Company Date 12/7/90
Well Number :	PHILLIPS	
Water Source :	LUSK DEEP	

>>> Oil Field Skim Grindouts <<<

COMPONENT	PERCENT
OIL	95
WATER	5

VISCO Water Analysis

Prepared for RICE ENGINEERING
HOBBS, NEW MEXICO

WESTENBURG, ELDON R.
NALCO Chemical Company
Date 12/7/90

Well Number : MANZANO
Water Source : FED. A

>>> Oil Field Water Analysis <<<

DISSOLVED SOLIDS

Cations		mg/l	meg/l			mg/l
Sodium	Na+	70740.0	3075.7	as	NaCl	
Calcium	Ca++	8800.0	440.0	as	CaCO3	22000
Magnesium	Mg++	3888.0	320.0	as	CaCO3	16000
Barium	Ba++	0.0	0.0	as	CaCO3	0
Strontium	Sr++			as	CaCO3	0
Total Cations		83428.0				

Anions						
Chloride	Cl-	133540.0	3765.8	as	NaCl	220000
Sulfate	SO4=	3163.7	65.8	as	Na2SO4	4680
Carbonate	CO3=	0.0	0.0	as	CaCO3	0
Bicarb.	HCO3-	244.0	4.0	as	CaCO3	200
Total Anions		136947.7				

Total Solids 220375.7

METALS

Total Iron, Fe	0.0	as	Fe
Acid to Phen,CO2	0.0	as	CaCO3

OTHER PROPERTIES

pH	6.7
Specific Gravity	1.1
Turbidity	
Oxygen, as O2 ppm	
Sulfide as H2Sppm	
Temperature F	55

VISCO Water Analysis

Prepared for	RICE ENGINEERING	WESTENBURG, ELDON R.	
	HOBBS, NEW MEXICO	NALCO Chemical Company	
		Date	12/7/90
Well Number :	KAISER FRANCIS		
Water Source :	FED 30 #2		

>>> Oil Field Water Analysis <<<

DISSOLVED SOLIDS

Cations		mg/l	meg/l			mg/l
Sodium	Na+	21863.8	950.6	as	NaCl	
Calcium	Ca++	2000.0	100.0	as	CaCO3	5000
Magnesium	Mg++	4617.0	380.0	as	CaCO3	19000
Barium	Ba++	0.0	0.0	as	CaCO3	0
Strontium	Sr++			as	CaCO3	0
Total Cations		28480.8				

Anions						
Chloride	Cl-	48560.0	1369.4	as	NaCl	80000
Sulfate	SO4=	2460.6	51.2	as	Na2SO4	3640
Carbonate	CO3=	0.0	0.0	as	CaCO3	0
Bicarb.	HCO3-	610.0	10.0	as	CaCO3	500
Total Anions		51630.6				
Total Solids		80111.4				

METALS

Total Iron, Fe	0.0	as	Fe
Acid to Phen,CO2	0.0	as	CaCO3

OTHER PROPERTIES

pH	6.7
Specific Gravity	1
Turbidity	
Oxygen, as O2 ppm	
Sulfide as H2Sppm	
Temperature F	55

VISCO Water Analysis

Prepared for: RICE ENGINEERING, HOBBS, NEW MEXICO
WESTENBURG, ELDON R.
NALCO Chemical Company
Date 12/7/90

Well Number : MITCHELL
Water Source : GERMINO FED

>>> Oil Field Water Analysis <<<

DISSOLVED SOLIDS

Cations		mg/l	meg/l			mg/l
Sodium	Na+	24325.3	1057.6	as	NaCl	
Calcium	Ca++	6000.0	300.0	as	CaCO3	15000
Magnesium	Mg++	3159.0	260.0	as	CaCO3	13000
Barium	Ba++	0.0	0.0	as	CaCO3	0
Strontium	Sr++			as	CaCO3	0
Total Cations		33484.3				

Anions						
Chloride	Cl-	54630.0	1540.6	as	NaCl	90000
Sulfate	SO4=	3319.2	69.0	as	Na2SO4	4910
Carbonate	CO3=	0.0	0.0	as	CaCO3	0
Bicarb.	HCO3-	486.0	8.0	as	CaCO3	400
Total Anions		58437.2				

Total Solids	91921.5		
METALS			
Total Iron, Fe	0.0	as	Fe
Acid to Phen,CO2	0.0	as	CaCO3

OTHER PROPERTIES	
pH	6.7
Specific Gravity	1
Turbidity	
Oxygen, as O2 ppm	
Sulfide as H2Sppm	
Temperature F	55

VISCO Water Analysis

Prepared for	RICE ENGINEERING	WESTENBURG, ELDON R.
	HOBBS, NEW MEXICO	NALCO Chemical Company
		Date 12/7/90
Well Number :	MITCHELL ENERGY	
Water Source :	GERMINO FED	

>>> Oil Field Skim Grindouts <<<

COMPONENT	PERCENT
OIL	40
PARAFFIN	30
IRON SULFIDE	5
WATER	25

VISCO Water Analysis

Prepared for	RICE ENGINEERING	WESTENBURG, ELDON R.	
	HOBBS, NEW MEXICO	NALCO Chemical Company	
		Date	12/7/90
Well Number :	FINA		
Water Source :	JONES FED		

>>> Oil Field Water Analysis <<<

DISSOLVED SOLIDS

Cations		mg/l	meg/l		mg/l
Sodium	Na+	21538.3	936.4	as NaCl	
Calcium	Ca++	4800.0	240.0	as CaCO3	12000
Magnesium	Mg++	3159.0	260.0	as CaCO3	13000
Barium	Ba++	1.2	0.0	as CaCO3	2
Strontium	Sr++			as CaCO3	0
Total Cations		29498.5			

Anions					
Chloride	Cl-	48560.0	1369.4	as NaCl	80000
Sulfate	SO4=	2839.2	59.1	as Na2SO4	4200
Carbonate	CO3=	0.0	0.0	as CaCO3	0
Bicarb.	HCO3-	488.0	8.0	as CaCO3	400
Total Anions		51887.2			
Total Solids		81385.7			

METALS

Total Iron, Fe	0.0	as Fe
Acid to Phen,CO2	0.0	as CaCO3

OTHER PROPERTIES

pH	=.7
Specific Gravity	1
Turbidity	
Oxygen, as O2 ppm	
Sulfide as H2Sppm	
Temperature F	55

VISCO Water Analysis

Prepared for	RICE ENGINEERING HOBBS, NEW MEXICO	WESTENBURG, ELDON R. NALCO Chemical Company Date 12/7/90
Well Number :	FIN4	
Water Source :	JONES FED	

>>> Oil Field Skim Grindouts <<<

COMPONENT	PERCENT
OIL	60
IRON SULFIDE	20
WATER	20

VISCO Water Analysis

Prepared for	RICE ENGINEERING HOBBS, NEW MEXICO	WESTENBURG, ELDON R. NALCO Chemical Company Date 12/7/90
Well Number :	TEXACO	
Water Source :	BOWMAN	

>>> Oil Field Water Analysis <<<

DISSOLVED SOLIDS

Cations		mg/l	meg/l			mg/l
Sodium	Na+	92616.0	4026.8	as	NaCl	
Calcium	Ca++	40800.0	2040.0	as	CaCO3	102000
Magnesium	Mg++	1944.0	160.0	as	CaCO3	8000
Barium	Ba++	3.5	0.1	as	CaCO3	6
Strontium	Sr++			as	CaCO3	0
Total Cations		135363.5				

Anions						
Chloride	Cl-	218520.0	6162.3	as	NaCl	360000
Sulfate	SO4=	2622.9	54.6	as	Na2SO4	3880
Carbonate	CO3=	0.0	0.0	as	CaCO3	0
Bicarb.	HCO3-	610.0	10.0	as	CaCO3	500
Total Anions		221752.9				
Total Solids		357116.4				

METALS

Total Iron, Fe	0.0	as	Fe
Acid to Phen,CO2	0.0	as	CaCO3

OTHER PROPERTIES

pH	6.7
Specific Gravity	1.1
Turbidity	
Oxygen, as O2 ppm	
Sulfide as H2Sppm	
Temperature F	55

VISCO Water Analysis

Prepared for	RICE ENGINEERING HOBBS, NEW MEXICO	WESTENBURG, ELDON R. NALCO Chemical Company Date 12/7/90
Well Number :	TEXACO	
Water Source :	BOWMAN	

>>> Oil Field Skim Grindouts <<<

COMPONENT	PERCENT
OIL	80
PARAFFIN	15
WATER	5

VISCO Water Analysis

Prepared for	RICE ENGINEERING HOBBS, NEW MEXICO	WESTENBURG, ELDON R. NALCO Chemical Company Date 12/7/90
Well Number :	TEXACO	
Water Source :	FED. T & J	

>>> Oil Field Water Analysis <<<

DISSOLVED SOLIDS

Cations		mg/l	meg/l			mg/l
Sodium	Na+	89412.7	3887.5	as	NaCl	
Calcium	Ca++	30000.0	1500.0	as	CaCO3	75000
Magnesium	Mg++	6075.0	500.0	as	CaCO3	25000
Barium	Ba++	5.9	0.1	as	CaCO3	10
Strontium	Sr++			as	CaCO3	0
Total Cations		125493.6				

Anions						
Chloride	Cl-	206380.0	5819.9	as	NaCl	340000
Sulfate	SO4=	2771.6	57.6	as	Na2SO4	4100
Carbonate	CO3=	0.0	0.0	as	CaCO3	0
Bicarb.	HCO3-	610.0	10.0	as	CaCO3	500
Total Anions		209761.6				
Total Solids		335255.2				

METALS

Total Iron, Fe	0.0	as	Fe
Acid to Phen,CO2	0.0	as	CaCO3

OTHER PROPERTIES

pH	6.7
Specific Gravity	1.1
Turbidity	
Oxygen, as O2 ppm	
Sulfide as H2Sppm	
Temperature F	55

VISCO Water Analysis

Prepared for	RICE ENGINEERING HOBBS, NEW MEXICO	WESTENBURG, ELDON R. NALCO Chemical Company Date 12/7/90
Well Number :	TEXACO	
Water Source :	FED T & J	

>>> Oil Field Skim Grindouts <<<

COMPONENT	PERCENT
OIL	70
WATER	25
PARAFFIN	5

VISCO Water Analysis

Prepared for RICE ENGINEERING
HOBBS, NEW MEXICO

WESTENBURG, ELDON R.
NALCO Chemical Company
Date 12/7/90

Well Number : TEXACO
Water Source : CITIES SERVICE ST

>>> Oil Field Water Analysis <<<

DISSOLVED SOLIDS

Cations		mg/l	meg/l			mg/l
Sodium	Na+	104174.9	4529.3	as	NaCl	
Calcium	Ca++	28000.0	1400.0	as	CaCO3	70000
Magnesium	Mg++	5832.0	480.0	as	CaCO3	24000
Barium	Ba++	4.7	0.1	as	CaCO3	8
Strontium	Sr++			as	CaCO3	0
Total Cations		138011.6				

Anions						
Chloride	Cl-	224590.0	6333.4	as	NaCl	370000
Sulfate	SO4=	3170.4	65.9	as	Na2SO4	4690
Carbonate	CO3=	0.0	0.0	as	CaCO3	0
Bicarb.	HCO3-	610.0	10.0	as	CaCO3	500
Total Anions		228370.4				
Total Solids		366382.1				

METALS

Total Iron, Fe	0.0	as	Fe
Acid to Phen,CO2	0.0	as	CaCO3

OTHER PROPERTIES

pH	6.7
Specific Gravity	1.1
Turbidity	
Oxygen, as O2 ppm	
Sulfide as H2Sppm	
Temperature F	55

VISCO Water Analysis

Prepared for	RICE ENGINEERING HOBBS, NEW MEXICO	WESTENBURG, ELDON R. NALCO Chemical Company Date 12/7/90
Well Number :	TEXACO	
Water Source :	CITIES SERVICE ST	

>>> Oil Field Skim Grindouts <<<

COMPONENT	PERCENT
WATER	65
PARAFFIN	20
OIL	15

VISCO Water Analysis

Prepared for RICE ENGINEERING
HOBBS, NEW MEXICO

WESTENBURG, ELDON R.
NALCO Chemical Company
Date 12/7/90

Well Number : JUNCTION
Water Source : K-11

>>> Oil Field Water Analysis <<<

DISSOLVED SOLIDS

Cations		mg/l	meg/l			mg/l
Sodium	Na+	44674.9	1942.4	as	NaCl	
Calcium	Ca++	4800.0	240.0	as	CaCO3	12000
Magnesium	Mg++	3645.0	300.0	as	CaCO3	15000
Barium	Ba++	0.0	0.0	as	CaCO3	0
Strontium	Sr++			as	CaCO3	0
Total Cations		53119.9				

Anions						
Chloride	Cl-	84980.0	2396.4	as	NaCl	140000
Sulfate	SO4=	3650.4	75.9	as	Na2SO4	5400
Carbonate	CO3=	0.0	0.0	as	CaCO3	0
Bicarb.	HCO3-	610.0	10.0	as	CaCO3	500
Total Anions		89240.4				

Total Solids 142360.3

METALS

Total Iron, Fe	0.0	as	Fe
Acid to Phen,CO2	0.0	as	CaCO3

OTHER PROPERTIES

pH	6.7
Specific Gravity	1.1
Turbidity	
Oxygen, as O2 ppm	
Sulfide as H2Sppm	
Temperature F	55

VISCO Water Analysis

Prepared for	RICE ENGINEERING HOBBS, NEW MEXICO	WESTENBURG, ELDON R. NALCO Chemical Company Date 12/7/90	
Well Number :	UNION TEXAS		
Water Source :	SHORT FUSE-N. YOUNG		

>>> Oil Field Water Analysis <<<

DISSOLVED SOLIDS

Cations		mg/l	meg/l			mg/l
Sodium	Na+	23224.0	1009.7	as	NaCl	
Calcium	Ca++	6000.0	300.0	as	CaCO3	15000
Magnesium	Mg++	2916.0	240.0	as	CaCO3	12000
Barium	Ba++	0.0	0.0	as	CaCO3	0
Strontium	Sr++			as	CaCO3	0
Total Cations		32140.0				

Anions						
Chloride	Cl-	51595.0	1455.0	as	NaCl	85000
Sulfate	SO4=	3785.6	78.7	as	Na2SO4	5600
Carbonate	CO3=	0.0	0.0	as	CaCO3	0
Bicarb.	HCO3-	976.0	16.0	as	CaCO3	800
Total Anions		56356.6				

Total Solids	88496.6		
METALS			
Total Iron, Fe	0.0	as	Fe
Acid to Phen,CO2	0.0	as	CaCO3

OTHER PROPERTIES	
pH	6.7
Specific Gravity	1
Turbidity	
Oxygen, as O2 ppm	
Sulfide as H2Sppm	
Temperature F	55

VISCO Water Analysis

Prepared for		RICE ENGINEERING	WESTENBURG, ELDON R.
		HOBBS, NEW MEXICO	NALCO Chemical Company
			Date 12/7/90
Well Number	:	UNION TEXAS	
Water Source	:	SHORT FUSE-N. YOUNG	

>>> Oil Field Skim Grindouts <<<

COMPONENT	PERCENT
WATER	90
OIL	5
PARAFFIN	5

VISCO Water Analysis

Prepared for	RICE ENGINEERING HOBBS, NEW MEXICO	WESTENBURG, ELDON A. NALCO Chemical Company Date 12/7/90	
Well Number :	JUNCTION		
Water Source :	D-14		

>>> Oil Field Water Analysis <<<

DISSOLVED SOLIDS

Cations		mg/l	meg/l			mg/l
Sodium	Na+	48635.9	2114.6	as	NaCl	
Calcium	Ca++	9200.0	460.0	as	CaCO3	23000
Magnesium	Mg++	2673.0	220.0	as	CaCO3	11000
Barium	Ba++	0.0	0.0	as	CaCO3	0
Strontium	Sr++			as	CaCO3	0
Total Cations		60508.9				

Anions						
Chloride	Cl-	97120.0	2738.8	as	NaCl	160000
Sulfate	SO4=	2298.4	47.9	as	Na2SO4	3400
Carbonate	CO3=	0.0	0.0	as	CaCO3	0
Bicarb.	HCO3-	488.0	8.0	as	CaCO3	400
Total Anions		99906.4				
Total Solids		160415.3				

METALS

Total Iron, Fe	0.0	as	Fe
Acid to Phen,CO2	0.0	as	CaCO3

OTHER PROPERTIES

pH	6.7
Specific Gravity	1
Turbidity	
Oxygen, as O2 ppm	
Sulfide as H2Sppm	
Temperature F	55

VISCO Water Analysis

Prepared for	RICE ENGINEERING HOBBS, NEW MEXICO	WESTENBURG, ELDON R. NALCO Chemical Company Date 12/7/90
Well Number :	SIETE	
Water Source :	QUANAH FED	

>>> Oil Field Water Analysis <<<

DISSOLVED SOLIDS

Cations		mg/l	meg/l			mg/l
Sodium	Na+	15543.8	675.8	as	NaCl	
Calcium	Ca++	24000.0	1200.0	as	CaCO3	60000
Magnesium	Mg++	3159.0	260.0	as	CaCO3	13000
Barium	Ba++	0.0	0.0	as	CaCO3	0
Strontium	Sr++			as	CaCO3	0
Total Cations		42702.8				

Anions						
Chloride	Cl-	72840.0	2054.1	as	NaCl	120000
Sulfate	SO4=	3447.6	71.7	as	Na2SO4	5100
Carbonate	CO3=	0.0	0.0	as	CaCO3	0
Bicarb.	HCO3-	610.0	10.0	as	CaCO3	500
Total Anions		76897.6				
Total Solids		119600.4				

METALS

Total Iron, Fe	0.0	as	Fe
Acid to Phen,CO2	0.0	as	CaCO3

OTHER PROPERTIES

pH	6.7
Specific Gravity	1
Turbidity	
Oxygen, as O2 ppm	
Sulfide as H2Sppm	
Temperature F	55

VISCO Water Analysis

Prepared for	RICE ENGINEERING HOBBS, NEW MEXICO	WESTENBURG, ELDON R. NALCO Chemical Company Date 12/7/90
Well Number :	SIETE	
Water Source :	QUANAH FED	

>>> Oil Field Skim Grindouts <<<

COMPONENT	PERCENT
PARAFFIN	50
OIL	20
WATER	20
IRON SULFIDE	10

VISCO Water Analysis

Prepared for	RICE ENGINEERING	WESTENBURG, ELDON R.	
	HOBBS, NEW MEXICO	NALCO Chemical Company	
		Date	12/7/90
Well Number :	SANTA FE ENERGY		
Water Source :	SHINNERY 14 FED		

>>> Oil Field Water Analysis <<<

DISSOLVED SOLIDS

Cations		mg/l	meg/l		mg/l
Sodium	Na+	24386.4	1060.3	as NaCl	
Calcium	Ca++	4800.0	240.0	as CaCO3	12000
Magnesium	Mg++	729.0	60.0	as CaCO3	3000
Barium	Ba++	0.0	0.0	as CaCO3	0
Strontium	Sr++			as CaCO3	0
Total Cations		29915.4			

Anions					
Chloride	Cl-	45525.0	1283.8	as NaCl	75000
Sulfate	SO4=	2906.8	60.5	as Na2SO4	4300
Carbonate	CO3=	0.0	0.0	as CaCO3	0
Bicarb.	HCO3-	976.0	16.0	as CaCO3	800
Total Anions		49407.8			
Total Solids		79323.2			

METALS

Total Iron, Fe	0.0	as Fe
Acid to Phen,CO2	0.0	as CaCO3

OTHER PROPERTIES

pH	6.7
Specific Gravity	1
Turbidity	
Oxygen, as O2 ppm	
Sulfide as H2Sppm	
Temperature F	55

VISCO Water Analysis

Prepared for	RICE ENGINEERING HOBBS, NEW MEXICO	WESTENBURG, ELDON R. NALCO Chemical Company Date 12/7/90
Well Number :	SANTA FE ENERGY	
Water Source :	SHINNERY 14 FED	

>>> Oil Field Skim Grindouts <<<

COMPONENT	PERCENT
OIL	100

RICE Engineering Corporation

122 WEST TAYLOR TELEPHONE (505) 393-9174

HOBBS, NEW MEXICO 88240

January 10,1990

Conoco, Inc.
10 Desta Drive, West Tower
Midland, Texas 79705
Attn: Barry Snyder

Re: MCA/Laguna Gatuna Disposal

Dear Mr. Snyder:

Please find enclosed copies of water analyses from other producing batteries using the Laguna Gatuna SWD System facilities as per your request.

At the meeting of 12/19/90, it was generally agreed by the Parties that solids accumulation in the settling pit at the System Terminal Facilities was a result of flushing action of large amounts of water since the water slug from your MCA unit itself was solids free at time of incident. However we understand your daily disposal is basically filter backwash which is collected in a 1500 - bbl vertical tank and then disposal pumps are activated as soon as backwash cycle is complete. It was indicated to us that solids are removed from this tank periodically and disposed of. We think it may be possible to delay the pumping cycle allowing more settling time in the tank. As an alternative, additional storage tank may be utilized prior to disposal of fluids in order to give more settling time.

Therefore we kindly ask Conoco's assistance to address the solids removal by some practical means allowing more settling time for filter backwash. If we can be of further service to you in this regard, please do not hesitate to contact us.

Yours very truly,

RICE ENGINEEERING CORPORATION

S. A. Haktanir

S. A. Haktanir
Division Manager

SAH/cf

CC: Laguna Gatuna, Inc.

RICE *Engineering Corporation*

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RICE ENGINEEERING CORPORATION

S. A. Haktanir
Division Manager

SAH/cf

CC: Laguna Gatuna, Inc.

If you have any questions of further suggesions in relation to this or other matters concening the water disposal system please let us know. Thanks for your cooperation and attention.

Very truly yours,

Larry C. Squires
Pres. Laguna Gatuna, Inc.

LCS:lls

cc: Barry Snyder
Larry Johansen
Loy Goodheart

dearnley-meier reporting service, inc.

SPECIALIZING IN: DEPOSITIONS, HEARINGS, STATE MENTS, EXPERT TESTIMONY, DAILY COPY, CONVENTIONS

1120 SIMMS BLDG. • P.O. BOX 1092 • PHONE 243-6691 • ALBUQUERQUE, NEW MEXICO

BEFORE THE

NEW MEXICO OIL CONSERVATION COMMISSION

Santa Fe, New Mexico

March 19, 1969

REGULAR HEARING

APR 26 AM 8 25

RECEIVED AUG 2 DIST. 6 N.M. Carlsbad New Mexico

IN THE MATTER OF:

Application of Larry C. Squires for an exception to Order No. R-3221, as amended, Lea County, New Mexico.

Case No. 4047

BEFORE: A. L. Porter, Jr., Secretary-Director
Alex J. Armijo, Land Commissioner
George Hatch, Counsel

TRANSCRIPT OF HEARING

MR. HATCH: Case 4047, continued from the February 19, 1969 Regular Hearing, application of Larry C. Squires for an exception to Order No. R-3221, as amended, Lea County, New Mexico.

MR. KELLAHIN: If the Commission please, Jason Kellahin of Kellahin and Fox, appearing for the applicant.

MR. PORTER: At this time, I would like to call for other appearances.

MR. MATKINS: If it please the Commission, I am Jerome D. Matkins of Carlsbad, attorney for protestants, D. S. Harroun, Russel Haworth, and E. W. Douglass.

MR. PORTER: Are there any other appearances to be made in this case? If not, the Commission recognizes the hearing for the applicant.

MR. KELLAHIN: We have two witnesses I would like to have sworn.

MR. PORTER: You have two witnesses?

MR. KELLAHIN: Yes, sir.

MR. PORTER: Let's have those witnesses sworn at the same time.

MR. MATKINS: Do you want to swear my witnesses at this time, also? I have two witnesses, also.

MR. PORTER: We might as well swear them all at once.

(Witnesses sworn.)

MR. KELLAHIN: I would like to call up my first witness, Mr. Larry Squires.

(Whereupon, Applicant's Exhibits Numbers 1, 2, and 3 were marked for identification.)

LARRY C. SQUIRES

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Would you state your name, please?

A Larry C. Squires.

Q Are you the applicant in Case 4047 presently before the Commission, Mr. Squires?

A Yes, sir.

Q What business are you engaged in?

A I am a veterinarian and a rancher.

Q And in connection with your operations as a rancher, are the lakes which are the subject matter of this application located on your ranch?

A They are located on my family's ranch.

Q And that is the --

A W. M. Snyder Estate.

Q Are you the manager of the W. M. Snyder Estate?

A Yes, sir.

Q Insofar as their ranching operations are concerned?

A General manager over everything.

Q Are you familiar with the area involved in this application, Mr. Squires?

A Yes, I have been familiar with it for quite some time.

Q Just what is it you are proposing to do here?

A Realizing the need for safe, economical, or inexpensive ways to put produced salt water in the area, it seemed to me a logical assumption that the salt lake would be a good place to put it, if it didn't endanger any fresh water supplies.

Of course, being in the ranching business, and we are very cognizant of what water means to us, and we sure don't want to hurt any of it, so I propose to find out or set out to find out if it would, in fact, harm any fresh water reserves in this area, or any other area. And I hired Mr. Ed Reed, a hydrologist from Midland to do some technical work, and give me an opinion on the area, and if there was any water there, and water that we didn't know about. Our water wells have been bad for a number of years, and have been abandoned in this area.

Q Do you presently have any fresh water supply in the vicinity of these lakes?

being used. If the Commission wishes to eliminate it, why, there would be no serious objection from us. We did apply for it, however, and we would like to leave it in there.

Q (By Mr. Nutter) In studying the application and being somewhat familiar with the area involved here, I think that Laguna Tonto is structurally somewhat higher than the other two lakes, and it might simplify your case if this one particular lake were not included.

MR. KELLAHIN: I think we will cover that in the other witness's testimony.

A I don't pretend to be an expert on where this water goes, or anything. That is why I have Mr. Reed. He will be here in a minute.

MR. PORTER: Does that conclude your examination of the witness, Mr. Nutter?

MR. NUTTER: Yes, sir.

MR. MATKINS: I have a question or two.

CROSS EXAMINATION

BY MR. MATKINS:

Q Have you entered into any preliminary negotiations with any oil companies at this time to dispose of water on these lakes?

A No, sir.

Q You do not have any notion at this time of the amount of water that might be placed upon these lakes?

A I feel that I have a notion. I feel like it won't be very much.

Q What makes you say that?

A Because there is not much water produced in this area. But I would much prefer that, rather than this water being put on our ranch, it be put in this lake, and there is some being put in an open pit on our ranch adjacent to this one lake, and I think it is far better to put it in this lake than it is to put it in that open pit.

Q Do you feel if there is not much water to be placed on the lake, there is a real need for this additional storage area?

A I think that there is a possibility that there will be a much greater need in the years to come. I don't have a crystal ball.

Q You don't have any fee land within these lakes, do you?

A I do.

Q Which one?

A The one next to the highway, Laguna -- the lake in the middle.

Q Laguna Gatuna?

A They told me to go ahead and file a special land use permit. I told them what I wanted to do, and they said that whatever the Oil Conservation Commission said, that it was fine with them.

Q You haven't as yet received the permit, is that correct?

A No, sir, it is pending the outcome of this hearing, as I understand it.

MR. KELLAHIN: That is all.

MR. PORTER: Does anyone else have a question? The witness may be excused.

ED L. REED

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q State your name, please.

A My name is Ed L. Reed.

Q What business are you engaged in, Mr. Reed?

A I am a consulting hydrologist.

Q Where are you located?

A Midland, Texas.

Q Have you done hydrological work in the State of New

Mexico?

A Yes, sir.

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

A Yes, sir.

MR. KELLAHIN: Would the Commission care to hear the witness's qualifications?

MR. PORTER: The Commission considers Mr. Reed qualified, Mr. Kellahin, since his qualifications have been made a matter of record.

However, if Mr. Matkins would like to question Mr. Reed, why, that is all right.

MR. MATKINS: Is it a matter of having him qualified as an expert in hydrology?

MR. KELLAHIN: That's correct.

MR. MATKINS: I have no objection to that.

Q (By Mr. Kellahin) Mr. Reed, are you familiar with the application of Larry C. Squires in Case 4047 before the Commission at the present time?

A Yes, sir.

Q Have you done some work for Mr. Squires in connection with this application?

A I have.

Q Did you make an investigation of the three lakes involved in this application?

A Yes, I did.

Q Did you personally visit those lakes and make an inspection on the ground?

A Yes, sir.

Q Have you made a study of the subsurface information that is available in this area?

A Yes, I have.

Q Would you state for the Commission just what procedures you followed in making this study?

A Procedures we followed in examining the area of the three salt lakes was, first, to go to the published literature on this area, principally the Bureau of Mines publications in Lea County and Eddy County, produced in cooperation with the United States Geological Survey.

We then went to the well inventory records and maps of the State Engineer's Office in the four townships embraced by these four lakes, and examined the well inventory records, water level measurements, and chemical analysis data, and total depths of wells drilled within the four-township area.

We examined the two topographic quadrangle maps which

cover this area. We secured radiation logs and electrical logs on most of the oil wells that have been drilled in the four-township area; and from this data constructed two contour maps which are presented on one map, the upper one being the top of the Triassic sequence, which had previously been mapped by the U.S.G.S.; and a second contour map on the top of the Rustler, which would, for all practical purposes, be the base of the Triassic sequence.

We made two trips to the field, and examined on the ground in detail the three lakes, walking around substantial portions of the three. In the course of this field investigation, samples of springs were secured, samples of water in the lake, and soil in one of the lakes was secured. Additional water level measurements were made in wells which were still open and could be measured. Two additional water well samples were secured, and analyses made of this data.

Triassic outcrops were examined in Laguna Gatuna, which had not previously been so indicated on the reports in the Lea County Report, which is Report No. 6 of the State Bureau of Mines and Mineral Resources.

Earlier chemical analyses of wells, springs, and surface water which had been secured both by Mr. Kellahin and Mr. Squires were examined, and all of this data has been put on

a map, a composite map reflecting the total knowledge that we have of the geology and the groundwater of this area.

