CASE 3302: Appli. of THE ATLANTIC RFG. CO. for a waterflood project, Eddy County, New Mexico.

CASE NO.
5302

Application,
Transcripts,
Small Exhibits
ETC.

AtlanticRichfieldCompany

North American Producing Division
New Mexico-Arizona District
P.O. Box 1710
Hobbs, New Mexico 88240
Telephone 505 393 7163

File

May 12, 1977

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, NM 87501

Attention: Mr. J. Ramey, Jr.
Secretary-Director

Re: Produced water samples required by Commission Order R-2969 entered in Case No. 3302, Concerning Atlantic Richfield Company - Swearingen - Shugart Waterflood Project

Gentlemen:

As per the above order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen Shugart Waterflood project.

Yours very truly,

L. C. Hudry

L. C. Hudry

LCH/mt

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, NM 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, NM 87501

WATER ANALYSIS — IONIC

TELEPHONE: HOBBS 393-7751
AREA CODE - 505

KE-TONE®

UNITED CHEMICAL CORPORATION
OF NEW MEXICO

601 NORTH LEECH
HOBBS, NEW MEXICO 88240

P. O. BOX 1499

OIL CONSERVATION COMMISSION

Company Atlantic Richfield

Field Shugart

Lease Swearingen Waterflood

Sampling Date 5-6-77

Type of Sample Sweet - Waterflood

WATER ANALYSIS

IONIC FORM		me/l *	mg/l *
Calcium (Ca++)		149.40	2,988
Magnesium (Mg++)		261.48	3,138
Sodium (Na+)	(CALCULATED)	593.71	36,639
Iron (Total)			
Bicarbonate (HCO_3-)		10.00	610
Carbonate (CO_3--)		Not	Found
Hydroxide (OH-)		Not	Found
Sulphate (SO_4--)		91.09	4,375
Chloride (Cl-)		1,903.50	67,500
Total Dissolved Solids			115,250
7.35 ph c 68 °F			
Dissolved Solids on Evap. at 103° - 105° C			
Hardness as $CaCO_3$		410.88	20,544
Carbonate Hardness as $CaCO_3$ (temporary)		10.00	500
Non-Carbonate Hardness as $CaCO_3$ (permanent)		400.88	20,044
Alkalinity as $CaCO_3$		10.00	500
Specific Gravity c 68° F 1.080			

* mg/l = milligrams per Liter
* me/l = milliequivalents per Liter

$CaCO_3$ Scaling Index positive @ 86°F. (1.33)

$CaSO_4$ Scaling Index positive (0.07)

Makes Water Work

U-LAB-31 © CA

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
September 8, 1965

EXAMINER HEARING

IN THE MATTER OF:

Application of The Atlantic Refining Company for a waterflood project, Eddy County, New Mexico.

Case No. 3302

BEFORE:

Elvis A. Utz, Examiner.

TRANSCRIPT OF HEARING

MR. UTZ: The next case will be Case 3302.

MR. DURRETT: Application of the Atlantic Refining Company for a waterflood project, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks authority to institute a waterflood project in the Shugart Pool, Eddy County, New Mexico, by the injection of water into the Queen formation through six injection wells in Sections 11 and 14, Township 18 South, Range 31 East. Applicant also seeks the establishment of an administrative procedure whereby the project area could be expanded and additional injection wells approved.

MR. HINKLE: Clarence Hinkle, Roswell, representing the Applicant, Atlantic Refining Company. We have one witness and eight exhibits.

(Witness sworn.)

(Whereupon, Applicant's Exhibits 1 through 8 marked for identification.)

RICHARD L. TRIMBLE, called as a witness, having been first duly sworn on oath, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. HINKLE:

Q State your name, please.

A Richard L. Trimble.

Q By whom are you employed?

A Atlantic Refining Company.

Q In what capacity?

A As a petroleum engineer.

Q You are a graduate petroleum engineer?

A Yes, sir.

Q Have you previously testified before the Oil Conservation Commission?

A Yes, sir.

Q Your qualifications as an expert petroleum engineer are a matter of record before the Commission?

A Yes, sir.

Q Have you made a study of Atlantic's requests in Eddy County, New Mexico?

A Yes, sir.

Q That study was made with respect to the waterflood projects?

A Yes, sir.

Q Are you familiar with the application of the Atlantic Refining Company waterflood project in Case Number 3302?

A Yes, sir.

Q What is Atlantic seeking to accomplish by this application?

A Atlantic is seeking to obtain approval of the Oil Conservation Commission for a waterflood project covering Atlantic's Swearingen Lease in the Shugart Pool, Eddy County,

New Mexico, pursuant to the provisions of Rule 701 of the Commission's Rules.

Q Refer to Atlantic's Exhibit Number 1 and explain what it shows, please.

A This is a plat showing Atlantic's proposed Swearingen waterflood project in Sections 11 and 14, Township 18 South, Range 31 East, Eddy County, New Mexico, covering, roughly, 720 acres. This exhibit shows the ownership of leases, the location of wells and the zones of completion for several miles around the project area, and it shows that all of the wells within the project area are completed in the Queen Sand. There are 13 wells within the project area. It shows Atlantic's proposed patterns for proposed injection wells. Injection wells are shown as triangles within the project area. It also shows the offset locations of the injection wells. The pattern is essentially a 40-acre five spot.

Q Is Atlantic the owner of all the leases within the project area?

A Yes, sir, Atlantic owns 100 percent of the working interest within the project area.

Q Are they all Federal lands?

A Yes, sir.

Q How many separate leases are involved in the project area?

A There are three separate leases within Atlantic's project area.

Q Can you give the description, or briefly state what each covers?

A Yes. The one lease covers the east half of the southeast quarter of Section 11, and another lease covers the northeast quarter, the southeast quarter of the northwest quarter and the north half of the southeast quarter of Section 14; and the third lease covers the remaining portion of Section 14.

Q Have all of the wells in the project area reached the advanced state of depletion and are similar to stripper wells?

A Yes, sir, they have.

Q Please refer to Exhibit Number 2 and explain what this shows.

A Exhibit Number 2 is an example showing the 13 completions within the project area giving the completion dates of the 13 wells, the initial 24-hour potential test of oil and water, and the June, 1965 daily production of oil, water and gas for each of the 13 wells. The 13 wells in June of 1965 produced at a rate of 32.4 barrels of oil per day.

Q That's the aggregate of the oil?

A That's the total of all the barrels which is less than three barrels of oil per day per well.

Q Abandoned?

A Abandoned on 1.7 barrels of water per day for the total project.

Q Now, referring to Atlantic's Exhibit Number 3, explain what that is and what it shows.

A Exhibit 3 is a structure map contoured on top of the Queen Sand, covering the Atlantic-Swearingen Project Area. It shows a rather gentle dipping to the south and east, and demonstrates that this is a stratographic trap type reservoir.

Q Does it indicate that all of the wells which have been completed in the Queen Sand formation are in the same reservoir?

A Yes, sir.

Q What is the approximate depth in which the wells of the project water and surrounding area are producing?

A The Queen Sand is found roughly to be 3400 feet.

Q Do you have a typical electrical log of any of the wells in the project area?

A Yes, sir, I have a log which is actually Exhibit Number 4, which is a gamma ray neutron log of Atlantic's Swearingen Federal Number 6 well which is located 1980 feet from the south and east lines of Section 14.

Q You might explain what this electrical log shows.

A This log shows the top of the Queen at 2428 feet and the base of the Queen at 3480 feet.

Q Were GORs taken on any of these wells in the project

when they were drilled?

A No, sir, we have no GOR information whatsoever. Now, we do have some information from nearby Queen reservoirs.

Q You have no definite information as to the permeability and porosity?

A No, sir, but from Exhibit Number 2 there, the initial potentials were, as you can see, ranged up to as high as 400 barrels per day, initially, so we anticipate they did have fairly good permeability.

Q Generally speaking, have waterflood projects in the similar Queen formations proved successful?

A Yes, sir.

Q Now, referring to Atlantic's Exhibit Number 5, state what that is, and what it shows.

A Exhibit Number 5 is performance curve showing monthly oil production, the cumulative oil production and the number of completions since 1953. Now, actually, this reservoir dates back to '39. It demonstrates that the peak production was in 1957 of about 5250 barrels of oil per month. Cumulative production to 7/1/65 was 487,906 barrels. Since that peak was reached in 1957, the production has declined rather steadily to 972 barrels oi oil per month in June of '65. And this Queen is typical of pressure depletion type reservoir which should respond to water flood.

Q In other words, this is a gas solution?

A Gas solution, gas-drive.

Q Now, refer to Atlantic's Exhibit 6 which consists of six parts, and explain each of those.

A Exhibit 6 is a diagramatic sketch of each of the proposed injection wells showing the total depth of the wells, the size and setting depth of its casing strings, number of sacks of cement used and the estimated top of the cement, or top of cement log. It shows the production interval in the Queen Sand; it shows the proposed packer and tubing setting depths and if you will notice, in every case, the packer is set on the tubing immediately above the producing interval and well below the estimated top of the cement.

Q All of these diagramatic sketches are similar?

A Yes, sir.

Q And all shows substantially the same thing?

A Yes, sir.

Q I notice that in some instances the casing has been set through the Queen Sand formation and perforated, and in others the casing has been set above the producing sand and you have open hole structures, is that correct?

A Yes, sir, that's right.

Q But in each instance the packers will be set above either the perforation or the producing formation?

A Yes, sir, it is as near to the producing interval as we can get them.

Q Now, what is the present condition of the casing in the proposed injection well?

A As far as we know the casing is in good shape.

Q Do you know whether new casing was used when these wells were drilled and completed?

A Actually we bought this production, and we think it had no casing in it, like some have said, some of the wells date back to '39 but we don't have definite records. We have not seen any logs.

Q Do you have any record to indicate that these wells were fracked?

A Yes, sir, every well has been fracked, and some as late as '62 and '63.

Q Would that indicate this casing withstood relatively high pressure?

A Yes, sir, it did.

Q Now, will the tubing, as shown on the diagramatic sketch of the well be plastic coated?

A No, sir, we don't plan to internally coat; we are going to be injecting fresh water, and until such time as we get back some residual water, we don't see any possibility of corrosion.

Q Do you intend to produce water in connection with the waterflood project?

A Yes, sir, we will reinject the produced water when it becomes available.

Q And if that water proves to be corrosive, or has any indication, do you anticipate Atlantic will take any action at that time with respect to the coating of the area of the tubing?

A Yes, sir. If corrosion is a problem we certainly will internally coat the tubing.

Q Approximately what quantity of water do you propose to inject, initially?

A We'll be injecting from about two to four hundred barrels per well per day, or a total of approximately 2,000 barrels of fresh water per day.

Q From what source would you obtain the water?

A This water will be purchased from the Double Eagle Corporation, and it will be fresh water.

Q Do you know where it comes from?

A Comes from the Capitan Reef, Lea County.

Q In the Caprock area?

A Right.

Q Now, would you refer to Atlantic's Exhibit Number 7 and explain what this is and what it shows?

A Exhibit Number 7 is a letter from the Assistant

District Engineer of the United States Geological Survey at Artesia, indicating his approval of Atlantic's proposed project plan of operation. This approval, of course, is subject to the Conservation Commission Regulations.

Q Now, I believe that Exhibit Number 1 indicates there is only one well, only one producing well located in the east half of the southeast quarter of Section 11, and that this well is to be converted to an injection well. Do you anticipate that this will effect, in any way, the status of the lease on which the well is located?

A No, sir, this is a ten-year term lease which can be renewed at the end of ten years.

Q For successive periods of ten years?

A Yes, sir.

Q Now, have you entered into any agreement with the owners of the overriding royalty interests with respect to the production which is to be allocated to this particular lease; that is the one covering the east half of the southeast quarter of Section 11?

A Yes, sir.

Q Referring to Atlantic's Exhibit Number 8, is this the agreement which you referred to?

A Yes, sir.

Q I might explain briefly --

A Exhibit Number 8 is a copy of the Overriding Royalty Pooling Agreement which simply allocates 1/13th of the production to the well located in the southeast quarter of Section 11.

Q Now, this agreement also indicated that Patons own certain overriding royalty interests in the east half of the southeast of Section 11, and the Johnsons own a like Overriding royalty interest in the other leases covering land in Section 14?

A Yes, sir.

Q Now, are they the only -- Well, is Paton the only overriding royalty interest owner in the east half of the southeast quarter of Section 11?

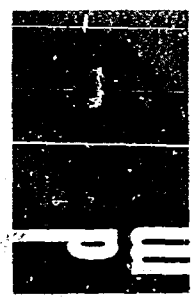
A Yes, sir, he is.

Q Now, have you entered into any other agreements with other lease owners surrounding the project area for the purpose of protecting lease-lines?

A Yes, sir, we have.

Q Will you indicate or state what agreement you have entered into?

A We have entered into a leas-line agreement with Maxwell Oil Company to the east of Atlantic's project area, which agreement specifies that Atlantic will put on injection there their Atlantic Johnson Federal Number 1 Well in Section 11,



and Atlantic will put on injection Atlantic's Swearingen "A" Federal Number 5 Well in Section 14; and Maxwell will put on injection his Well "B" Taylor Federal Number 4 in Section 13. Then off to the west of Atlantic's project we have entered into a lease-line agreement with Hudson and Hudson, which specifies that Atlantic will put on injection its Swearingen Federal "B" Number 3 in Section 14; that we will convert to injection Shugart "B" Number 2 in Section 15, and Shugart "B" Number 1 in Section 11.

Q Now, is it your understanding that both Maxwell Oil Company and Hudson and Hudson will make appropriate applications to the Oil Conservation Commission for approval of these injection wells which you have indicated?

A Yes, sir, this is my understanding.

Q And you understand that will be done shortly?

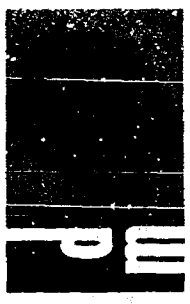
A Yes, sir.

Q What do you anticipate will be the life of this waterflood project?

A We anticipate approximately an eight year life.

Q What do you anticipate will be the total or aggregate quantity of fresh water which will be injected on the project?

A Well, we think we need to purchase about two and a half million barrels of water and inject the produced water, about a million barrels of produced water, for a total injection



of three and a half million barrels.

Q Now, is Atlantic proposing that a project allowable be assigned to the project in accordance with Rule 701 of the Commission Rules?

A Yes, sir.

Q Now, in connection with the order which Atlantic is seeking, approving this project, would it be beneficial to Atlantic to provide for administrative approval of the expansion of the project area, and the drilling of any additional injection wells, or the drilling of any additional wells for the project's purposes?

A Yes, sir, it would.

Q In your opinion, will the proposed waterflood project in the --

A Yes, sir.

Q In your opinion, will the project be operated in a manner as to protect correlative rights, including those of override royalty interests?

A Yes, sir.

MR. HINKLE: We would like to offer in evidence Exhibits 1 through 8, inclusive.

MR. UTZ: Without objection Exhibits 1 through 8 will be entered into the record of this case.

(Whereupon, Applicant's Exhibits 1 through 8 admitted in evidence.)

MR. HINKLE: I believe that concludes our testimony.

CROSS EXAMINATION

BY MR. UTZ:

Q Mr. Trimble, is it your thought that Maxwell and Hudson and Hudson would come under administrative approval of your record for expansion of this waterflood?

A No, sir. As I understand it they will come up for their own case. I don't think they are quite ready. They had some lease-line agreements of their own to work out with -- Hudson did with Marathon to the west there.

Q But you anticipate each one will be a separate lease project?

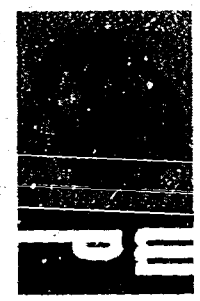
A Yes, sir. They plan their own plant; we intend to build our own plant and they will have their separate plant.

Q Well, then it's your intention that your project area will only include the cross-hatched area that is shown on your Exhibit 1?

A Yes, sir.

Q Do you intend to load the annulus in these injection wells?

A No, sir. We had planned to do that; actually, we'll be injecting, and if we, of course, if a leak occurs we will



get some pressure, some casing pressure immediately, and we will remedy it at once.

Q How will you detect the casing pressure?

A With a gauge.

Q A gauge on the annulus?

A Yes, sir.

Q You feel sure that you don't have any leaks in the casing then?

A We don't think we do. We have been producing. They make very little water, very little fluid of any kind, and when we fracked them, we should have it showing pretty good if it was going to, and it never did.

Q Did you put the frack pressure on the air portion of the casing also, or did you put it under a packer?

A We fracked some of the wells.

Q Fracked some of them right straight down the casing?

A Yes, sir.

Q But not all of them?

A No, sir.

Q These, of course, these fracks --

A These were done before we purchased the property, we bought it in 1964.

MR. UTZ: Are there other questions of the witness?

MR. GRAY: E. D. Gray, State Engineer's Office.

BY MR. GRAY:

Q At the present time about five percent of the fluid being produced is water, and you mentioned that in the total amount of water required, of about a million barrels, would be recirculated water, which is a total of about 30 percent of your total injection fluids. Now, I would thing that this would be a large quantity of water to be putting down an uncoated tubing.

A Yes, sir, that won't occur until about another anticipated three or four years before we get a sufficient volume of this produced water back, and at that time when we do -- The problem with these fluids is the produced water. Purcahsed water, of course, is fresh water, and it doesn't cause corrosion. When the produced, when we start injecting it, we will have to watch for corrosion, and we plan to have several coupon corrosion stations throughout our system.

Q Well, now, on that, this five percent of water that you are now producing, will that be injected immediately?

A No, sir, no, sir.

Q How will that be disposed of?

A It will probably evaporate, relatively, in the pit.

MR. GRAY: I believe that's all the questions I have.

BY MR. UTZ:

Q Is it a common practice to pull tubing, periodically,

in injection wells?

A Pardon?

Q Is it common practice to pull tubing in injection wells?