Q Will you have that marked as Exhibit 1, please?

Mr. Reed, directing your attention to Applicant's Exhibit 1, would you identify that exhibit?

A Yes, I will. Exhibit Number 1 is a sectionized map of Townships 19 and 20 South, Ranges 32 and 33 East. On this map, I have shown in blue the outline of the three salt lakes, Laguna Gatuna, Laguna Plata, and Laguna Tonto. A fourth lake which has been filled in, Laguna Toston, is also indicated.

I have shown on the map in yellow, contours reflecting the top of the Triassic; and in the broad dashed lines, contours on the top of the Rustler.

I have posted on the map all of the water wells, and all of the springs which I have any knowledge of, either from personal visits or from inventory records of the State Engineer's Office. I have indicated by a half circle those wells which we think are producing from Quaternary alluvial sediments, as distinguished from wells producing from Triassic sands.

On each of the wells, I have posted all of the data which is available, including the elevation where it is available, the total depth of the well, the water level where

available, and partial chemical analysis where available. Now, I have outlined in blue the water level elevations of those wells producing from Quaternary alluvial sands. I have indicated with red underlying those, water samples which are considered brackish or too high in chlorides or sulfates, or both, to be useful in domestic or stock purposes.

I have indicated in black, the areas of Triassic outcrops, the large one which is at the north side of Laguna Plata, three smaller areas which I have examined on the west side and south side of Laguna Gatuna. Finally, I have indicated with blue areas the general direction of groundwater movement in the shallow Quaternary alluvial sediment as determined from water level data in those wells.

Very briefly, this area is west of the most westerly outcrop of Ogalalla sediments, with the possible exception of an outlayer of Ogalalla to the southeast some several miles. The eastern edge of the -- the western edge of the Ogalalla would be along the so-called Mescalero Ridge at Monument. There are some remnants of Ogalalla material on the west side of Laguna Gatuna above the water table, very thin remnants of Ogalalla material as outlined, but well above the water table.

Groundwater in this area is contained in sediments of two different geological ages. Most of the water is derived,

and most of the potable water is derived from Triassic sands and gravels to depths of 600 or 700 feet below the land surface. In isolated areas, low areas, there are thin sequences of Quaternary alluvial sands above the Triassic, which produce good quality water.

The area structurally is occupied by a broad synclinal trough, as reflected at the top of the Triassic; this being the 3,500-foot contour, the 3,450-foot contour, a broad synclinal area, the lowest part of which is in the area of Laguna Plata, and the other two lakes being in the central portion of what is the regional synclinal area. The Triassic rises significantly to the southeast, culminating in a major northeast-southwest trending ridge, which is off the map, which serves to separate a southeasterly basin hydrologically from groundwater in this area. This northeast-southwest trending ridge extends clear over to the Ogalalla outcrop, and has been described in the U.S.G.S. Bureau of Mines Bulletin.

As far as the area of immediate concern, the area of immediate interest is concerned, the elevation of the Triassic, at least to this point where the Triassic is at an elevation of 3,600 feet, and perhaps to this point --

Q Would you state what point, Mr. Reed?

A The point extending diagonally across the central

portion of 20 South, 33 East, the Triassic would be above the regional water level in the Quaternary alluvial section. This Triassic ridge has had the effect of diverting the movement of water in the Quaternary from what would perhaps be a southerly direction to a southwesterly direction, there being no water over this Triassic ridge, Triassic divide. The general movement of water in the Quaternary section then would be from north to south, to southwest, the direction being diverted by this structural arch. The Rustler or the base of the Triassic dips to the east. The top of the Triassic, of course, is dipping to the west, as I have explained. This results in a divergence of the top of the Triassic, the top of the Rustler sequence going easterly, the interval on the top of the Triassic to the top of the Rustler is of the order of 850 feet on the west side of the area up to 1,400 feet on the east side.

I think this is a little bit more than academic, in that there has been some suggestion that the waters discharging into Laguna Gatuna, for example, might be leaking out of Laguna Gatuna into the Rustler. I think it is significant that Laguna Gatuna is underlain by a slump structure in the Rustler, involving undoubtedly solution of the underlying salado, and collapse of the Rustler sequence, and an overthickening of the Triassic in the same area.

This is a phenomenon that has been observed in other areas. For example, in the Half Way oil fields to the west, I studied slump structure of this same type, somewhat the same magnitude in 1943, where the Triassic has thickened to accommodate an additional thickness or additional elevation resulting from the solution and collapse of the underlying Rustler sequence. This solutioning and collapse of the Rustler would, of necessity, have taken place prior to or during the deposition of the Triassic. We now have in this area some 1,300 feet of Triassic sediment between the surface and the top of the Rustler, with Triassic still outcropping around the margin of Laguna Gatuna, even though there has been substantial solution and slumping of the Rustler.

Q Would that prevent any leaking of the Laguna Gatuna into the Rustler?

A Yes, because of the great thickness of impermeable playas into the Triassic sequence. The three lakes which we are discussing, Laguna Plata, Laguna Tonto, and Laguna Gatuna are true playas in that they are water table lakes, they are areas in which the land surface has been depressed to the point of intersection with the water table, and are receiving groundwater discharge both at the surface and by underflow, and discharging the water by evaporation. They are also

receiving surface water influx, which is discharged by evaporation. These are lakes of interior drainage, and as a result of no significant outlet, have accumulated thicknesses which, as far as I am concerned, of evaporides, particularly gypsum, calcium sulfate, magnesium sulfate, sodium sulfate, and sodium chloride, at least at the surface, of a typical lake deposit, fine-grained, highly organic.

Groundwater is discharging into Laguna Plata from the northeast. We have examined four springs. There are others, smaller ones, but we have examined four springs discharging into the northeast side of Laguna Plata, and we have had these samples analyzed, and the records of analyses will go into the record, by Southwestern Laboratories of Midland. The springs are generally of the same concentration, chlorides of the order of 7,500 to 8,000 parts per million; sulfates, 11,755 to 12,743; high both in chlorides and sulfates.

A shallow well, Well No. 13, on Mr. Squires' land, was drilled some years ago. This well has been abandoned, because it was not potable. We do not have an analysis of it, and it cannot be entered.

A well between Laguna Plata and Laguna Gatuna, Well No. 33, which was drilled to 130 feet, has a chloride concentration of 9,744, a sulfate concentration of 1,878, which would not

be considered potable.

A Triassic well on the northwest side of Laguna Gatuna with a deep water level, a water level of about 250 feet, nevertheless has a high chloride sulfate concentration, chlorides are 21,000 and a little more, the sulfates about 3,900.

There are two springs on the west side of Laguna Gatuna discharging into the lake. One which I have identified as No. 55 has a chloride concentration of 27,657, and sulfate concentration of nearly 38,000.

To the northeast, No. 56, the chlorides are about 11,000, and the sulfates nearly 14,000.

MR. PORTER: Is that a spring?

THE WITNESS: That is a spring. Now, I wish to point out that some of this water in the two springs, and some of the dissolved solids may be derived from a salt water disposal pit, which is situated just to the north and a little west of Spring 56, and which theoretically would seep out of the pipe and move southward toward this little arm or bay of Laguna Gatuna; and it is not possible to determine to what extent this spring flow is derived from the pits, or to what extent it is of consequence, except to say that the sulfate concentration of 37,979 is more than ten times as much as the sulfate concentration in the produced brines in this general field area. Brine in the oil well

to the north has a sulfate concentration of 2,250. Here is one well at 5,500, another oil well with sulfate concentration of 2,600.

MR. PORTER: So all the pit water could do would be to serve to dilute, as far as sulfates are concerned?

THE WITNESS: This is correct. It would also serve to dilute, as far as the chlorides are concerned, because the brines in the salt lake field, based upon the analysis we have, is substantially lower than the chlorides in the springs.

In the Bass No. 1, the chlorides are 6,600, the sulfates are 2,600.

In the Well T-74, which is another spring and can be related directly from the chemical analysis sheet, the chlorides are 5,900, the sulfates are 2,250.

The Well T-73, the chlorides are 6,700, the sulfates are 3,200. This seems to be about an average concentration of the brines in the field that could relate to the quality of water in the spring.

There is another spring on the south side of Laguna Gatuna south of the highway, which was sampled in October of 1968 -- not by me, but analysis furnished to me -- with a chloride concentration of 51,736, the sulfate concentration of 73,590. In attempting to duplicate this and get as near the

same locality as possible, we went into a ravine south of the highway, a tributary to Laguna Gatuna, and on one week in February of this year it was dry. We dug a hole and got very little water, insufficient to sample. We returned a week later and found water in the hole after a rain, which may have contributed some, but obviously not much. We took a sample then from this locality south of the highway, south of the bridge, and in February of this year the chlorides were 163,105, and the sulfates were 24,594. At the same time, a hole was dug north of the highway, north of the bridge, at the early date, and in a sample a week later the chlorides were 12,333, sulfates were 24,273.

We took another sample in February on the other southeast side of the lake, some standing water, the chlorides were 66,600, the sulfates were 29,728.

A sample taken somewhere in the lake -- and I can't give you an exact location for it, I put it in the middle because I don't know precisely where it was taken -- in 1968, had a chloride concentration of 158,000, and a sulfate concentration of 125,000.

Going then to -- well, let me summarize. In the case of Laguna Gatuna, we have Triassic outcrops along the northwest side which I have observed. Incidentally, an oil well at this

point has a water level almost precisely equal in elevation to the top of the Triassic, a very fine alluvial section discharging directly into the lake on top of the Triassic, Triassic outcrops in the west central part of the lake and just south of the spring sample south of the highway. I can't say that there are continuous Triassic outcrops along the west side of the lake, because most of it is covered and cannot be determined except by drilling.

The east side of the lake below the ridge just at the break of the hills coming out of the lake has a deposit of red sands which are derived from the Triassic. I would like to say they are bedded Triassic sands, but they are not. They are reworked Triassic sands. The indication is that the Triassic is near the surface on the east side of the lake, but I could not find any bedded material.

Going on to Laguna Tonto, I found no fresh water springs discharging into Laguna Tonto. Laguna Tonto is a deep lake, a small lake, substantial bluffs around it. There is an area on the northeast side which I walked to, where there are substantial oval travertine deposits situated at an elevation of ten or twelve feet above the present bed of the lake. These travertine deposits are spring deposits; they are evidences of at one time fresh water discharge into the lake at a time when

the water table was at least ten feet, perhaps higher, regionally than it is today.

Examining these travertine deposits would suggest that these springs have not been active for many years, perhaps a hundred years, perhaps longer. However, there are Indian remains around those springs, in further substantiation of the existence of at one time fresh water. This is characteristic that the water table has declined many hundred feet in the last hundred years.

We were not able to get a water sample, because it was just entirely too soft to get out, but we did take a sample of soil in the north part of the lake, and had a one-to-one extract made and analyzed, and in the one-to-one extract of the soil sample, the chlorides were 48,931, sulfates were 37,698. We also collected some samplesof the evaporites, the crystalline deposits that formed as a thin veneer on top of the lake during Triassic periods. These crystals, these evaporite deposits were analyzed with the results showing as a percentage by weight -- these were not corrected for water content, they were high in water content -- by weight, chloride is 4.2 per cent, and sulfates are 29.23 per cent by weight, a very high sulfate-chloride ratio.

The well southeast of Laguna Tonto, 24, has been sampled

twice. In 1965, chlorides were 2,382, and the electric conductivity was 10,175, which would convert to about 9 million parts per million.

The elevation of this lake at the bottom is about 3,525 feet above sea level. This is the highest of the three lakes; Laguna Gatuna being about 3,495, and the other one about 3,431.

The elevation of the groundwater near Well No. 24 is 3,520, which is lower than the bottom of the lake of Laguna Tonto, and would suggest -- in fact, it would strongly indicate, together with the quality of the water in Well 24, that water is escaping by underflow from Laguna Tonto in a southeasterly direction to the area of Well 24. Well 24, on the other hand, is higher than the bottom of Laguna Gatuna, and I have indicated a flow path from Well 24 into Laguna Gatuna.

MR. PORTER: Mr. Reed, your blue arrows indicate the direction of the flow?

THE WITNESS: Yes, sir.

MR. PORTER: Thank you.

THE WITNESS: Likewise for Well 34, the movement would be into Laguna Gatuna. From Well 21, there are three wells, 21, 22, and 23, which have an elevation of 2,541, fairly high, and does not quite fit the Triassic contouring, and I can't

resolve the question, so I left it alone.

Water is moving northward into Laguna Gatuna from the high point southwest of Laguna Gatuna Well No. 18, at an elevation of 2,538. The movement is northeasterly into Laguna Gatuna.

The wells at Half Way Bar are alluvial wells and extremely good quality. Chlorides are 85, the sulfates are 82. The water level is 3,516, as compared to our estimate of 3,495, or very close to it. These are not surveyed elevations. They have been taken from the topographic map. But it is evidence that water has never leaked out of Laguna Gatuna into the area of Well 17.

West of Well 18, the movement is probably regional to the west or southwest. There appears to be no flow across between Laguna Gatuna and Laguna Plata, as I once thought when I first started this investigation.

In summary, it is my opinion that the three salt lakes are three playas, into which both groundwater and surface water has discharged for thousands of years into the lake area. Wind action has continued to keep the surface elevation of these lakes within a very narrow limit of the elevation of the water table, by wind action in piling up of the debris on the eastern side with the characteristic dunes formed on the eastern side

of the lakes.

As the water table has risen or fallen, the lake bed has risen or fallen in accordance, except for Laguna Toston, which is a fossil playa lake. It has finally caught up and is being filled up.

It is my judgment that with the exception of Laguna Tonto, and with the possible exception of the west side of Laguna Plata, for which we have no data, the movement of water is into the lakes rather than away from the lakes.

It would be my judgment that it would be acceptable, and that no damage would occur to the quality of groundwater presently existing in the area to use Laguna Gatuna and Laguna Plata for salt water disposal; and Laguna Tonto, in my judgment, could be used since the movement, in my opinion, toward Laguna Gatuna in Well No. 24 is already high. But it is a small lake, about a quarter-section, a very deep one, and my client advises that he would not insist on this one being included.

MR. PORTER: Are these relatively deep lakes?

THE WITNESS: They are relatively deep. Water levels in the Triassic are substantially lower than the water levels in the Quaternary. The Triassic water is under artesian conditions, that is to say, it has a pressure exerted on it, as opposed to the Quaternary water which is under water table

conditions or conditions of gravity.

There is adequate thicknesses of clays, of an impermeable nature to isolate the alluvial water completely from the Triassic water, except or unless a well is drilled through both zones, with the upper zones remaining open. In this instance, with the Quaternary water having a higher head, the interchange would be from the Quaternary down to the Triassic.

It is my opinion that the use of these lakes in the disposal of oil field brine would be preferable to the use of salt water disposal pits on the lands; even in areas where locally there is no Quaternary water because there are patches of Quaternary water, such as the one at Half Way Back, which is this one, and this one here, and possibly one up in here, which would contain a good quality water, and into which water seeping down to the top of the Triassic, in finding no home, will continue to move in response to the topography of the Triassic surface until it reaches the groundwater.

MR. PORTER: Mr. Reed, in this exhibit there is a well located here, I believe. What is that, Section 21?

THE WITNESS: Yes.

MR. PORTER: In the northwest part of that section?

THE WITNESS: Yes.

MR. PORTER: The analysis of which shows 3,518 parts

per million of chlorides, and sulfates 905?

THE WITNESS: Yes, sir.

MR. PORTER: Do you have any idea why that well would have that higher chloride content?

THE WITNESS: I suspect it is in response to this general circulation of water from Tonto into Laguna.

MR. PORTER: You think it would be the influence of Tonto, perhaps?

THE WITNESS: Perhaps.

MR. PORTER: That would be a possibility?

THE WITNESS: Yes.

MR. PORTER: But the direction of flow here is into Laguna.

Q (By Mr. Kellahin) Mr. Reed, in examining this area, to sum this up, the only fresh water you found in the area is that lying south of the highway, is that correct?

A In the Quaternary?

Q Yes. Did you find any fresh water, also, in the Quaternary?

A Well 14, is north of the highway, and it is about what Midland used to drink when they used to complain, but it is acceptable.

Q Where is that located?

A Section 23, 20 South, 32.

Q Would the use of these lakes for salt water disposal have any effect on this salt water supply?

A In my opinion, it would not.

Q Would the use of these lakes have any effect on any fresh water supply in the vicinity?

A In my opinion, it would not.

Q What volume of water do you feel could safely be discharged into these lakes?

A Mr. Kellahin, in view of the fact that there has been no mention of a volume of water available to put into these lakes, and because Laguna Plata is so large, something more than 1,200 acres, I have not made a detailed study as to the potential maximum amount that any one lake could accept.

I have determined the area of Laguna Gatuna and Laguna Plata, and those numbers look like this. Laguna Gatuna has approximately 383 acres within the lowest closing contour. Laguna Plata has 1,241 acres within the lowest closing contour.

I believe in the case of Lane Lake in northwest Lea County, detailed studies of this lake were made, indicating that volumes, as I recall, up to 30,000 barrels per day could safely be disposed. Lane Lake is slightly smaller than Laguna Gatuna. The evaporite is slightly lower at Lane Lake than in Laguna Gatuna,

so I would say that within the limits of a foot of impounded water, the same maximum limits would apply to Laguna Gatuna, in the order of 30,000 barrels per day.

Laguna Plata, I haven't made an effort to calculate, because I should think it's safe rate would exceed the total volume of water that could conceivably be transported into this area.

Q In connection with the presentation of the case in Lane Lake, you recommended that observation wells be drilled at certain points around the lake to determine the effect of water disposal there. Do you feel that that is necessary in this case?

A Not really. Well, let me modify that. I think the necessity for a monitor hole or holes, assuming we are speaking only of Laguna Gatuna and Laguna Plata, necessity would be remote in the case of Laguna Plata. It would be my judgment that it would be desirable in the case of Laguna Gatuna, only if the discharge volumes would approach something like half of the suggested maximum rate, or 15,000 barrels per day. There is so much evidence of Triassic cutoff on the south and west side of Laguna Gatuna, there seems to be such a distinct possibility which has not been defined, and can't be without extensive core drilling, of a continuous Triassic ridge along the west side of

Laguna Gatuna. It would take very little imagination to connect the three outcrop areas up. I have not done it, because I am not certain of it.

But with the relative elevations of the groundwater in Laguna Gatuna and out spring discharges both from the south and from the west, I think the necessity of a monitor hole would not make itself known until substantial quantity of water were put into the lake, sufficient to raise the level of the lake four to six inches across the entire 370 acres. At that point, I think it might be desirable.

MR. PORTER: That is in relation to Laguna Gatuna?

THE WITNESS: Yes, sir.

Q In your testimony you have used some water analyses. Do you have those available?

A I do, yes. These are copies of all of the analyses that have been used, with the exception of the analyses that have been taken directly from a map prepared by the State Engineer's Office, from their records, and which is titled, Well Location, Well Depth, Depth to Water, and Chemical Quality of Water, Capitan Underground Water Basin, Lea and Eddy Counties, New Mexico, sheet 2 of 6, by the State Engineer's Office.

For the record, I have also used in the preparation of this map, the quadrangle Laguna Gatuna, New Mexico, 1963, and

the Clayton Basin, New Mexico, quadrangle, 1944, both at a scale of 1 to 62,500.

Q The maps to which you referred are presently here and available for inspection?

A Yes, sir.

Q I hand you what has been marked as Applicant's Exhibit Number 2, will you identify that, please.

A Applicant's Exhibit Number 2 is a series of 13 water and soil samples collected by my office, and analyzed by Southwestern Laboratories of Midland.

Q Are those the analyses you used in the preparation of Exhibit Number 1?

A Yes, sir.

Q I hand you what has been marked as Exhibit Number 3, and ask you to identify that, please.

A These are analyses of five water wells and springs, or surface samples; and six brines from six oil wells in the salt lake field, prepared by United Chemical Corporation and used in the preparation of the map.

Q Was Exhibit Number 1 prepared by you or under your supervision?

A Yes.

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

evidence Exhibits 1, 2, and 3.

MR. PORTER: If there is no objection, the exhibits will be admitted.

(Whereupon, Applicant's Exhibits Numbers 1, 2, and 3 were admitted in evidence.)

MR. KELLAHIN: That completes the direct examination of the witness.

CROSS EXAMINATION

BY MR. PORTER:

Q Now, I would assume from your testimony here, Mr. Reed, that it is your opinion that just about 100 per cent of the water that goes into Laguna Gatuna goes out by evaporation?

A Yes, sir.

Q There is no other outlet?

A That's correct, yes.

Q Now, over in Laguna Plata, at the time you were making your examinations, did you find any water being discharged into that lake from National Potash Mine?

A I did not go to the west side of Laguna Plata, which I understand is the point that water is being introduced. I did not see it, no, sir.

Q And you say there is a possibility that the water from the west side of that lake might flow west?

A I just leave that as an open question.

Q You don't have information on it?

A No, sir.

MR. PORTER: Mr. Matkins, do you wish to examine?

MR. MATKINS: No, I have no further questions.

MR. PORTER: Mr. Nutter?

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Reed, your map specifically identifies the water levels, and you have discussed them in considerable detail of the Quaternary wells. However, there are some Triassic water wells in the area also?

A Yes, sir.

Q Now, what is the source bed of the water in the Triassic beds in the area?

A The source of the water?

Q What sands or what zone produces this water?

A I suspect from the well records, there are several different zones. They might be lumped either as Santa Rosa equivalent or younger. I think there are probably shallower sands than the so-called Santa Rosa, if it can be identified over here and I rather think it can.

Q Now, the Triassic beds also include some non-permeable

clays, and things like this, don't they?

A For the most part, it is composed of non-permeable.

Q So then you would have maybe a streak of permeable sand, which would be carrying the water where you have water wells?

A Yes, sir. This is the reason for the Artesian head upon the Triassic sands. Each of these individual sand beds are overlain by impermeable red clays, which hold the water in under pressure, and the intake obviously is at some higher elevation.

Q Why is it that you believe that the water that is discharged into these lakes leaves only by means of evaporation, and doesn't flow out through the bottom of the lake or into the Triassic beds?

A Principally because the Triassic, at least in the outcrop, is quite impermeable. It is a red or gray clay, and a well drilled immediately on the west side of Laguna Gatuna found it necessary to go about 400 feet to get any water. As a matter of fact, it went 450 feet.

Q We take the difference between the two contour lines that you have drawn on your map, and we find that the Triassic bed would run anywhere from 850 to 1,000 feet thick.

A 1,400 feet on the east side.

Q Just in the vicinity of the two lakes?

A That's correct.

Q And so you would have approximately 1,000 feet, then, of impermeable clays or impermeable Triassic rocks, interlaced with possible aquifers containing Triassic water?

A That's correct, yes, sir.

Q On Plate 2 in Groundwater Report, Nicholson and Clebsch, shows a definite depression in the asymptomatic table there for the Triassic water, and then they theorize on page 57 of that report that there may be some enhanced verticle permeability because of this slumping, and you showed the slumping underneath Laguna Gatuna, and they think there is a possibility that the water discharged into this area does permeate downward into the Permian rocks.

What is your theory on this feeling?

A Well, in examining the logs, and I can't tell from their report, and I am not remembering the date of the drilling of these wells, but I rather think that there is some data available today that was not available at that time, showing the magnitude of the slumping of the Rustler under Laguna Gatuna. There have been wells drilled out in the lake that reflect this over-thickening of the Triassic sequence.

This is not greatly unlike the problem on the Colorado

River where it was postulated that because of faulting involving Triassic beds, salt water was moving upward along fault plains and escaping into the Colorado River.

It is my personal opinion that the Triassic, made up as it is primarily of extra-fine grained clays, there was very low permeability in the clays and relatively permeability in the sands, and are incompetent to maintain porosity, either by fracturing or by faulting.

I would also like to say that the chances of faulting occurring with respect to the slumping under Laguna Gatuna, in my judgment, are quite remote. In examining the structure of Rustler Hills in Eddy County, which is a similar product but where we can examine the Rustler at the surface, and examine the manner in which the Rustler responded to solution in slumping, it is quite evident that that took place at a time when there was a substantial amount of overburden; because the Rustler, rather than being fractured and faulted, is folded into structures upward of 45 degrees of depth. I think this of necessity would involve a massive amount of overburden. Very little faulting is exhibited in the competent and brittle Rustler dolamite.

I think here we have the same phenomena occurring essentially at the same time, and a thickening of the Triassic sequence over this slumped structure. Even though there may have been continued movement throughout the deposition of the Triassic, this movement would have been reflected by solid flow, rather than by faulting in the Triassic, or if it were faulted, it would seal itself up.

Q In other words, if you feel that the Triassic beds are incompetent to maintain porosity as a result of any slumping or faulting, that would also hold true for permeability? You feel that the beds would be incompetent to maintain permeability?

A That would be my opinion.

Q You don't ascribe to the theory that the movement would be downward into the Permian rocks?

A No, sir.

Q And all the outlet would have to be by means of evaporation?

A Yes, sir.

Q As far as we know, the direction of movement with respect to Laguna Gatuna, we have some springs which would indicate the flow from the east side into the lake, and you don't have knowledge of the direction of flow on the south, west, or north side of the lake?

A It would be the other way around then. We have springs on the west side of the lake.

Q I am talking about Laguna Plata. You have springs on the east side there?

A That's correct.

Q And we don't have knowledge of the flow from the north, west or south?

A Except that there is a massive outcrop of Triassic on the north, which presumably would eliminate any flow in the Quaternary; and the U.S.G.S. did not indicate any springs on the topographic maps, other than three of the four that I have identified on the northeast side.

Now, this is not to say they are not there, because, as I recall, they did not indicate springs in the Laguna Gatuna, and these are rather small ones, and you would not be impressed by their size. The springs on the northeast side of Laguna Plata are substantial springs, flowing upwards perhaps five or six gallons per minute.

Q They are seeps, then?

A They are more than seeps. They are flowing into the lake bottom in rivulets carved into the evaporide sequence. The U.S.G.S. chose to identify these springs and show them on the maps. We simply verified their existence, and added one or two

to them, and took their samples.

Q Is there any evidence of Triassic formation on the south and southeast side of Laguna Plata?

A Not that I can identify, no, sir. I will have to say I didn't walk all that out.

Q That is a good-size lake?

A It really is.

Q Generally speaking, Mr. Reed, don't the surface contours follow the contours of your Triassic beds shown in yellow on your Exhibit 1? Just generally speaking, isn't the surface contour pretty much reflected by the Triassic contour?

A Yes, sir.

Q There is another depression to the west of here known as Williams Sink. Are you generally familiar with Williams Sink?

A Excuse me, Mr. Nutter, let me see if I can find it and see if I am familiar with it. By that name, I think I am not. I have not been to Williams Sink. We have been to Laguna Toston. We have not been to Williams Sink.

Q Well, the general surface contours here, this is the head, so to speak, of a cynclinal feature that flows to the west and on over into the Pecos River Valley, and what I was concerned with was if the outlet here to the Laguna Plata would be westward?

In response to a question by Mr. Porter, you didn't know just what the situation is on the west, and I was wondering if there would be a connection then from Laguna Plata westward into Williams Sink, and thence on down into the Pecos River Valley?

A Mr. Nutter, I can't answer that question. I don't know.

Q But the only evidence you do know of of Triassic beds around Laguna Plata would be those beds you show on your map on the north side?

A That's correct.

MR. NUTTER: I believe that is all.

MR. PORTER: Mr. Reed, did you have occasion to observe whether or not the west side of Laguna Plata, that is the base of the lake, was higher than the east side?

THE WITNESS: No. Let me see what the map reflects. I have not examined that precisely, no, sir. There is an elevation at the northwest corner of Section 10, 20 South, 32, of 3,431. And there is an elevation of a drill hole in the north center of the northwest quarter of Section 11 to the southeast, of 3,433, which is two feet higher.

MR. PORTER: So it is relatively level, apparently?

THE WITNESS: Yes, sir. And a little bit lower on the west, but essentially level.

MR. PORTER: Let's take a ten-minute recess.

MR. KELLAHIN: I want to ask one question, and perhaps we will be through with Mr. Reed.

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

REDIRECT EXAMINATION

BY MR. KELLAHIN:

Q Mr. Reed, in connection with the question on the west side of Laguna Plata, did you take into consideration the fact that this Commission granted an areawide exception to the provisions of the salt water disposal Order R-3221, in considering the situation over there?

A I did.

Q Was that the reason you did not make an inspection of the west side of the lake?

A It is.

MR. KELLAHIN: If the Commission please, I would like the Commission to take notice of its own order which granted an exception on the Order R-3221, to the area immediately west of Laguna Plata.

MR. PORTER: The Commission will take administrative notice of that order.

Are there any further questions of this witness?

RECROSS EXAMINATION

BY MR. UTZ:

Q Mr. Reed, it is my understanding that your testimony was that there is some leakage from Laguna Tonto, which comes south and eventually ends up in Laguna Gatuna. Now, if there were surface disposal in the area of Sections 9, 10, 15, and 16, and 20 South and 33 East, would it be your opinion that that surface water would eventually find its way into Laguna Gatuna?

A Yes, sir.

MR. UTZ: That is all I have.

MR. PORTER: If there are no further questions, the witness may be excused, and we will take a ten-minute recess.

(Thereupon, a recess was taken.)