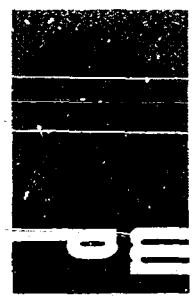
A No, sir, we wouldn't. We woudn't normally pull the tubing unless we suspicioned we had a tubing leak.

Q I was at a little bit of a loss as to why you want to wait four years?

A Well, the reason I said four years, because that is when we anticipate we will be getting back the produced water and it is the water that generally causes the corrosion. This water that we're purchasing, and we have signed the contract, it's drinkable water. You can actually drink it. So, until we do start to reinject the produced water, we don't anticipate any corrosion. I went out and I looked at Double Eagle's system, and it has been there six or seven years, and there has been no corrosion throughout their system yet.

Q Well, I wouldn't question your statement as to the water and the Double Eagle's system on down the road. I was questioning the advisability of pulling the tubing and putting plastic coated tubing in at the time you start reinjecting the produced water. I would gather that you were not convinced that even then you will then have corrosion problems?

A Being we are not convinced that we will at that time,



of course, we will have -- we'll have to look and see what the remaining life of the project is, and just what the completions are at that time. We are like a lot of oil companies, I guess, we want to defer expense as long as we can. I guarantee we will take care of it when it comes up.

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

(Witness excused.)

MR. UTZ: Are there other statements in this case? The case will be taken under advisement and the hearing is adjourned.

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

I, Henry Watts, Court Reporter, do hereby certify that the foregoing and attached transcript of proceedings before the New Mexico Oil Conservation Commission Examiner at Santa Fe, New Mexico, is a true and correct record to the best of my knowledge, skill and ability.

IN WITNESS WHEREOF I have affixed my hand and notarial seal this 28th, day of October, 1965.

Henry Watts
Notary Public - Court Reporter

My Commission Expires:
April 9, 1969

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 3302, heard by me on 9-8-65, 19

Examiner
New Mexico Oil Conservation Commission

BEFORE EXAMINER UTZ
OIL CONSERVATION COMMISSION
EXHIBIT NO. 2
CASE NO. 3302

Exhibit No 2

SWEARINGEN QUEEN
SHUGART POOL
Eddy County, New Mexico

Well	Completion Date	24 Hour Initial Potential Oil	24 Hour Initial Potential Water	June, 1965 Daily Production Oil	June, 1965 Daily Production Water	June, 1965 Daily Production Gas M.C.F.
Section 11-T-18-S, R-31-E						
Atlantic Johnson Federal 1	4-4-39	30	0	1.8	0	----
Section 14-T-18-S, R-31-E						
Atlantic Swearingen "A" Federal 1	1-20-39	73	0	1.2	0	3.1
Atlantic Swearingen "A" Federal 2	9-13-39	20	0	1.2	0	----
Atlantic Swearingen "A" Federal 3	9-13-39	10	0	.2	0	----
Atlantic Swearingen "A" Federal 4	2-28-49	25	0	.2	0	----
Atlantic Swearingen "A" Federal 5	8-29-55	120	0	.7	.4	----
Atlantic Swearingen "A" Federal 6	5-25-57	170	0	5.1	.3	16.2
Atlantic Swearingen "A" Federal 7	7-25-58	100	0	3.7	.1	11.1
Atlantic Swearingen "B" Federal 1	11-15-52	60	0	2.6	.1	3.9
Atlantic Swearingen "B" Federal 2	1-31-57	400	0	1.5	0	6.8
Atlantic Swearingen "B" Federal 3	11-21-57	250	0	3.0	.1	13.8
Atlantic Swearingen "B" Federal 4	9-22-59	100	0	5.7	.4	6.6
Atlantic Swearingen "B" Federal 5	10-24-61	55	0	5.5	.3	9.0
				32.4	1.7	70.5

AtlanticRichfieldCompany

North American Producing Division
New Mexico-Arizona District
P.O. Box 1710
Hobbs, New Mexico 88240
Telephone 505 393 7163

RECEIVED
JUN - 8 1978
OIL CONSERVATION COMM.
Santa Fe

Case file

June 7, 1978

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Attn: Mr. J. Ramey, Jr.
Secretary-Director

Re: Produced Water samples required by Commission Order R-2969 entered in Case No. 3302, concerning Atlantic Richfield Company - Swearingen - Shugart Waterflood Project

Gentlemen:

As per the above order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen Shugart waterflood project.

Yours very truly,

L. C. Hudry
rm

L. C. Hudry
Senior Operations Engineer

LCH:rm

Attachment

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

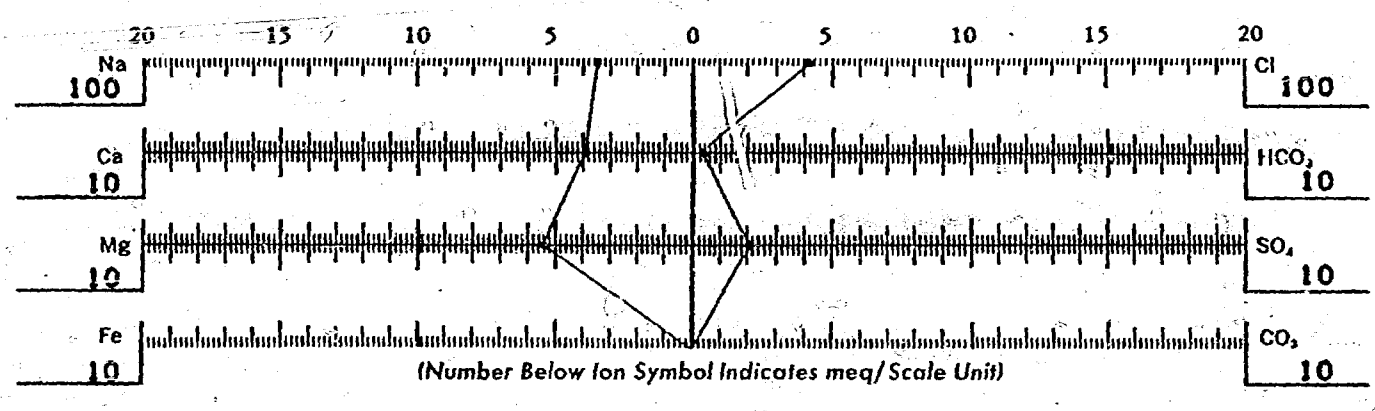
PRODUCTION PROFITS, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

Client: Atlantic Richfield Company
County: Eddy State: New Mexico
Field: Shugart Lease: Swearingen Waterflood Well No.:
Formation: Depth: Perf.:
Source of Sample: Produced Water
Date Collected: 5-13-78 by:

REPORT OF WATER ANALYSIS

Lab. Number: A-7343 Specific Gravity: 1.0192 pH: 7.7
Total Dissolved Solids: 25684 Resistivity (Ohmmeters at 68° F.): .191 Hydrogen Sulfide: ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	25684	
Sodium (Calc.)	8120	353.1
Iron (Dissolved)	0	0.
Barium	0	0.
Calcium	772	38.5
Magnesium	650	53.4
Chloride	14900	420.2
Bicarbonate	232	3.8
Carbonate	0	0.
Sulfate	1010	21.0

TOTAL IRON: 12

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

	mg/l
Total Undissolved Solids	
Oil (Solvent Soluble)	
Acid Solubles	
Iron ____ as ____	
Calcium ____ as ____	
Magnesium ____ as ____	
Sulfate ____ as ____	
Organic (Ignition Loss)	
Acid Insolubles	
Sand & Clay	
Barium Sulfate (Quan.)	
(Qual.)	

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: .49 Scaling Tendency: POS.
Calcium Sulfate Stability at 95°F
Concentration: 21.01 meq/l. Calc. Solubility: 57.15 meq/l. Percent Saturation: 36.76
Barium Sulfate Stability at 95° F
Concentration: ____ meq/l. Calc. Solubility: ____ meq/l. Percent Saturation: ____

REMARKS

AtlanticRichfieldCompany

North American Producing Division
New Mexico-Arizona District
P.O. Box 1710
Hobbs, New Mexico 88240
Telephone 505 393 7163

RECEIVED
JUN - 8 1978
OIL CONSERVATION COMM.
Santa Fe

June 7, 1978

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Attn: Mr. J. Ramey, Jr.
Secretary-Director

Re: Produced Water samples required by Commission Order R-2969 entered in Case No. 3302, concerning Atlantic Richfield Company - Swearingen - Shugart Waterflood Project

Gentlemen:

As per the above order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen Shugart waterflood project.

Yours very truly,

L. C. Hudry

L. C. Hudry
Senior Operations Engineer

LCH:rm

Attachment

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

PRODUCTION PROFITS, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

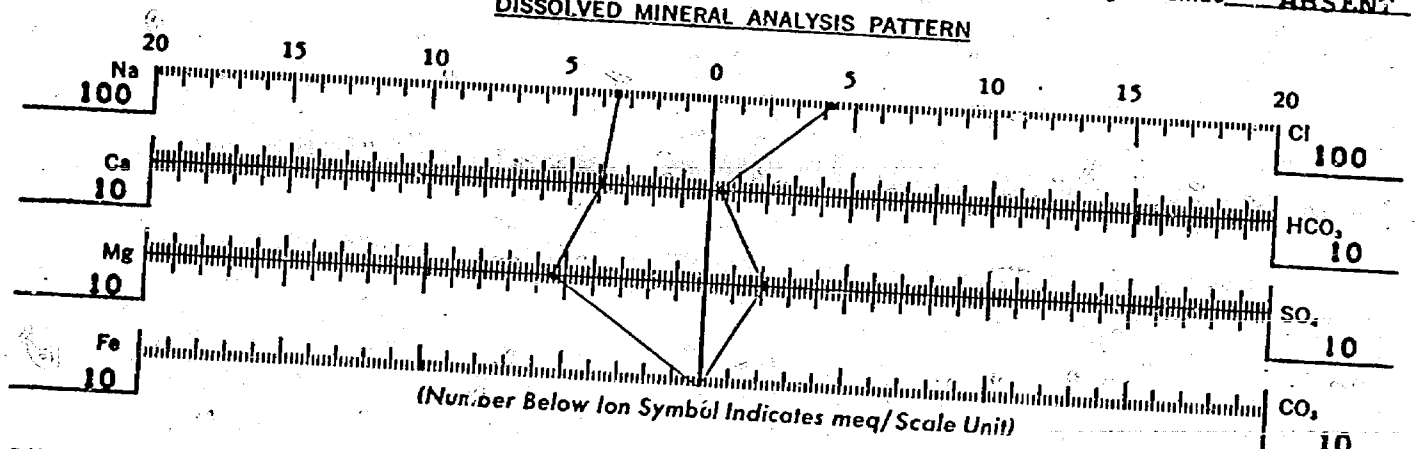
Client: Atlantic Richfield Company

Field: Shugart | County: Eddy | State: New Mexico
Formation: | Lease: Swearingen Waterflood | Well No.:
Source of Sample: Produced Water | Depth: | Perf.:
Date Collected: 5-13-78 | by:

REPORT OF WATER ANALYSIS

Lab. Number: A-7343 | Specific Gravity: 1.0192 | pH: 7.5
Total Dissolved Solids: 25684 | Resistivity (Ohmmeters at 68° F.): .191 | Hydrogen Sulfide: ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	25684	
Sodium (Calc.)	8120	353.1
Iron (Dissolved)	0	0.
Barium	0	0.
Calcium	772	38.5
Magnesium	650	53.4
Chloride	14900	420.2
Bicarbonate	232	3.8
Carbonate	0	0.
Sulfate	1010	21.0

TOTAL IRON: 12

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

		mg/l
Total Undissolved Solids		
Oil (Solvent Soluble)		
Acid Solubles		
Iron	as	
Calcium	as	
Magnesium	as	
Sulfate	as	
Organic (Ignition Loss)		
Acid Insolubles		
Sand & Clay		
Barium Sulfate		
(Quan.)		
(Qual.)		

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: .49
Calcium Sulfate Stability at 95°F
Concentration 21.01 meq/l. Calc. Solubility 57.15 meq/l. Scaling Tendency POS.
Barium Sulfate Stability at 95° F
Concentration _____ meq/l. Calc. Solubility _____ meq/l. Percent Saturation 36.76

REMARKS

Percent Saturation

AtlanticRichfieldCompany

North American Producing Division
New Mexico-Arizona District
P.O. Box 1710
Hobbs, New Mexico 88240
Telephone 505 393 7163

JAN 18 1978
OIL CONSERVATION COMM.
SANTA FE

Case file
3302

January 17, 1978

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Attention: Mr. J. Ramey, Jr.
Secretary-Director

Re: Produced water samples required by Commission Order R-2969 entered in Case No. 3302, concerning Atlantic Richfield Company - Swearingen - Shugart Waterflood Project

Gentlemen:

As per the above order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen Shugart waterflood project.

Yours very truly,

L. C. Hudry

LCH:ac
Attachment

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

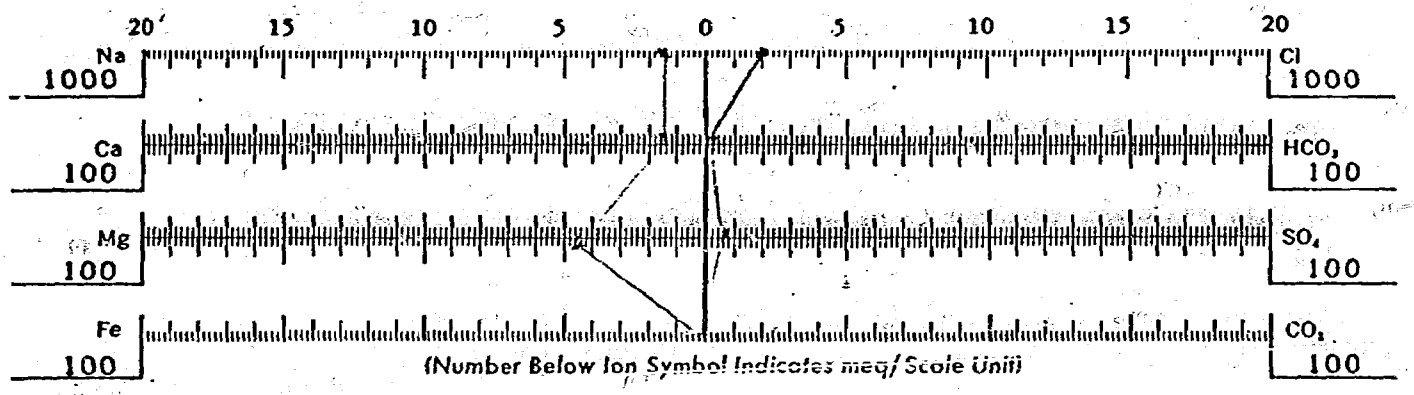
PRODUCTION PROFITS, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

Client ATLANTIC RICHFIELD COMPANY
County Eddy State New Mexico
Field Shugart Field Lease Swearingen Waterflood Well No.
Formation Depth Perf.
Source of Sample Produced Water Sample
Date Collected 12-1-77 by

REPORT OF WATER ANALYSIS

Lab. Number A-7139 Specific Gravity 1.0792 pH 7.0
Total Dissolved Solids 119627 Resistivity (Ohmmeters at 68° F.) .068 Hydrogen Sulfide ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	119627	
Sodium (Calc.)	33800	1469.4
Iron (Dissolved)	0	0.
Barium	10	.1
Calcium	3510	175.1
Magnesium	5810	477.6
Chloride	72200	2036.0
Bicarbonate	717	11.8
Carbonate	0	0.
Sulfate	3580	74.5

TOTAL IRON 5

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

	mg/l
Total Undissolved Solids	
Oil (Solvent Soluble)	
Acid Solubles	
Iron ____ as ____	
Calcium ____ as ____	
Magnesium ____ as ____	
Sulfate ____ as ____	
Organic (Ignition Loss)	
Acid Insolubles	
Sand & Clay	
Barium Sulfate (Quan.)	
(Qual.)	

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F .80 Scaling Tendency POS.
Calcium Sulfate Stability at 95°F
Concentration 74.46 meq/l. Calc. Solubility 70.40 meq/l. Percent Saturation 100.00
Barium Sulfate Stability at 95° F
Concentration .15 meq/l. Calc. Solubility 0. meq/l. Percent Saturation 100.00

REMARKS

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
P.O. Box 1710
Hobbs, New Mexico 88240
Telephone 505 393 7163

SEP 5 1978

September 1, 1978

Case 3302

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Attention: Mr. J. Ramey, Jr.
Secretary-Director

Re: Produced water samples required by Commission Order R-2969 entered in Case No. 3302, concerning Atlantic Richfield Company - Swearingen - Shugart Waterflood Project

---

Gentlemen:

As per the above order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen Shugart waterflood project.

Yours very truly,

L. C. Hudry

LCH:ac
Attachment

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

UNICHEM
INTERNATIONAL

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

Company Atlantic Richfield

Field Loco Hills

Lease Swearinger Water Flood Sampling Date 8-30-78

Type of Sample

WATER ANALYSIS

IONIC FORM	me/l *	mg/l *
Calcium (Ca++)	150.74	3,015
Magnesium (Mg++)	238.78	2,865
Sodium (Na+) (CALCULATED)	1,519.07	34,923
Iron (Total)		6
Bicarbonate (HCO_3 -)	10.10	616
Carbonate (CO_3 --)	Not	Found
Hydroxide (OH-)	Not	Found
Sulphate (SO_4 --)	93.69	4,500
Chloride (Cl-)	1,804.80	64,000
Total Dissolved Solids		109,919
7.3 ph c 68 °F		
Dissolved Solids on Evap. at 103° - 105° C		
Hardness as Ca CO_3	389.52	19,476
Carbonate Hardness as $CaCO_3$ (temporary)	10.10	505
Non-Carbonate Hardness as $CaCO_3$ (permanent)	379.42	18,971
Alkalinity as $CaCO_3$	10.10	505
Specific Gravity c 68° F 1.075		

* mg/l = milligrams per Liter

* me/l = milliequivalents per Liter

$CaCO_3$ Scaling Index positive @ 86° F. (0.88)
$CaSO_4$ Scaling Index positive (0.32)

U-LAB 31 (REV. 6/78)

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1710
Hobbs, New Mexico 88240
Telephone 505 393 7163

March 30, 1977

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Attention: Mr. J. Ramey, Jr.
Secretary-Director

Re: Produced water samples required by Commission Order R-2969 entered in Case No. 3302, concerning Atlantic Richfield Company - Swearingen - Shugart Waterflood Project

Gentlemen:

As per the above order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen Shugart waterflood project.

Yours very truly,

L. C. Hudry

LCH:rm

Attachment

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

PRODUCTION PROFITS, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

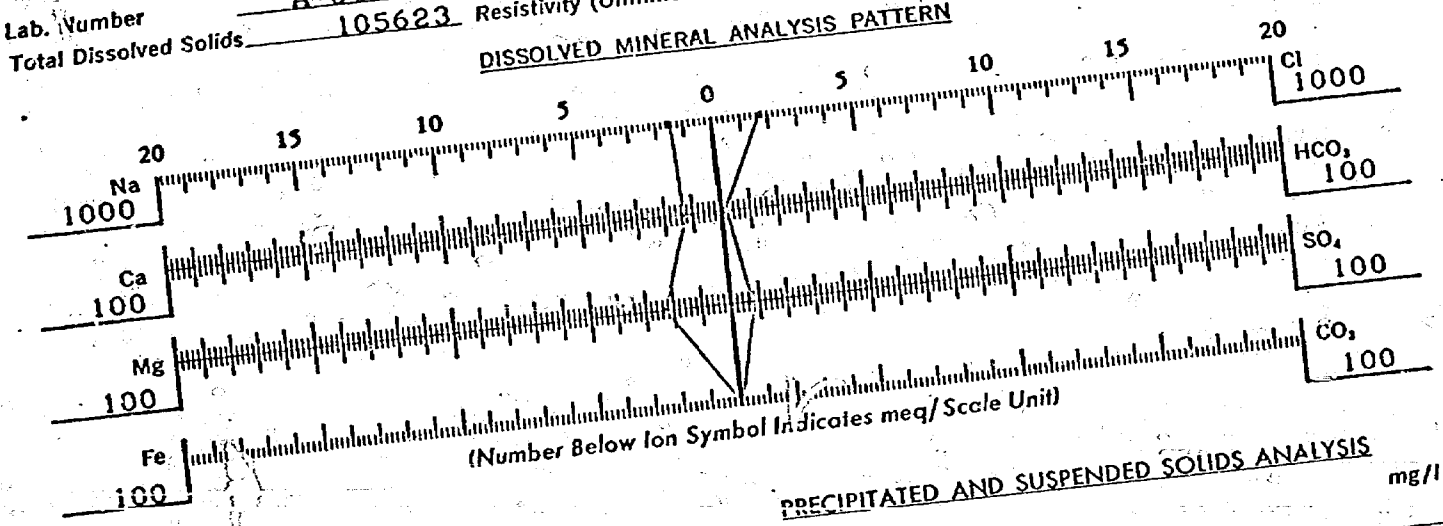
Client: Atlantic Richfield Company
County: Eddy
State: New Mexico
Field: Shugart
Lease: Swearingen Waterflood
Well No.:
Formation:
Depth:
Perf.:
Source of Sample: Produced Water Sample
Date Collected: Letter from Cecil Johnson 2-23-77
by: Cecil Johnson

APR - 1 1977
OIL CONSERVATION COMM.

REPORT OF WATER ANALYSIS

Lab. Number: A-6801
Total Dissolved Solids: 105623
Specific Gravity: 1.0759
Resistivity (Ohmmeters at 68° F.): .084
pH: 5.8
Hydrogen Sulfide: PRESENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS	mg/l	meq/l
Total Solids (Calc.)	105623	
Sodium (Calc.)	33300	1446.0
Iron (Dissolved)	363	13.0
Barium	-	-
Calcium	2890	144.2
Magnesium	2900	238.4
Chloride	63000	1776.6
Bicarbonate	210	3.4
Carbonate	0	0.
Sulfate	2960	61.6

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS		mg/l
Total Undissolved Solids		
Oil (Solvent Soluble)		
Acid Solubles		
Iron	as	
Calcium	as	
Magnesium	as	
Sulfate	as	
Organic (Ignition Loss)		
Acid Insolubles		
Sand & Clay	(Quan.)	
Barium Sulfate	(Qual.)	

TOTAL IRON: 586

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F.: -1.18 — Scaling Tendency: NEG.

Calcium Sulfate Stability at 95°F — Concentration: 61.57 meq/l. — Calc. Solubility: 72.68 meq/l. — Percent Saturation: 84.71

Barium Sulfate Stability at 95° F — Concentration: _____ meq/l. — Calc. Solubility: _____ meq/l. — Percent Saturation: _____

REMARKS

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1710
Hobbs, New Mexico 88240
Telephone 505 393 7163

March 30, 1977

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Attention: Mr. J. Ramey, Jr.
Secretary-Director

Re: Produced water samples required by Commission Order R-2969 entered in Case No. 3302, concerning Atlantic Richfield Company - Swearingen - Shugart Waterflood Project

Gentlemen:

As per the above order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen Shugart waterflood project.

Yours very truly,

L. C. Hudry

LCH:rm

Attachment

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

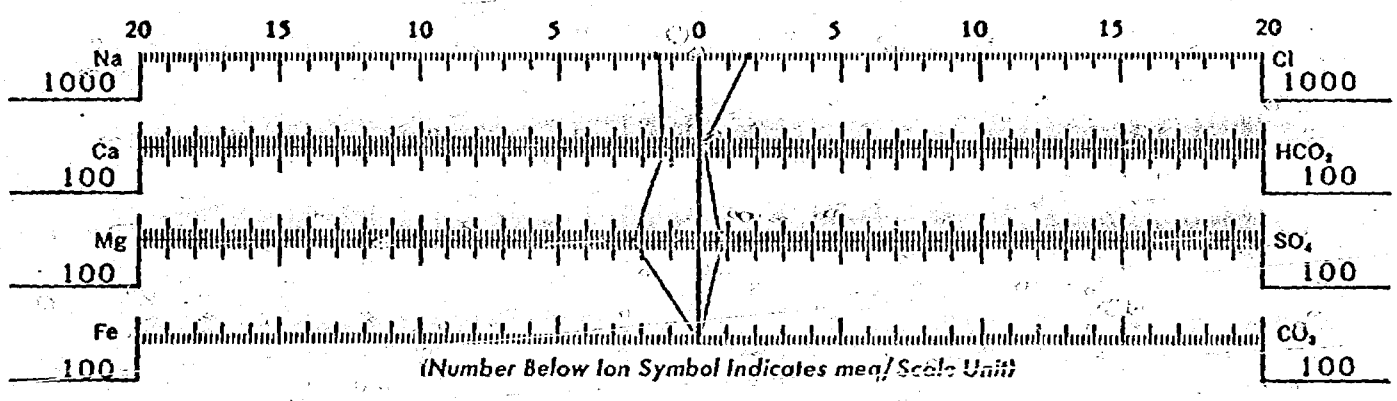
PRODUCTION PROFITS, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

Client: Atlantic Richfield Company
County: Eddy State: New Mexico
Field: Shugart Lease: Swearingen Waterflood Well No.:
Formation: Depth: Perf.:
Source of Sample: Produced Water Sample
Date Collected: Letter from Cecil Johnson 2-23-77 by: Cecil Johnson

REPORT OF WATER ANALYSIS

Lab. Number: A-6801 Specific Gravity: 1.0759 pH: 5.8
Total Dissolved Solids: 105623 Resistivity (Ohmmeters at 68° F.): .084 Hydrogen Sulfide: PRESENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	105623	
Sodium (Calc.)	33300	1446.0
Iron (Dissolved)	363	13.0
Barium	-	-
Calcium	2890	144.2
Magnesium	2900	238.4
Chloride	63000	1776.6
Bicarbonate	210	3.4
Carbonate	0	0.
Sulfate	2960	61.6

TOTAL IRON 586

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

	mg/l
Total Undissolved Solids	
Oil (Solvent Soluble)	
Acid Solubles	
Iron as	
Calcium as	
Magnesium as	
Sulfate as	
Organic (Ignition Loss)	
Acid Insolubles	
Sand & Clay	
Barium Sulfate (Quan.)	
(Qual.)	

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: -1.18 Scaling Tendency: NEG.
Calcium Sulfate Stability at 95°F
Concentration: 61.57 meq/l. Calc. Solubility: 72.68 meq/l. Percent Saturation: 84.71
Barium Sulfate Stability at 95° F
Concentration: meq/l. Calc. Solubility: meq/l. Percent Saturation:

REMARKS

AtlanticRichfieldCompany

North American Producing Division
New Mexico-Arizona District
Post Office Box 1710
Hobbs, New Mexico 88240
Telephone 505 393 7163

January 4, 1977

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, NM 87501

Attention: Mr. J. Ramey, Jr.
Secretary-Director

Re: Produced water samples required by Commission Order R-2969 entered in Case No. 3302, concerning Atlantic Richfield Company - Swearingen - Shugart Waterflood Project

Gentlemen:

As per the above order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen Shugart waterflood project.

Yours very truly,

L. C. Hudry

LCH/rd
Attachment

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, NM 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, NM 87501

PRODUCTION PROFITS, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

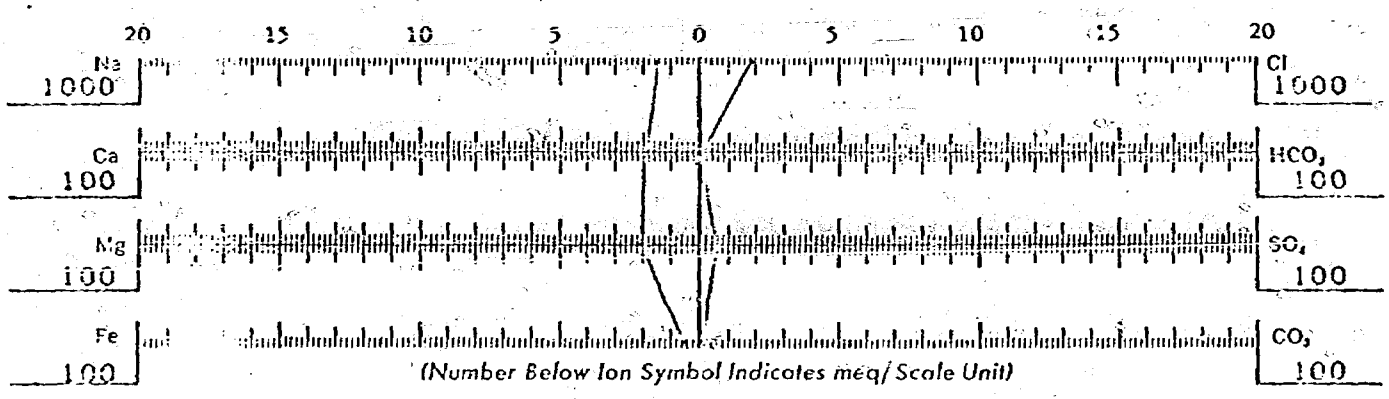
RECEIVED
JAN - 5 1977
OIL CONSERVATION COMM.
Santa Fe

Client: Atlantic Richfield Company
County: Eddy
State: New Mexico
Field: Shugart
Lease:
Well No.:
Formation:
Depth:
Perf.:
Source of Sample: Swearingen Waterflood
Date Collected:
by:

REPORT OF WATER ANALYSIS

Lab. Number: A-6728
Specific Gravity: 1.0753
pH: 5.5
Total Dissolved Solids: 107916
Resistivity (Ohmmeters at 68° F.): .085
Hydrogen Sulfide: PRESENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	107916	
Sodium (Na)	32500	1412.0
Iron (Dissolved)	1570	56.4
Barium	-	-
Calcium	3770	188.1
Magnesium	2730	224.4
Chloride	64900	1830.2
Bicarbonate	46	.8
Carbonate	0	0.
Sulfate	2400	49.9
TOTAL	2100	

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

		mg/l
Total Undissolved Solids		
Oil (Solvent Soluble)		
Acid Solubles		
Iron	as	
Calcium	as	
Magnesium	as	
Sulfate	as	
Organic (Ignition Loss)		
Acid Insolubles		
Sand & Clay		
Barium Sulfate	(Quan.)	
	(Qual.)	

SCALE PREDICTIONS

Calcium Carbonate Stability Index at 77° F: -1.98
Scaling Tendency: NEG.

Calcium Sulfate Solubility at 95°F
Calcium: 49.92 meq/l.
Calc. Solubility: 57.89 meq/l.
Percent Saturation: 86.23

Barium Sulfate Solubility at 95° F
Barium: meq/l.
Calc. Solubility: meq/l.
Percent Saturation:

REMARKS:

Case 3302

'65 SEP 22 AM 8

STATE OF NEW MEXICO

STATE ENGINEER OFFICE

SANTA FE

S. E. REYNOLDS
STATE ENGINEER

ADDRESS CORRESPONDENCE TO:
STATE CAPITOL
SANTA FE, NEW MEXICO 87501

September 21, 1965

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

Dear Mr. Porter:

Reference is made to the application of Atlantic Refining Company which seeks approval of the Swearingen Waterflood Project consisting of 720 acres in Sections 11 and 14, Township 18 South, Range 31 East which was the subject of Case 3302 heard on September 8, 1965.

This office offers no objection to the granting of the application provided:

(1) 1. The coupon method of measuring corrosion is used from inception of injection and reports furnished to the Oil Conservation Commission and the State Engineer Office, giving the results of the examination of the coupons every three months.

(2) 2. An inhibited fluid is used in the annulus between the casing and tubing.

(3) 3. The Oil Conservation Commission and the State Engineer Office are <u>immediately</u> notified when re-injection of produced water commences and are furnished an analysis of the produced water every sixty days for the first six months, following commencement of use of produced water and at longer intervals after the end of the six-month period.

4. The disposal of produced water into unlined pits shall be limited to one-half barrel per day per well.

✓ 4 5. Any changes in the casing, tubing or cement program from the plans submitted at the hearing, with respect to the injection wells, shall be approved by the Oil Conservation Commission and the State Engineer Office prior to use.

Yours truly,

S. E. Reynolds
State Engineer

By: Frank E. Irby
Frank E. Irby
Chief
Water Rights Div.

FEI/ma

CLARENCE E. HINKLE
W. E. BONDURANT, JR.
S. B. CHRISTY IV
LEWIS C. COX, JR.
PAUL W. EATON, JR.
CONRAD E. COFFIELD
HAROLD L. HENSLEY, JR.
MICHAEL R. WALLER

LAW OFFICES
HINKLE, BONDURANT & CHRISTY
HINKLE BUILDING
ROSWELL, NEW MEXICO

OF COUNSEL: HIRAM M. DOW
TELEPHONE 622-6510
AREA CODE 505
POST OFFICE BOX 10

August , 1965

Case 3302

Oil Conservation Commission
Box 2088
Santa Fe, New Mexico

Gentlemen:

We enclose in triplicate application of The Atlantic Refining Company for approval of the Swearingen Water Flood Project in the Shugart Pool. We would like to have this matter set down for hearing at the first examiner's hearing in September, which we assume will be September 8.

We are sending a complete copy of the application to the State Engineer.

Yours sincerely,

HINKLE, BONDURANT & CHRISTY

By _____

CEH:cs
Enc.
cc: State Engineer
cc: The Atlantic Refining Company

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Exhibit No. 7

P. O. Drawer U
Artesia, New Mexico 88210

BEFORE EXAMINER UTZ
OIL CONSERVATION COMMISSION
EXHIBIT NO. 7
CASE NO. 3302

May 25, 1965

The Atlantic Refining Company
P. O. Box 1978
Roswell, New Mexico

Re: Swearingen Waterflood Project
Shugart Pool, T. 18 S., R. 31 E.
Eddy County, New Mexico

Gentlemen:

Your letter of May 17, 1965, requests approval to institute a waterflood of the Queen formation in the Shugart Pool, T. 18 S., R. 31 E., Eddy County, New Mexico. Atlantic has 100% working interest of the project area which involves 720 acres consisting of Federal leases Las Cruces 029388(b), described as the E/2 SE¼ sec. 11, Las Cruces 047633(a), described as the NE¼, SE¼NW¼, and N/2 SE¼ sec. 14, and Las Cruces 047633(b), described as the N/2 NW¼, SW¼NW¼, SW¼ and S/2 SE¼ sec. 14, T. 18 S., R. 31 E. There are no other lands involved in the project area.

You propose to operate the project on a lease basis and to flood on an 80 acre five-point pattern. There are 13 wells involved, six of which are to be converted to water injection. Only the Queen formation will be flooded, which is at an average of 3500 feet.

The proposed plan for operating your Swearingen Waterflood Project in the area outlined above is satisfactory to this office and hereby approved subject to approval by the New Mexico Oil Conservation Commission and the following:

1. This project will be operated in compliance with the New Mexico Oil Conservation Commission regulations governing waterflood operations.

2. When this project is expanded to involve other operators and interests, the correlative rights of all concerned will be protected and therefore cooperative agreements will be negotiated when injection wells are introduced along lease lines.

3. Appropriate notices and reports to drill new wells and to convert existing wells to water injection will be submitted for approval prior to commencing the work. Duplicate copies of a monthly progress report are to be submitted showing the volume of water

injected and average pressures for each injection well and monthly oil and water production for the producing wells in the project area.

Sincerely yours,

Robert L. Beekman

Robert L. Beekman
Acting District Engineer

RLB:gs

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

September 28, 1965

COPY

Mr. Clarence Hinkle
Hinkle, Bondurant & Christy
Attorneys at Law
Post Office Box 10
Roswell, New Mexico

Dear Sir:

Enclosed herewith is Commission Order No. R-2969, entered in Case No. 3302, approving the Atlantic Refining Company Swearingen-Shugart Waterflood Project.

Injection of water is to be through the six authorized water injection wells, which shall be equipped with tubing and packers, said packers being set within 100 feet of the uppermost perforation or in the case of open-hole completions, within 100 feet of the casing shoe.