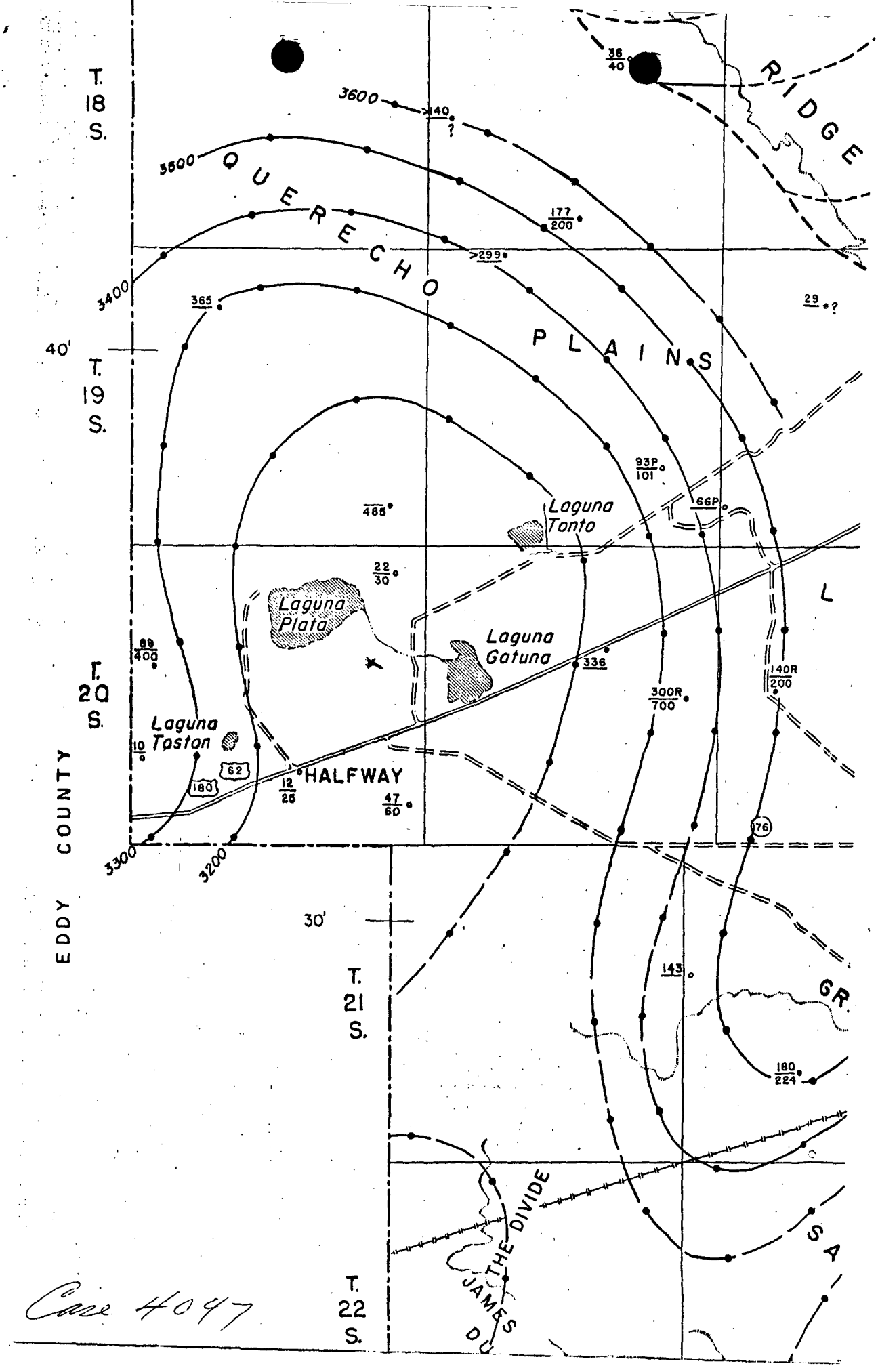
MR. PORTER: The hearing will come to order, please. The Commission will recognize Mr. Kellahin.

MR. KELLAHIN: If the Commission please, that completes our direct testimony in the application of Larry Squires. We may have some additional testimony to offer after the presentation of the other side, and the objections.

MR. PORTER: You will have the privilege of recalling the witness, if you feel it is necessary.

Mr. Matkins.

MR. MATKINS: Thank you. Mr. Harroun, would you take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Laguna Tonto
22/30
Laguna Plata
Laguna Gatuna
336
89/400
10
Laguna Toston
62
180
HALFWAY
12/25
47/60
300R/700
140R/200
76
143
180/224
THE DIVIDE
JAMES
36/40
29
Case 4097

the stand, please.

DANIEL S. HARROUN

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

DIRECT EXAMINATION

BY MR. MATKINS:

Q State your name and residence, please.

A Daniel S. Harroun, Carlsbad, New Mexico.

Q Mr. Harroun, are you in connection with the joint ownership of Mr. Russel Haworth, and individually owner of certain federal and state potasium leases and prospecting permits, and applications for potasium leases, both with the Bureau of Land Managemcnt and the State of New Mexico?

A Yes, sir.

Q And included in these leases, applications, and permits, are any of the lands covered by these leases in these three lakes which the applicant is applying to deposit water?

A Yes, sir.

Q Could you tell the Commission the lease number, and what section is involved in the Laguna Plata?

A In Laguna Plata, potasium lease 013298-D, Section 11, all of Section 11.

Q Do you have some applications for federal leases

relating to the lands covered by the Laguna Gatuna?

A Yes, sir.

Q What sections are covered by that?

A That is in Section 18, the northeast quarter, and the north half of the southeast quarter; and in Section 11, the northwest quarter, the south half of the northwest quarter, Township 20 South, Range 33 East.

Q Do you have both a lease and a prospecting permit covering lands under Laguna Tonto?

A Yes, sir.

Q And what are those?

A Lease number, New Mexico 013298-A, Section 5, Township 20 South, Range 33 East. And prospecting permit, New Mexico 3232, Section 33, Township 19 South, Range 33 East.

Q Now, is it your hope and intention from these leases and other leases which you own, to produce potasium and related products from these lands?

A Yes, sir.

Q And in connection with that desire, have you consulted with Mr. D. W. Douglass respecting a process whereby the grade of ore in these leases might be commercially produced?

A Yes, sir.

Q And in connection with his furnishing you with this

International to cooperate in the production of sodium. A hearing was held, International opposed it, it was carried to the Secretary, and Mr. Douglass was turned down on this very same matter.

Q He was applying for sodium sulfate leases, and they were denied?

A They were denied, that's right.

Q Then an appeal was taken to the Secretary, is that your testimony?

A Yes, sir.

Q And the denial was upheld by the Secretary?

A Yes, sir.

Q I have just one other question, Mr. Harroun. I didn't quite get your testimony in regard to your ownership in Laguna Tonto. Did I understand you to say you had Section 5 in 20 South, 33 East?

A Yes, sir.

Q And that doesn't lie within Laguna Tonto, does it? It touches on the border of it?

A It is close to it, yes.

Q You have also Section 4, do you not, or a portion of it?

A I will have to look at my map.

We have in Section 4 under a potasium prospecting permit, we have the north half of the northeast quarter, in the southeast quarter of the northeast quarter, and the -- let's see, the northeast quarter of the southwest quarter.

Q And that would not touch the lake at all, would it?

A No, sir.

Q You have, as I understand it, you have Sections 32 and 33, or the greater portion thereof, in 19 South, 33 East, is that right?

A 19-33?

Q Yes.

A Which --

Q Sections 32 and 33.

A Section 32, we have under a state lease.

Q Under a state lease?

A Yes, sir. And Section 33, we have all but 80 acres under a prospecting permit.

Q Under Laguna Gatuna, do you have leases covering substantially all of the lake bed?

A We have an application for a lease there.

Q You do not have a lease there, do you?

A No, sir.

Q You have no leases which would affect Laguna Gatuna at

of salts.

Q Specifically, Mr. Douglass, what experience and background have you had in the development and production of sodium sulfate?

A Well, with the Ozark Mahoning Company, of course, I was their only chemical engineer in the development of the process that they are using at Monahans, Texas, now. That same process has been transferred almost as designed to their plants at Seagraves, and also near Brownfield, Texas.

While I was with Ozark Mahoning, too, we also put into operation a plant for production of potasium sulfate by the reaction of salt and sulfuric acid, which later was converted to a plant to produce potasium sulfate.

Q Have you been called upon to investigate possible sources of sodium sulfate?

A While I was with the Ozark Mahoning Company, I investigated a great number of lakes in West Texas, some in Wyoming, and some in North Dakota, for the Ozark Mahoning Company.

On the Cedar Lake area, they have a plant now. The Brownfield area, I didn't investigate when I was with them.

Q Have you had some prior experience with attempts to produce sodium sulfate from the areas affected by this application?

past.

Q And where were these samples taken?

A I took a sample from Tonto from 18 inches under the surface; and I took a sample from a seep or spring in the lake bed at the west end of Lake Plata. Both of those are processable brines by direct chilling operations, as are used in the Monahans plant.

Q Tell the Commission how you take these samples, and how you test them for the presence of sodium sulfate?

A These two samples, I simply dug down to a depth of 18 inches in Tonto and took the water that seeped into the hole at that depth; and a sample from the seep was taken essentially at the surface. It was pretty muddy getting out there, but I took a sample.

Now, these two samples, I did nothing more than put them in my refrigerator, and to determine the depth of sodium sulfate crystals that were produced from the chilling operation there. Now, over the past years, I have chilled enough samples that way that I can recognize a commercial yield of sodium sulfate.

Q And what were the results of these two samples?

A These two samples when chilled gave a crystal depth of three-quarters of the depth of the total solution. Now,

sodium sulfate, of course, is a hydrate of sodium sulfate, and gives a very substantial crystal volume.

Q In your experience, did these results warrant, in your judgment, additional testing to determine if there is sodium sulfate in commercial quantities in these lakes?

A Well, yes. But prior to this, I have taken a number of samples that have been analyzed chemically, and they have all been taken from the lake beds, and been taken from all three lakes, and they show from ten to twelve per cent of sodium sulfate.

Of course, these units are present in the brine as ions, and are not associated; and depending on your method of calculation, and the method to which you might use in treating the brine, the total sulfate may or may not be calculated as sodium sulfate.

But in calculating the total sulfate as sodium sulfate, the brines run from ten to thirteen per cent of sodium sulfate, which is processable sodium sulfate. The plant at Monahans, Texas, is now operating on brines of the order of seven per cent sodium sulfate. I still have a little stock in Ozark Mahoning, so I have access to some of their records.

Q What needs to be done now to determine if the sodium sulfate is there in commercial quantities?

quantities?

A I think this could easily be done within a year's time, after the go-ahead to do the investigation.

Q You were present, were you not, when Mr. Reed testified on behalf of the applicant in this hearing?

A Yes.

Q Was there anything in his testimony which would alter your opinion or support your opinion as to the existence of sodium sulfate?

A I think it would support my opinion as to the existence of sodium sulfate. He had indicated not only the sodium sulfate within the lake beds, but also the migrating sodium sulfate from one lake bed to another, which represents areas outside the lake beds, and this is certainly true in other areas.

At Monahans, Texas, most of the sodium sulfate that has been produced there has been produced from wells that have been well outside the little lake bed that they have there.

Q Mr. Douglass, did you hear Mr. Reed's testimony to the fact that in his judgment any water produced in connection with oil and gas production, and dumped on these lakes would evaporate? Did you hear that testimony?

A Yes. Would you like me to comment on it?

Q My question is: if that is true, in what manner would

the disposal of this water on the lakes damage the production of sodium sulfate or the testing for sodium sulfate?

A At the present time, I think any water that was put on the surface of the lakes would evaporate and simply leave sulfate there, because the water table is at the surface of the lakes. But I think, as soon as you went in to produce sodium sulfate from the area, that you would have a funnel to your well, and that any surface water would start migrating to your wells, both within and outside the lake, so that the salt water or partially salt water and other things would start coming to you, and would affect your production.

Q What effect would this salt water have on your sodium sulfate?

A Well, it would simply reduce your sodium sulfate production, and it might also effect it by having other salts, magnesium salts and other things in it that would be detrimental to your circuit and chilling circuit.

Q Now, in earlier testimony you heard the testimony about some disposal brine by National Potash, did you not?

A Yes, sir.

Q Have you seen that disposal?

A Yes, sir, I have seen that disposal, and I have talked to the National Potash people about it. That material runs in

at the west end of the lake, and runs along the south side --

Q You are speaking of which lake now?

A Lake Plata, runs along the south side, rather up toward the east end, and evaporates there. Of course, the amount of brines that they are putting in is nothing compared to the total evaporation that would come from the surface of that lake, if it were covered with brine.

At the present time, with these springs at the surface bringing sulfate into the area, it isn't damaging the thing. But if we put wells in there and start drawing brine from them, then that brine will start coming to the wells that we were to drill.

Q Do you know of any other way to determine the presence of sodium sulfate in commercial quantities, other than the drilling process you mentioned?

A I don't know of any other way of making an accurate determination, except to go in, drill wells, and do pumping tests on them, and determine what the quantity is that can probably be produced from them.

Q You heard some questions earlier in the applicant's case relating to the conditions on the western portion of Laguna Plata. Have you personally inspected that, and can you aid the Commission in what you saw there in any way?

A The western portions of Lake Plata, that is the one that is along the highway?

Q No, that is the large one up here.

A That is the large one. I have taken samples on several occasions from Plata, and all of them have been in the order of ten to twelve per cent of sodium sulfate, along with approximately nine per cent of sodium [illegible]orides, with a small amount of magnesium.

Q Is there anything else you wish to state to the Commission in connection with your objection to this application?

A I don't know of anything, except that in my talks with the National Potash Company, I am certain that arrangements can be made with them in regard to the disposal of their salt water, because the presence of a sodium sulfate plant adjacent to them with cheap glauber salt, which would be a tremendous asset to them for the production of potasium sulfate. Potasium sulfate is one of the few potasium compounds that hasn't gone down too tremendously in value, and can't be produced from the Canadian operations, and the spread between potasium sulfate and potasium chloride now is something like $34, compared to about $12 or $13; and the incentive for making potasium sulfate from their potasium chloride is such that they are willing to consider, I think, probably any reasonable method of disposing of their salt water in

order to have available a possible source of sodium potasium.

In addition to that, this process which Mr. Harroun and Mr. Haworth are interested in, is a possible process for producing the potasium sulfate from the area where their mine is located. They are now producing all of their potasium chlorides from the government, or reserves that they purchased about 20 miles to the west of there, and are not producing from their deposits that they put their plant on. I think this new process is another thing that National Potash is keenly interested in.

Q Mr. Douglass, if you have the opportunity to test for sodium sulfate and it appears that it is not present in commercial quantities, then you would have no further interest in this property or in objecting to this application, is that correct?

A That is true.

MR. MATKINS: That is all I have.

MR. PORTER: Any questions?

CROSS EXAMINATION

BY MR. KELLAHIN:

Q Mr. Douglass, as I understand, you say there is very little water going into Laguna Plata from the Potash Company?

A Relative to the total evaporation.

Q Do you know how much is going in?

A I had a figure, but I don't know whether I have it with me or not. But, as I recall, it amounted to about an inch or two annually over the total area of the lake.

Q It doesn't, in fact, spread over the total area of the lake?

A No, it doesn't spread over the total area of the lake.

Q Would you agree that testimony before this Commission by the Potash Company shows disposal of approximately 50 million gallons a year?

A I would go along with that.

Q And about 3,200 barrels per day?

A Perhaps, yes. I haven't figured it into barrels.

Q And you haven't objected to that?

A I wouldn't object -- I haven't objected to it. I have been out to talk to them about it, about what other method might be used for disposal. But I am not objecting to it at the present time. It is not, I don't think, affecting the brine that is flowing into the lake, the sulfate brines flowing in; and if it is stopped at the time sulfate brines are started to be taken out, I don't think it will seriously affect it. But if there is a deposit of sodium sulfate there, and they start taking brine out of the wells in the lake, I think the brine

will migrate to the wells, and will be detrimental to the operation.

Q As I understand, you would be operating under an agreement with Mr. Harroun and Mr. Haworth?

A That is true.

Q Then you heard Mr. Harroun's testimony as to what leases they held?

A Yes.

Q If we assume that his leases do, in fact, core sodium sulfate, which we do not concede, that will give you then only the right to go into Laguna Tonto in Section 11, in 20 South, 32 East, in Laguna Plata?

A That's right.

Q And you have no rights in Laguna Gatuna at all at the present time?

A Unless the present lease applications go to Harroun and Haworth.

Q Are those applications for sodium sulfate leases?

A They are applications for potash, potash leases.

Q Were you aware of the fact that subsequen to your application, applications for sodium sulfate have been filed?

A Yes. I know that Mr. Brown of Hobbs filed applications for sodium sulfate -- prospecting permits adjacent to Laguna

Gatuna.

Q And they were denied?

A They were denied, the same as mine were.

Q In connection with your denial, your name is E. W. Douglass?

A Yes.

Q And your wife's name is Cleo Douglass?

A Yes.

Q Is this the decision issued by the Secretary of Interior in connection with your application?

A Yes, I believe this is it.

(Whereupon, Applicant's Exhibit Number 5 was marked for identification.)

MR. KELLAHIN: At this time, I would like to offer Applicant's Exhibit Number 5, which is the decision of the Secretary of Interior, involving application of New Mexico 042594 and 042595.

MR. PORTER: Do you have any objection?

MR. MATKINS: No, sir.

MR. PORTER: It will be admitted.

(Whereupon, Applicant's Exhibit Number 5 was admitted into evidence.)

Q According to this decision, you did contend that the potasium deposits occurred separately from the sodium sulfate, did you not?

A Yes.

Q Mr. Douglass, you made one test hole, as I understand, in Lake Laguna Tonto, a hole about 18 inches deep?

A Yes.

Q Do you have any opinion or any basis for that opinion as to the productivity of the well drilled in Lake Plata?

A No, I don't have that -- actually, 18 inches, you don't know the depth of the sediment, and you don't know the horizontal stratification of your crystals, and there is --

Q If you had wells in the lake bottom, you would be dependent upon seepage into those well holes, is that right?

A Well, if there is a vertical strata, or vertical section sufficient to develop you ten foot of brine over, it would represent a quarter-million tons of sodium sulfate directly inside the lake.

Q Well, how fast could you produce this, though, from these lakes?

A Well, they vary a great deal. Over in Cedar Lake, I believe they have five or six wells producing 200 tons of sodium sulfate a day. We used to operate as many as twelve or

fourteen at Monahans to produce 100 tons a day.

Q Are these wells in a lake bottom, just like these lakes?

A They are at Cedar Lake. They are at Monahans. They are outside the lake.

Q As I understand, you also testified there is a possibility of developing the area, I take it, between Laguna Tonto and Laguna Gatuna, where Mr. Reed's testimony showed there was migration water across there?

A Yes, sir.

Q Using the lakes for water disposal would not interfere with that type of production, would it?

A Only when your well got below the level of the lake bed, your water table got below the level of your lake bed, migration would be from your lake bed to your well, I assume.

Q You haven't made any study of that problem, have you?

A Well --

Q You don't know whether it would occur or not?

A We haven't had an opportunity to do any drilling work out there.

MR. KELLAHIN: That is all I have. Thank you.

MR. PORTER: Does anyone else have a question?

THE WITNESS: In regard to the State land in this area,

I did consult with Mr. Jordan, and he told me that in order to produce sodium sulfate from the State lands, that what I would need would be a contract with the owners of the potash leases, a farmout arrangement similar to the oil arrangement.

MR. PORTER: Mr. Nutter.

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Douglass, I would like to clarify a couple of numbers. You mentioned if you had a column of sodium sulfate ten feet deep, that would represent 1,000,000 tons per mile, per square mile?

A No, if you had a column of brine ten feet deep containing ten per cent sodium sulfate, you would have approximately one million tons, I believe, of sodium sulfate per square mile.

Q When you mentioned the figure $45 million, were you talking about the three square miles involved here, or is that per mile?

A The three square miles. It is about $15 a ton at a minimum price. Now, this process that they are using at Monahans does make a certain amount of very high grade potasium -- or sodium sulfate, which is used by special industries, and that demands a market price of around $24 per ton. But I believe most of the stuff, and they are able to satisfy that market, and

also make a lot of low grade material which runs around 96 per cent, which is used by the paper mills. Practically all of the salt cake that is produced in this country goes to the paper mills, and is used to make that brown paper that you get your groceries in, and the cardboard boxes that are used for handling materials.

Q Now, the $45 million, then, would represent refined sodium sulfate?

A It would be delivered at the railhead near the lakes there.

Q In making an economic evaluation of the sodium sulfate that is in the lake bed, then the $45 million would have to have the cost of extracting, processing, and refining deducted from that?

A Yes. There would be, of course, an overriding royalty to the government and to the state. They are the primary owners of the materials, and they would get their royalty.

Q Is there any sodium sulfate associated with the potasium sulfate that is mined down here, potasium chlorides, by the potash industry?

A There is a little potasium sulfate in all of the ore, I think, but it is very little in most of it. But there

are beds which contain substantial amounts of potasium sulfate.

Q Now, the effluent which goes from the National Potash Company's plant into Laguna Plata, does that effluent contain sodium sulfate?

A In no appreciable quantity.

Q If you were to put wells in these lakes or around these lakes, and withdraw these brines, and extract the sodium sulfate from them, what would you do with the water that was left?

A My initial proposal would be for the National Potash Company to use it for the disposal of their tailings, in place of the fresh water they are now using for tailing disposal.

Q It would eventually get into Laguna Plata, wouldn't it?

A It would if they continued to dump into Laguna Plata. If they found other methods of getting rid of this, they can, I think, return that salt water and use it for taking their tailings out. It isn't completely essential that they put that water into the lake there. That is, that water could circulate; the only reason for that water is to transport their tailings away from the plant, and they could use salt water to transport their tailings away from the plant, and they could use the salt water that they are pumping into Laguna Plata to transport

probably make -- I am not completely familiar with their operations -- but I am sure they are making approximately 88 to 90 per cent recovery of the sulfate ion that is available. That is, I don't think they would accept anything less on the basis of the work that we used to do.

Q If it were a ten per cent brine, and they are extracting 100 tons, would that mean that ten times that or 1,000 tons of water would be necessary?

A Well, this water would come to their plant, yes, with their sodium sulfate.

Q What I was wondering about, was whether you have --

A Ordinarily, the brine that they process will contain a total of between 25 and 30 per cent of salts. Now, these salts will be sodium sulfate, and sodium chloride, and magnesium -- it may be either satisfied with the sodium or potasium radical; and they will base their extraction on the sulfate there, and they will make an attempt to convert all of their sulfate to sodium sulfate by adjusting the concentration of their brines.

Q Now, the limitation on the process, or on the extraction of the ore would be, if you don't have any extraneous source of inflow into the lake such as National Potash Company, or oil field brines, the limitation on the amount that you could extract would be the natural flow? You wouldn't want to remove more than

the natural flow coming into play, would you?

A Why, sure, it is an exploitable material, the same as the potash, or anything else. You would try to produce it in a reasonable time to take care of your plant depreciation. If you had a 200 ton plant there, I would think you would want to develop something like 3 million tons in order to depreciate the plant, and assure a plant life of something like 40 years, or something like that.

MR. NUTTER: I believe that is all.

CROSS EXAMINATION

BY MR. PORTER:

Q Mr. Douglass, if in the event that the Commission should grant the applicant permission to use one or more of these lakes for salt water disposal, would that interfere with your testing?

A I don't think it would interfere with the testing. You could probably stay away from the brines, assuming they were reasonable quantities of brines.

Q And you say a year would be a reasonable period for you to conclude your testing and evaluation?

A A year after the legal aspects are worked out in regard to the Bureau of Land Management. We don't have a firm decision from the Bureau of Land Management yet regarding just

what conditions I could go in there and do the work. I think the State, if the opinion of the attorney for the land department here is valid, I think we have reason now to assume we can go in on the State land held by Harroun and Haworth, and probably by the U.S. Potash Company.

Q So, assuming that it is feasible to develop this sodium sulfate, it would be something more than a year before you could begin any kind of operations toward extracting the product?

A Yes, that's right. I think it would take about a year to do the investigation. And I think, personally, I would consider a contract for a plant within two years of the completion of the experimental work. I think three years for an operation there is a reasonable thing, but I think one year is sufficient for the investigation to determine whether there is sulfate there or not in sufficient quantities.

Q But it would actually be somewhat close to three years before you would start extracting any of the sodium sulfate on a commercial basis?

A I think that is probably true.

MR. PORTER: Does anyone else have a question? Mr. Kellahin.

At this point, Mr. Kellahin, do you propose to recall

your witness?

MR. KELLAHIN: We probably will, yes, sir.

MR. PORTER: In that case, let's recess the hearing until one thirty this afternoon, at which time Mr. Douglass will resume the stand for further cross examination.

(Whereupon, the hearing was adjourned until one thirty o'clock, P.M.)

MR. PORTER: The hearing will come to order.

CROSS EXAMINATION

BY MR. KELLAHIN:

Q Mr. Douglass, as I understand, the provision you are proposing in this area, if it is practicable, would entail extraction of the sodium sulfate from the brine?

A That is true.

Q Do you have any opinion as to how much water you would produce from any hole or well, or excavation in the lake beds, gallons per minute, or any other basis?

A No, I think the minimum plant that would be possible to consider would be a plant that would produce 100 tons of sodium sulfate a day.

Q Let's say you are going to produce 100 tons of sodium sulfate a day, and you have a pretty good idea of the concentrates available in this area --

A Yes.

Q How much water would go through that plant per day?

A Well, the total brine would probably be about eleven times the production of sodium sulfate.

Q That would be eleven times 100 tons?

A Yes.

Q Could you give me that in barrels or gallons per minute, or some kind of a figure?

A Well, that brine would be composed of about, between 25 and 30 per cent of salts, and the remainder would be water. You would have about 75 per cent water; or per ton of production of sodium sulfate, you would probably have about seven and a half tons of water to take out of the well, per ton of sodium sulfate.

Q When you talk about a 100-ton plant, you mean 100 tons per day?

A Per day of production, yes, of course, one would want to get beyond that in production if they possibly could. That is, a plant producing 200 or 300 tons a day is no more expensive to operate from the standpoint of the manpower involved, than a 100-ton plant.

Q Well, what I am getting back to, though, Mr. Douglass, and if you can't answer it, I would appreciate it if you would

just say so, how much water would you have to produce out of these lake beds to achieve the production you are talking about?

A Well, it would be seven and a half tons of water, approximately, per ton of sodium sulfate; or in 100 tons of sodium sulfate production, there would probably be 750 tons of water coming along with it. In addition to that, there would be the salt in solution, the sodium chloride, and the magnesium salt.

Q So we understand what I am talking about, do you know how much water weighs?

A Water weighs about 62 and a half pounds to the cubic foot, about eight and a third pounds to the gallon. I don't deal in barrels, and it is pretty difficult for me to get the barrels.

MR. KELLAHIN: I understand this is not in your line of thinking, but I wanted the Commission to understand how much water we were talking about producing. I think we have the answer. Thank you, sir.

MR. PORTER: Does anyone else have a question? You may be excused.

MR. MATKINS: I will call Mr. Raul Martinez.

Q Mr. Martinez, have you been here throughout the testimony in this hearing?

A Most of it, yes.

Q And you have heard the testimony concerning the use or the development of sodium in connection with potasium leases? Have you heard that testimony?

A Yes.

Q And some question having been raised as to whether sodium can be produced under a federal potasium lease? Has this question been decided by the Bureau of Land Management?

A It is under consideration at the present time.

Q Do you know this of your own knowledge?

A Yes, sir.

Q Is it still a policy of the Bureau that where there exists a potasium lease, that a sodium lease will not be issued on the same land?

A That is true.

Q Were you also present when there was testimony relating to an application with your department for special land use permits?

A Yes, sir.

Q Are these given automatically, or what considerations are given for the issuance of these permits?

A I can't very well state policy on that, since those permits are handled in our district office. It is my understanding that special land use permits have been issued in the past where the Commission has approved certain contracts. They are not automatic, in other words, although we have been cooperating with the Oil and Gas Commission. But, possibly one explanation, that those special land use permits are cancellable immediately if an emergency arises, or there is some other conflict with a greater use -- application, you might say.

MR. PORTER: In other words, if conditions change from the time that they are issued, they may be cancelled?

THE WITNESS: Yes.

Q Do you happen to know if any of the considerations being reviewed at the present time to allow the production of sodium in connection with the potash leases, and the reasons they are considering them?

A I beg your pardon?

Q The reasons why they are considering them?

A Well, only that the possibility of minable sodium deposits exist, and it is something that the Bureau wants to look at very carefully, because if it is minable it is beneficial in two ways. It would bring in a new industry to the state, and apparently it would also benefit the potash industry

or the potash products that so far has maintained a higher price than, I believe, it is potasium sulfate, than other potash products.

MR. MATKINS: That is all I have.

MR. PORTER: Any questions of the witness?

MR. KELLAHIN: No questions.

MR. MATKINS: That concludes the witnesses on behalf of the protestants.

MR. PORTER: Mr. Kellahin, do you desire to recall Mr. Reed?

MR. KELLAHIN: I would like to recall Mr. Reed.

ED L. REED

recalled as a witness by the Applicant, having been previously duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Mr. Reed, in connection with the presentation of the testimony by Mr. Douglass, he stated that there is a possibility of producing fluid containing sodium sulfate between the lakes. Have you any information on that?

A Only to say that if the groundwater between the lakes contains minable sodium sulfate, it is my opinion that the use of the lakes for salt water disposal would not have any

deleterious effect upon these deposits in the groundwaters between the lakes, since the groundwater elevations between the lakes appears to be substantially higher than the lake beds, themselves.

Q Then will you say there would be no adverse effect by using the lakes for water disposal?

A That would be my opinion.

Q You heard Mr. Douglass testify as to the volume of water required to service a 100-ton plant which, as I understand, is seven and a half tons of water per ton of sodium sulfate to be extracted. Have you made a calculation of how many gallons per day that would be?

A Yes, sir.

Q How many would it be?

A In rough numbers, about 140 gallons per minute.

Q Would a series of wells in your opinion -- first, let me ask you, have you examined the contents of these lakes and the bottoms, the composition of them?

A In the upper portion I have, yes.

Q On the basis of your examination of the composition of these lake beds, would a series of wells drilled into the lake beds supply water in that volume?

A Unless there were sediments below the near surface

materials with a higher permeability than those which I have seen, it would be rather difficult. I would at least be apprehensive about the well producing any substantial quantities of water, and I don't know what the minimum rate per well would be to be economic. But I think it would be relatively simple to determine what the range of permeabilities would be in these lake deposits by drilling a well, and running a pumping test in a well which penetrates the entire lake sequence.