Approval is also contingent upon the following conditions:

1. The coupon method of measuring corrosion is used from inception of injection and reports furnished to the Oil Conservation Commission and the State Engineer Office, giving the results of the examination of the coupons every three months.

2. An inhibited fluid is used in the annulus between the casing and tubing.

3. The Oil Conservation Commission and the State Engineer Office are immediately notified when re-injection of produced water commences and are furnished an analysis of the produced water

every sixty days for the first six months, following commencement of use of produced water and at longer intervals after the end of the six-month period.

4. Any changes in the casing, tubing or cement program from the plans submitted at the hearing, with respect to the injection wells, shall be approved by the Oil Conservation Commission and the State Engineer Office prior to use.

As to allowable, our calculations indicate that when all of the authorized injection wells have been placed on active injection, the maximum allowable which this project will be eligible to receive under the provisions of Rule 701-E-3 is 546 barrels per day, provided that any leases which have any variation in ownership have been consolidated or pooled or otherwise covered by some kind of agreement authorizing transfer of allowables.

Please report any error in this calculated maximum allowable immediately, both to the Santa Fe office of the commission and the appropriate district proration office.

In order that the allowable assigned to the project may be kept current, and in order that the operator may fully benefit from the allowable provisions of Rule 701, it behooves him to promptly notify both of the aforementioned commission offices by letter of any change in the status of wells in the project area, i.e., when active injection commences, when additional injection or producing wells are drilled, when additional wells are acquired through purchase or unitization, when wells have received a response to water injection, etc.

Your cooperation in keeping the Commission so informed as to the status of the project and the wells therein will be appreciated.

Very truly yours,

A. L. PORTER, Jr.
Secretary-Director

ALP/DSN/ir

cc: Mr. Frank Irby

Oil Conservation Commission - Artesia, New Mexico

COPY

Docket No. 25-65

DOCKET: EXAMINER HEARING - WEDNESDAY - SEPTEMBER 8, 1965

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

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

CASE 3300: Application of Tidewater Oil Company for approval of a unit agreement, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval of the Justis-McKee Unit Area comprising 880 acres of Federal, State and fee lands in Township 25 South, Ranges 37 and 38 East, Lea County, New Mexico.

CASE 3301: Application of Tidewater Oil Company for approval of a waterflood project, Lea County, New Mexico. Applicant, in the above-styled cause, seeks permission to institute a waterflood project in the Justis-McKee Unit Area by the injection of water into the McKee formation through five injection wells located in Sections 13, 24, and 25, Township 25 South, Range 37 East, Lea County, New Mexico.

CASE 3302: Application of The Atlantic Refining Company for a waterflood project, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks authority to institute a waterflood project in the Shugart Pool, Eddy County, New Mexico, by the injection of water into the Queen formation through six injection wells in Sections 11 and 14, Township 18 South, Range 31 East. Applicant also seeks the establishment of an administrative procedure whereby the project area could be expanded and additional injection wells approved.

Case. 3302
Heard 9-8-65
Rec. 9-16-65

approves the waterflood requested by Atlantic.

The 6 six injection wells to be approved are:

Atlantic-	~~Swearingen 'B' #3~~ Johnson Fed. #1				P	-	P- 11-18S-31E
-	Swearingen 'A'		#	3			B- 14-18S-31E
-	-	-	#	5	H	-	- -
-	-	-	#	6	J	-	- -
-	-	'B'	#	3	E	-	- -
-	-	-	#	4	P	-	- -

The letter of transmittal shall contain (by agreement with Frank Irby) the following requirements.

1. Use the coupon method of detecting corrosion from initial injection & report to OCC & SEO every 30 days.
2. Fill annulus with inert fluid with pressure gauge at surface.
3. Notify OCC & SEO when injection of produced water begins.
4. Any change in casing or cementing or tubing program for injection wells shall be approved by OCC & SEO. ow

ATLANTIC

THE ATLANTIC REFINING COMPANY
INCORPORATED - 1870
PETROLEUM PRODUCTS

November 15, 1965

'65 NOV 16 AM

NORTH AMERICAN PRODUCING DEPARTMENT
NEW MEXICO - ARIZONA DISTRICT
S. L. SMITH, DISTRICT MANAGER
JACK BIARD, DISTRICT LANDMAN
E. R. DOUGLAS, DISTRICT GEOLOGIST
A. D. KLOXIN, DISTRICT DRLG. & PROD. SUP'T.
M. D. ROBERTS, DISTRICT GEOPHYSICIST
W. P. TOMLINSON, DISTRICT ENGINEER
B. R. WARE, DISTRICT ADMINISTRATIVE SUP'V.

SECURITY NATIONAL BANK BLDG.
MAILING ADDRESS
P. O. BOX 1978
ROSWELL, NEW MEXICO

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico

Attention: Mr. A. L. Porter

Re: Swearingen-Shugart Waterflood
Order No. R-2969

Gentlemen:

This is to advise that the final three injection wells in the Swearingen-Shugart Waterflood Project are now in service. This makes a total of six injection wells in the project. Information concerning the first three wells was contained in our letter to you dated November 9, 1965.

All of the injection wells are completed so that injection is down tubing and below a packer. The casing annulus is filled with inhibited water and corrosion coupons are installed in the well heads on wells A-6 and B-3. Coupons are also installed in the injection manifold.

Below are data on the final three injection wells.

Well Name	Packer Setting Depth	Depth of Casing Shoe	Top of Perforations	Date Injection Started
Swearingen "B" No. 3	3312'	3661'	3378'	November 10
Swearingen "A" No. 6	3351'	3512'	3443'	November 9
Johnson Federal #1	3270'	3347'	O.H.	November 9

We trust that this information will satisfy your needs. If you desire additional data please advise.

Yours very truly,

W. P. Tomlinson

W. P. Tomlinson

EMP:jcb

3302

ATLANTIC

THE ATLANTIC REFINING COMPANY
INCORPORATED – 1870
PETROLEUM PRODUCTS

November 9, 1965

MAIL SECTION
'65 Nov 10 AM 7

NORTH AMERICAN PRODUCING DEPARTMENT
NEW MEXICO – ARIZONA DISTRICT
S. L. SMITH, DISTRICT MANAGER
JACK BIARD, DISTRICT LANDMAN
E. R. DOUGLAS, DISTRICT GEOLOGIST
A. D. KLOXIN, DISTRICT DRLG. & PROD. SUP'T.
M. D. ROBERTS, DISTRICT GEOPHYSICIST
W. P. TONLINSON, DISTRICT ENGINEER
B. R. WARE, DISTRICT ADMINISTRATIVE SUP'V.

SECURITY NATIONAL BANK BLDG.
MAILING ADDRESS
P. O. BOX 1978
ROSWELL, NEW MEXICO

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico

Attention: Mr. A. L. Porter

Re: Swearingen-Shugart Waterflood
Order No. R-2969

Dear Sir:

The Atlantic Refining Company started injecting water into the Swearingen Shugart Waterflood Project on November 6, 1965. We are currently injecting into the Swearingen "A" No. 5 and the Swearingen "B" No. 4. Injection is down tubing and below a packer. The casing tubing anulus is filled with inhibited water and corrosion coupons were installed in the well head on key wells.

The Swearingen "A" No. 3 has been completed for injection and we will start injecting into it immediately. The following table shows packer setting depth, depth of casing shoe and top of perforations for the three wells that have been completed to date for injection. This information indicates compliance with provisions of your letter dated September 28, 1965, on this subject.

	Packer Setting Depth	Depth of Casing Shoe	Top of Perforations
Swearingen "A" No. 3	3152'	3230'	O. H.
Swearingen "A" No. 5	3390'	3470'	O. H.
Swearingen "B" No. 4	3411'	3540'	3490'

The other three injection wells are being converted presently and we will forward completion data on them as soon as they are completed.

Yours very truly,

W. P. Tomlinson

W. P. Tomlinson

VRC:jcb

cc: United States Geological Survey
Attention: Mr. J. A. Knauf
P. O. Drawer U
Artesia, New Mexico

New Mexico Oil Conservation Commission
Attention: Mr. M. L. Armstrong
P. O. Drawer DD
Artesia, New Mexico

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

April 28, 1966

COPY

The Atlantic Refining Company
P. O. Box 1978
Roswell, New Mexico

Attention: Mr. W. P. Tomlinson

Administrative Order CTB-156

Gentlemen:

Reference is made to your application dated January 17, 1966, for administrative approval of an exception to Rule 309-A of the Commission Rules and Regulations to permit the commingling of oil production from your Swearingen "A" Lease comprising the NE/4, SE/4 NW/4, and N/2 SE/4 of Section 14, and your Swearingen "B" Lease comprising the N/2 NW/4, SW/4 NW/4, SW/4, and S/2 SE/4 of Section 14, and your Johnson Federal Lease comprising the E/2 SE/4 of Section 11, all in Township 18 South, Range 31 East, NMPM, Shugart Pool, Eddy County, New Mexico. The United States Geological Survey has consented to the commingling from the aforesaid leases until such time as the total production reaches 440 barrels per day; all overriding royalty owners have agreed to the commingling as evidenced by executed overriding royalty pooling agreements which were received in this office April 28, 1966. It is our understanding that each of the leases will share in the production from the waterflood on the commingled acreage on the basis of the number of wells located on each lease as compared to the total number of wells (13) on all the leases.

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

April 28, 1966

The Atlantic Refining Company
Roswell, New Mexico

Administrative Order CTB-156

Under the authority granted me pursuant to Rule 309-B, The Atlantic Refining Company is hereby authorized to commingle the above-described production as proposed, subject to the applicable provisions of the Commission "Manual for the Installation and Operation of Commingling Facilities."

As the result of the pooling agreements, the 546 barrels per day stated in our letter of September 28, 1965, as the maximum allowable which this project would be eligible to receive under the provisions of Rule 701-E-3, provided that the leases were consolidated, will now be considered as the effective maximum.

Very truly yours,

A. L. PORTER, Jr.
Secretary-Director

ALP/DSN/esr

cc: Oil Conservation Commission - Artesia
Oil & Gas Engineering Committee - Hobbs
United States Geological Survey - Roswell

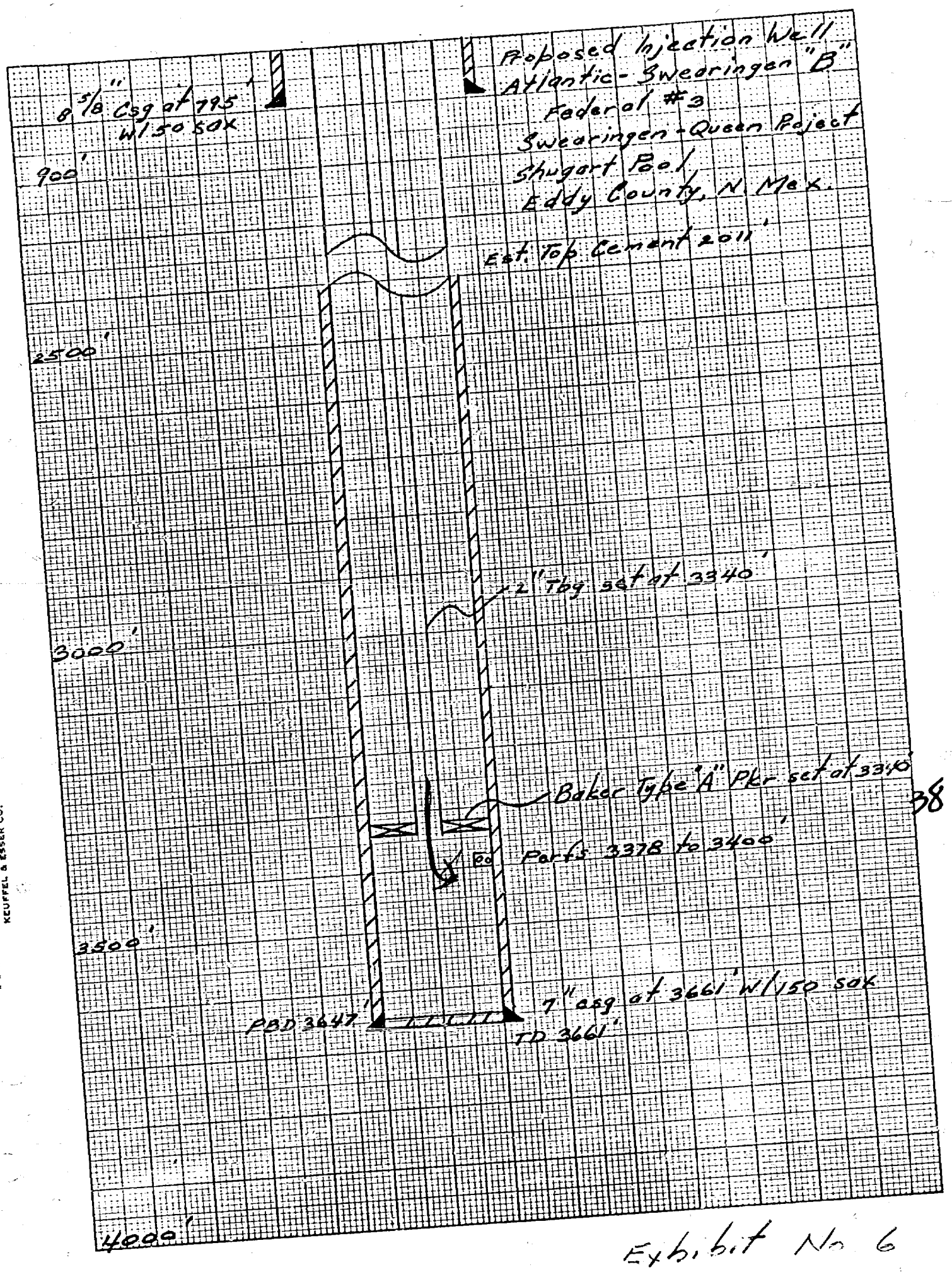
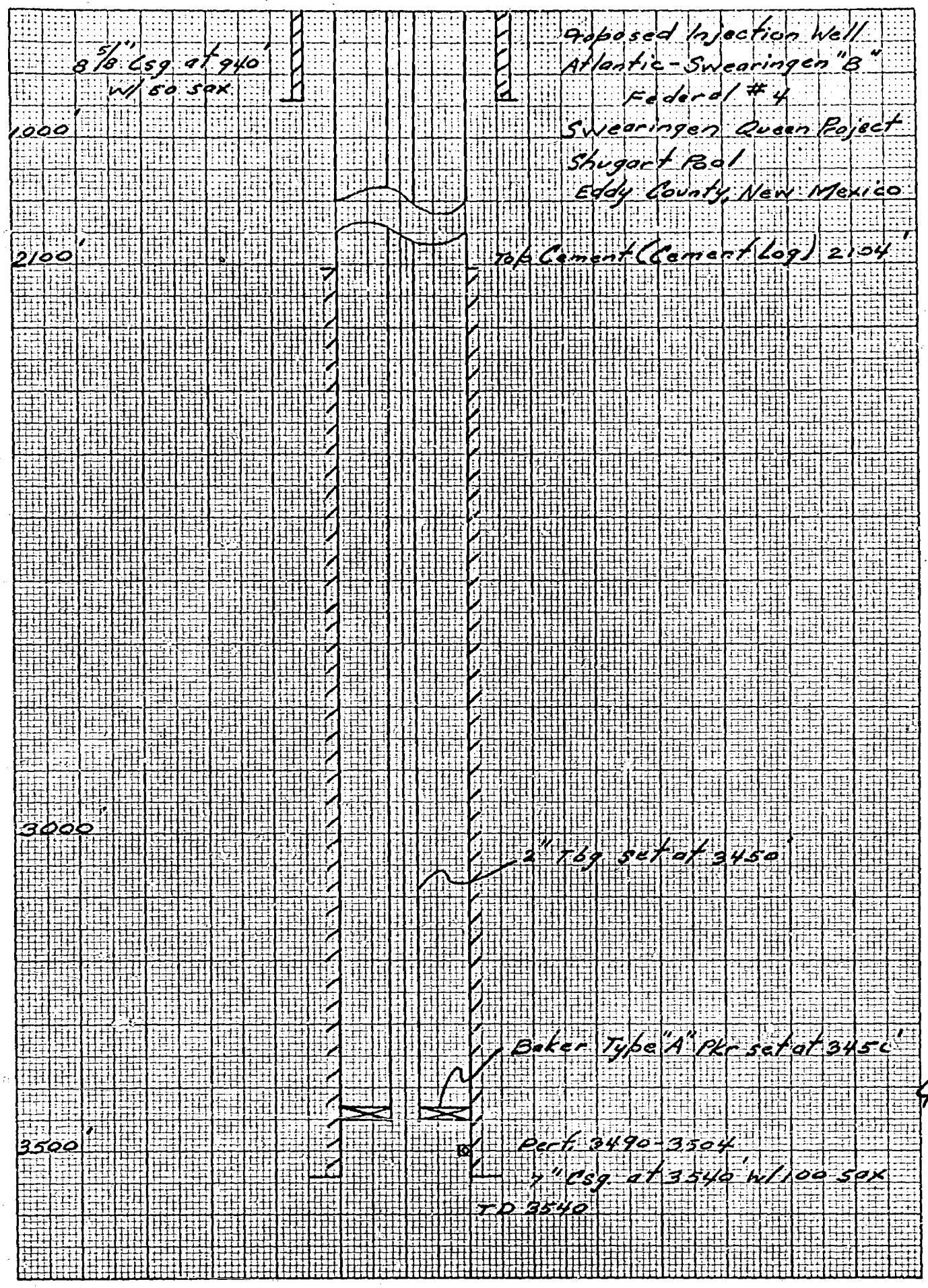
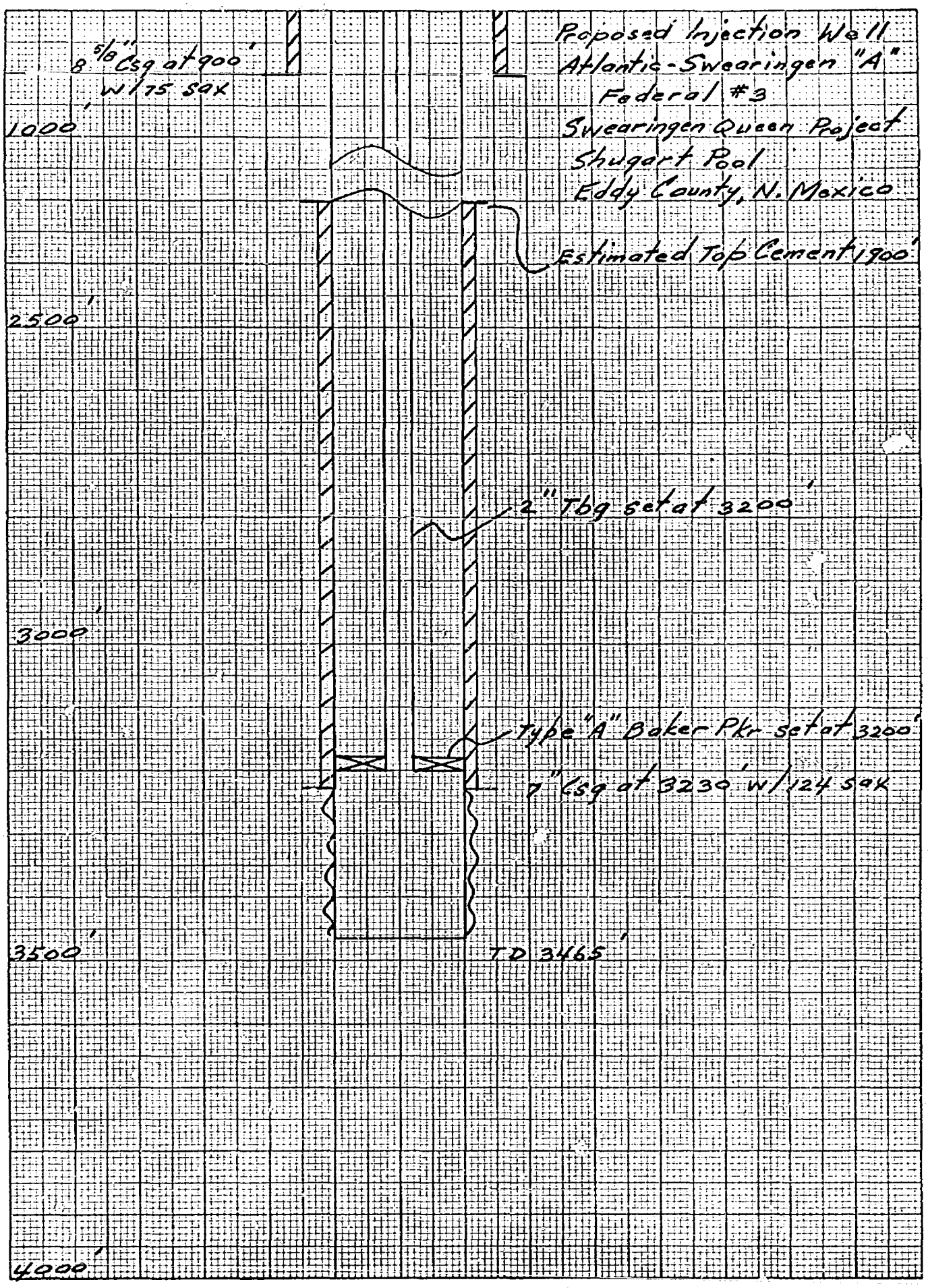
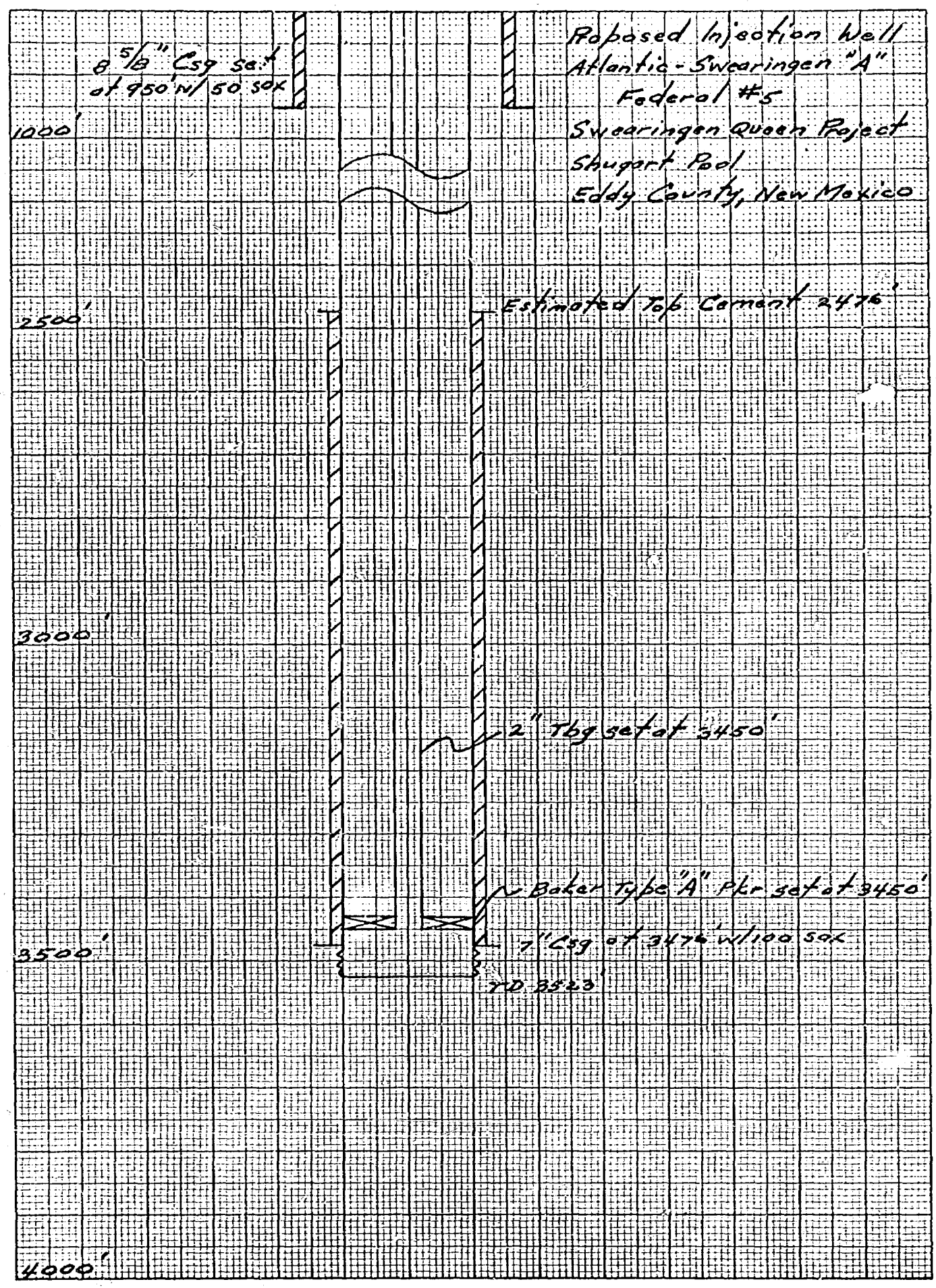


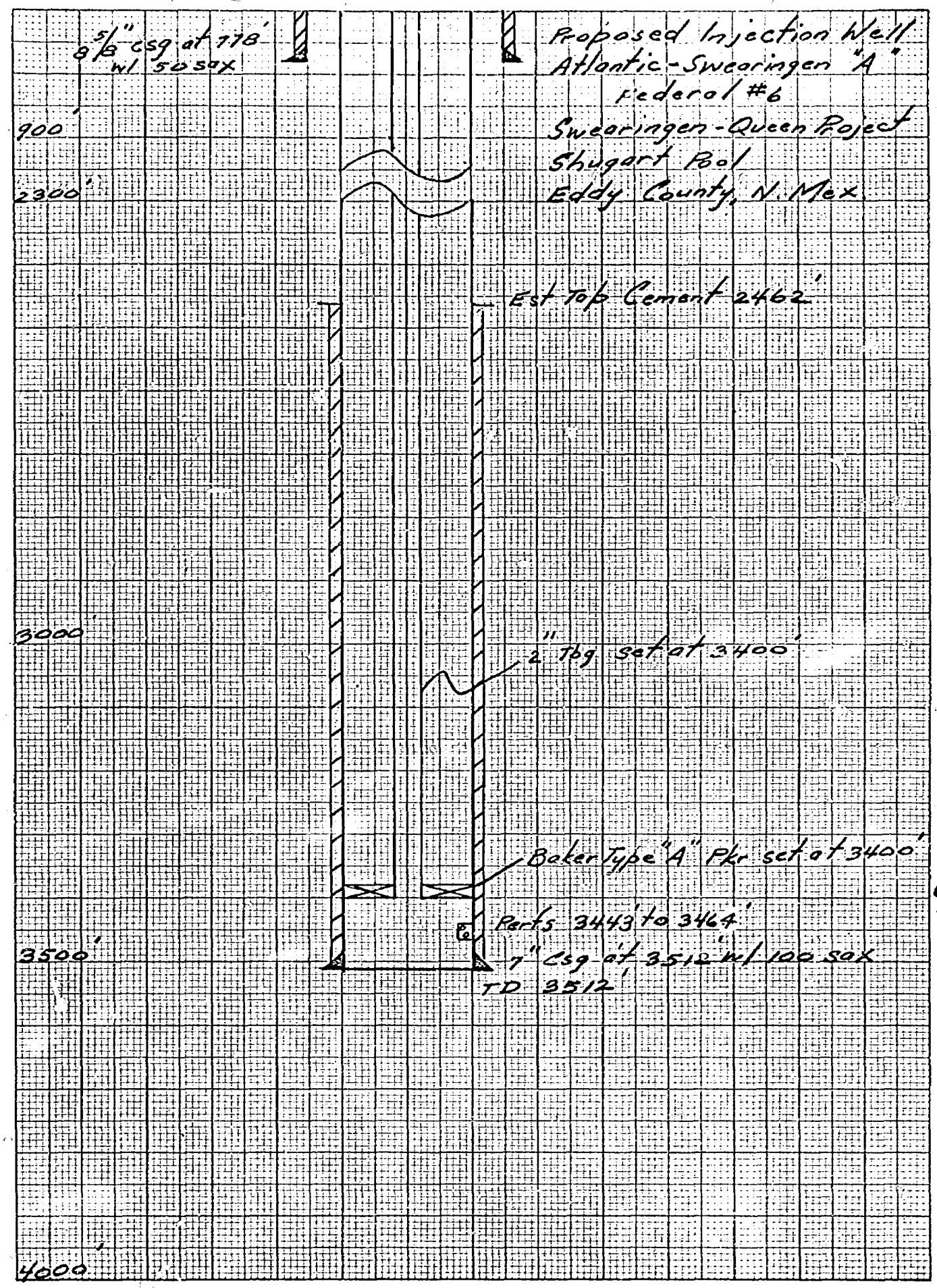
Exhibit No 6

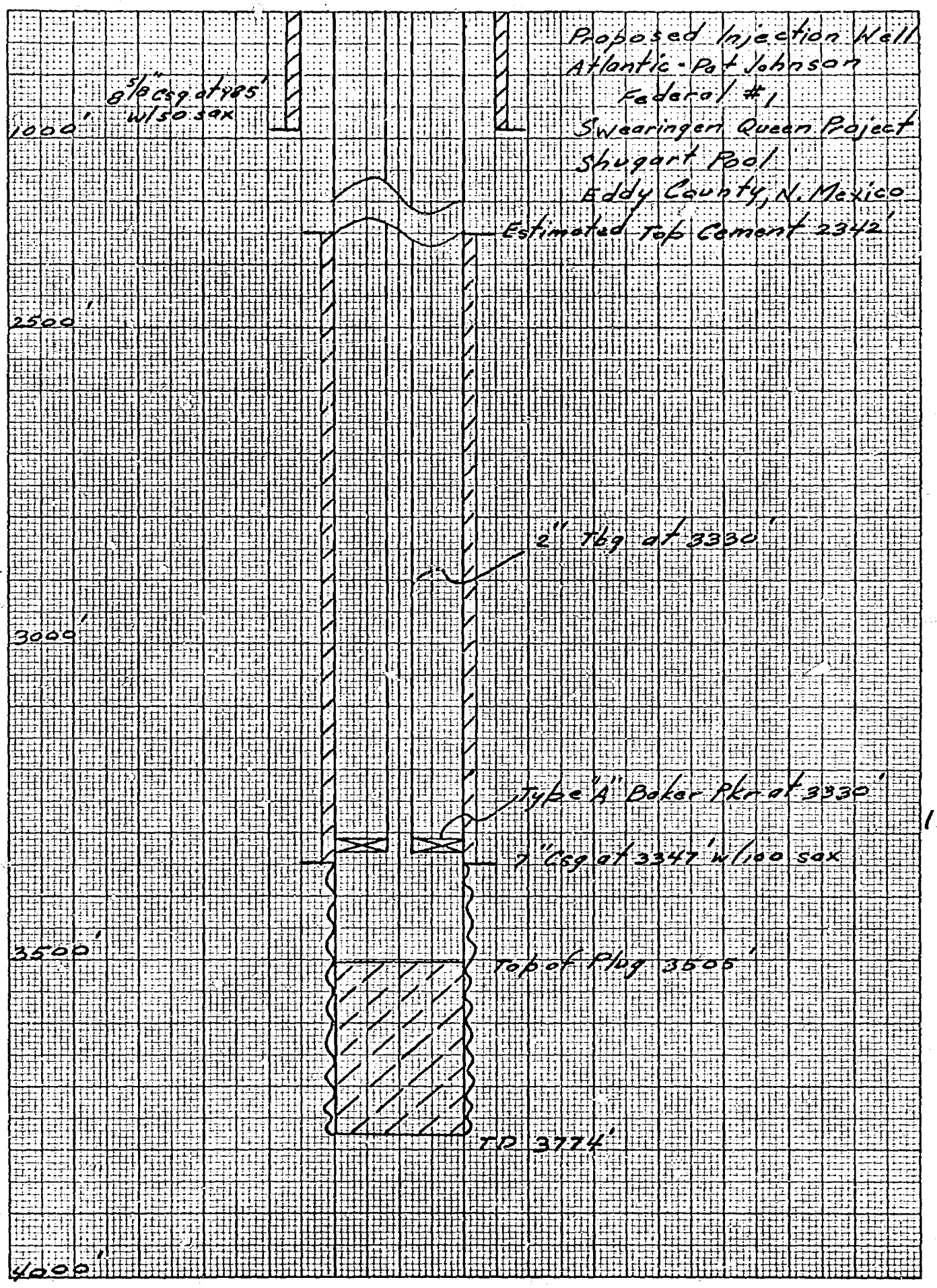


4 d









17

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Exhibit No. 7

P. O. Drawer U
Artesia, New Mexico 88210

3302

May 25, 1965

The Atlantic Refining Company
P. O. Box 1978
Roswell, New Mexico

Re: Swearingen Waterflood Project
Shugart Pool, T. 18 S., R. 31 E.
Eddy County, New Mexico

Gentlemen:

Your letter of May 17, 1965, requests approval to institute a waterflood of the Queen formation in the Shugart Pool, T. 18 S., R. 31 E., Eddy County, New Mexico. Atlantic has 100% working interest of the project area which involves 720 acres consisting of Federal leases Las Cruces 029388(b), described as the E/2 SE¼ sec. 11, Las Cruces 047633(a), described as the NE¼, SE¼NW¼, and N/2 SE¼ sec. 14, and Las Cruces 047633(b), described as the N/2 NW¼, SW¼NW¼, SW¼ and S/2 SE¼ sec. 14, T. 18 S., R. 31 E. There are no other lands involved in the project area.

You propose to operate the project on a lease basis and to flood on an 80 acre five-point pattern. There are 13 wells involved, six of which are to be converted to water injection. Only the Queen formation will be flooded, which is at an average of 3500 feet.

The proposed plan for operating your Swearingen Waterflood Project in the area outlined above is satisfactory to this office and hereby approved subject to approval by the New Mexico Oil Conservation Commission and the following:

1. This project will be operated in compliance with the New Mexico Oil Conservation Commission regulations governing waterflood operations.

2. When this project is expanded to involve other operators and interests, the correlative rights of all concerned will be protected and therefore cooperative agreements will be negotiated when injection wells are introduced along lease lines.

3. Appropriate notices and reports to drill new wells and to convert existing wells to water injection will be submitted for approval prior to commencing the work. Duplicate copies of a monthly progress report are to be submitted showing the volume of water

injected and average pressures for each injection well and monthly oil and water production for the producing wells in the project area.

Sincerely yours,

Robert L. Beekman

Robert L. Beekman
Acting District Engineer

RLB:gs

GOVERNOR
EDWIN L. MECHEM
CHAIRMAN

State of New Mexico
Oil Conservation Commission

LAND COMMISSIONER
E. S. JOHNNY WALKER
MEMBER

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

P. O. BOX 871
SANTA FE

Injection of water is to be through the six authorized water injection wells, ~~injection~~ which shall be equipped with tubing and packers, said packers being ~~at~~ within 100 feet of the uppermost perforation or in the case of open hole completions, within 100 feet of the casing shoe.

Mr. Clarence Hinkle
Hinkle, Bondurant & Christy
Attorneys at Law
Post Office Box 10
Roswell, New Mexico

_____, 19__

If approval is also contingent upon the following conditions:
quote 1 2 3 and 5 of Irby's letter.

Gentlemen:

Enclosed herewith is Commission Order No. R- 2969, entered in Case No. 3304~~2~~, approving the Atlantic Refining Company Swearingen-Shugart Water Flood Project.