I think it might also be important to consider that if small wells could be completed in the lake deposits, we shall say the range of ten gallons per minute, which would require fourteen wells, this would be indicative of relatively low permeabilities, and it would be my judgment then that the lakes could be divided into areas which, because of the low permeabilities, could be considered hydrologically extinct. In the situation of low permeability, production of water at these rates and at these depths would create rather steep-sided cones of depression, and the area of influence of a given well or a group of wells would be measurable. Under these conditions, it would be my judgment that concurrently both operations could go on in a large lake like Laguna Plata without interference. If the permeabilities are less than would be required to yield ten gallons per minute per well, this would, of course, require

closer spaced wells, and would require more wells, and produce a situation which could almost be considered a vertical mining of a resource, which has little, if any, horizontal effect or drainage effect, as it were, upon adjoining lands.

Under these circumstances, which could only be determined by drilling a well and running pumping tests, and determining what the permeability of the aquifer truly is, this is the only way this could be resolved. I should think that one or two wells in a lake like Laguna Gatuna would at least begin to give a magnitude of the problem.

MR. KELLAHIN: That is all I have.

MR. PORTER: Any questions of Mr. Reed? You may be excused.

Does anyone else desire to present any further testimony in this case?

MR. MATKINS: May I be permitted to recall Mr. Douglass?

MR. PORTER: Yes.

E. W. DOUGLASS

recalled as a witness by the Protestants, having been previously duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. MATKINS:

Q Mr. Douglass, you have heard the testimony by Mr. Reed

which was just concluded?

A Yes, I heard it, and I agree with him that we need some test wells in the lakes, themselves, to determine what could be produced per well, and how much.

Now, I have had holes with a post auger to a depth of approximately ten feet out there, and this was in Lake Gatuna; and for the first three feet, I had relatively solid saturated mud, but after I got down to a depth of about four feet, I started running into horizontal layers of gypsum, well crystalized, defined, and loosely matted together, and by the time I was to a depth of six feet, the water flowed into the hole and up to within three inches of the surface, indicating, I think, that there is horizontal percolation through the lake, at least in the shallower depths, and that there would be substantial migration across horizontally through the lake beds.

MR. MATKINS: I have nothing further.

MR. PORTER: Do you have any questions?

CROSS EXAMINATION

BY MR. KELLAHIN:

Q Mr. Douglass, what disposition would you make of this water after it runs through your plant?

A Well, I am not certain as to just what I will do at the present time. But my thinking at the present time is that

it will probably be used by the National Potash Company for their salt disposal operation and allow them to use that much fresh water, and from their fresh water operations.

MR. KELLAHIN: That is all.

MR. PORTER: Then it would eventually go into their disposal pits?

THE WITNESS: It would eventually go into their disposal pits, and I feel confident that as time goes on, and they realize the help that a sodium sulfate operation would be adjacent to their operation, that they will find a way of recycling their salt water so it need not go to a separate disposal area.

Q (By Mr. Kellahin) This would be a saturated brine you would be delivering to them, then, would it not?

A No, it wouldn't. Having taken the sodium sulfate out of it, and the process reheats the brine to approximately the temperature at which we receive it, it is unsaturated. We have taken the sodium sulfate out, and it will be an unsaturated brine. It will have some salt in it, and a very minimum amount of sulfate, but it will be not a saturated brine.

Q It would have a rather high content of sulfate?

A Will probably have a ten per cent or twelve per cent of sodium chloride.

Q Wouldn't they be able to use these oil field brines to better advantage than this brine you are going to deliver?

A Well, I don't think it would -- there would be the inducement to use the salt brines that there would be with a sodium sulfate operation in there.

MR. KELLAHIN: That is all.

MR. PORTER: Any further questions? You may be excused.

If that concludes the testimony, we will hear any closing statements you may have.

MR. KELLAHIN: If the Commission please, I would like to have those letters read into the record prior to making closing statements. I presume as applicant, I will be permitted to close.

MR. PORTER: Yes, we indicated earlier that the letters would be read.

MR. HATCH: Telegram received by the Commission on March 18, addressed to Mr. A. L. Porter: Regarding Case No. 4047, the Lea County Farm and Livestock Bureau strongly objects to the surface disposal of produced salt water into so-called salt lakes in Lea County. We urge that your Order No. R-3221, as amended, prohibiting surface disposal be enforced without granting exceptions. J. W. Spears, President.

Then a telegram was received on March 18th by the Commission, addressed to Mr. A. L. Porter: We protest the granting of the application of Larry T. Squires in Case No. 4047 to dispose of salt water into the three natural lakes in question, notwithstanding what the hydrologist, who will testify for the applicant, may say. It is our belief that disposal of salt water into the lakes will be no different than that disposal into open surface pits, just more concentrated in one area. We suggest it is a safer approach, even though more expensive, it is to use salt water disposal wells in accordance with Order No. R-3221. Mark Smith has land adjoining one lake, and all three of the undersigned ranchers are in the area, and fear condemnation of their fresh water supplies. Mark Smith, G. H. Bingham, Tom Lineberry.

MR. PORTER: That is apparently all the communications we have, Mr. Kellahin. Mr. Matkins, would you like to make a closing statement?

MR. MATKINS: Thank you, Mr. Commissioner. May I inquire if the Commission also received a letter from U.S. Potash and Chemical Company?

MR. HATCH: We have. The letter is addressed to the New Mexico Oil Conservation Commission, from the U.S. Potash and Chemical Company: It has been called to our attention that

Case No. 4047 will be brought before the New Mexico Oil Conservation Commission on February 19, 1969, to consider the disposal of salt brines into the Lea County areas known as Laguna Plata, Laguna Gatuna, and Laguna Tonto, all located in western Lea County, New Mexico. Continental American Royalty Company owns substantial potash leases, with U.S. Potash and Chemical Company designated the operator, on a portion of Laguna Gatuna, and in the vicinity of Laguna Tonto. In these areas, there is a very definite possibility that economic minerals in the form of sodium sulfate and possibly other minerals exist in economic quantities that must be carefully evaluated for the proper conservation of mineral resources. It is strongly felt that the discharge of salt brines into these lagoon areas could very materially adversely contaminate the potential economic value of commercial minerals that may be in place in the Laguna areas. Therefore, U.S. Potash and Chemical Company strongly objects to any approval consideration for Case No. 4047, due to the fact it is imperative, in our opinion, that additional facts, information, and technical data must be secured concerning the presence of commercial minerals in the Laguna areas prior to any decision. The additional time of at least one year is respectfully recommended and needed for procurement of facts and data so as this information can be capably evaluated, in

keeping with proper conservation of potential commercial mineral resources. Very truly yours, Earl H. Miller, Executive Vice President.

MR. PORTER: What is the date of receipt of that letter?

MR. HATCH: February 18, 1969.

MR. PORTER: That was prior to the February hearing. Thank you, Mr. Matkins, for calling that to our attention.

MR. MATKINS: Thank you, Mr. Commissioner.

Gentlemen of the Commission, I will not take much of your time. The application by Mr. Squires is to put this water in these lakes, and we are not told how much water is involved, nor do we know the exact composition of what might be in the water besides the brine. We protest, as Mr. Douglass has said, in order to allow adequate time to meet the requirements and seek the permission of the governmental regulatory agencies, and other leasehold owners, to determine whether the sodium sulfate which has been found by Mr. Douglass in these lakes, exist in commercial quantities, and if the conditions are such that sodium sulfate can be produced at a profit.

Mr. Douglass indicated that should they be found in a certain quantity, that could mean a million-dollar business to the State of New Mexico and western Lea County.

We feel this is of such importance that the application should not be granted at this time, in order that this additional discovery and these tests may be run. As Mr. Douglass has testified, in the event that the product is not found there in commercial quantities, then our protest in effect is withdrawn.

Linked with this is the possibility of further potash development with the process of Mr. Douglass in this area, and we feel that all of these considerations are significant to this state, and that the benefits to be received by the oil industry and by Mr. Squires by placing the waters on these lakes at this time does not warrant the doing away with the opportunity to investigate and show if the sodium sulfate can in fact be produced. Thank you very much.

MR. PORTER: Mr. Kellahin.

MR. KELLAHIN: If the Commission please, this is a water disposal case which has taken a little different turn than most. I think we have clearly established that the disposal of oil field brines in the three lakes involved here would cause no possible damage to any fresh water supplies, there being no fresh water supplies that could possibly be affected by such disposal toward it. This has already been considered by the Commission in previous cases, in that the Commission after notice and hearing deleted the western portion of Laguna Plata and the

I N D E X

STATE OF NEW MEXICO)
) ss.
COUNTY OF BERNALILLO)

I, SAMUEL MORTELETTE, Court Reporter in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Hearing before the New Mexico Oil Conservation Commission was reported by me, and that the same is a true and correct record of the said proceedings, to the best of my knowledge, skill and ability.

Samuel Mortelette
COURT REPORTER

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
STATE LAND OFFICE BLDG.
SANTA FE, NEW MEXICO

8 August 1984

EXAMINER HEARING

IN THE MATTER OF:

Application of Pollution Control, Inc. for amendment to Division Order No. R3725, Lea County, New Mexico.

CASE 8292

BEFORE: Richard L. Stamets, Examiner

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the Oil Conservation Division:
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I N D E X

E X H I B I T S

MR. STAMETS: The hearing will please come to order.

We'll call next Case 8292.

MR. PEARCE: That case is on the application of Pollution Control, Inc. for amendment to Division Order No. R-3725, Lea County, New Mexico.

MR. KELLAHIN: If the Examiner please, I'm Tom Kellahin of Santa Fe, New Mexico, appearing on behalf of the applicant and I have one witness to be sworn.

MR. PEARCE: Are there other appearances in this matter?

(Witness sworn.)

TIM KELLY,

being called as a witness and being duly sworn upon his oath, testified as follows, to-wit:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Mr. Kelly, for purposes of the record would you please state your name and occupation?

A My name is Tim Kelly. I'm from Albuquerque and I'm a consulting hydrologist.

Q Mr. Kelly, as a hydrologist, have you

previously testified before the New Mexico Oil Conservation Division and had your qualifications as a hydrologist accepted and made a matter of record?

A Yes, they have been.

Q And have you prepared, pursuant to your employment by Pollution Control, a hydrologic assessment of the area involved in this application?

A Yes, I have.

MR. KELLAHIN: We tender Mr. Kelly as an expert hydrologist.

MR. STAMETS: He is considered qualified.

Q Mr. Kelly, let me refer to your package of exhibits, which we have simply marked as Exhibit Number One, and ask you to turn to page 28 of that report, and as an introduction for the Examiner, would you describe for us in a general way what has been the history of the Pollution Control operations in the Laguna Gatuna area?

A Yes, sir. In February of 1969 Pollution Control retained the services of Ed L. Reed of Midland, Texas, to prepare an assessment of the area referred to as the salt lakes in western Lea County. It included Laguna Gatuna, Laguna Plata, and Laguna Tonto. And an application was made at that time. I believe it's Case Number 4047; was heard on March 19th, 1969, in which Pollution Control requested the use of Laguna Gatuna and Laguna Plata and Laguna Tonto as a site for disposal of oilfield brine.

The application was approved for use at -- of disposal of oilfield brine in Laguna Gatuna and Laguna Plata, and subsequently, Pollution Control began operations at Laguna Gatuna, which is shown in detail on page 28 of Exhibit One.

This shows in the north half of Section 18 of Township 20 South, Range 32 East, the present site of their operations, which have -- which they have had in operation since 1969.

They have also proposed a new site on the southeast site of Laguna Gatuna, which is shown in Section 17.

Q All right, sir, if you'll turn to the first appendix following page 36 in the Exhibit Number One, is that the Commission Order R-3725 that you've made reference to that's approved the current operations of Pollution Control at Laguna Gatuna?

A Yes, it is.

Q All right, sir. Would you outline for us generally, Mr. Kelly, what Pollution Control proposes to do at its site in the southwest quarter of Section 17?

A They propose to use this site in addition to their existing site for disposal of oilfield brine and waste products from the oil industry at this site.

I might mention that the site has been selected because of the lease which they presently have and also its proximity to Highway 62/180, which makes it some-

what more accessible to trucks.

Q What was the purpose of having Pollution Control retain you as a hydrologist to study this area? What were you looking to study, Mr. Kelly?

A The plans by Pollution Control were to add the additional site in Section 17 and at the same time to update the hydrologic assessment of the area, since their operation had been continuing for fifteen years, to determine if there had been any adverse effects from their previous operations and what the effect of the new site might be on the hydrologic system.

Q In going about studying for that goal, what information did you review and what studies did you undertake?

A The first thing we did was review the Reed study in detail and the Reed study consisted primarily of one illustration or exhibit, which was used in 1969, and that is included in our report as a plate.

Q All right, let's look at that for a minute. Let's unfold one of those and look at it.

Let me try and understand what this is. This represents Mr. Reed's work as consulting hydrologist and is the basis upon which the 1969 order was entered approving Pollution Control's use of Laguna Gatuna for a disposal site?

A That's correct.

Q All right, sir, and this, then, was the

basis where you started your review of this property.

A Right. We first of all reviewed the testimony from the hearing and then reviewed the map.

We then made a literature and file search of available data, of which a considerable amount had been collected in the past, both from work which we had done or the Bureau of Land Management in that area, and the WIPP site studies, which are nearby, and then we made an on-site evaluation in which we actually went into the field, updated the geologic map as best we could. We looked at the water quality information and the water levels which Reed had measured, as well as interviewed Mr. Snyder -- excuse me, Mr. --

Q Squires.

A Mr. Squires with Snyder Ranches, and to determine what the history of the water use in that area was. We also talked to some additional ranchers.

On the basis of this we prepared our report which is submitted here.

Q All right, sir, on Exhibit -- page 34 of Exhibit Number One, is that a tabulation of the reference material and other studies that you reviewed and included in your analysis of this area?

A Yes, it is.

Q Has a --

A I might -- I might mention that these references are the ones which are specifically referenced in

our report. These are not necessarily all the ones we evaluated.

Q As an expert hydrologist, Mr. Kelly, do you believe that you had an adequate data base from which to reach certain conclusions with regards to the continued suitability of Laguna Gatuna as a disposal facility?

A Yes, I do.

Q Before we go into detail on the facts surrounding your conclusions, Mr. Kelly, I think it might be helpful if we simply turn to page 30 of your report and have you give us a general synopsis from page 30 and 33 of the six major conclusions you have reached based upon your study, and then we'll go back and talk about each one of those items.

A All right. Laguna Gatuna is a natural ground water discharge point. It is the site where the facility is now in operation. The information in that area indicates that the ground water is naturally discharging into Laguna Gatuna so that the flow is to the lake rather than away from it.

The same thing is true of Laguna Plata, which is also shown on this plate several miles to the northwest.

The second concludion we made was that natural discharge from springs at Laguna Gatuna and Laguna Plata is much more highly mineralized than the water that is being produced from wells in the area or from the water

which is being disposed of by Pollution Control, Incorporated. So the natural water is worse than what is being put in there from the oilfield sources.

Q All right, sir.

A Our third conclusion was that the site of Laguna Gatuna is suitable for the discharge of as much as 30,000 barrels brine per day. This was what the original application was for.

The fourth conclusion was that after fifteen years of operation by Pollution Control there appears to be no adverse impacts on the hydrologic system in that area.

Our fourth is that the solid wastes which have been disposed of at Laguna Gatuna have not in any way been detrimental to the hydrologic system, and our final conclusion was that the facility which is proposed in the southwest corner of Section 17 would not adversely impact the hydrologic conditions, although we see no reason to increase the original allocation which was granted of 30,000 barrels per day combined from the two facilities.

Q All right, sir. Let's go back, then, Mr. Kelly, and follow your report using the order that you have placed them on the table of contents page, and have you first of all discuss for us in a general way the geology of the project area and focus in on the availability of any fresh water aquifers in the area.

A The significant structural control, Nash

Draw to the west, which is a result of the solution of brines from the Rustler formation and the top of the Salado formation, which has resulted in the collapse of Nash Draw and, in my opinion, Laguna Plata and Laguna Gatuna and Laguna Tonto are all extensions of Nash Draw. They simply are not physiographically or topographically joined.

Q All right, let's go to page three of the package of Exhibits and have you use that as a plat from which you can reference the geology.

A All right. The site itself is at Laguna Gatuna, which is shown in Township 20 South, Range 33 East, and about seven miles east of the Lea/Eddy County line.

Nash Draw is formed along the west edge of Lea County and -- but primarily in Eddy County, so that it is just off the margin of the map to the left.

These sites, then, are just to the northeast of Nash Draw, and the WIPP site, where there's been a considerable amount of drilling and testing performed.

The beds, then, in this area dip to the east beneath Eddy County and are controlled to a large extent by the Delaware Basin.

Q To the north and east on the plat is a line that says Mescalero Ridge. What is that?

A Mescalero Ridge is the west and the southwest boundary of the Ogallala formation. That is -- has a bearing on this particular project because the original ranchers in the vicinity of the salt lakes had a very

difficult time finding water for stock and domestic purposes. Most of the water was brackish.

When the potash mines and the refineries for the potash industry went into Nash Draw, as a source of water they piped water from the high plains or north of Mescalero Ridge to the Nash Draw area.

The pipelines, as a trade off by the ranchers, were then tapped by ranchers to provide water for their use, primarily in this salt lake area.

So that many of the wells which were originally shown on the Ed Reed map have fallen into disrepair because of the better quality and more dependable supply which is obtained from the pipeline.

So he was able to measure some water levels but most of these wells are no longer in use simply because the water quality is much poorer than is available.

Q All right, sir, we'll come back in a minute to those wells that are still in use in the area, but let me have you go to page four of the Exhibit Number One and have you give us the -- cite specific geologic features at --

A All right.

Q -- Laguna Gatuna.

A Figure 2 on page 4 shows a cross section of Laguna Gatuna. The lowermost formation are the Dewey Lake Redbeds, which are shown by the horizontal lines. The Dockum Group forms the bedrock in that area beneath the lake

itself, and then there is a think veneer of alluvial and playa deposits, both on the upper ridges and also in the base of the playa itself.

There is an intermittent lake in the playa and the fault zones indicated on both sides of this lake, or playa, are in my opinion the avenues through which ground water from the Rustler formation is moving upward and being discharged as springs along the boundaries of the playa itself.

Any discharge from Pollution Control facilities, which are diagrammatically shown on the left, come down into the lake itself from the northwest corner and from the left.

The new facility is illustrated by that tank and would also empty into the playa itself.

The --

Q As a hydrologist, do you see any adverse consequences of significance to the fact that the point of discharge for Pollution Control as at the higher ground areas adjacent to the laguna itself, rather than down in the laguna?

A The -- any water which is held up on the boundaries is confined in surface impoundments and may, in fact, enter to some extent into the very thin alluvium, but at that point it has an opportunity to evaporate so it's contained in the boundaries of the playa itself, rather than getting out into the middle of the lake.

Q Does it make any hydrologic difference whether or not the discharge is up at the points you've depicted on the schematic rather than down at the lake level?

A No, it doesn't.

Q All right. Let's go back, then, Mr. Kelly, and look at the Reed plat and have you identify for us any wells that Mr. Reed studied that continue to be used.

A To my knowledge none of the wells which Reed evaluated are still in use.

There are two which we were able to measure the water level in; however, they were not in a sufficient state of repair to actually pump a water sample from them, so we were able to measure the water level but not the -- but not collect a sample.

These two, one is located in the northwest corner of Section 25, which is southwest of Laguna Gatuna, and this shows a water level -- an elevation of 3555 and water level of 3516, or 38 feet, 38.6 feet below land surface. When we measured that the water level was less than a foot below the level that Reed measured, so the water level, the natural water table in that particular well had declined less than a foot in the fifteen years since Reed did his work.

Q What significance do you make of that fact?

A That there has certainly been no effect from water contributed to Laguna Gatuna and I would attri-

bute it simply to a gradual decline in the water level with time.

Q Conversely, if the water level had been increased?

A The water level should have risen; would have had to have come from some source, either much more precipitation or some source such as water being emptied into Laguna Gatuna or some other source.

Q Is that well at a location hydrologically where it would be down gradient from water disposed of in Laguna Gatuna?

A No, it's up gradient. It's about, well, let me see, the water level in that well is about 21 feet higher than Laguna Gatuna but if the water in Laguna Gatuna had risen significantly it should have affected the regional ground water flow. There could have been some deline, but I would not have expected much, so in fact both of these wells that we were able to remeasure have a higher water level than the base of Laguna Gatuna. All of the rest of the wells were in disrepair.

Q You made reference to Nash Draw and to the potash operations. Is there a plat that shows the location of that area?

A The illustration on page 25, Figure Three.

Q Well, let's make sure everybody's got that.

All right, sir, let's discuss this plat.

A This shows in the very southeast corner of the map the topographic contours show a significant depression there. That is the northernmost edge of Nash Draw and it shows the proximity of Nash Draw to Laguna Tulston (sic), Laguna Plata, and Laguna Gatuna.

The rest of the draw is off to the left side; however, these water table contours show a regional flow of ground water from the 3525 foot contour towards to the west and northwest so that on the north and west side of Laguna Plata the water table is as much as a hundred feet below that to the east side of the project area.

Q All right, would you summarize for us your findings and conclusions with regards to the ground water movement?

A Yes, sir. We prepared this contour map based on the data which Reed had generated which we were able to measure and water levels which have been produced since the Reed study, and this shows a regional ground water flow essentially from east to west with local variations around Laguna Plata and also Nash Draw, where the 3425 foot contour makes a large swing back to the southeast.

The reason that we did this was it shows a more regional ground water flow, whereas Reed simply drew arrows showing what he supposed to be directions of ground water flow, but by working with a regional area we were able to see the large pictures, whereas Reed was looking at very

minor changes in a small area and therefore I felt that the regional pictures would supplement the work that Reed had done.

Q All right, sir.

A So that there is no conflict from what we have done with what Reed did. We simply expanded his, as shown in Figure 3.

Q All right, sir, let's go on and have you summarize your findings with regards to the water quality data.

A The water quality which Reed evaluated indicates that the oilfield brine in the area is less highly mineralized than the natural discharge in Laguna Gatuna and Laguna Plata.

We have the information from Pollution Control and the data which they provided us, and we found no contradiction in this data. The conclusion being, then, that the highly mineralized water being discharged into Laguna Gatuna and Laguna Plata has to originate from some deeper source, presumably either the Rustler or more logically from the so-called Brine aquifer on top of the Salado formation, and the regional gradients are such that it would move up along joints and fault zones which would be associated with Laguna Plata and Laguna Gatuna.

Q Let's get sites specific now, Mr. Kelly, and have you give us your opinion as to the suitability of Laguna Gatuna, both in the northwest corner of the laguna

and the southeast corner of the laguna as sites for the disposal of produced salt water brines and other waste products.

A Our conclusion was that Laguna Gatuna is an excellent site for the purposes with which Pollution Control is using it. The work by Reed was accurate. Due to highway construction in that area there were more exposures of the Dockum Group, which is shown on page 28, Figure 4, as TR. This substantiated our conclusions that the alluvial material is extremely thin in that area and the amount of brine which has been disposed of by Pollution Control in the past fifteen years has never resulted in a permanent pool of Laguna Gatuna. With its surface area of 383 acres it is adequate to evaporate all of the brine which is being disposed of in the lake by Pollution Control.

Q Let's go to page 29 and have you describe for us the evaporation studies that were conducted.

A We conducted some evaporation studies in the Nash Draw area, which is just a few miles to the west, and we concluded that the evaporation rate, the summer evaporation rate, from a brine surface in that area was approximately 6.69 gallons per minute, or roughly 229 barrels of brine per acre per day.

On the other hand, the winter evaporation loss was approximately 13 barrels of brine per acre per day. With the minimum surface area of Laguna Gatuna, there is the evaporation potential of 87,700 barrels per day during the

summer and about 5000 barrels per day during the winter.

This is well within the annual disposal range of Pollution Control and clearly these evaporation calculations have shown that they are adequate to take care of the amount of brine being discharged by Pollution Control.

Q Let's go now, Mr. Kelly, to pages 31 and 32, which are the discharge rates recently used at Laguna Gatuna.

A Right. This is information which I believe has been submitted to the Oil Conservation Division, but they simply show the monthly disposal rate for 1983 and 1984, both as a graph and then on page 32 in the cumulative totals for the individual months.

And I might mention that the original application and grant was for 30,000 barrels per day, whereas if you'll look at the monthly totals on Table 3, page 32, it is considerably less than that, and I would assume that the discharges at the present time, in fact I believe that Mr. Foster told me that the highest discharge rate by Pollution Control occurred in the early eighties but are not much less than what you see here on -- on Table 3.

Q All right, sir, in addition to the conclusions that you've made on pages 31 and 33, I'd like to direct you back now to the Division Order of April of '69, and go through some of the findings that were made back in '69, and have you conclude for us whether you still concur

or disagree with any of those findings.

Let's start with -- do you have the order?

A Yes, I do. You're starting on page one of that order?

Q Yes, sir, on Finding No. 3 they make reference to the areawide Order R-3229, which prohibits the disposal of produced salt water brines in unlined pits. It then goes on --

A Right. All right, there is -- as near as we have been able to determine there is no potable water in this area. By potable water I'm using the definition that the EID uses of 1000 parts per million.

Q That is also the State Engineer's definition on --

A Oh, yes.

Q -- Finding No. 4, page 2 of the order?

A Yes.

Q All right, sir.

MR. STAMETS: Mr. Kelly said 1000 and Finding 4 is 10,000.

A That's -- okay. The difference there, one, the State Engineer uses 10,000 as a definition of fresh water, whereas I'm using the definition of potable water, that is water suitable for human consumption.

Q So your standard is even higher than the State Engineer's standard --

A Yes.

Q -- for water to be protected?

A Right.

Q All right, and using your higher standard --

A We can find no evidence that there is any water in the area which could be considered potable, other than at one time there was a well at what was then called Midway. It was a bar and service station located on Reed's map in the south half of Section 23, and approximately two and a half miles southwest of Laguna Gatuna.

This shows a chloride of 362 parts per million. This water was potable, was used in the operation, but the facility has been destroyed and the wells are abandoned.

Q All right.

Q That was the only fresh water we were able to find, and this was verified by other ranchers in the area who are still in operation, who haul water or take it from the pipeline.

Q Let's go back to the State Engineer's standard of 10,000 parts per million.

Do you find any water in this area that is of that quality or greater?

A There is a lot of water in the area that's greater than 10,000.

Q I've got this backwards. I meant 10,000

or less.

A There is very little water in the area that's 10,000 or less.

Most of the water, and certainly the water from the springs, exceeds this -- this amount; water which is naturally discharged into the lake itself.

For example, at Laguna Gatuna you can see a lake sample identified by Reed which had chlorides of 158,000 parts per million and sulfates of 125,000.

Q All right, let me make sure I'm clear. Are there any waters in the area containing 10,000 parts per million or less of total dissolved solids which have a present or reasonably foreseeable beneficial use that might be impaired by the discharge of water in Laguna Gatuna as the applicant proposes to do?

A No, sir.

Q All right. Let's go down to Finding No. 7. I think you've concluded for us that this water is not fresh water in the lagunas?

A That's correct.

Q All right, sir, and Finding No. 8?

A The -- I conclude with this finding that the underlying Redbeds are virtually impermeable and the -- any seepage which would get into, or which would be -- any water which would be impounded in the lakes would not seep into the underlying formation.

Q All right, sir, and Finding No. 9?

A These -- the synclinal structure does exist and that the flow of surface and subsurface water into the boundaries is towards those lakes.

Q All right, sir, so you concur and believe the Finding No. 9 is supported by substantial evidence?

A Yes, I do.

Q Let's go to No. 10.

A I also agree with this finding, that there is no leakage from Laguna Plat and Laguna Gatuna, simply because, first of all, the hydrologic gradient indicates that it toward the lakes rather than away, but also, the evaporation surface at the bottom of each of these lakes is great enough to evaporate any natural or artificially discharged brine into those lakes.

Q Finding No. 11 is directed towards Laguna Tonto, which is not the subject of our application here.

A That's correct.

Q Let's go to Finding No. 12 with regards to utilization of Laguna Gatuna. Do you -- do you concur with that finding?

A Yes, I do. It does not constitute a hazard to fresh water supplies that may exist in the area.

I believe that most of these other findings pertain to the -- to Laguna Tonto to a large extent.

Q Yes, sir, I agree with you. I think that you have covered the essential findings in the prior order that would apply to the current application.

In conclusion, then, Mr. Kelly, do you believe the continued use of Laguna Gatuna as a disposal site for as much as 30,000 barrels of brine per day is still a suitable disposal site?

A Yes, I do.

Q And do you see any adverse consequences of changing or adding to the point of disposal by adding the southwest quarter of Section 17 to the disposal operation?

A No, sir.

Q Based upon your studies and knowledge of the area, Mr. Kelly, do you see any adverse consequences of the fifteen years, or so, operation by Pollution Control in this Laguna Gatuna as a disposal facility?

A No, we saw no evidence at all.

Q And do you see any adverse consequences hyrologically to the continued use of Laguna Gatuna as a repository for solid oilfield waste products --

A No, sir.

Q -- drilling cutting and drilling muds?

A No, sir. In my opinion it's probably one of the most suitable sites in the area.

Q Was Exhibit Number One prepared by you or compiled under your direction and supervision?

A Yes, it was.

Q All right, sir.

MR. KELLAHIN: Mr. Examiner, that concludes our examination of Mr. Kelly. We have con-

cluded our examination of Mr. Kelly by discussion of oil well solid waste products. That is paragraph 3 of our application. It is also specifically addressed in the current -- now I've lost my place.

I'll admit I can't pick it out real quickly, Mr. Stamets, but the application in this case seeks to have a finding addressing the use of this disposal facility for -- as a repository for these oilfield waste products, including the drill cuttings and drilling muds.

As a practical matter, this site has been used for very many years for that purpose. Mr. Kelly has demonstrated that he sees no adverse consequences from continuing that to occur and we would request that a specific finding and approval for that part of the operation be included in the order.

We move the introduction of Exhibit Number One.

MR. STAMETS: Exhibit Number One will be admitted.