~~According to~~ as to allowables, our calculations indicate that when all of the authorized injection wells have been placed on active injection, the maximum allowable which this project will be eligible to receive under the provisions of Rule 701-E-3 is 546 barrels per day, provided that any leases which have undergone variation in ownership have been consolidated or pooled or otherwise covered by some kind of agreement authorizing transfer of allowables.

Please report any error in this calculated maximum allowable immediately, both to the Santa Fe office of the Commission and the appropriate District proration office.

In order that the allowable assigned to the project may be kept current, and in order that the operator may fully benefit from the allowable provisions of Rule 701, it behooves him to promptly notify both of the aforementioned Commission offices by letter of any change in the status of wells in the project area, i.e., when active injection commences, when additional injection or producing wells are drilled, when additional wells are acquired through purchase or unitization, when wells have received a response to water injection, etc.

Your cooperation in keeping the Commission so informed as to the status of the project and the wells therein will be appreciated.

Very truly yours,

A. L. PORTER, Jr.
Secretary-Director

cc: OCC - Artesia
Mr. Frank Irby

THE ATLANTIC REFINING COMPANY

INCORPORATED — 1870

DIVISION ORDER

TO THE ATLANTIC REFINING COMPANY
P. O. BOX 2819
DALLAS, TEXAS 75221

Effective 7 A.M. October 1, 1964

Each of the undersigned hereby warrants that he is the owner of the interest set out below opposite his name in the oil produced from the THE ATLANTIC-Swearingen "A" #64855-65811 lease or unit located in the County or Parish of Eddy, State of New Mexico, described as follows:

NE 4, SE/4 NW/4, N/2 SE/4 Section 14, T-18S, R-31E, NMPM

(From Surface to 3900' below the Surface)

(LC 047633 (a))

and until further written notice you or your nominee is authorized for your own account to receive and purchase such oil in quantities acceptable to you and pay therefor as follows:

CREDIT TO	INTEREST	P. O. ADDRESS
SEE ATTACHED		

NM 3536 NM 3529

Oil received and purchased hereunder shall become your property when delivered to you or your nominee or to any public or private carrier designated by you. Such oil shall be credited to the respective owners in proportion to their interests shown above at your posted price in effect on the date of delivery for the same kind and quality of oil in the field in which said lease or unit is located, or, if sold by you from the lease or unit to another purchaser, at the price received by you for such oil on the basis of the volume computations made by such purchaser, less, in both contingencies, trucking or barging expense, if any, to the point of delivery designated by the purchaser. Oil received by you in any calendar month shall be paid for (less any tax paid or payable by you for account of the undersigned with respect to such oil or the proceeds thereof, whether or not validly imposed) during the next following month by checks mailed to the above parties at the addresses shown above, except that you shall not be required to pay monthly for interests amounting to Two Dollars ($2.00) or less, but may hold same without interest, remitting the accumulation annually.

Quantities and qualities of oil received hereunder shall be determined by the practice prevailing in the area in which the oil is produced and in accordance with rules and regulations of the governmental agency or commission having recognized jurisdiction or control of the production and handling of crude oil in such area. You or your nominee will receive only oil, which, in the exclusive opinion of you or your nominee is merchantable and may require well owners to treat or steam any unmerchantable oil at well owner's expense, before acceptance thereof.

We severally agree to notify you in writing of any change of ownership, and that any transfers of interest will be made effective on the first day of the calendar month preceding or following notice to you of said transfer.

You assume no responsibility for over payment of any limited amounts set forth in this division order, and without liability may continue payments as set forth herein unless and until furnished with written releases terminating such agreements.

Evidence of title satisfactory to you will be furnished you as of the effective date hereof and at any time thereafter when requested by you. If such evidence of title is not furnished, or in the event of a claim or controversy, which, in your opinion, concerns title to any interest hereunder, you may hold, without interest and without any liability, the amount credited to said owner until indemnity satisfactory to you has been furnished, or until such claim or controversy is settled to your satisfaction.

Each of the undersigned agrees to protect and indemnify you and/or your nominee from and against any loss or expense which you and/or your said nominee may suffer or sustain or become liable for by reason of you and/or your nominee's purchase, pursuant hereto, of said undersigned's interest in said oil and the payment therefor to said undersigned, regardless of how the same may arise and including (not to the exclusion of any causes not herein expressly set out) the following: Any judgment rendered in an action or suit affecting the title to either the real property above described or the oil produced therefrom; all reasonable costs or expenses incurred in defending in such suit or action your position or that of your nominee receiving the oil: any claim or claims or judgment arising therefrom, for any tax which may be asserted by any taxing authority against you or your nominee in connection with, incident or in any manner related to any sum or sums of money held in suspense by you or either of you during the existence of any claim or controversy.

This Division Order shall become valid and binding upon each and every owner above named as soon as signed by him, her or it, regardless of whether or not any of the other above named or any other owners have so signed.

WEP:cv

WITNESS:

John D. Pagan

Margaret L. Pagan

Bob Johnson

Printed in U.S.A.

3D-236 7/61

THE ATLANTIC-Swearingen "A" #64855-65811

CREDIT TO	INTEREST	ADDRESS
Leroy English	.000281 ORR	4820 East Main Street, Framington, N.M.
James B. Francis, Trustee	.000219 ORR	1900 Mercantile Dallas Building, Dallas 1, Texas
[illegible] Johnson	.027500 ORR	P. O. Box 577, Artesia, New Mexico
[illegible] Johnson	* .200000 ORR	
[illegible] York Life Insurance Company Acct #M. I. 1008	.014875 ORR	Attn. Treasury Dept., 51 Madison Avenue, New York, New York
Juretta L. English Olsen, Guardian of the Estate of Stanley G. English (Minor)	.000104 ORR	1801 Knudsen Avenue, Farmington, N.M.
Juretta L. English Olsen, Guardian of the Estate of J. Kathleen English (Minor)	.000104 ORR	1801 Knudsen Avenue, Farmington, N.M.
Juretta L. English Olsen, Guardian of the Estate of William B. English (Minor)	.000104 ORR	1801 Knudsen Avenue, Farmington, N.M.
Mrs. L. M. Swearingen	.027500 ORR	c/o E. W. Bray, P. O. Box 443, Trona, Calif.
Tenneco Oil Company	.002625 ORR	Division Order Supervisor P.O.Box 2511, Houston, Texas
C. E. Woodcock, Executor of the Estate of Ruby English (Dec'd)	.001375 ORR	Route 1, Box 357 Durango, Colorado
Evelyn Ann English Wood, Administratrix of the Estate of P. B. English, Jr. (Dec'd)	.000313 ORR	909 East 23rd, Farmington, New Mexico
United States Geological Survey	.125000 RI	P.O.Drawer, Roswell, New Mexico
The Atlantic Refining Company	.600000 WI	

* This overriding royalty is based upon the premise that the lease is subject to overriding royalties now totaling not to exceed 7½% of 8/8 of production. In the event it should be determined that there are any other outstanding overriding royalties, production payments, or similar burdens to said lease which are presently valid and subsisting and to which the interest acquired by Atlantic hereunder is subject, then and in such an event it is agreed that the same shall be borne and paid out of this overriding royalty interest.

BEFORE THE OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION OF THE ATLANTIC REFINING COMPANY FOR APPROVAL OF THE SWEARINGEN WATER FLOOD PROJECT (SHUGART POOL) CONSISTING OF 720 ACRES IN SECTIONS 11 AND 14, TOWNSHIP 18 SOUTH, RANGE 31 EAST, EDDY COUNTY, NEW MEXICO	)	No. 3304

Oil Conservation Commission
State of New Mexico
Santa Fe, New Mexico

Comes The Atlantic Refining Company, acting by and through the undersigned attorneys, and hereby makes application for approval of the Swearingen Water Flood Project (Shugart Pool) Eddy County, New Mexico, in accordance with Rule 701 of the rules of the New Mexico Oil Conservation Commission, and in support thereof respectfully shows:

1. The Atlantic Refining Company is the owner of all of the working interest in and to oil and gas leases embracing lands of the United States covering the following described lands situated in Eddy County, New Mexico, to-wit:

Township 18 South, Range 31 East, N.M.P.M.
Section 11 - E½SE¼
Section 14 - All
containing 720 acres, more or less

There are 13 producing wells located upon the above described lands producing from the Queen formation at a depth of approximately 3400 feet below the surface. All of said wells have reached an advanced state of depletion and are regarded as what is commonly referred to as "stripper" wells, said wells averaging less than 3 barrels of oil per day.

2. Atlantic proposes to inaugurate a secondary recovery program by the injection of water into the Queen formation by the conversion of 6 of the producing wells to injection wells. There

is attached hereto, made a part hereof, and for purposes of identification marked Exhibit "A", a plat showing the project area above described and the location of the wells situated thereon and the wells which Atlantic proposes to convert to injection wells. Said plat also shows the location of all other wells within a radius of 2 miles from said project area, together with the ownership of the leasehold interests within said 2 mile radius. That Atlantic is informed that Hudson & Hudson plans to submit for approval of the Commission an application for a water flood project adjoining applicant's project area to the west. Atlantic also proposes to enter into agreements with Hudson & Hudson and Maxwell Oil Company, the owner of the leasehold interests to the east, for the protection of the respective lease lines and to protect the correlative rights of the overriding royalty owners.

3. There are filed herewith electric logs covering the following injection wells.

Swearingen 6-A, located in NW¼SE¼ Section 14;
Swearingen 3-B, located in SW¼NW¼ Section 14;
Swearingen 4-B, located in SE¼SE¼ Section 14.

That logs of the other injection wells are not available.

4. There is attached hereto, made a part hereof, and for purposes of identification marked Exhibit "B", a diagrammatic sketch of each of the proposed injection wells showing all casing strings, including diameters and setting depths; quantities used and tops of cement; tubing strings, including diameters and setting depths; and type and location of packers to be used.

5. Atlantic proposes to start injecting fresh water into the injection wells indicated on Exhibit "A" attached hereto at the rate of approximately 2,000 barrels per day, and produced water when it occurs will be reinjected into the injection wells. The water to be used for injection purposes will be purchased from the Double Eagle Corporation of New Mexico.

6. That applicant requests that a project allowable be assigned to the Swearingen Water Flood Project in accordance with the rules of the Commission and that the order of the Commission approving the project provide for administrative approval of expansions of the project area and of any additional injection wells which later may prove to be necessary in connection therewith.

7. That a copy of this application, with all exhibits, is being mailed to the State Engineer of the State of New Mexico, Capitol Building, Santa Fe, as of the date of this application.

8. That applicant respectfully requests that a hearing on the within application be held before an examiner at the earliest possible date.

DATED this 6th day of August, 1965.

Respectfully submitted,

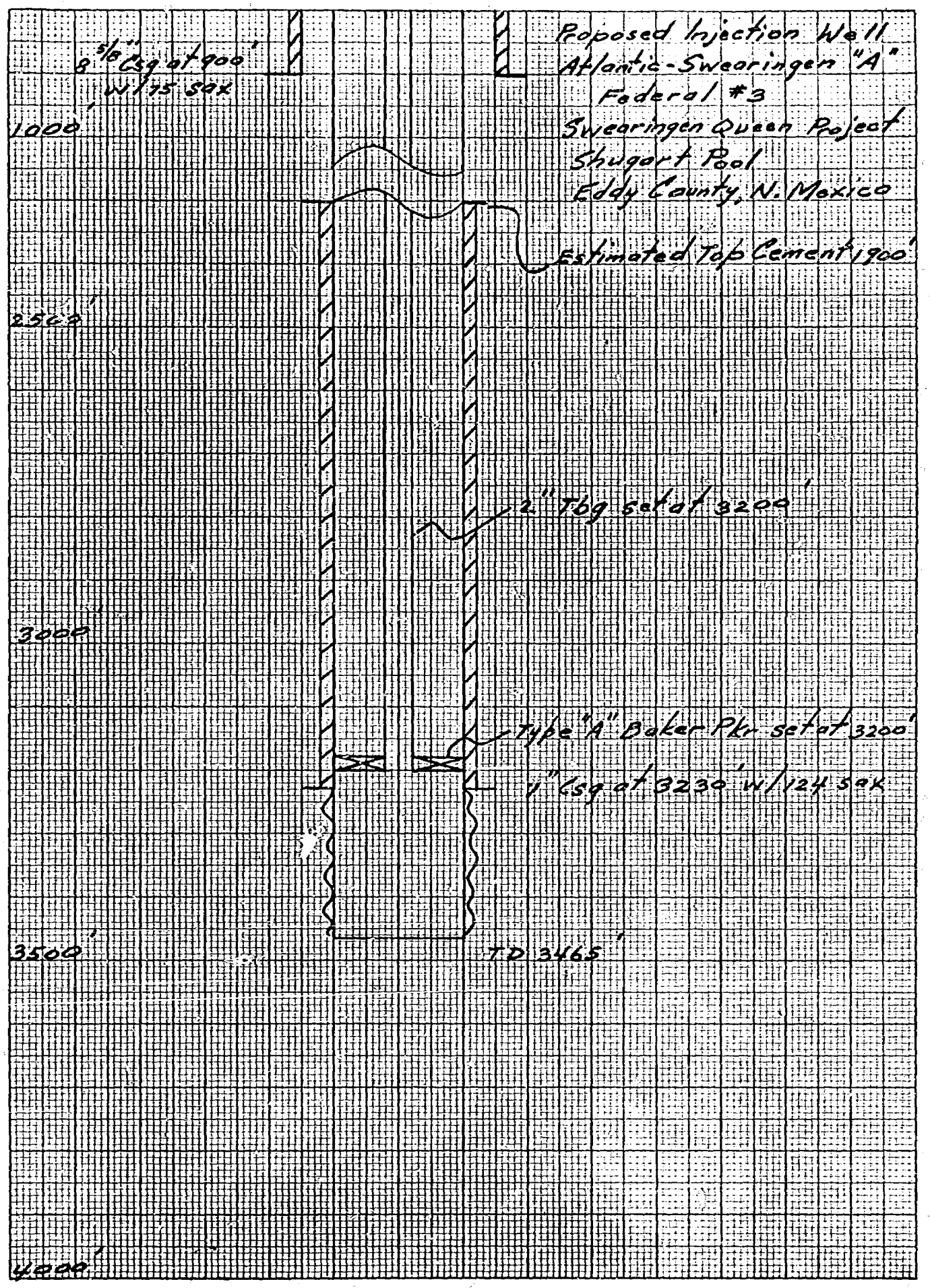
THE ATLANTIC REFINING COMPANY

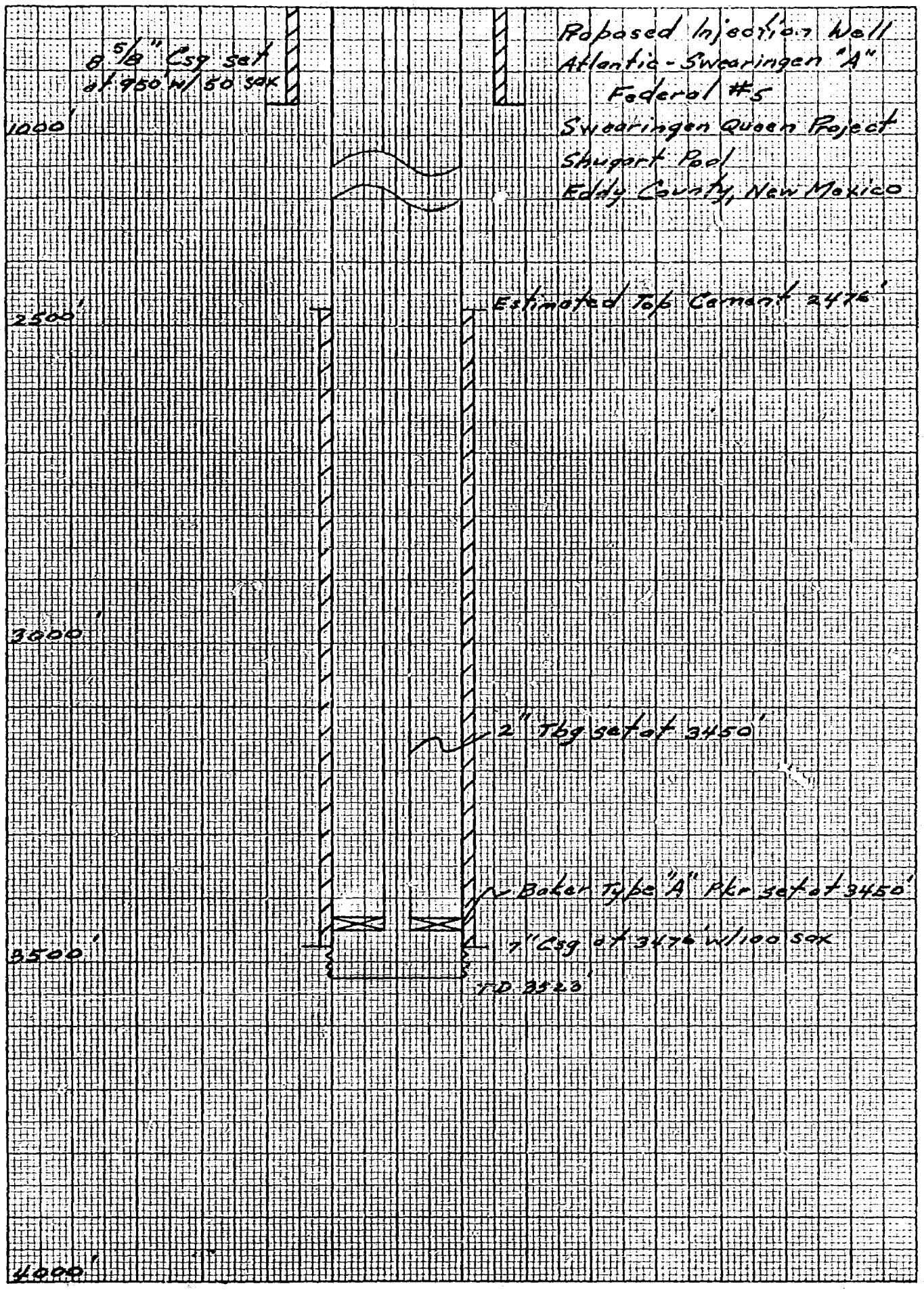
By _____
Attorney

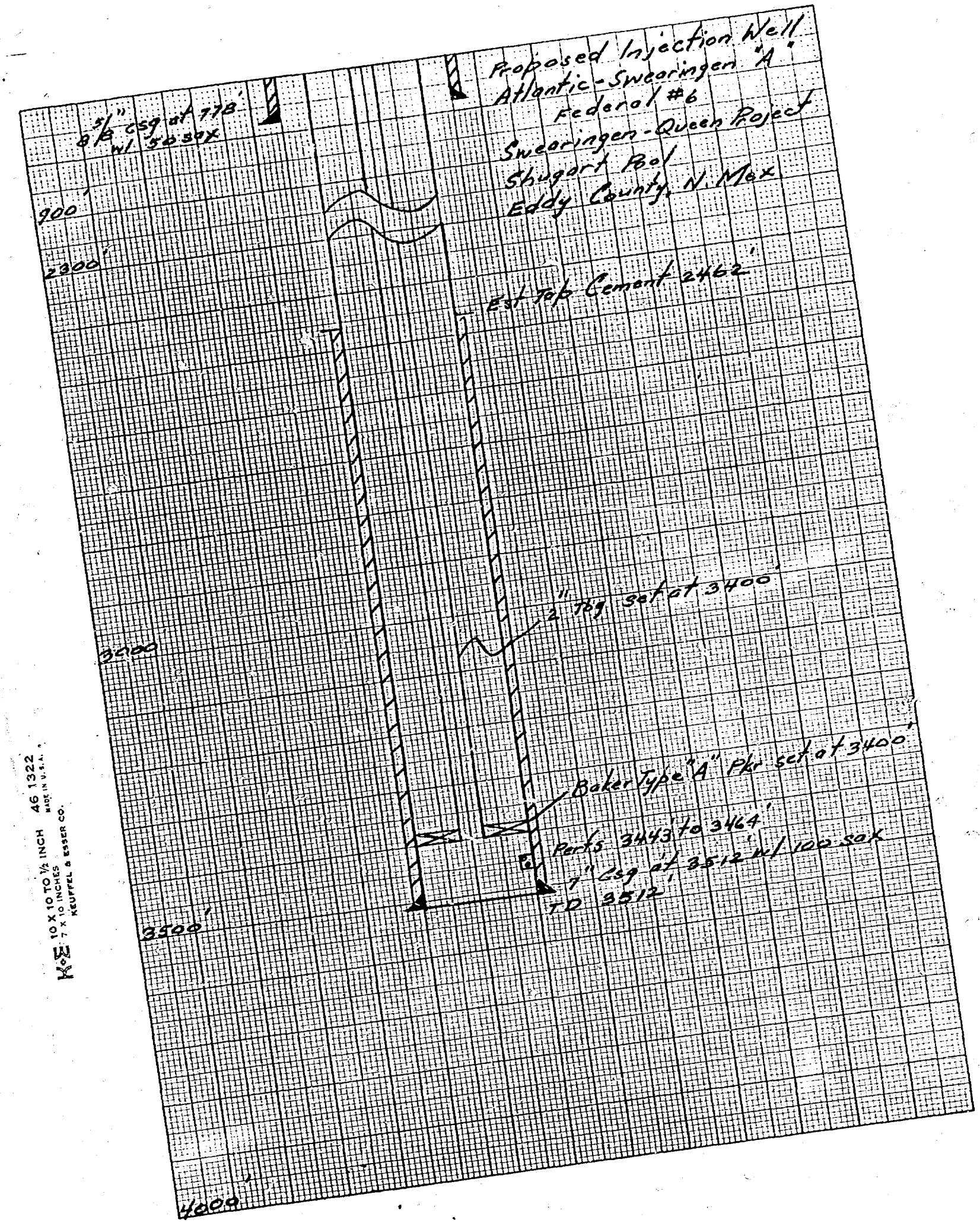
HINKLE, BONDURANT & CHRISTY

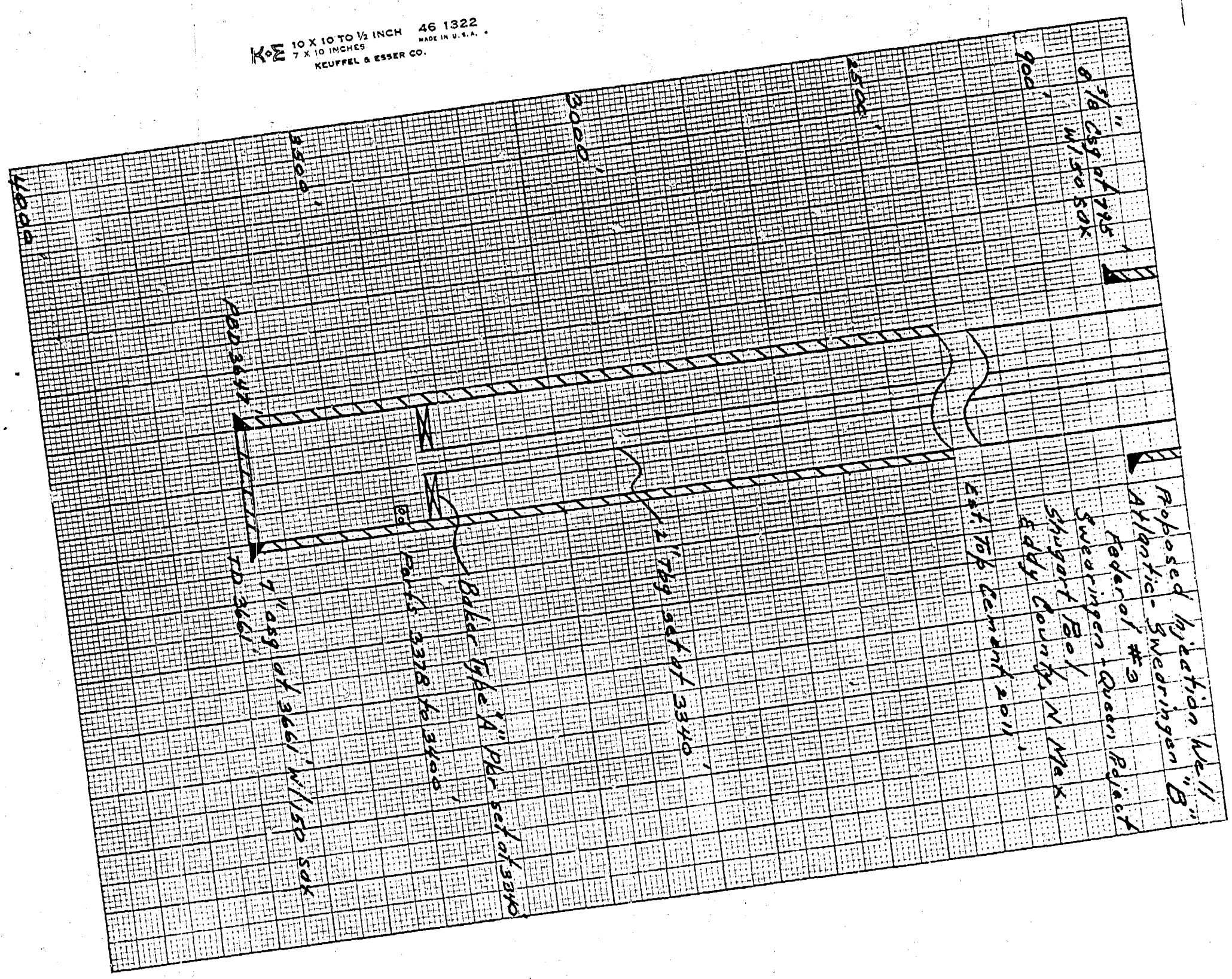
By _____
Attorneys for Applicant
P.O. Box 10
Roswell, New Mexico

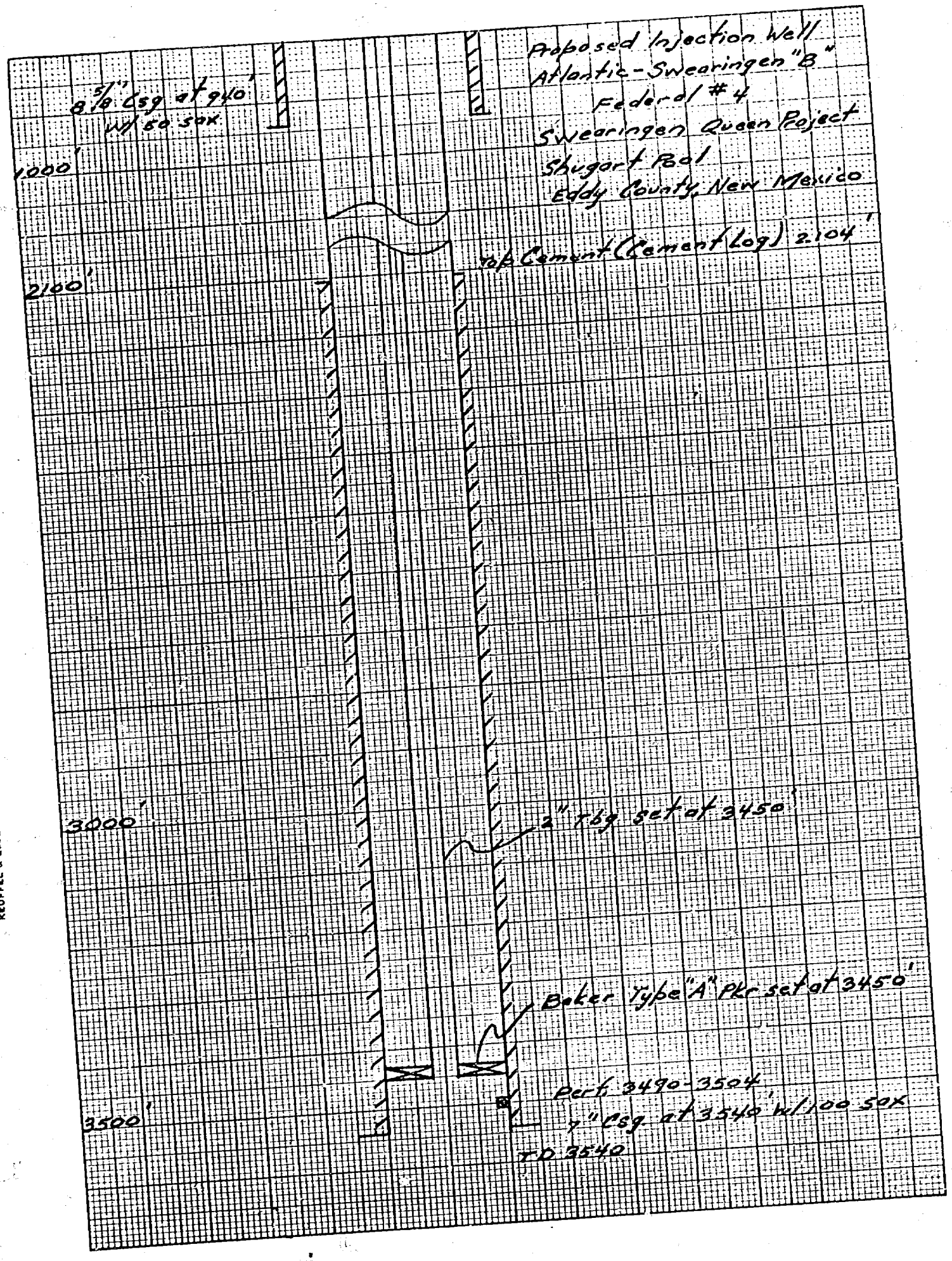
EXHIBIT "B"

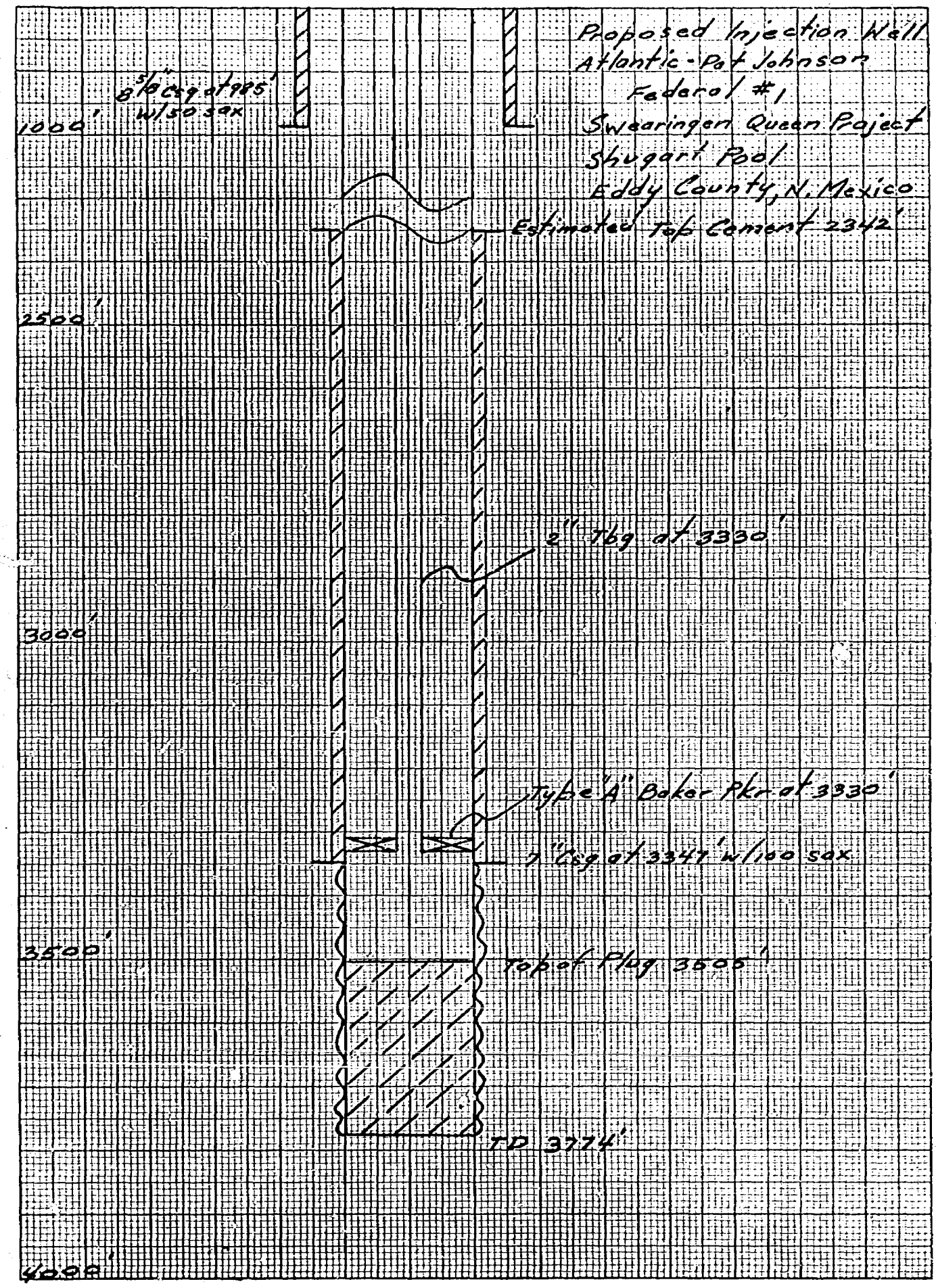












'65 AUG 30

August 27, 1965

Mr. Clarence E. Hinkle
Attorney at Law
P. O. Box 10
Roswell, New Mexico

Dear Mr. Hinkle:

Reference is made to the application which you submitted on behalf of Atlantic Refining Co. for approval of a water flood project in the Shugart Pool on an undesignated date in August, and which has been set for hearing on September 8, 1965. I would appreciate receiving answers to the following questions prior to the hearing, if possible. If it is not possible to provide these answers prior to the hearing, please request your witness to answer them at the hearing.

1. When were each of the wells completed?

2. What is the present condition of the casing?

3. Will the water produced as a result of the flooding be re-injected?

4. Will the tubing shown on the diagrammatic sketches of the wells be internally coated?

5. What is the expected life of the project?

6. What is the total amount of water required?

FEI/ma
cc-A. L. Porter, Jr.
F. H. Hennighausen

Yours truly,

S. E. Reynolds
State Engineer

By:
Frank E. Irby, Chief
Water Rights Div.

Exhibit No 8

OVERRIDING ROYALTY POOLING AGREEMENT

THIS AGREEMENT made this 17th day of July, 1965, by and between E. A. Paton and wife, Hattie Paton, and Doris Paton, a widow, hereinafter called "Patons", and Bob Johnson and wife, Sibyl Johnson, hereinafter called "Johnsons".

W I T N E S S E T H:

WHEREAS, the Patons represent that they own an overriding royalty of twenty percent (20%) of the oil, gas and other kindred substances produced, saved and marketed under United States Oil and Gas Lease LC 029388(b) from the E½SE¼ Section 11, Township 18 South, Range 31 East, N.M.P.M., Eddy County, New Mexico, to a depth of 3,900 feet below the surface (said land being hereinafter called "Paton land"), as reserved in that certain Operating Agreement dated September 25, 1964, recorded in Book 147 at page 335, from the Patons to The Atlantic Refining Company;

WHEREAS, the Johnsons represent that they own an overriding royalty of twenty percent (20%) of the oil, gas and other kindred substances produced, saved and marketed under United States Oil and Gas Leases LC 047633(a) and LC 047633(b) from all of Section 14, Township 18 South, Range 31 East, N.M.P.M., Eddy County, New Mexico, to a depth of 3,900 feet below the surface (said lands being hereinafter called "Johnson land"), as reserved in that certain Operating Agreement dated September 26, 1964, recorded in Book 147 at page 348, from the Johnsons to The Atlantic Refining Company; and,

WHEREAS, the Patons and the Johnsons desire to pool their respective overriding royalty interests as to all oil, gas and other kindred substances to be produced from the Queen Formation underlying the above described lands by means of a contemplated secondary recovery program.