CROSS EXAMINATION

BY MR. STAMETS:

Q Mr. Kelly, is it your opinion that with the 30,000 barrels of water per day disposal limitation that no water can move out of the area of Laguna Gatuna?

A Yes, sir, it is. The summer evaporation rate would certainly more than cover that.

The winter evaporation rate would not, but the hydrologic conditions are such that even if a ponding occurred during the winter, it would be evaporated during the summer.

So it is my opinion that that would be the case.

MR. STAMETS: Are there other quesitons of the witness?

MR. BOYER: Yes.

QUESTIONS BY MR. DAVID BOYER:

Q My name is David Boyer. I'm a staff hydrogeologist with the Oil Conservation Division. I have a few questions of Mr. Kelly.

Mr. Kelly, am I correct in understanding you agreed with the finding of No. 11 on that 1969 order, that the evidence indicates that there may be some leakage of water into -- to the southeast and therefore southwestward toward Lagune Gatuna? Did I understand you correctly on that?

A Not in -- not in relation to Laguna Tonto. We did not discuss Laguna Tonto in the original findings.

Laguna Tonto was excluded from use by Pollution Control.

Q So you did not -- you did not investigate that particular --

A No.

Q -- thing. All right, I was -- getting back to Figure 3 on page 25, you showed the hydrologic contours and it would show a couple of things.

First off, that this -- it is my understanding that the water table contour map was prepared by you for inclusion in this report.

A That's correct.

Q Okay. It shows that, according to the contours, that you could have movement northwesterly out of Laguna Gatuna towards the northwest if the hydrologic flow lines are followed.

Is it a possibility also that you might have a closed contour around Laguna Gatuna that would move material into the laguna instead of to the northwest?

A Yes, sir, there is.

Q That was not investigated, though, and you don't have sufficient information?

A No, there's not sufficient information. These are 25 foot contours and certainly with additional drilling information we might be able to verify that, but I might mention that the water quality in Laguna Plata is generally worse than that in Laguna Gatuna, so I, if it did move to the northwest, I would assume that Laguna Plata would become the discharge point.

Q All right. On the -- on the map prepared by Reed, you went back and determined that the well in the northwest one-quarter of Section 25 to the southwest of La-

guna Gatuna was able to be measured, is that correct?

A Yes.

Q Did you -- did you attempt to get a conductivity measurement to that well at all?

A No, the well had a windmill on it but the windmill was not operative, so we could not get a sample from it with the sucker rods. There was not enough room to sample it.

Q Nor was there enough room to get a conductivity probe down -- down inside it at all, losing it or possibly getting a conductivity measurement?

A Well, Mr. Boyer, our conductivity measure has a probe about six inches long and we wouldn't have reached the 16 feet, but I presume a downhole conductivity meter could have been used, yes, sir.

Q And one additional question, the well that is shown in the northwest one-quarter of Section 21, that shows that there was water that was probably greater than 1000 pps, but certainly less than 10,000 in the Reed map.

That was unavailable for any type of measurement or water level or anything like that?

A No, I thought that was the one I referred to as the other measurement. I could be wrong. Let me --

If you will refer to page 23, the fourth listing from the top in Table 2 identifies a windmill at location 20-33-21, 111, with a surface elevation of 3536.

That is the well in question here.

The water level on January 25th of 1984 was 35.42 feet below land surface.

When Reed measured the water level it was 36.6 feet.

Q And that well is also inoperable and you were unable to get a water level -- I mean a water sample?

A Right. Right.

MR. BOYER: That's the extent of my questions.

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

Is there anything further in this case?

The case will be taken under advisement.

(Hearing concluded.)

C E R T I F I C A T E

I, SALLY W. BOYD, C.S.R., DO HEREBY CERTIFY that the foregoing Transcript of Hearing before the Oil Conservation Division was reported by me; that the said transcript is a full, true, and correct record of the hearing, prepared by me to the best of my ability.

Sally W. Boyd CSR

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. ____, heard by me on _____ 19____.

_____, Examiner
Oil Conservation Division

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. 4047
Order No. R-3725

APPLICATION OF LARRY C. SQUIRES
FOR AN EXCEPTION TO ORDER NO.
R-3221, AS AMENDED, LEA COUNTY,
NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 a.m. on March 19, 1969, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission."

NOW, on this 16th day of April, 1969, 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 effective January 1, 1969, Order (3) of Commission Order No. R-3221, as amended, prohibits in that area encompassed by Lea, Eddy, Chaves, and Roosevelt Counties, New Mexico, the disposal, subject to minor exceptions, of water produced in conjunction with the production of oil or gas, or both, on the surface of the ground, or in any pit, pond, lake, depression, draw, streambed, or arroyo, or in any watercourse, or in any other place or in any manner which would constitute a hazard to any fresh water supplies and said disposal has not previously been prohibited.

(3) That the aforesaid Order No. R-3221 was issued in order to afford reasonable protection against contamination of fresh

water supplies designated by the State Engineer through disposal of water produced in conjunction with the production of oil or gas, or both, in unlined surface pits.

(4) That the State Engineer has designated, pursuant to Section 65-3-11 (15), N.M.S.A., 1953 Compilation, all underground water in the State of New Mexico containing 10,000 parts per million or less of dissolved solids as fresh water supplies to be afforded reasonable protection against contamination; except that said designation does not include any water for which there is no present or reasonably foreseeable beneficial use that would be impaired by contamination.

(5) That the applicant, Larry C. Squires, seeks an exception to the provisions of the aforesaid Order (3) to permit the disposal of water produced in conjunction with the production of oil or gas, or both, in three natural salt lakes located in Lea County, New Mexico, as follows:

> Laguna Plata, sometimes referred to as Laguna Grande, located in Sections 2, 3, 9, 10, and 11, Township 20 South, Range 32 East, NMPM;
>
> Laguna Gatuna, sometimes referred to as Salt Lake, located in Sections 7, 17, 18, 19, and 20, Township 20 South, Range 33 East, NMPM;
>
> Laguna Tonto, located in Sections 32 and 33, Township 19 South, Range 33 East, and Section 4, Township 20 South, Range 33 East, NMPM.

(6) That the subject lakes are situated within the confines of a synclinal feature.

(7) That the water in the aforesaid three lakes is not fresh water.

(8) That that portion of the Triassic red beds underlying said three lakes is virtually impermeable and therefore prevents seepage from said lakes into the sand stringers within said red beds which may contain fresh water.

(9) That as to sands that are in communication with said lakes, the evidence indicates that the major flow of surface and subsurface water within the boundaries of said synclinal feature is toward the subject lakes.

(10) That the evidence indicates that there is no leakage of water from said Laguna Plata and Laguna Gatuna into the adjoining formations.

(11) That the evidence indicates that there may be some leakage of water from said Laguna Tonto into the adjoining formations to the southeast, thence southwestward toward Laguna Gatuna.

(12) That the utilization of Laguna Plata and Laguna Gatuna for the disposal of water produced in conjunction with the production of oil or gas, or both, will not constitute a hazard to fresh water supplies that may exist in the vicinity of said lakes.

(13) That the utilization of Laguna Tonto for the disposal of water produced in conjunction with the production of oil or gas, or both, may constitute an additional threat of contamination of fresh water supplies as designated by the State Engineer existing to the southeast of said lake.

(14) That the evidence indicates that commercial deposits of sodium sulphate ($Na_2 SO_4$) may exist in and/or near the three subject lakes.

(15) That disposal of produced salt water into Laguna Plata and Laguna Gatuna will not interfere with the testing required to determine if there are commercial deposits of sodium sulphate in and/or near the said three lakes.

(16) That said disposal prior to actual mining operations will not impair the value of said sodium sulphate nor render its recovery more difficult.

(17) That this case should be reopened upon the motion of the Commission or any other interested party whenever tests have been conducted which indicate to a substantial degree that commercial deposits of sodium sulphate probably exist in and/or near the subject lakes, at which time all interested parties should be prepared to appear and show cause why continued disposal in said lakes should or should not be allowed.

(18) That the applicant should be authorized to utilize Laguna Plata and Laguna Gatuna for the disposal of water produced in conjunction with the production of oil or gas, or both.

(19) That the request of the applicant to utilize Laguna Tonto for the disposal of water produced in conjunction with the production of oil or gas, or both, should be denied.

IT IS THEREFORE ORDERED:

(1) That the applicant, Larry C. Squires, is hereby granted an exception to Order (3) of Commission Order No. R-3221, as amended, to dispose of water produced in conjunction with the production of oil or gas, or both, in two natural salt lakes located in Lea County, New Mexico, as follows:

> Laguna Plata, sometimes referred to as Laguna Grande, located in Sections 2, 3, 9, 10, and 11, Township 20 South, Range 32 East, NMPM;
>
> Laguna Gatuna, sometimes referred to as Salt Lake, located in Sections 7, 17, 18, 19, and 20, Township 20 South, Range 33 East, NMPM.

(2) That the application of Larry C. Squires to utilize Laguna Tonto, located in Sections 32 and 33, Township 19 South, Range 33 East, and Section 4, Township 20 South, Range 33 East, NMPM, Lea County, New Mexico, for the disposal of water produced in conjunction with the production of oil or gas, or both, is hereby denied.

(3) That the Commission may by administrative order rescind such authority whenever it reasonably appears to the Commission that such rescission would serve to protect fresh water supplies from contamination.

(4) That this case shall be reopened upon the motion of the Commission or any other interested party whenever tests have been conducted which indicate to a substantial degree that commercial deposits of sodium sulphate probably exist in and/or near the aforesaid lakes, at which time all interested parties should appear and show cause why continued disposal in said lakes should or should not be allowed.

(5) That the first person to determine to a substantial degree by tests that commercial deposits of sodium sulphate probably exist in and/or near said lakes shall so notify the Commission, setting forth in writing the supporting facts,

whereupon the Commission shall give notification for the reopening of this case.

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

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

DAVID F. CARGO, Chairman

ALEX J. ARMIJO, Member

S E A L

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

esr/

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
DIVISION FOR THE PURPOSE OF
CONSIDERING:

CASE NO. 8292
Order No. R-3725-A

APPLICATION OF POLLUTION CONTROL INC.
FOR AN AMENDMENT TO DIVISION ORDER
NO. R-3725, LEA COUNTY, NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 8:00 a.m. on August 8, 1984, before Examiner Richard L. Stamets.

NOW, on this 20th day of August, 1984, the Division Director, having considered the testimony, the records, and the recommendations of the Examiner, and being fully advised in the premises,

FINDS:

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

(2) That the applicant, Pollution Control Inc., has been operating a surface salt water disposal facility at Laguna Gatuna and more specifically at the NE/4 NW/4 of Section 18, Township 20 South, Range 32 East, NMPM, Lea County, New Mexico, as an exception to Division Order No. R-3221, under the terms and conditions of Division Order No. R-3725.

(3) That the applicant now seeks the amendment of said Order No. R-3725 to permit the use of a second salt water disposal site on Laguna Gatuna in the SW/4 SW/4 of Section 17 in said township and for authorization to dispose of solid oil-field waste products including drilling mud and cuttings at either or both sites.

(4) That applicant proposes to utilize the expanded facility at a rate combined with its existing Laguna Gatuna facility so that the total combined discharge from both sites does not exceed 30,000 barrels of salt water per day.

(5) That the geohydrologic evidence presented in this case reaffirms or establishes that:

(a) Laguna Gatuna is sited within the confines of a collapse structure;

(b) naturally occurring highly mineralized springs are located on the periphery of Laguna Gatuna;

(c) the water in Laguna Gatuna is not fresh water;

(d) that portion of the Triassic red beds underlying said Laguna Gatuna is virtually impermeable and therefore prevents seepage from said lake into the sand stringers within said red beds which may contain fresh water;

(e) as to sands that are in communication with said lake, the major flow of surface and subsurface water within the boundaries of said collapse structure is towards Laguna Gatuna;

(f) the evidence indicates that there is no leakage of water from Laguna Gatuna into the adjoining formations containing fresh waters;

(g) the salt springs and brine associated with Laguna Gatuna are more highly mineralized than water collected from oil wells in the immediate area;

(h) Laguna Gatuna is a suitable disposal site for as much as 30,000 barrels of brine per day;

(i) there is no evidence that the fifteen years of operation by Pollution Control Inc has adversely impacted the hydrological system in the vicinity of Laguna Gatuna and that continued operations as proposed will not endanger the pre-1969 conditions;

(j) Laguna Gatuna is a satisfactory repository for solid oil-field waste products; and,

(k) the utilization of Laguna Gatuna for the disposal of water produced in conjunction with the production of oil or gas, or both, and oil field waste products, including drill cuttings and drilling muds will not constitute a hazard to fresh water supplies that may exist in the vicinity of said lake.

(6) That the applicant should be authorized the proposed expansion of its disposal operations at Laguna Gatuna.

IT IS THEREFORE ORDERED:

(1) That the applicant, Pollution Control Inc., is hereby authorized the expansion of its Laguna Gatuna disposal operation by approval of a second disposal site located in the SW/4 SW/4 of Section 17, Township 20 South, Range 32 East, NMPM, Lea County, New Mexico, and for disposal of solid oil-field wastes including drilling mud and cuttings at this and/or the original disposal site.

PROVIDED HOWEVER, that the total disposal rate of salt water into Laguna Gatuna at both sites shall not exceed 30,000 barrels per day.

PROVIDED FURTHER, that the applicant shall not permit any oil from the disposal operations to migrate to the surface of Laguna Gatuna and shall contain any oil contaminated waste products in earthen structures at the disposal sites.

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

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

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION

JOE D. RAMEY,
Director

S E A L

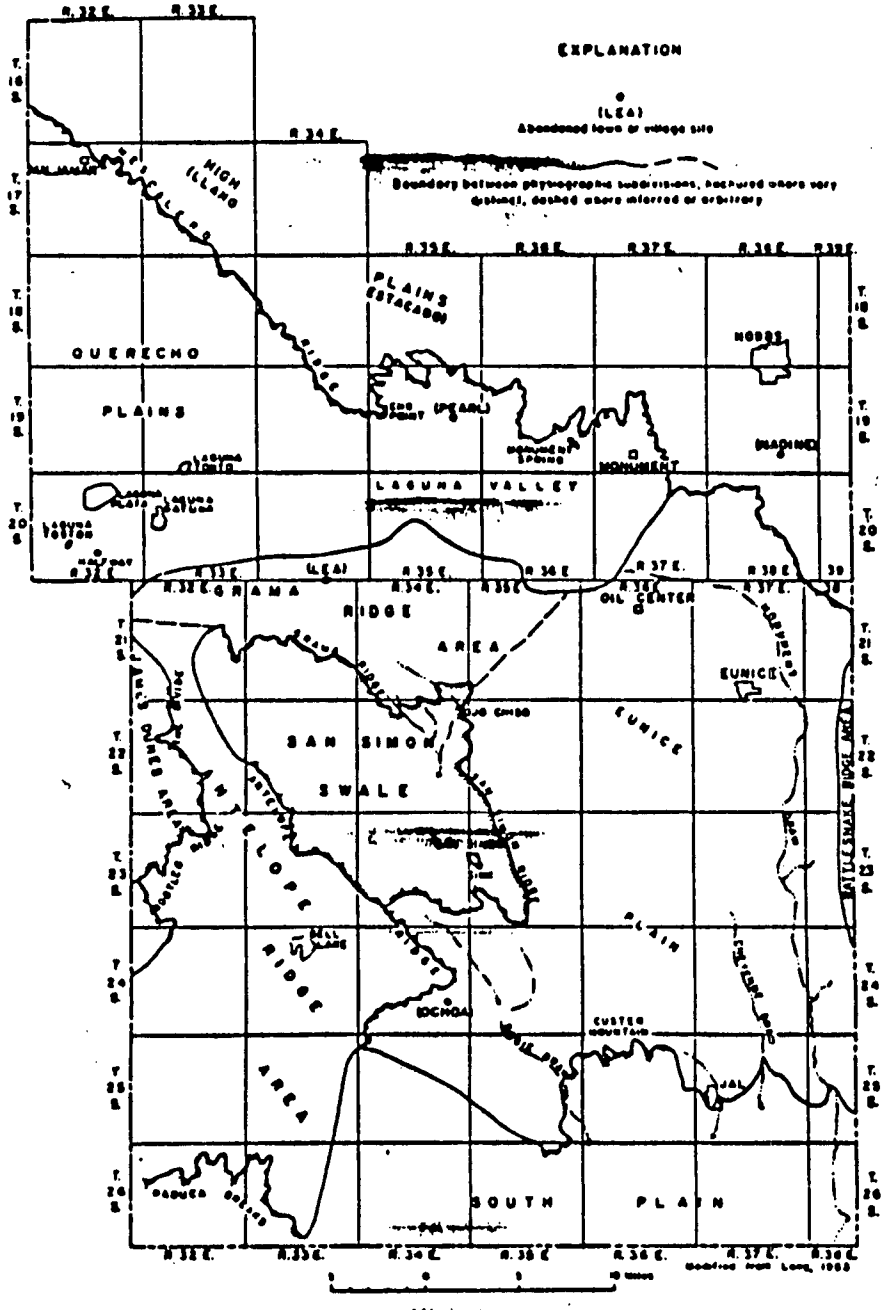

Figure 1.--Map of southern Lea County showing location of project area (Nicholson and Clebsch, 1961, p. 8).

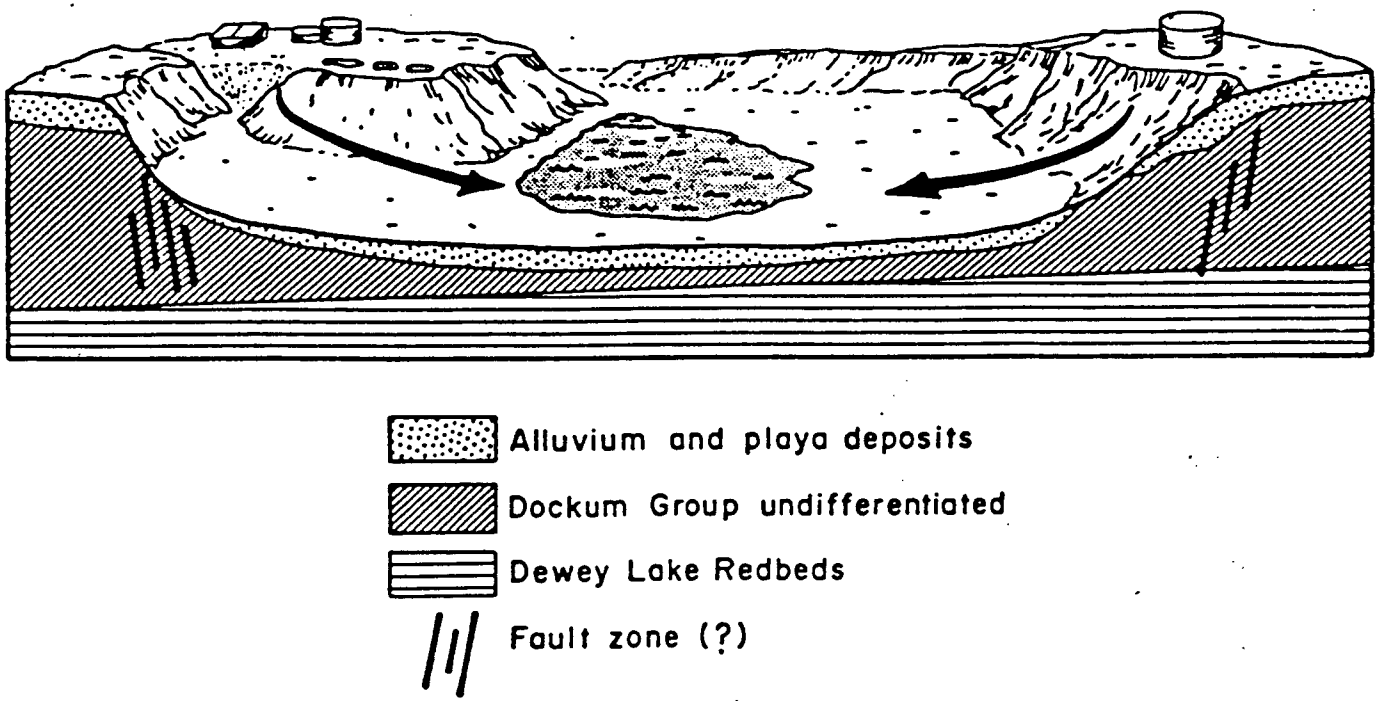

Figure 2.--Diagrammatic section of Laguna Gatuna showing geologic features.

LARRY C. SQUIRES
President

POLLUTION CONTROL, INC.

August 17, 1988

New Mexico Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87504

Attention: David Boyer

Re: Compliance w/OCD Order
R-8662 and Rule #711
(L. C. Squires & Pollution
Control, Inc.)

Gentlemen:

Larry C. Squires and Pollution Control, Inc. have obtained OCD Order Nos. R-3725 and R-3725-A, which authorizes disposal of oil field waters and wastes into the Laguna Gatuna natural salt lake, and R-6718, which authorizes the treatment and reclaiming of sediment oil at the Laguna Gatuna disposal facility. A $25,000.00 bond as required in OCD Order No. R-8662 has been secured along with an additional $10,000.00 bond which is required by the BLM.

The following information is furnished in compliance with Rule No. 711 and we are respectfully requesting administrative approval for this previously permitted facility.

1. A plat and topographic map showing the location of the facility located in the NW/4 of Section 18 and SW/4 of Section 17, T20S, R33E, NMPM, Lea County, New Mexico (Dwg PCI-1). There are no dwellings or water wells within one mile of the facility.

2. The landowners of record are the Bureau of Land Management (USA), State of New Mexico and Snyder Ranches, Inc., P. O. Box 2158, Hobbs, New Mexico. Snyder Ranches, Inc. owns or has the surface grazing leases from the Bureau of Land Management and State of New Mexico for all lands surrounding the Laguna Gatuna disposal facility and controls all access to the site.

3. Diagrams with land descriptions are enclosed. See Drawings PCI-2 and PCI-3 which shows existing disposal facilities in the SW/4 SW/4 of Section 17 and NE/4 NW/4 of Section 18. Drawings PCI-4 and 4-A show proposed new site located in the NW/4 NW/4 of Section 18.

LARRY C. SQUIRES
President

POLLUTION CONTROL, INC.

4. The plan for disposal of oilfield brines at an additional Laguna Gatuna disposal site located in the NW/4 NW/4 of Section 18 is to transport the water by pipeline to a series of terminal tanks where any hydrocarbons can be removed; from these terminal tanks the water will be circulated through an unlined surface pit for additional skimming and settling (see Dwg PCI-4), and from that pit the water will be transported by pipeline to a second holding area for final skimming and settling before being discharged into the Laguna Gatuna for evaporation. An existing discharge facility located in the SW/4 SW/4 of Section 17 will receive water by pipeline and by approved truckers (see Dwg PCI-3) into a tank and then discharged into a number of skim/ settling pits before being discharged into the Laguna Gatuna. A minimum of solid wastes will be accepted at existing facilities located in the NE/4 NW/4 of Section 18 (see Dwg PCI-2). This material will be properly identified and placed in eathern pits, allowed to cure and when adequately cured the pits will be closed. Any water will be pulled off and disposed into the Laguna Gatuna and any oil will be reclaimed and sold to a certified oil reclaiming facility.

5. Any significant spills will be routinely reported to the OCD and appropriate clean up will be accomplished at the earliest possible time.

6. The Laguna Gatuna facilities will be checked on a daily schedule by qualified personnel to ensure permit compliance and maintenance will be accomplished on a regular basis.

7. Several old pits at the present facilities located in the NE/4 NW/4 of Section 18 are scheduled to be closed within the next two years as water and recoverable hydrocarbons are removed. This will be done on a continuing basis and as pits are adequately cured they will be closed. Flood control dikes will be constructed around the old pits to prevent invasion of rain waters into the pit area.

Old pits will be closed by filling and mounding and the proposed flood control dikes will divert rain waters around old pit areas.

LARRY C. SQUIRES
President

POLLUTION CONTROL, INC.

8. Geological and hydrological evidence demonstrating that disposal of oil field wastes will be adversely impact fresh water was done by Geohydrology Associates, Inc. and is enclosed. This was furnished at previous OCD hearing in 1969 and 1984.

9. Notice requirements were previously given before the 1969 and 1984 hearings.

I certify that the information submitted is true, accurate and complete to the best of my knowledge.

Respectfully submitted

Larry C. Squires
President

LCS/jp

Encls: OCD Order No. R-3725
OCD Order No. R-3725-A
OCD Order No. R-6718
Report/Hydrologic Assessment
Dwgs. PCI-1
PCI-2
PCI-3
PCI-4
PCI-4A

cc: OCD-Hobbs

LARRY C. SQUIRES
President

POLLUTION CONTROL, INC.

August 17, 1988

New Mexico Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87504

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R-8662 and Rule #711
(L. C. Squires & Pollution
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LARRY C. SQUIRES
President

POLLUTION CONTROL, INC.

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LARRY C. SQUIRES
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POLLUTION CONTROL, INC.

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I certify that the information submitted is true, accurate and complete to the best of my knowledge.

Respectfully submitted

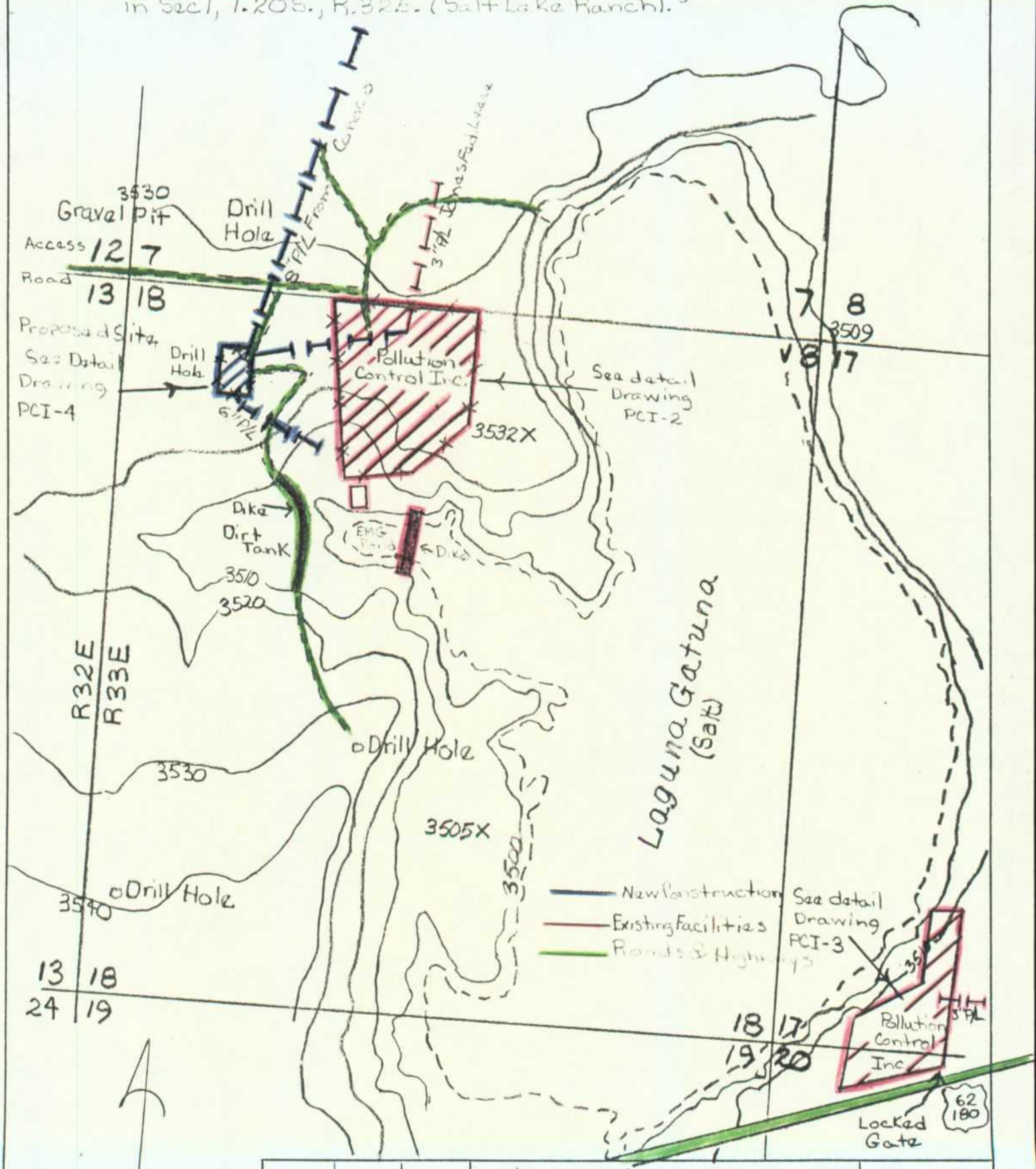
Larry C. Squires
President

LCS/jp

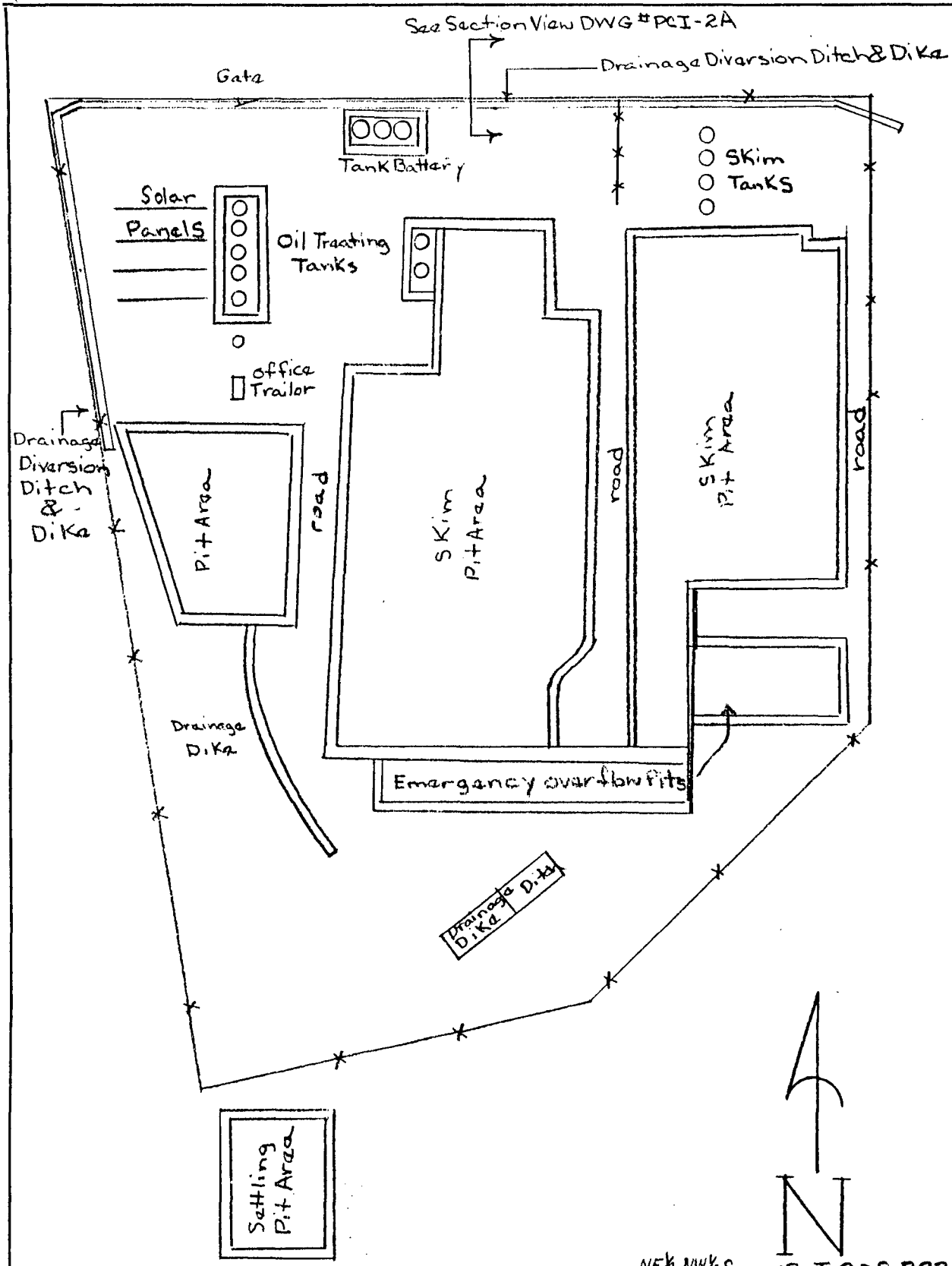
Encls: OCD Order No. R-3725
OCD Order No. R-3725-A
OCD Order No. R-6718
Report/Hydrologic Assessment
Dwgs. PCI-1
PCI-2
PCI-3
PCI-4
PCI-4A

cc: OCD-Hobbs

Note: All Grazing Permits & Leasing around Lake are owned by Snyder Ranches. Snyder Ranch Headquarters is located in Sec 1, T. 20S., R. 32E. (Salt Lake Ranch).

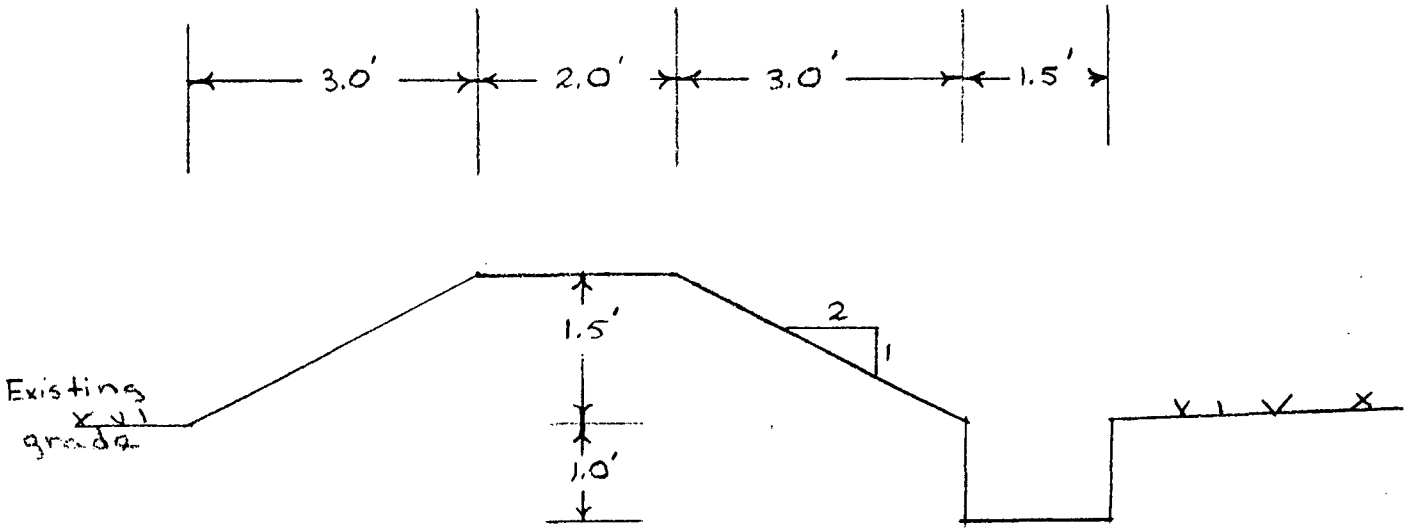


DWN	8-12-~~88~~	RA	Laguna Gatuna Showing Pollution Control Inc. Facilities	SCALE 1" = 1000'
			Rice Engineering & Operating, Inc. Hobbs, New Mexico	DWG NO. PCI-1

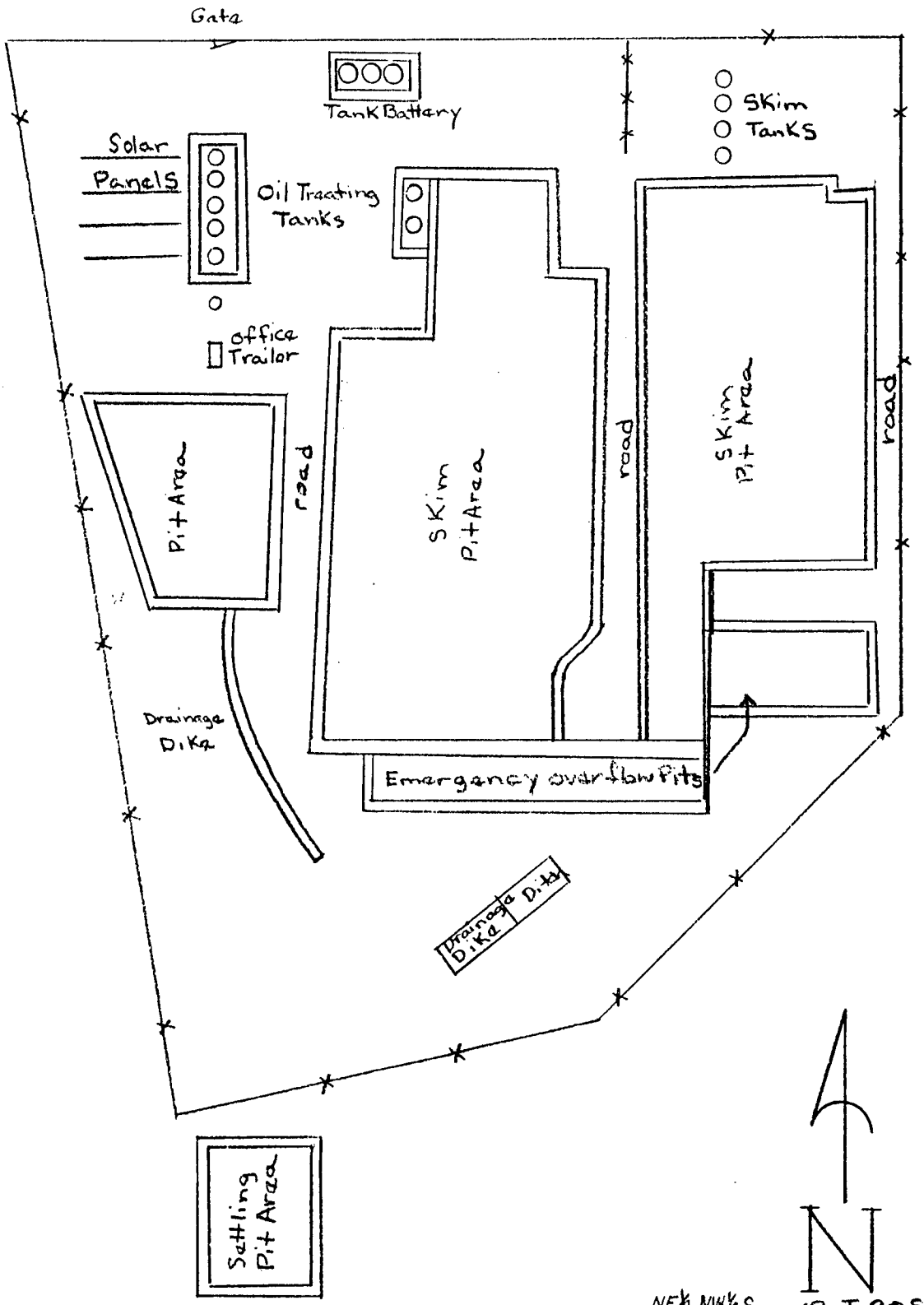


NE¼, NW¼ Sec 18, T. 20 S. R 33 E.
Lea County, N. M.

DWN	8/12/88	RA	Present Pollution Control Location	SCALE 1" = 200'
			Rice Engineering & Operating, Inc. Hobbs, New Mexico	DWG NO. PCI-2

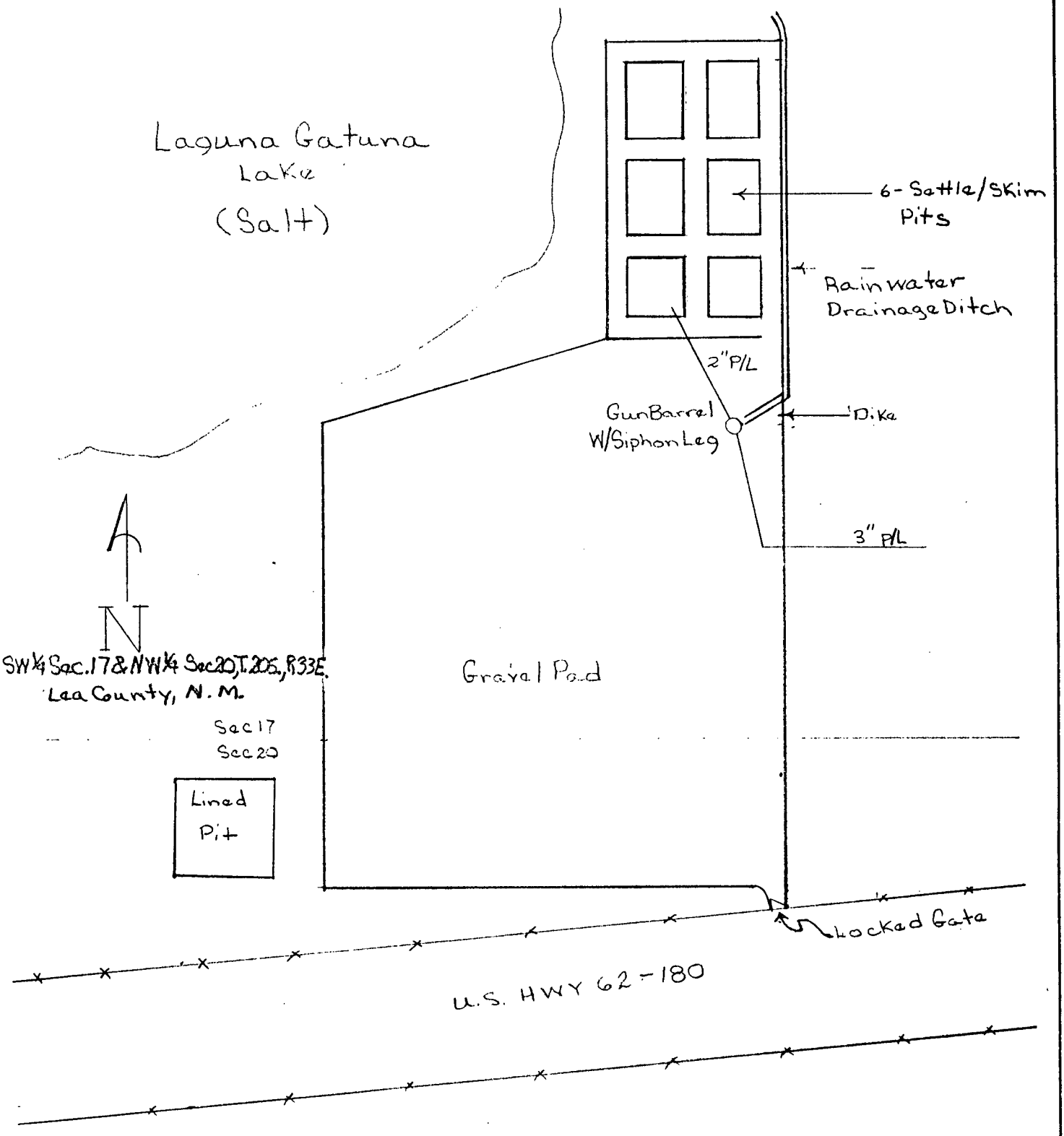


DWN	8/19/83 RA		Present Pollution Control Location Drainage Diversion Section View	SCALE 1" = 2'
			Rice Engineering & Operating, Inc. Hobbs, New Mexico	DWG NO. PCI-2A

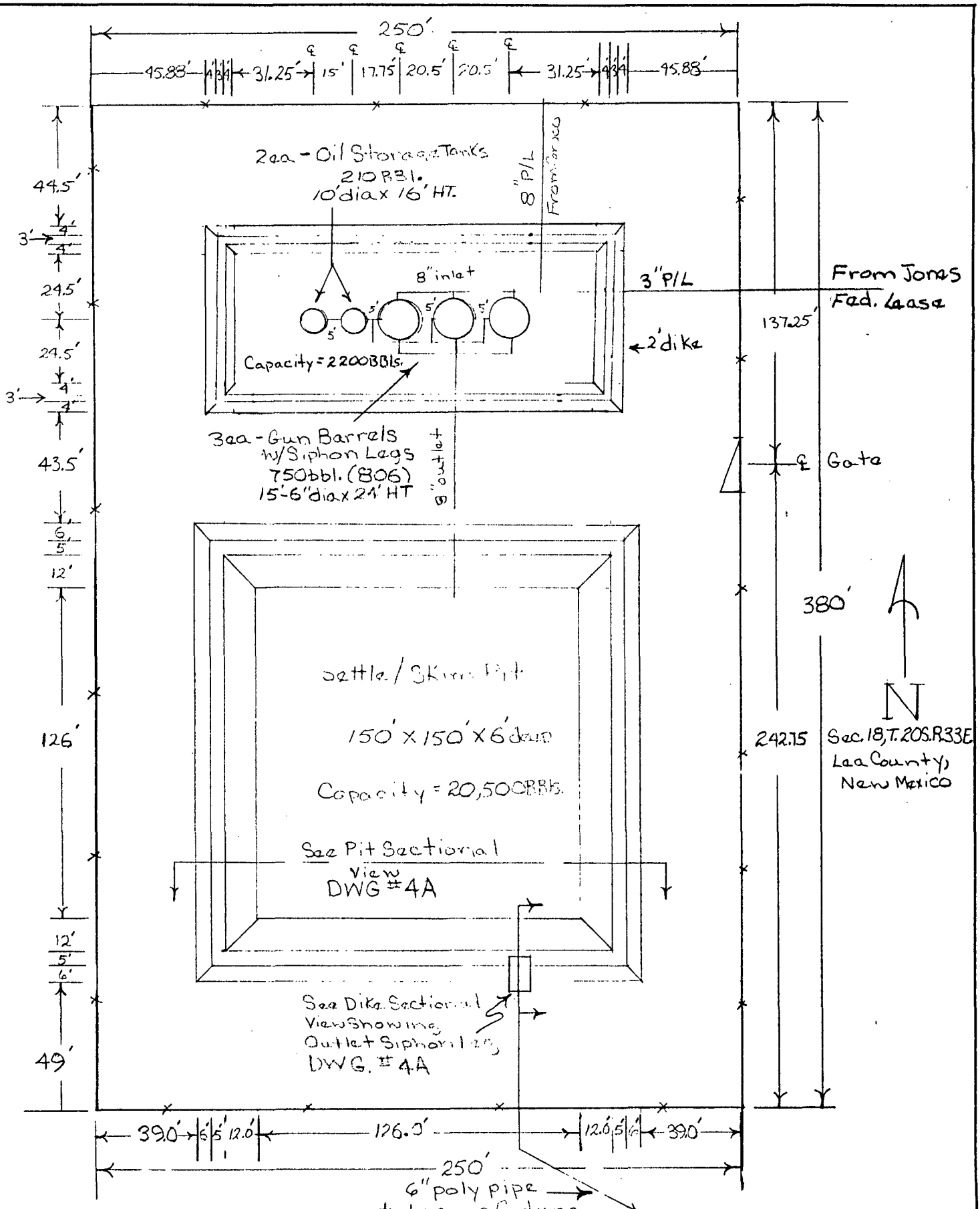


NE¼, NW¼ Sec 18, T. 20S. R33E.
Lea County, N.M.

DWN	8/12/88	RA	Present Pollution Control Location	SCALE 1" = 200'
			Rice Engineering & Operating, Inc. Hobbs, New Mexico	DWG NO. PCI-2



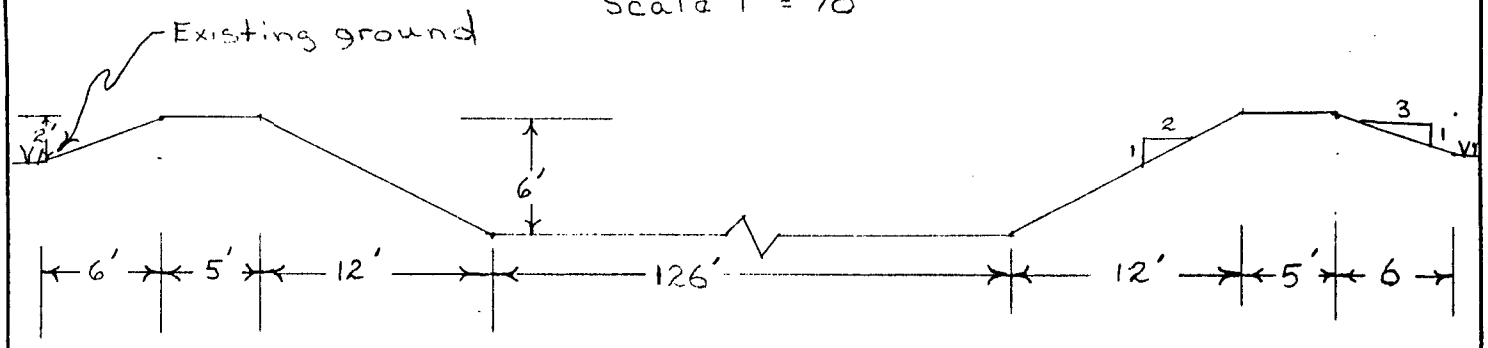
DWN	8/14/85	RA	Laguna Gatuna Existing Location for Future Truck Unloading Disposal	SCALE 1" = 200'
			Rice Engineering & Operating, Inc. Hobbs, New Mexico	DWG NO. PCI-3



DWN	9/15/05	PA	Laguna Gatuna Proposed Site NW¼, NW¼ Sec 18, T. 20S R. 33E, Lea County, NM.	SCALE 1" = 50'
			Rice Engineering & Operating, Inc. Hobbs, New Mexico	DWG NO. PCI-4

Pit Sectional View

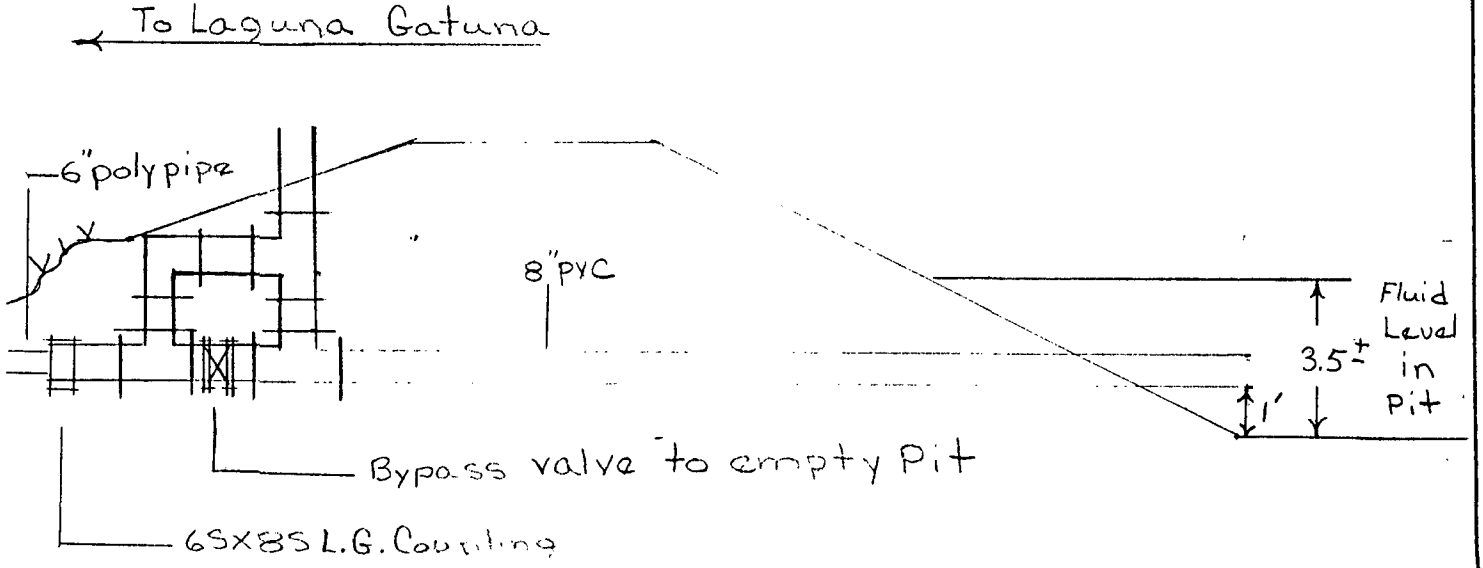
Scale 1" = 10'



Dike Section View

Showing Pit Outlet Siphon Leg

Scale 1" = 4'



DWN	8/14/89	RA	Latuna Gatuna Pit Detail Drawings	SCALE
			Rice Engineering & Operating, Inc. Hobbs, New Mexico	DWG NO. PCI-4A

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION DIVISION FOR THE PURPOSE OF CONSIDERING:

CASE NO. 7278
Order No. R-6718

APPLICATION OF POLLUTION CONTROL, INC. FOR AN OIL TREATING PLANT PERMIT, LEA COUNTY, NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 9 a.m. on June 17, 1981, at Santa Fe, New Mexico, before Examiner Daniel S. Nutter.

NOW, on this 1st day of July, 1981, the Division Director, having considered the testimony, the record, and the recommendations of the Examiner, and being fully advised in the premises,

FINDS:

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

(2) That the applicant, Pollution Control, Inc., seeks authority to construct and operate a chemical and heat-treatment type oil treating plant in the E/2 NW/4 of Section 18, Township 20 South, Range 33 East, NMPM, Lea County, New Mexico, for the reclamation of sediment oil recovered from waters trucked in to applicant's salt water disposal facilities at Laguna Gatuna, which are operated pursuant to the provisions of Division Order No. R-3725, dated April 16, 1969.

(3) That dikes, dams and/or emergency pits should be constructed around the plant capable of holding the entire capacity of all tanks and vessels at the plant location in order that sediment oil, reclaimed oil, or waste oil cannot escape from the immediate vicinity of such plant.

(4) That the proposed plant and method of processing will efficiently process, treat, and reclaim the aforementioned waste oil, thereby salvaging oil which would otherwise be wasted.

(5) That the subject application should be approved as being in the best interests of conservation.

IT IS THEREFORE ORDERED:

(1) That the applicant, Pollution Control, Inc., is hereby authorized to install and operate a chemical and heat-treatment type oil treating plant in the E/2 NW/4 of Section 18, Township 20 South, Range 33 East, NMPM, Lea County, New Mexico, for the purpose of treating and reclaiming sediment oil to be obtained from salt water being disposed of in applicant's salt water disposal facilities located at Laguna Gatuna.

PROVIDED HOWEVER, that the continuation of the authorization granted by this order shall be conditioned upon compliance with the laws of the State of New Mexico and the rules and regulations of the New Mexico Oil Conservation Division;

PROVIDED FURTHER, that prior to commencing operation of said plant, the applicant shall file with the Division and obtain approval of a performance bond in the amount of $10,000.00 conditioned upon substantial compliance with applicable statutes of the State of New Mexico and all rules, regulations and orders of the Oil Conservation Division.

(2) That the operator of the above-described oil treating plant shall clear and maintain in a condition clear of all debris and vegetation a fireline at least 15 feet in width and encircling the site upon which the plant is located.

(3) That dikes, dams and/or emergency pits shall be constructed around the plant capable of holding the entire capacity of all tanks and vessels at the plant location and capable of preventing the escape of any sediment oil, reclaimed oil, or waste oil from the immediate vicinity of said plant.

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

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

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION

JOE D. RAMEY
Director

S E A L
fd/

ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION DIVISION FOR THE PURPOSE OF CONSIDERING:

CASE NO. 8292
Order No. R-3725-A

APPLICATION OF POLLUTION CONTROL INC. FOR AN AMENDMENT TO DIVISION ORDER NO. R-3725, LEA COUNTY, NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 8:00 a.m. on August 8, 1984, before Examiner Richard L. Stamets.

NOW, on this 20th day of August, 1984, the Division Director, having considered the testimony, the records, and the recommendations of the Examiner, and being fully advised in the premises,

FINDS:

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

(2) That the applicant, Pollution Control Inc., has been operating a surface salt water disposal facility at Laguna Gatuna and more specifically at the NE/4 NW/4 of Section 18, Township 20 South, Range 32 East, NMPM, Lea County, New Mexico, as an exception to Division Order No. R-3221, under the terms and conditions of Division Order No. R-3725.

(3) That the applicant now seeks the amendment of said Order No. R-3725 to permit the use of a second salt water disposal site on Laguna Gatuna in the SW/4 SW/4 of Section 17 in said township and for authorization to dispose of solid oil-field waste products including drilling mud and cuttings at either or both sites.

(4) That applicant proposes to utilize the expanded facility at a rate combined with its existing Laguna Gatuna facility so that the total combined discharge from both sites does not exceed 30,000 barrels of salt water per day.

(5) That the geohydrologic evidence presented in this case reaffirms or establishes that:

(a) Laguna Gatuna is sited within the confines of a collapse structure;

(b) naturally occurring highly mineralized springs are located on the periphery of Laguna Gatuna;

(c) the water in Laguna Gatuna is not fresh water;

(d) that portion of the Triassic red beds underlying said Laguna Gatuna is virtually impermeable and therefore prevents seepage from said lake into the sand stringers within said red beds which may contain fresh water;

(e) as to sands that are in communication with said lake, the major flow of surface and subsurface water within the boundaries of said collapse structure is towards Laguna Gatuna;

(f) the evidence indicates that there is no leakage of water from Laguna Gatuna into the adjoining formations containing fresh waters;

(g) the salt springs and brine associated with Laguna Gatuna are more highly mineralized than water collected from oil wells in the immediate area;

(h) Laguna Gatuna is a suitable disposal site for as much as 30,000 barrels of brine per day;

(i) there is no evidence that the fifteen years of operation by Pollution Control Inc has adversely impacted the hydrological system in the vicinity of Laguna Gatuna and that continued operations as proposed will not endanger the pre-1969 conditions;

(j) Laguna Gatuna is a satisfactory repository for solid oil-field waste products; and,

(k) the utilization of Laguna Gatuna for the disposal of water produced in conjunction with the production of oil or gas, or both, and oil field waste products, including drill cuttings and drilling muds will not constitute a hazard to fresh water supplies that may exist in the vicinity of said lake.

(6) That the applicant should be authorized the proposed expansion of its disposal operations at Laguna Gatuna.

IT IS THEREFORE ORDERED:

(1) That the applicant, Pollution Control Inc., is hereby authorized the expansion of its Laguna Gatuna disposal operation by approval of a second disposal site located in the SW/4 SW/4 of Section 17, Township 20 South, Range 32 East, NMPM, Lea County, New Mexico, and for disposal of solid oil-field wastes including drilling mud and cuttings at this and/or the original disposal site.

PROVIDED HOWEVER, that the total disposal rate of salt water into Laguna Gatuna at both sites shall not exceed 30,000 barrels per day.

PROVIDED FURTHER, that the applicant shall not permit any oil from the disposal operations to migrate to the surface of Laguna Gatuna and shall contain any oil contaminated waste products in earthen structures at the disposal sites.

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

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

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION

JOE D. RAMEY,
Director

S E A L

ATTACHMENT B

Mr. Harold Berenda

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. 4047
Order No. R-3725

APPLICATION OF LARRY C. SQUIRES
FOR AN EXCEPTION TO ORDER NO.
R-3221, AS AMENDED, LEA COUNTY,
NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 a.m. on March 19, 1969, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission."

NOW, on this 16th day of April, 1969, 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 effective January 1, 1969, Order (3) of Commission Order No. R-3221, as amended, prohibits in that area encompassed by Lea, Eddy, Chaves, and Roosevelt Counties, New Mexico, the disposal, subject to minor exceptions, of water produced in conjunction with the production of oil or gas, or both, on the surface of the ground, or in any pit, pond, lake, depression, draw, streambed, or arroyo, or in any watercourse, or in any other place or in any manner which would constitute a hazard to any fresh water supplies and said disposal has not previously been prohibited.

(3) That the aforesaid Order No. R-3221 was issued in order to afford reasonable protection against contamination of fresh

water supplies designated by the State Engineer through disposal of water produced in conjunction with the production of oil or gas, or both, in unlined surface pits.

(4) That the State Engineer has designated, pursuant to Section 65-3-11 (15), N.M.S.A., 1953 Compilation, all underground water in the State of New Mexico containing 10,000 parts per million or less of dissolved solids as fresh water supplies to be afforded reasonable protection against contamination; except that said designation does not include any water for which there is no present or reasonably foreseeable beneficial use that would be impaired by contamination.

(5) That the applicant, Larry C. Squires, seeks an exception to the provisions of the aforesaid Order (3) to permit the disposal of water produced in conjunction with the production of oil or gas, or both, in three natural salt lakes located in Lea County, New Mexico, as follows:

> Laguna Plata, sometimes referred to as Laguna Grande, located in Sections 2, 3, 9, 10, and 11, Township 20 South, Range 32 East, NMPM;
>
> Laguna Gatuna, sometimes referred to as Salt Lake, located in Sections 7, 17, 18, 19, and 20, Township 20 South, Range 33 East, NMPM;
>
> Laguna Tonto, located in Sections 32 and 33, Township 19 South, Range 33 East, and Section 4, Township 20 South, Range 33 East, NMPM.

(6) That the subject lakes are situated within the confines of a synclinal feature.

(7) That the water in the aforesaid three lakes is not fresh water.

(8) That that portion of the Triassic red beds underlying said three lakes is virtually impermeable and therefore prevents seepage from said lakes into the sand stringers within said red beds which may contain fresh water.

(9) That as to sands that are in communication with said lakes, the evidence indicates that the major flow of surface and subsurface water within the boundaries of said synclinal feature is toward the subject lakes.

(10) That the evidence indicates that there is no leakage of water from said Laguna Plata and Laguna Gatuna into the adjoining formations.

(11) That the evidence indicates that there may be some leakage of water from said Laguna Tonto into the adjoining formations to the southeast, thence southwestward toward Laguna Gatuna.

(12) That the utilization of Laguna Plata and Laguna Gatuna for the disposal of water produced in conjunction with the production of oil or gas, or both, will not constitute a hazard to fresh water supplies that may exist in the vicinity of said lakes.

(13) That the utilization of Laguna Tonto for the disposal of water produced in conjunction with the production of oil or gas, or both, may constitute an additional threat of contamination of fresh water supplies as designated by the State Engineer existing to the southeast of said lake.

(14) That the evidence indicates that commercial deposits of sodium sulphate ($Na_2 SO_4$) may exist in and/or near the three subject lakes.

(15) That disposal of produced salt water into Laguna Plata and Laguna Gatuna will not interfere with the testing required to determine if there are commercial deposits of sodium sulphate in and/or near the said three lakes.

(16) That said disposal prior to actual mining operations will not impair the value of said sodium sulphate nor render its recovery more difficult.

(17) That this case should be reopened upon the motion of the Commission or any other interested party whenever tests have been conducted which indicate to a substantial degree that commercial deposits of sodium sulphate probably exist in and/or near the subject lakes, at which time all interested parties should be prepared to appear and show cause why continued disposal in said lakes should or should not be allowed.

(18) That the applicant should be authorized to utilize Laguna Plata and Laguna Gatuna for the disposal of water produced in conjunction with the production of oil or gas, or both.

(19) That the request of the applicant to utilize Laguna Tonto for the disposal of water produced in conjunction with the production of oil or gas, or both, should be denied.

IT IS THEREFORE ORDERED:

(1) That the applicant, Larry C. Squires, is hereby granted an exception to Order (3) of Commission Order No. R-3221, as amended, to dispose of water produced in conjunction with the production of oil or gas, or both, in two natural salt lakes located in Lea County, New Mexico, as follows:

Laguna Plata, sometimes referred to as Laguna Grande, located in Sections 2, 3, 9, 10, and 11, Township 20 South, Range 32 East, NMPM;

Laguna Gatuna, sometimes referred to as Salt Lake, located in Sections 7, 17, 18, 19, and 20, Township 20 South, Range 33 East, NMPM.

(2) That the application of Larry C. Squires to utilize Laguna Tonto, located in Sections 32 and 33, Township 19 South, Range 33 East, and Section 4, Township 20 South, Range 33 East, NMPM, Lea County, New Mexico, for the disposal of water produced in conjunction with the production of oil or gas, or both, is hereby denied.

(3) That the Commission may by administrative order rescind such authority whenever it reasonably appears to the Commission that such rescission would serve to protect fresh water supplies from contamination.

(4) That this case shall be reopened upon the motion of the Commission or any other interested party whenever tests have been conducted which indicate to a substantial degree that commercial deposits of sodium sulphate probably exist in and/or near the aforesaid lakes, at which time all interested parties should appear and show cause why continued disposal in said lakes should or should not be allowed.

(5) That the first person to determine to a substantial degree by tests that commercial deposits of sodium sulphate probably exist in and/or near said lakes shall so notify the Commission, setting forth in writing the supporting facts,

whereupon the Commission shall give notification for the reopening of this case.

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

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

DAVID F. CARGO, Chairman

ALEX J. ARMIJO, Member

S E A L

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

POLLUTION CONTROL, INC.

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HYDROLOGIC ASSESSMENT OF THE SALT LAKES AREA, WESTERN LEA COUNTY, NEW MEXICO

by

Geohydrology Associates, Inc.

In February 1969, Pollution Control, Inc., of Hobbs, New Mexico, requested that a hydrologic study be conducted in the vicinity of the salt lakes in western Lea County, New Mexico. The study was conducted by Ed L. Reed of Midland, Texas. The purpose of this study was to determine the suitability of Laguna Gatuna, Laguna Plata, and Laguna Tonto as sites for disposal of oil-field brine. The results of the work by Mr. Reed were presented on a single illustration (Plate 1), and his interpretations were largely contained in his testimony before the New Mexico Oil Conservation Commission. This testimony and cross examination were presented at the March 19, 1969, regular hearing of the Commission, Case No. 4047.

Approval of the application was granted by the Commission on April 16, 1969, as Order No. R-3725 (Appendix A).

In December 1983, Pollution Control, Inc., requested that Geohydrology Associates, Inc., of Albuquerque, New Mexico, review that original work of Mr. Reed and prepare an update of that work. The purpose of this study was (1) to provide documentation for expansion of the original disposal system, and (2) to request a variance in order to dispose of other oil field waste products in addition to brine.

The present study was based on a thorough literature and file search of existing data; it also drew heavily from earlier reports by Geohydrology Associates, Inc. (GAI) which were prepared for the Bureau of Land Management, the Sandia Corporation, and other clients. A field reconnaissance was made which included a visual inspection of the area of Ts. 19 and 20 S., Rs. 32 and 33 E. Well data was collected for a somewhat larger area (fig. 1). An analysis of these data and the resulting conclusions are presented in this report.

GEOLOGY OF THE PROJECT AREA

A number of studies of the geology of western Lea County have been made. These include the work by King (1942), Vine (1963), and Brokaw and others (1972). Studies related to water resources in the area include Hendrickson and Jones (1952), Nicholson and Clebsch (1961), and Geohydrology Associates, Inc. (1978, 1978a, 1979). Mercer and Gonzalez (1981) and Mercer (1983) evaluated the hydrologic conditions in the vicinity of the Waste Isolation Pilot Plant (WIPP) which is located only a few miles south of the project area.

There are three formations in the vicinity of the salt lakes and Laguna Gatuna that are directly concerned by this study. These are the Dewey Lake Redbeds, the Triassic deposits, and the surficial alluvial material (fig. 2). In addition, imported water from the Ogallala Formation is widely used in the project area.

Logs of test holes drilled in the area are included in Table 1.

Geologic Structure

The basic tectonic structure of the salt lakes area is a simple homoclinal dip of about 2^{o} to the east which developed mainly in pre-Pliocene

Table 1.--Sample logs and descriptions of test holes in project area.

Top and Thickness figures are given in feet.

Well 19.21.29.32; drilled November 8, 1978.

Top	Thickness	Description
0	11	caliche, white, moderate to strong formation
11	19	sand, brown-buff, unconsolidated aeolian, medium to fine texture
30	10	sand, buff, fine texture, weakly consolidated
40	10	as above, but lighter in color and has some silty laminae, small caliche nodules
50	10	shale, maroon, clayey, has greenish gray inclusions (elongated), concentrated along bedding, slightly moist
60	10	as above, but fewer greenish inclusions and contains rounded limestone fragments (aphanitic, red)
70	10	shale, variqated red-buff, very clayey, also has limestone fragments mentioned above
80	10	limestone, crystalline (fine), mottled maroon to gray, has a few laminae of grayish-green, silty shale
90	10	limestone, fine crystalline, silty, maroon, has some greenish gray silty shale laminae and some minor clayey shale (red) laminae

Total Depth - 100'

Wet sediments encountered at 50'
Bailing test - dry ?
Casing perforated - 30-100' below LSD
Footage subtotal - 2,610'
Footage subtotal - 2,510'
Dry, March 15, 1979

Table 1, continued.

Well 20.31.2.34; drilled November 13, 1978.

Top	Thickness	Description
0	6	sand, buff, medium-fine texture (aeolian)
6	6	caliche, white medium formation
12	8	sand, brownish-buff medium-fine texture, secondary carbonate cement
20	10	shale, reddish brown, clayey
30	10	shale, brown, silty, has a bed of green silty shale
40	10	shale, reddish brown, silty
50	10	shale, brown,silty, has greenish gray inclusions
60	10	shale, maroon, silty, has clayey laminae, greenish gray laminae
70	10	shale, brown, silty
80	15	shale, maroon-brown, silty
95	8	limestone, mottled gray-white, red, fine crystalline
103	7	shale, brown, clayey-silty greenish gray inclusions
110	20	shale, brown, clayey
130	10	as above, but with minor laminae of green silty shale
140	10	shale, reddish brown, silty-sandy, has a bed of green silty shale, slightly moist
150	10	sandstone, brown, medium-fine texture, calcareous cement

Total Depth - 160'

Bailing test - estimates less than 1 gpm
Encountered moist sediments - 145' below LSD
Water level - 150' below LSD
Measurement: January 19, 1979: Water level - 137.0' below LSD

Table 1, continued.

Well 20.31.17.33; drilled November 14, 1978.

Top	Thickness	Description
0	12	caliche, white-gray medium to strong formation
12	9	sand, brown, medium-fine texture, calcareous cement
21	11	shale, reddish brown silty
32	8	shale, brown, silty with clayey laminae
40	9	shale, brownish red, clayey, with silty laminae and greenish gray silty laminae
49	11	shale, brown, clayey, has greenish gray laminae and is fissile with micaceous partings
60	10	shale, reddish brown, clayey
70	18	shale, dark brown, very clayey, has chloritic partings, has laminae of green clayey shale
88	20	shale, brown, silty, has greenish gray inclusions
108	20	as above, but more clay
128	20	as above, but has laminae of greenish-gray silty-clayey shale
148	12	shale, reddish brown, silty, has clayey laminae
160	10	as above, but no clay
170	10	shale, brown, silty, has clayey laminae, has green clayey laminae, has fine crystalline gray anhydrite laminae
180	10	shale, reddish brown, silty has some green inclusions has some laminae of clear satin spar gypsum
190	10	shale, reddish brown, clayey, has some fine crystalline gray anhydrite
200	10	shale, reddish brown, silty, has greenish gray inclusions, has some thin clear satin spar gypsum
210	20	as above, but has some gray fine crystalline anhydrite
230	10	as above, but has some greenish gray inclusions and some clayey laminae

Total Depth - 240'

Bailing results - estimates ½ gpm
Casing perforations - 220-240' below LSD

Measurement: March 1, 1979: Water level - 227.0' below LSD

Table 1, continued.

Well 20.31.27.24; drilled November 1, 1978.

Top	Thickness	Description
0	4	sand, brownish-buff, fine to medium
4	8	strong caliche formation forms thick continuous bed
12	16	sand, dark brown, medium texture, slightly calcareous from overlying carbonate mineralization
28	12	as above, but less calcareous and finer texture
40	11	shale, dark reddish brown, very clayey
51	10	sandstone, greenish gray, fine to medium texture, with a lens of very clayey green shale
61	10	as above, but with lenses of mottled brown and green fine sandstone
71	9	shale, reddish brown, texture mostly coarse silt but with lenses of very clayey brown shale
80	10	as above, but with no clayey lenses
90	20	shale, silty, reddish brown. minor clayey laminae
110	14	shale, brownish red, silty with clayey laminae
124	7	shale, reddish brown, clayey, slightly silty
131	10	shale, reddish brown, silty
141	9	shale, reddish brown, silty with some clayey laminae and some greenish gray silty laminae

Total Depth - 150'

Casing perforated - 130-150' below LSD
Bailing test - 3-4' water in hole after casing placement-bailer removed it in 4 trips (producing less than 1 gpm)
Measurement: February 28, 1979: Water level - 114' below LSD

Table 1, continued.

Well 20.31.30.44; drilled October 31, 1978.

Top	Thickness	Description
0	10	sand, caliche, very strong, constituting major volume of sample, buff
10	10	sandstone, reddish brown, calcareous, calcite cement from strong caliche profile above
20	7	sandstone, fine to medium texture, mottled brownish red to gray (gray grains inside red) non- calcareous
27	21	as above, but containing minor lenses of red silty shale and greenish-white siltstone
48	3	shale, silty, bluish-green
51	8	resumes characteristics of silty sandstone, see above
59	11	dolomitic sandstone, silty, mottled brown to greenish gray; thin lenses show vigorous effervescense
70	10	silt, reddish brown, unconsolidated except minor lenses which have some clay and are darker in color, slightly calcareous
80	20	siltstone, reddish brown, slightly calcareous, moderate consolidation
100	10	shale, red, silty, with some minor laminae of greenish gray shale (silty)
110	8	shale, mottled brown to gray, silty with notable laminae of dark reddish brown zones of very clayey composition
118	17	silt, reddish brown, very loosely consolidated
135	8	shale, brown, very clayey
143	7	shale grayish, green, clayey, loosely consolidated in silt strata
150	50	shale, reddish brown, very clayey
200	10	shale, dark brown subequal amounts of silt and clay with some thin layers of green claystone
210	10	shale, brown, silty
220	10	as above, but containing minor lenses of green siltstone
230	10	shale, brown, silty
240	10	as above, but with minor lenses of green siltstone
250	20	shale reddish brown, clayey thin lenses of green siltstone, traces of satin spar gypsum concentrated in bedding (white to clear)
270	10	as above, but with traces of selinite gypsum (clear)
280	20	shale, reddish brown, clayey, laminae of satin spar gypsum, has a small number of limestone fragments (white)
300	8	shale, red, silty has thickish laminae of satin spar gypsum and minor amounts of greenish gray anhydrite, fine crystalline
308	12	shale, brownish red, clayey small amounts of greenish gray anhydrite

Total Depth - 320'

Casing perforated - 300-320' below LSD
Water standing in well upon completion - 3-4' (316' below LSD)
Bailing test - negligible
Measurement: February 27, 1979: Water level - 228' below LSD

Table 1, continued.

Well 20.32.17.13; drilled November 8, 1978.

Top	Thickness	Description
0	3	sand, fine buff-brown aeolian, 3" organics
3	10	calcareous ooze, white (lacustrine)
13	7	as above, but with sand laminae, calcified (caliche)
20	15	sandstone, brown, fine texture, loosely consolidated
35	5	shale, brown, sandy, silty, has gypsum, selenite and fine crystalline (gray)
40	10	shale, reddish brown, clayey with silt, has green clayey laminae
50	10	shale, reddish brown, silty with clay, has green silty laminae
60	23	as above, but reddish color
83	7	shale, brown, silty, has greenish-gray silty laminae
90	10	shale, brown, sand (fine)

Total Depth - 100'

Casing perforated - 20-40' below LSD
Bailing test - estimates 15 gpm
Encountered water at 18' below LSD
Water very salty (maybe with potassium)

Measurement: February 28, 1979; Water level - 9' below LSD

Table 1, continued.

Well 20.32.22.33; drilled November 8, 1978.

Top	Thickness	Description
0	3	sand, brownish-buff, medium-fine texture (aeolian) 6" organic profile
3	9	caliche, white, medium to strong formation
12	18	sand, pinkish buff, medium-fine texture, calcareous cement
30	10	shale, brown, clayey with laminae of greenish-gray medium crystalline, anhydrite
40	20	shale, brown, silty
60	10	shale, red-brown, silty, clayey, has minor amount thin laminae of green silty shale
70	10	as above, but no green shale
80	20	shale, red-brown, clayey with laminae of green clayey-silty shale
100	10	as above, but no green shale
110	30	shale, brown, silty
140	10	shale, brown-silty, clayey, has laminae of gray silty shale
150	10	shale, brown, clayey, has laminae of greenish gray silty shale
160	10	shale, reddish brown, silty-clayey, has greenish gray inclusions, has small nodules of maroon limestone

Total Depth - 170'

Driller encountered water at 35' (probably perched brine from Laguna Toston)
Casing perforated - 150-179' below LSD
Bailing results - estimates 12-15 gpm
Tastes fresh

Measurement: February 28, 1979: Water level - 30' below LSD

Table 1. continued.

Well 20.32.31.13: drilled November 8, 1978

Too	Thickness	Description
0	10	sand, buff medium to fine texture, moderate caliche formation
10	13	sand, brown-buff, fine to medium texture, leached carbonate
23	13	shale, reddish brown, silty with clayey laminae
36	4	shale, greenish gray, silty, sandy
40	30	shale, brown, silty-clayey shale, reddish brown
70	10	silty-clayey, has a bed of greenish-gray siltstone
80	20	shale, brown, clayey
100	20	as above, but more silt
120	30	shale, brown, clayey, interbedded with limestone, brown, fine crystalline
150	10	shale, brown, clayey-silty
160	10	as above, but reddish brown
170	10	shale, brown, silty-clayey, has zones of superior cementation along bedding, probably calcite
180	10	shale, brown, clayey, fairly cohesive from cementation
190	10	shale, brown, varigated clayey to silty, has greenish gray inclusions
200	20	shale, greenish to gray, silty, interbedded with brown silty shale
220	20	shale, reddish brown silty zones of calcite cementation along bedding
240	10	shale, reddish brown, clayey

Total Depth - 250'

Water level-drilled dry, never encountered moist sediments
Casing perforated - 230-250' below LSD
Bailing results - bailing showed about 8' water in hole (probably residual from drilling) - dry ; DTW 135.12' March 15, 1979

Table 1, continued.

Well 21.29.2.14; drilled November 16, 1978.

Top	Thickness	Description
0	5	sand, brown-buff, medium-fine texture (aeolian) has 3-6" of organics
5	15	caliche, white, formed in sand, medium formation
20	10	sand, brownish buff, medium-fine texture, sub-angular to rounded quartz grains
30	10	as above, but has some pebbles (quartz) 6 mm in diameter
40	20	as above, but pebbles increase in size to 1.5 cm
60	10	sand, reddish brown medium-fine small quartz pebbles
70	10	shale, red clayey
80	20	shale, red, clayey-silty, has laminae of greenish gray clayey shale and greenish gray inclusions
100	20	as above, but no inclusions green-gray laminae
120	10	shale, red, silty with clayey laminae
130	20	as above, but has greenish gray inclusions
150	10	shale, brownish-red, silty, clayey
160	10	shale, reddish brown, clayey, has greenish gray inclusions
170	10	as above, but silty
180	10	shale, brown, clayey, has greenish gray inclusions
190	20	as above, but reddish brown and silty
210	10	shale, brown, silty, has same greenish gray inclusions
220	10	as above, but very loosely consolidated
230	10	shale, red, silty
240	20	as above, but has some clay, has greenish gray inclusions
260	34	gypsum, light gray, fine crystalline
294	21	shale, red, silty-clayey, has greenish gray inclusions
315	25	gypsum, white, aphanitic, has laminae of silty red shale
340	10	as above, but gypsum is light gray
350	16	above, but no shale
366	24	shale, light red, silty, has laminae of gypsum, light gray to white, fine crystalline, gypsum in small rounded fragments, well mixed
390	40	as above, but redder in color (mixture of red clayey shale and gypsum)
430	30	mixture of red shale, silty-clayey, gypsum, soft dark gray, fine crystalline, also has selenite gypsum in small amounts

Total Depth - 460'

Bailing results - estimates more than 20 gpm
Casing perforated - 420-460' below LSD
Water level - 350' below LSD
Water tastes salty

Measurement: March 1, 1979: Water level 273.0' below LSD

Table 1, concluded.

Well 21.31.3.22; drilled November 9, 1978.

Top	Thickness	Description
0	18	caliche, white, moderate to strong formation
18	12	sand, brown-buff, medium-fine texture, calcareous cement
30	10	shale, buff-red, silty, calcareous laminae
40	10	shale, red, clayey with some silt
50	10	shale, mottled red, greenish gray, has sandy laminae but mostly silt
60	10	shale, brown, silty, with clayey laminae, has greenish gray inclusions
70	10	shale, reddish, brown, silty, has good cement, some laminae (calcite) (these laminae are gray-red)
80	10	as above, but subequal amounts of silt and clay
90	10	shale, red, silty, ahs clayey laminae
100	20	shale, brownish red, silty, has laminae with calcite cement
120	10	as above, but more calcite zones (mineralized with crystalline calcite)
130	10	shale, brownish red, silty
140	10	as above, but has clayey laminae
150	10	shale, brownish red, silty, has calcite mineralized laminae
160	10	shale, red, clayey, has laminae of silty greenish gray shale
170	10	shale, reddish brown, silty
180	10	as above, but has laminae of greenish gray shale
190	10	shale, brownish red, subequal amounts of silt and clay, has greenish gray laminae, silty

Total Depth - 200'

Driller encountered water at 150' below LSD
Casing perforated 140-160' below LSD
Bailing results - estimates 8 gpm
Water level on completion - 128' below LSD
Measurement: February 28, 1979: Water level - 142' below LSD

time. It is superimposed on Permian and Delaware basins. The more complex surficial structure near Nash Draw exerts a more immediate effect on the hydrology of the area. This area is typified by collapse of the Rustler Formation and overlying beds due to solution within the Rustler and at the top of the Salado Formation. Beds of the Rustler generally dip toward the larger depressions (Vine, 1963). In addition, hydration of anhydrite to gpysum causes localized doming. Sinkholes and domes influence the direction of ground-water movement, which in turn controls the development of collapse structures.

It is possible that the salt lakes of Laguna Gatuna, Laguna Plata, Laguna Tonto, and Laguna Toston occupy collapse structures associated with a northeastward extension of the "brine aquifer". Robinson and Lang (1938) described the "brine aquifer" as an important conduit of natural brine beneath Nash Draw. However, recent work at the WIPP site has shown that ". . . along the eastern side, the boundary is very irregular and in places extends farther east than previously indicated by Robinson and Lang " (Mercer, 1983, p. 50). Likewise, these depressions are located in a geographic location very similar to other depressions, sinks, and collapse structures in southeastern New Mexico and west Texas (Anderson, 1981, fig. 2). A hydraulic connection between the "brine aquifer" and the salt lakes would explain the origin of the depressions and the presence of highly mineralized spring discharge along the boundary of Laguna Gatuna and Laguna Plata.

Dewey Lake Redbeds

The Dewey Lake Redbeds underlie all of the project area (Brokaw and others, 1972), but they have not been identified in surface exposures. These deposits consist entirely of siltstone and fine-grained sandstone. The reddish-orange

to reddish-brown sandstone and siltstone are thinly laminated with very small scale cross-laminae. Ripple marks are present in the upper part of the formation. No evaporite deposits have been reported in the Dewey Lake sequence which is locally 500 feet thick. Although the Redbeds are not generally considered to be an aquifer, it is possible that some wells located north and east of the salt lakes may produce small quantities of water from these deposits.

Dockum Group, Undifferentiated (Triassic)

The Dockum Group unconformably overlies the Dewey Lake Redbeds (Brokaw and others, 1972). In some areas this Group is divisible into the Santa Rosa Sandstone and the Chinle Formation; however, the distinction cannot be made in western Lea County because of lithologic similarities and poor exposures (Nicholson and Clebsch, 1961, p. 35). Reed simply referred to these deposits as "Triassic" (plate 1).

Coarse-grained clastic deposits in the Dockum Group are generally fine to coarse-grained sandstone with minor shale layers. Locally these deposits range from siltstone to conglomerate. Although red is the predominant color, white, gray, and greenish-gray sands are present. Red and green claystone may be present in the eastern part of the project area.

The Dockum Group is exposed at several locations around the perimeter of Laguna Gatuna. Some of these were originally mapped by Reed; others have subsequently been exposed by highway construction, particularly on the south and east sides of the playa.

According to Hendrickson and Jones (1952, p. 75), the Dockum Group and underlying Dewey Lake Redbeds produce water to wells in eastern Eddy County. Also, Reed (1969) assumed that most of the wells in the vicinity of the salt lakes produce from the Triassic rocks.

Alluvium and Playa Deposits

The surficial deposits are composed mostly of locally derived sediments, including reworked Dockum and fragments of caliche and gypsum. Dune sands are common in the northern part of the project area and along the boundaries of the salt lakes. The sand is fine to medium grained and unconsolidated; it is present throughout the area, but in most areas has been stabilized by mesquite and other vegetation.

Playa deposits generally consist of fine sand, silt, and clay that has been reworked by intermittent lakes that are present after heavy rainfall. The interior of Laguna Gatuna and Laguna Plata contain abundant gypsum crystals and other salt deposits.

There is no evidence that the alluvium or playa deposits are water bearing. According to Nicholson and Clebsch (1961, p. 59), ". . . there does not seem to be a continuous saturated zone in the thin cover of alluvium. . ." of western Lea County. They attribute this to the limited precipitation in the area, and to the permeability of the Dockum Group which underlies the alluvium.

Ogallala Formation

The Ogallala is the principal water-bearing formation in southeastern New Mexico and much of eastern Lea County. The western edge of the formation is locally known as The Caprock or Mescalero Ridge which is approximately 11 miles northeast of Laguna Gatuna (fig. 1). Although the Ogallala Formation is not present in the vicinity of salt lakes, water from the Formation is piped across the area by potash refineries located in Nash Draw.

As a concession for right-of-way for the pipelines, most ranch owners obtained the right to tap these water lines for normal ranching operations. The

Snyder Ranches have made extensive use of this water source north of Highway 62-180. According to Mr. Smith at the Bingham Ranch, all of the water used south of the highway is obtained from the Kerr-McGee pipeline. Consequently, many of the windmills in the area are no longer in use and have fallen into disrepair. Some of the wells in use during Reed's 1969 study are no longer serviceable.

Potable water was reported by Reed near Halfway in section 23, T. 20 S., R. 32 E., and also from two wells located in sections 17 and 18, T. 19 S., R. 33 E. However it should be noted that the wells at Halfway have been abandoned since the Reed report has been completed. The two wells in sections 17 and 18 are used only for stock watering.

In his testimony before the Oil Conservation Division, Case No. 4047 on March 19, 1969, Mr. Larry C. Squires stated that there was no fresh water in the vicinity of the salt lakes.

Although somewhat brackish water can be used for stock watering, most of the water near Laguna Gatuna would be classified as brine. Spring samples collected by Reed contained sulfate concentrations greater than 11,000 ppm (parts per million) and chloride concentrations greater than 7,400 ppm. One spring at Laguna Gatuna (Reed's No. 55) contained 37,979 ppm sulfate and 27,657 ppm chloride. A 1969 sample from the bed of the playa contained 125,000 ppm sulfate and 158,000 ppm chloride.

The origin of these brines in Laguna Gatuna are difficult to explain. Although potash refiners dispose of saturated brines in Williams' Sink, Laguna Plata, and Laguna Toston, the direction of ground-water flow would carry the potash waste away from Laguna Gatuna. Laguna Gatuna is more than 20 feet higher than Laguna Toston and at least 60 feet higher than Laguna Plata and Williams' Sink.

GROUND-WATER MOVEMENT

The regional flow systems in Nash Draw, west of the project area, have been described by numerous workers, including Robinson and Lang (1938), Cooper and Glanzman (1971), Brokaw and others (1972), and Geohydrology Assoc., Inc. (1978, 1982), and Mercer (1983). Most of these studies conclude that, with some local variation, the ground-water flow in the shallow aquifers is from north toward the south. Nash Draw is one of the major flow paths. Recharge areas are the sand dunes of Chaves and Lea Counties; ground-water discharges into the Pecos River along most of its length (Geohydrology Assoc., Inc., 1978, p. 16).

Data were collected from a variety of sources in order to determine the local flow systems in Ts. 19-20 S., Rs. 32-33 E. A number of test-hole logs and water levels were obtained from an earlier study (Geohydrology Assoc., Inc., 1979) and are included in Tables 1 and 2 of this report. Land-surfacing elevations were used at well-documented springs located at Laguna Gatuna and Laguna Plata. These data were used to construct the water-level contours shown in Figure 3. Existing contour maps from outside the area were used for control where appropriate.

Most of the water-level data in T. 20 S, which includes Laguna Gatuna and other playas, shows a well defined flow system. The highest water-level elevations are present south to Highway 62-180 and in the vicinity of Laguna Tonto. The 3425-foot contour defines this area. Ground-water movement away from this contour would be west-northwest towards Laguna Plata and Williams' Sink.

This flow system is within the Dockum Group. The alluvial sediments are quite thin, as described in the preceeding section of this report. The

Table 2.--Records of wells in vicinity of Laguna Gatuna.

Explanation: Location-See Introduction for explanation of well-numbering system.
Depth of Well and Depth to Water-Reported depths are given to nearest foot; measured depths are given to nearest tenth or hundredth of a foot.
Aquifer-Qtal=Quaternary; Ogll=Ogallala; Trsc=Triassic; Rslr=Rustler; Dckm=Dockum; Trcl=Tertiary; Cplm=Capitan lime.
Remarks-S.C.=Specific Conductance; est=estimated; gpm=gallons per minute

Location	Well Status	Altitude (feet)	Depth of Well (feet)	Depth to Water(ft)	Aquifer	Date of Measurement	Remarks
18.31. 1.44432	Windmill	3797		460.42	Trcl	04/07/71	
12.223	Stock	3795	480+	453.39		10/18/77	
12.23144	Stock	3775	600	435.34	Trcl	04/07/71	
14.22133	Open cased hole	3731	400	377.30	Trcl	04/06/71	
35.31324	Domestic	3631	300	261.08	Trcl	04/05/71	
18.32.16.22433	Uncased open hole	3793	100	84.18	Ogll	03/18/68	
20.13311	Domestic	3470	270.0	179.35	Trcl	02/23/71	
22.32322	Oil test	3763		434.41	Trcl	04/06/71	
34.22241	Windmill	3721		117.46	Trcl	04/06/71	
18.33. 3.34133	Open cased hole	4015		60.10	Qtal	04/05/66	
3.343	Domestic/Stock	4012	64	59.18	Qtal	02/19/71	
10.23244	Domestic	4005	75	41.64	Qtal	02/09/71	
10.44211	Stock	3985	60	41.64	Ogll	02/09/71	
11.4433	Irrigation	3986		42.40	Qtal	02/09/71	
12.44211	Windmill	4089		137.48	Qtal	02/05/71	
13.13144	Open cased hole	3968		31.85	Qtal	02/08/71	
13.44244	Open cased hole	3973		46.66	Qtal	02/08/71	
14.111	None	3965	40.0	35.8	Qtal	06/03/54	
14.1114	Windmill	3976		35.20	Qtal	02/09/71	
14.11140	Stock	3976	46.0	35.84	Qtal	03/06/68	
19.142	Stock	3820		140+	Trsc?	12/09/58	
23.23140	Open cased hole	3881	58	45.65	Qtal	02/09/71	
34.133	None	3760	200.0	177.4	Trsc	12/09/58	

Table 2, continued.

Location	Well Status	Altitude (feet)	Depth of Well (feet)	Depth to Water (ft)	Aquifer	Date of Measurement	Remarks
18.34. 1.12222	Industrial	3991		79.70	Ogll	03/06/61	
2.223333	Industrial	4009		98.03	Ogll	02/04/71	
4.11124	Open cased hole	4064		126.78	Ogll	02/04/71	
8.23213	Windmill	4042		104.20	Ogll	02/04/71	
11.43212	Industrial	4000	211.0	110.78	Ogll	02/23/71	
12.42333	Industrial	3982	204.0	111.01	Ogll	02/19/71	
15.24130	Windmill	4015		103.28	Ogll	02/05/71	
18.413212	Open cased hole	4076		143.30	Ogll	02/05/71	
20.323323	Windmill	4015		98.92	Ogll	02/05/61	
20.323333	Domestic/Stock	4020	111.0	100.19	Ogll	03/06/68	
22.343				109.92	Ogll	01/08/75	
25.13111	Uncased shot hole	3977		94.88	Qtal	03/09/61	
25.133232	Uncased shot hole	3947		97.16	Qtal	03/09/66	
27.33311	Windmill	3994		110.42	Ogll	02/05/71	
29.112.13	Open cased hole	3972		60.40	Qtal	02/05/71	
30.211224	Open cased hole	3955		44.03	Ogll	02/05/71	
19.31.27.21144	Open cased hole	3573		142.71	Trsc	02/01/71	
27.23344	Oil test	3573		143		02/01/71	Abandoned
28.330	Domestic	3480		180	Dckm	11/29/48	
28.333		3442		110.07		12/14/77	
28.3332	Domestic/Stock	3483	200.0	186.87		12/15/77	S.C. 2200
28.33433	Stock	3442	180	108.21	Trsc	02/01/71	Abandoned
31.132		3397	4103	632.55	Cplm	05/ /73	
33.110	Abandoned	3450	160	100.7	Dckm	11/29/48	North well of 3
33.142	Domestic/Stock	3455	250	140		09/30/59	
19.32. 8.200	Stock	3650		365.3	Trsc	12/09/58	
31.110		3518	4190	651.25	Cplm	09/ /74	
34.421424	Community	3960	575	252.49	Trsc	01/28/71	
34.42322	Community	3959	575	252.27	Trsc	01/28/71	
36.100	Domestic/Stock	3565	485		Trsc		

Table 2, continued.

Location	Well Status	Altitude (feet)	Depth of Well (feet)	Depth to Water (ft)	Aquifer	Date of Measurement	Remarks
19.33. 5.12322	Stock	3710		299+	Trsc	12/09/58	
17.11224	Stock	3650	131.0	117.67	Trcl	01/28/71	Abandoned
18.133223	Oil test	3635	800	211.86	Trsc	01/28/71	
26.244	Stock/Domestic	3600	101	92.9	Qtal	07/01/54	
19.34. 6.34143	Stock windmill	37777		234.71		03/18/68	Abandoned
9.114	Stock	3790	33	28.6	Trsc?	06/03/54	
16.33410	Oil test	3755		243.91		03/19/68	Abandoned
31.131	Stock	3625	66	58.6	Qtal	11/17/65	Yield-6gpm est; Reported dry 01/12/71
20.31.13.42	Stock;abandoned	3427	32.5	1.1		10/05/77	S.C. >8000; 70°F
13.440	Stock	3450		203.8	Dckm?	12/22/48	
15.130	Stock	3450	70 ?	63.1	Dckm?	12/22/48	
16.24	Stock	3458	110.0	61.0	Dckm?	10/05/77	Abandoned
20.32. 1.322	Stock	3510	30	21.8	Qtal	01/25/84	Water not potable
18.233	Industrial	3450	400	89.2	Trsc	03/24/54	
23.43312	Commercial	3551	78	38.03	Trsc	01/25/84	Abandoned
24.33333	Windmill	3555	65	38.72	Ogll	01/25/84	
25.111	Windmill	3555	67.5	35.07		12/16/77	Abandoned
27.144	None	3543	25	12.3	Qtal	06/11/54	
27.32322	Stock	3530		15.30	Ogll	03/29/65	
27.32411	Stock	3530	75	16.55	Ogll	02/02/71	Unused
30.142	None	3530		9.9	Qtal	06/11/54	
36.214	Domestic	3588	60	46.6	Qtal	06/06/55	Abandoned
36.21424	Windmill	3586	65	48.46	Qtal	01/25/84	
36.221	Windmill	3588	53.7	45.31		12/16/77	Abandoned; S.C. 2000

Table 2, continued.

Location	Well Status	Altitude (feet)	Depth of Well (feet)	Depth to Water (ft)	Aquifer	Date of Measurement	Remarks
20.33. 4.43211	Used windmill	3556	58	33.19	Ogll	03/19/68	Plugged 1/25/84
5.34321	Oil test	3550	680	278.57	Trsc	02/02/71	
18.12322	Open hole	3520		249.88	Trsc	03/19/68	Abandoned
21.111	Windmill	3536	47.5	35.42	Trsc	01/25/84	Inoperative
24.122	Stock	3630	700±	300±	Trsc		
24.124113	Stock	3633	676	413.55	Trsc	02/03/71	Used
20.34. 4.44434	Stock	3635	200+	172.19	Trsc	02/03/71	
17.334	Stock	3635	200	140	Trsc	07/01/54	
22.222333	Stock	3656	250	214.98	Trsc	02/03/71	
22.223	Stock	3655	235		Trsc		
21.31. 2.221	Abandoned	3569	31.87	30.15		10/19/77	
7.331		3350	367.0	192.1	Rslr	09/14/72	S.C. 3500
18.411	Windmill	3310		158+	Rslr	03/17/76	S.C. 3200
21.32. 6.11131	Stock	3597	55	44.04	Ogll	02/03/71	Used windmill
21.33. 2.231	Domestic	3810	1150		Trsc		
2.24141	Domestic	3792	120	104.54	Trsc	11/16/65	Abandoned
2.24233	Open hole	3791	120	104.01	Trsc	11/16/65	Abandoned
2.42214	Open cased hole	3785	150	85.32	Trsc	02/04/71	
2.422334	Used windmill	3768	100	79.13	Trsc	11/16/65	
2.42233	Stock/Domestic	3768	102	83.20	Trsc	02/04/71	
2.442	Stock	3800		72.9	Ogll	06/28/54	
11.11144	Stock	3820	195	144.52	Ogll	02/04/71	
18.112	Stock	3900		143	Ogll	06/21/54	
18.11410	Used windmill	3892	160	148.43	Ogll	11/16/65	
18.12314	Used windmill	3855	123	117.50	Ogll	02/04/71	

Table 2, concluded.

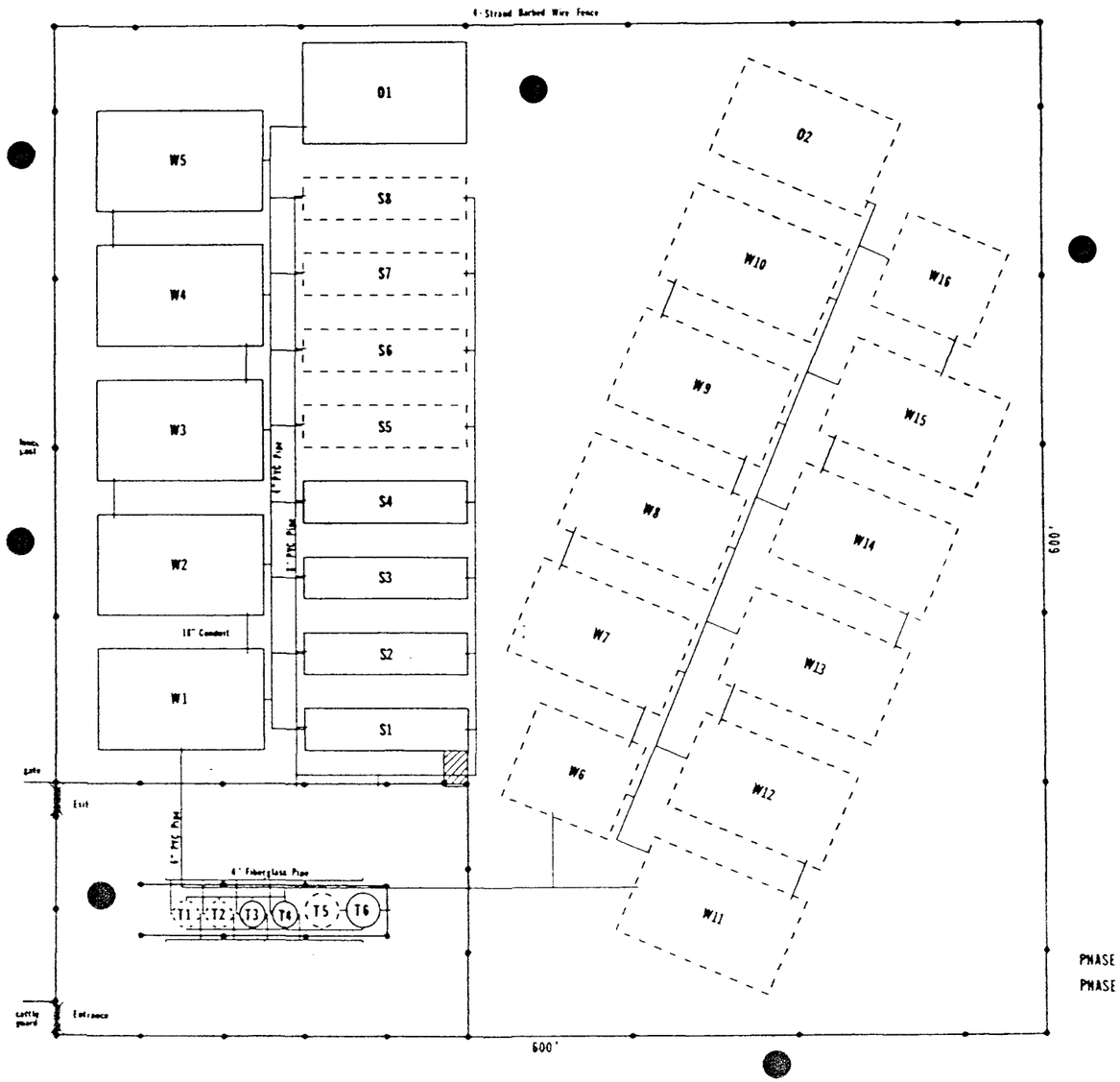
Location	Well Status	Altitude (feet)	Depth of Well (feet)	Depth to Water (ft)	Aquifer	Date of Measurement	Remarks
21.33.25.42322	Used windmill	3666		58.95	Ogll	02/04/71	
28.12443	Used windmill	3688	224	178.62	Trsc	02/04/71	
21.34. 1.24122	Used windmill	3662		68.92	Trsc	02/10/71	
8.422	Stock	3705	120	105.8	Ogll	06/30/54	
8.42341	Stock	3706		105.64	Ogll	02/10/71	Used windmill
13.324	Domestic	3655	335	200	Trsc	1943	
21.13141	Open cased hole	3677	196	99.61	Trsc	02/10/71	
23.223	Industrial/Domestic	3660	220	150	Ogll	1954	
23.310		3717		1151.96	Cplm	09/ /74	
24.222	Domestic	3655	125		Trsc?	02/10/71	
25.13141	Open cased hole	3677	196	99.61	Trsc	02/19/71	
33.233441	Used windmill	3641	92	64.45	Ogll	02/04/71	

WELL NO. 1 ● WELL NO. 2 ●

(See OBSERVATION WELL DIAGRAM)

W - WATER PIT
S - SOLIDS PIT
O - OVERFLOW PIT
T - TANK BATTERY

Proposed Monitoring Well Sites

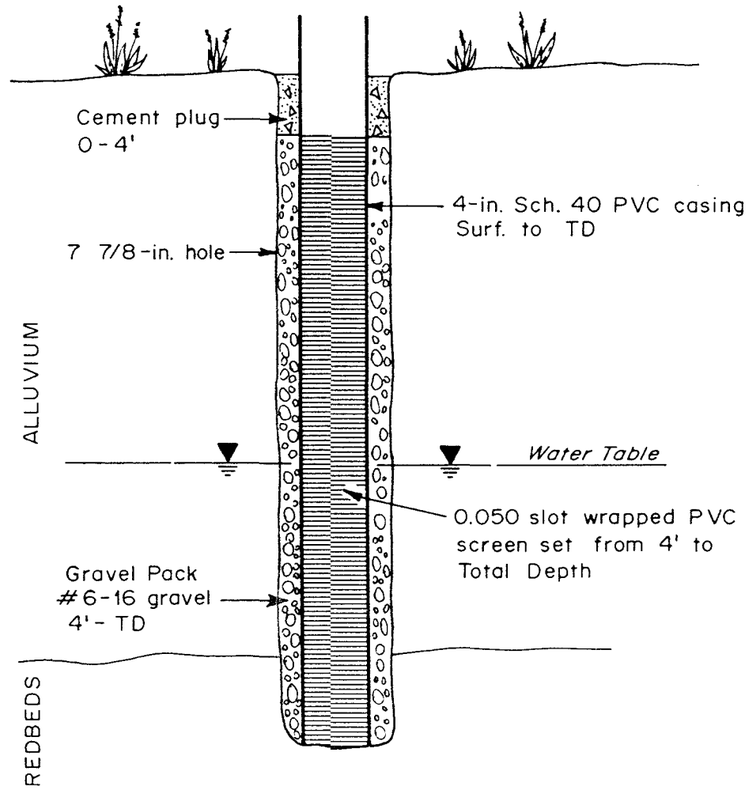


N
W E
S

PHASE 1 - solid lines
PHASE 2 - dashed lines

Proposed Monitoring Well

(Schematic)



Well should be drilled with air from surface to five feet below top of redbeds. Run geophysical logs for SP, resistivity, gamma and neutron.

ground-water movement would occur through the more permeable zones in the Dockum deposits, and in particular through the Santa Rosa sandstone.

Laguna Gatuna and Laguna Plata are natural ground-water discharge areas. Both lakes have intermittent springs along their borders, indicating that the bed of each lake is below the natural water table. No springs have been found at Laguna Tonto.

A second flow system is indicated by some of the water levels in the area north of Laguna Plata in T. 19 S. These water levels seem to be associated with a deeper flow system, perhaps in the Rustler Formation. Anomalous depths also were reported for wells in section 24, T. 20 S., R. 33 E. and section 3, T. 21 S., R. 32 E.

Water-quality data indicate that a deep, brine flow system exists also. This is discussed in the following section of this report.

WATER-QUALITY DATA

Reed (1969) collected chemical data at 14 different sites (Appendix B). These included samples from wells, springs, and soil samples from playas. The electrical conductivity was measured at several sites also. From these data, Reed concluded that there was very little potable water in the region.

The concentration of brine cannot be attributed to contamination from oil wells located near Laguna Gatuna. Work by Reed has shown that a water sample from a nearby oil well contained only 2,250 ppm sulfate and 5,900 ppm chloride, considerably less than found in springs and the lake itself. Evaporation of fresh water runoff into the playa would result in an increase in salt concentration, however this could not explain the high mineralization in the springs at higher elevations than the lake bottom. Also, there is no known source of brine up-gradient (or southeast) of Laguna Gatuna.

In the preceding section describing Geologic Structure, the similarity of Laguna Gatuna with other collapse structures in the region was pointed out. If Laguna Gatuna and the other playas in the area are the result of collapsing strata, normal faulting would be a consequence. These fault zones would serve as conduits for highly mineralized water in the brine aquifer. This seems to be the most plausible explanation for brine in Laguna Tonto. Inasmuch as there are no springs discharging into that lake, and it has a relatively small drainage area from which surface drainage would enter, a deep-seated brine source with movement along fault zones could account for brine on the lake surface.

SITE SUITABILITY

As shown in Appendix A (page 4), the original authorization for disposal of oil-field brines was granted to Mr. Larry C. Squires for the use of Laguna Plata and Laguna Gatuna. The application to utilize Laguna Tonto was denied. Since that time Pollution Control, Inc., has operated at a facility constructed on the northwest side of Laguna Gatuna in the north half of section 18, T. 20 S., R. 32 E. (fig. 4). Mr. Squires is President of Pollution Control, Inc. An additional facility has now been proposed for the SW¼, SW¼ of section 17, T. 20 S., R. 32 E. on land currently held by the Snyder Ranches under Bureau of Land Management lease BL-745.

Laguna Gatuna is a natural playa which has a surface area of approximately 383 acres within the lowest closing contour. The elevation of the bed is about 3,495 feet above mean sea level; the upper perimeter of the playa is generally defined by the 3,510-foot contour. The total drainage area for Laguna Gatuna is less than two square miles. One tributary channel enters the playa from the west directly south of the Pollution Control facility. A shorter tributary

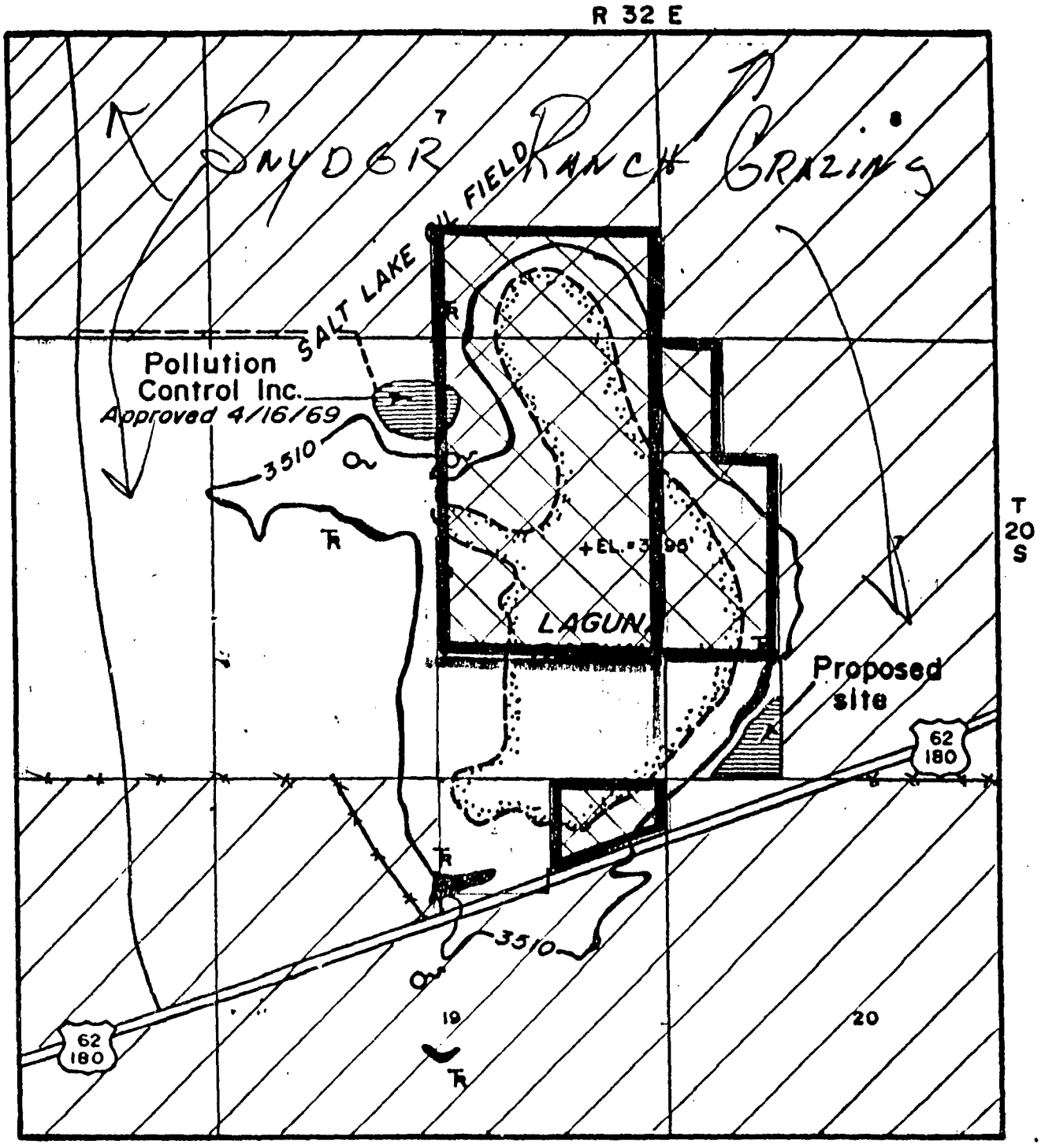


Figure 4.--Detailed map of Laguna Gatuna showing location of Pollution Control, Inc., facilities.

enters from the south in section 19. Assuming that only 10 percent of the annual precipitation enters the playa as runoff, Laguna Gatuna would entrap about 8,000 gallons of precipitation annually.

In most areas the steep-sided walls are covered by unconsolidated alluvium and slope wash; however there are at least five exposures of the Dockum Group. These unconsolidated sediments are composed primarily of hard reddish-brown shale and siltstone; thin laminae of very fine grained sandstone is locally present. Two exposures in sections 17 and 19 were developed by roadwork associated with Highway 62-180. These exposures show that the alluvial material is very thin; around the perimeter of the playa, the alluvial cover probably does not exceed five feet in thickness. Figure 2 is a generalized cross section of Laguna Gatuna.

The presence of well-defined springs and seeps on the rim of the playa established that Laguna Gatuna is a natural ground-water discharge point. However the springs probably fluctuate with seasonal temperatures. According to Mr. Steve Foster, Vice President of Pollution Control, Inc., the playa remains dry except during periods of heavy rainfall and runoff.

Evaporation studies have been conducted in Nash Draw to determine the loss of water from a brine solution exposed on a free water surface (Geohydrology Assoc., Inc., 1979, p. 71). These studies showed that the summer evaporation rate was 6.69 gpm (gallons per minute) per acre or 229 barrels per acre per day. The winter loss was 0.37 gpm per acre or about 13 barrels per acre per day. Inasmuch as Laguna Gatuna has a minimum surface area of 383 acres, the seasonal evaporation from the playa would be about 87,700 barrels per day during the summer and about 5,000 barrels per day during the winter.

These evaporation rates support the original estimate by Reed (1969, p. 30) that Laguna Gatuna has a disposal rate of 30,000 barrels per day. During the

winter of 1983-1984, Pollution Control, Inc., disposed of an average of about 50,000 barrels per month, and the playa remained totally dry throughout the period, according to Mr. Steve Foster. Also, the maximum disposal to date occurred in 1981 when disposal of 150,000 barrels per month was not uncommon (fig. 5, Table 3). This is less than 20 percent of the recommended maximum suggested by Reed and approved by the Oil Conservation Division.

During the recent field investigations conducted for this study, several wells measured in 1969 were again measured. A well located in the northwest corner of section 21, T. 20 S., R. 33 E., has shown a decline of 0.82 feet between 1969 and 1984. This well is located about one mile east of Laguna Gatuna. The water level in a well located in the northwest corner of section 25, T. 20 S., R. 32 E., declined 0.12 feet during the same period. This second well is located about one and a half miles southwest of the lake. The elevation of these water levels is higher than the elevation of Laguna Gatuna; nevertheless, this indicated that 15 years of operation by Pollution Control, Inc., has not affected the water table in the immediate vicinity of the disposal site.

CONCLUSIONS

1. Laguna Gatuna is a natural ground-water discharge point. The playa probably occupies a collapse structure associated with Nash Draw and others in the region. There is a thin blanket of alluvium covering the less permeable Dockum Group below.

2. The salt springs and brine associated with Laguna Gatuna are more highly mineralized than water collected from oil wells in the immediate area. There are no known salt deposits in the Dockum Group or in shallow deposits up-gradient from the playa. It is possible that the brine originates in the Rustler Formation at depth with the fault zones associated with collapse

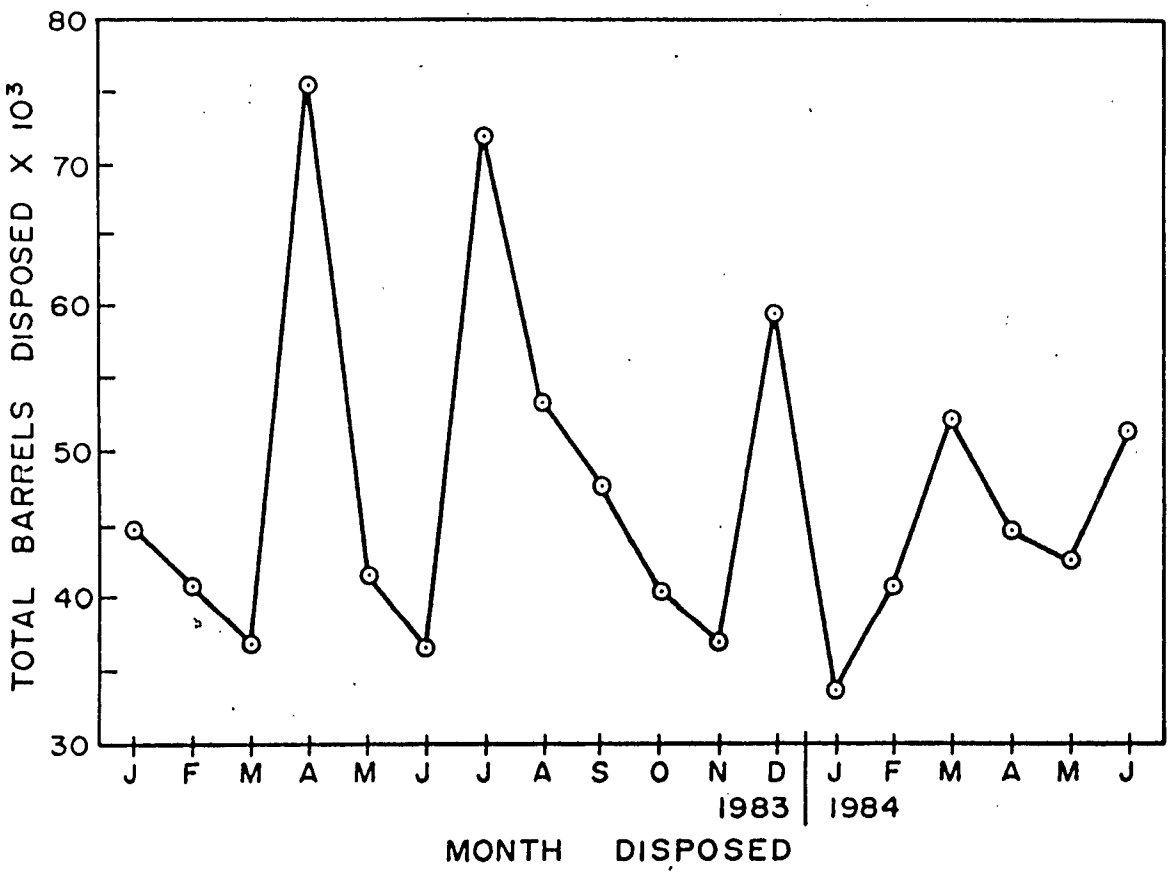


Figure 5.--Plot of monthly disposal volumes at Laguna Gatuna during 1983-1984.

Table 3.--Monthly discharges for 1983-1984 at Laguna Gatuna.

Month	Total Cumulative
January 1983	44,963 barrels
February	40,967
March	36,851
April	76,634
May	41,615
June	36,499
July	72,058
August	53,279
September	47,788
October	40,572
November	36,924
December	59,401
January 1984	33,521
February	40,777
March	52,119
April	44,720
May	42,623
June	51,200

structures acting as the conduit to the surface.

3. Laguna Gatuna is a suitable disposal site for as much as 30,000 barrels of brine per day.

4. There is no evidence to show that 15 years of operation by Pollution Control, Inc., has adversely impacted the hydrologic system in the vicinity of Laguna Gatuna. Continued operation of the existing facilities will not endanger the pre-1969 conditions.

5. Laguna Gatuna is a satisfactory repository for solid oil-field waste products, such as drill cuttings and drilling mud. Oil-contaminated waste products should be contained by earthern structures in order to maintain the aesthetic quality of the playa.

6. The proposed facility in the SW¼, SW¼ of section 17, T. 20 S., R. 32 E. will not adversely impact the hydrologic conditions in Laguna Gatuna provided that the combined discharge from both sites does not exceed 30,000 barrels of brine per day.

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