NOW, THEREFORE, in consideration of the premises, the parties agree as follows:

1. This Pooling Agreement shall be applicable only to the production of oil, gas and other kindred substances recovered from the Queen Formation underlying the above described lands by means of a secondary recovery program.

2. The total production attributable to said overriding royalty interests shall be apportioned between the Patons and the Johnsons in the following manner: each party shall be entitled to that portion of said production as the number of wells located on said party's land bears to the total number of wells on the Paton and Johnson lands. In other words, if one well is located on the Paton land and twelve wells are located on the Johnson land, the Patons shall be entitled to 1/13 and the Johnsons shall be entitled to 12/13

of the production attributable to said overriding royalty interests. Said ratios and apportionment of production shall be subject to change as additional wells are drilled or existing wells are plugged and abandoned. A well within the meaning hereof shall be either a production or injection well in the Queen Formation.

3. In the event the overriding royalty interest of either party is less than as represented above, the allocation of production between the parties shall be adjusted accordingly.

4. The overriding royalty production allocated to the Patons shall be owned one-half by E. A. Paton and Hattie Paton, his wife, and one-half by Doris Paton.

5. The Patons and the Johnsons do hereby grant and convey to each other such interest and title as may be necessary to constitute the above apportionment of their overriding royalty interests.

This Agreement is binding upon the parties hereto, their heirs, personal representatives and assigns, and shall be effective as of the date of first production from the Queen Formation by means of a secondary recovery program.

E. A. Paton
E. A. PATON

Hattie Paton
HATTIE PATON

Doris Paton
DORIS PATON

Bob Johnson
BOB JOHNSON

Sibyl Johnson
SIBYL JOHNSON

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

The foregoing instrument was acknowledged before me this 21st day of July, 1965, by E. A. Paton and Hattie Paton, his wife.

Leta Elliott
Notary Public

My Commission Expires:
Oct. 8, 1966

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

The foregoing instrument was acknowledged before me this 21st day of July, 1965, by Doris Paton, a widow.

Leta Elliott
Notary Public

My Commission Expires:
Oct. 8, 1966

STATE OF TEXAS)
) ss.
COUNTY OF SCURRY)

The foregoing instrument was acknowledged before me this 17th day of July, 1965 by Bob Johnson and Sibyl Johnson, his wife.

Virginia M. Lane
Notary Public

My Commission Expires:
June 1, 1967

No objection provided:

(1) there is a clear showing that the surface casing is set into the salado

(2) Current method of measuring corrosion be used from inception of injection and reports furnished to OCC and SEO every three months or to record the of examination of coupons.

(3) Inhibited fluid in annulus

(4) Notify OCC & SEO when re-injection of produced water commences

(5) Report on coupons every 30 days after reinjection of produced water starts

(6) Limit on disposal into unlined pit — ½ bbl/well

(7) Any change in injection well casing, tubing or cement to be approved by OCC & SEO prior to use

DRAFT
JMD/esr
9-16-65

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. 3302

Order No. R-2969

APPLICATION OF THE ATLANTIC REFINING COMPANY
FOR A WATERFLOOD PROJECT, EDDY COUNTY,
NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on September 8, 1965, at Santa Fe, New Mexico, before Examiner Elvis A. Utz.

NOW, on this _____ day of September, 1965, the Commission, a quorum being present, 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 Commission has jurisdiction of this cause and the subject matter thereof.

(2) That the applicant, The Atlantic Refining Company, seeks permission to institute a waterflood project in the _____ ~~in the Unit Area~~ Shugart Pool by the injection of water into the Queen formation through six injection wells in Sections 11 and 14, Township 18 ~~North~~ South, Range 31 ~~West~~ East, NMPM, Eddy County, New Mexico.

(3) That the applicant also seeks the establishment of an administrative procedure whereby the Secretary-Director of the Commission is authorized to approve expansion of the waterflood project and additional water injection wells. (under)

recovery of otherwise unrecoverable oil, thereby preventing waste.

(6) That the subject application should be approved and the project should be governed by the provisions of Rules 701, 702, and 703 of the Commission Rules and Regulations.

IT IS THEREFORE ORDERED:

(1) That the applicant, The Atlantic Refining Company, is hereby authorized to institute a waterflood project in the ~~in the Unit Area~~ Shugart Pool by the injection of water into the Queen formation through the following-described wells in Township 18 ~~North~~ South, Range 31 ~~West~~ East, NMPM, Eddy County, New Mexico:

Atlantic-Johnson Federal Well No. 1, Unit P, Section 11

Atlantic-Swearingen "A" Well No. 3, Unit B, Section 14

Atlantic-Swearingen "A" Well No. 5, Unit H, Section 14

Atlantic-Swearingen "A" Well No. 6, Unit J, Section 14

Atlantic-Swearingen "B" Well No. 3, Unit E, Section 14

Atlantic-Swearingen "B" Well No. 4, Unit P, Section 14

(2) That the subject waterflood project shall be governed by the provisions of Rules 701, 702, and 703 of the Commission Rules and Regulations; provided, however, that the Secretary-Director of the Commission may approve expansion of the waterflood project and such other additional injection wells at such locations as may be necessary to complete an efficient water injection pattern. (under)

tions.

(4) 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.

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1710
Hobbs, New Mexico 88240
Telephone 505 393 7163

MAR 29 1976
OIL CONSERVATION COMM.
Santa Fe

Case 3302

March 26, 1976

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, NM 87501

Attention: Mr. J. Ramey, Jr.
Secretary-Director

Re: Produced water samples required by Commission Order R-2969 entered in Case No. 3302, concerning Atlantic Richfield Company - Swearingen - Shugart Waterflood Project

Gentlemen:

As per the above order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen Shugart waterflood project.

Yours very truly,

L. C. Hudry

LCH/rd

Attachment

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, NM 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, NM 87501

PRODUCTION PROFITS, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

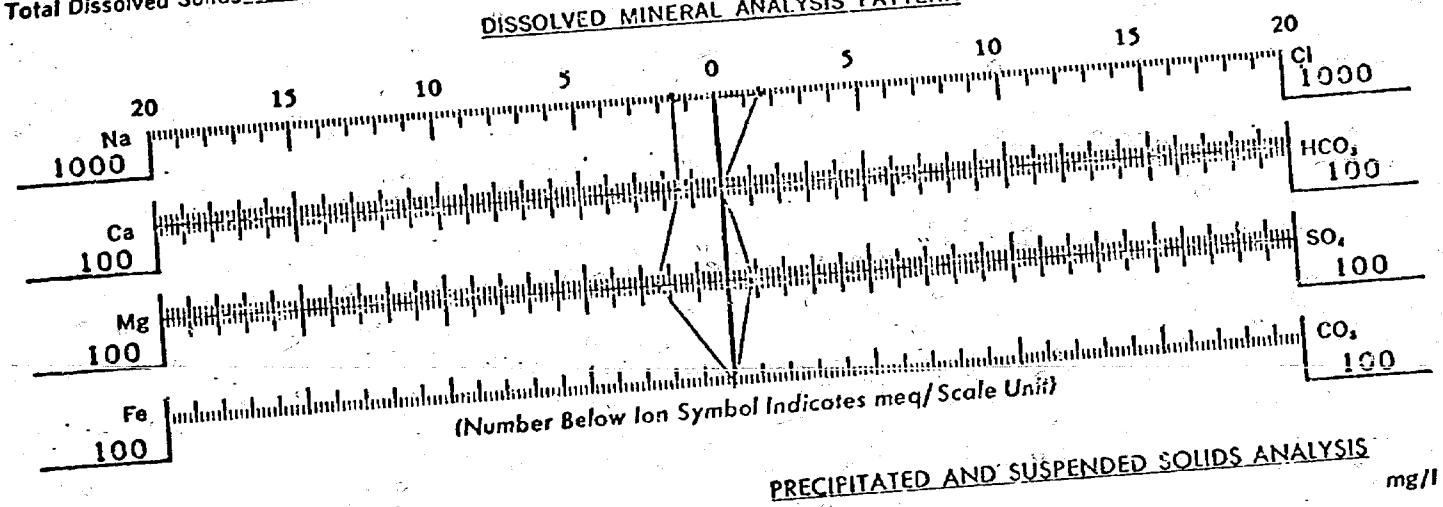
Client: Atlantic Richfield Company
County: Eddy
State: New Mexico
Field: Shugart
Lease: Swearingen Waterflood
Well No.
Formation
Depth
Perf.
Source of Sample: Produced Water
Date Collected: Letter dated 2-23-7[illegible] by: James Ceglum

OIL CONSERVATION COMM. Santa Fe

REPORT OF WATER ANALYSIS

Lab. Number: A-6369
Total Dissolved Solids: 105696
Specific Gravity: 1.0743
Resistivity (Ohmmeters at 68° F.): .022
pH: 6.5
Hydrogen Sulfide: ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	105696	
Sodium (Calc.)	33400	1450.5
Iron (Dissolved)	0	0.
Barium	–	–
Calcium	2890	144.2
Magnesium	2930	240.8
Chloride	61600	1737.1
Bicarbonate	676	11.1
Carbonate	0	0.
Sulfate	4200	87.4

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

		mg/l
Total Undissolved Solids		
Oil (Solvent Soluble)		
Acid Solubles		
Iron	as	
Calcium	as	
Magnesium	as	
Sulfate	as	
Organic (Ignition Loss)		
Acid Insolubles		
Sand & Clay	(Quan.)	
Barium Sulfate	(Qual.)	

TOTAL IRON: 14

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: .03
Scaling Tendency: POS.

Calcium Sulfate Stability at 95°F
Concentration: 87.36 meq/l.
Calc. Solubility: 81.72 meq/l.
Percent Saturation: 100.00

Barium Sulfate Stability at 95° F
Concentration: _____ meq/l.
Calc. Solubility: _____ meq/l.
Percent Saturation: _____

REMARKS

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1710
Hobbs, New Mexico 88240
Telephone 505 393 7163

January 26, 1976

New Mexico Oil Conservation Commission
P.O. Box 2088
Santa Fe, New Mexico 87501

Attention: Mr. J. Ramey, Jr.
Secretary-Director

Re: Produced water samples required by Commission Order R-2969 entered in Case No. 3302, concerning Atlantic Richfield Company - Swearingen - Shugart Waterflood Project

Gentlemen:

As per the above order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen Shugart waterflood project.

Yours very truly,

L. C. Hudry

L. C. Hudry

LCH:mt

Attachment

cc: New Mexico Oil Conservation Commission
P.O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

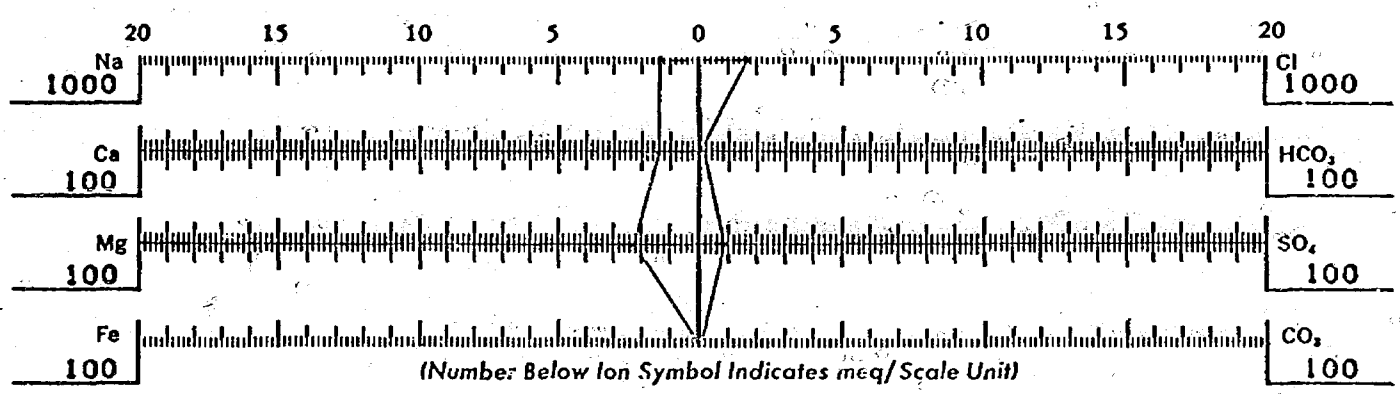
PRODUCTION PROFITS, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

Client Atlantic Richfield Company
County Eddy State New Mexico
Field Shugart Lease Swearingen Water Flood Well No.
Formation Depth Perf.
Source of Sample Produced Water Sample
Date Collected by

REPORT OF WATER ANALYSIS

Lab. Number A-6300 Specific Gravity 1.0734 pH 6.4
Total Dissolved Solids 103418 Resistivity (Ohmmeters at 68° F.) .090 Hydrogen Sulfide ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	103418	
Sodium (Calc.)	32600	1419.1
Iron (Dissolved)	0	0.
Barium	-	-
Calcium	2880	143.7
Magnesium	2820	231.8
Chloride	60000	1692.0
Bicarbonate	878	14.4
Carbonate	0	0.
Sulfate	4240	88.2

TOTAL IRON 16

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

		mg/l
Total Undissolved Solids		
Oil (Solvent Soluble)		
Acid Solubles		
Iron	as	
Calcium	as	
Magnesium	as	
Sulfate	as	
Organic (Ignition Loss)		
Acid Insolubles		
Sand & Clay		
Barium Sulfate	(Quan.)	
	(Qual.)	

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F .03 Scaling Tendency POS.
Calcium Sulfate Stability at 95°F
Concentration 88.19 meq/l. Calc. Solubility 81.73 meq/l. Percent Saturation 100.00
Barium Sulfate Stability at 95° F
Concentration meq/l. Calc. Solubility meq/l. Percent Saturation

REMARKS

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1710
Hobbs, New Mexico 88240
Telephone 505 393 7163

File

September 26, 1975

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Produced water samples required by Commission Order R-2969 entered in Case No. 3302, concerning Atlantic Richfield Company - Swearingen - Shugart Waterflood Project

Gentlemen:

As per the above order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen Shugart waterflood project.

Yours very truly,

L. C. Hudry

L. C. Hudry

LCH:rm

Attachment

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

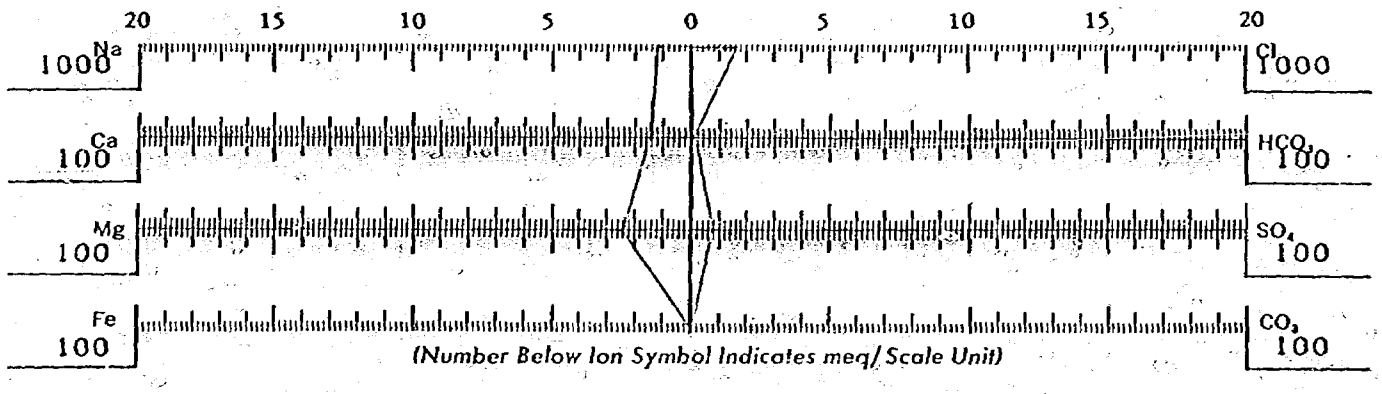
PRODUCTION PROFITS, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

Client: Atlantic Richfield Company
County: Eddy State: New Mexico
Field: Shugart Lease: Swearingen Well No.
Formation: Depth: Perf.
Source of Sample: Produced Water
Date Collected: by

REPORT OF WATER ANALYSIS

Lab. Number: A-6236 Specific Gravity: 1.0688 pH: 7.1
Total Dissolved Solids: 99110 Resistivity (Ohmmeters at 68° F.): .103 Hydrogen Sulfide: Present

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	99110	
Sodium (Calc.)	30700	1335.0
Iron (Dissolved)	0	0.
Barium	-	-
Calcium	2910	145.2
Magnesium	2930	240.8
Chloride	57300	1615.9
Bicarbonate	1020	16.7
Carbonate	0	0.
Sulfate	4250	88.4

TOTAL IRON: 1800

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

	mg/l
Total Undissolved Solids	
Oil (Solvent Soluble)	
Acid Solubles	
Iron as	
Calcium as	
Magnesium as	
Sulfate as	
Organic (Ignition Loss)	
Acid Insolubles	
Sand & Clay	
Barium Sulfate (Quan.)	
(Qual.)	

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: .77 Scaling Tendency: POS.
Calcium Sulfate Stability at 95°F
Concentration: 88.40 meq/l. Calc. Solubility: 80.47 meq/l. Percent Saturation: 100.00
Barium Sulfate Stability at 95° F
Concentration: meq/l. Calc. Solubility: meq/l. Percent Saturation:

REMARKS

AtlanticRichfieldCompany

North American Producing Division
New Mexico-Arizona District
Post Office Box 1710
Hobbs, New Mexico 88240
Telephone 505 393 7163

September 27, 1974

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Produced water samples required by Commission Order R-2969 entered in Case No. 3302, concerning Atlantic Richfield Company - Swearingen - Shugart Waterflood Project

Gentlemen:

As per the above order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen Shugart waterflood project.

Yours very truly,

L. C. Hudry

LCH:rm

Attachment

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

PRODUCTION PROFITS
DIVISION OF SONICS INTERNATIONAL, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

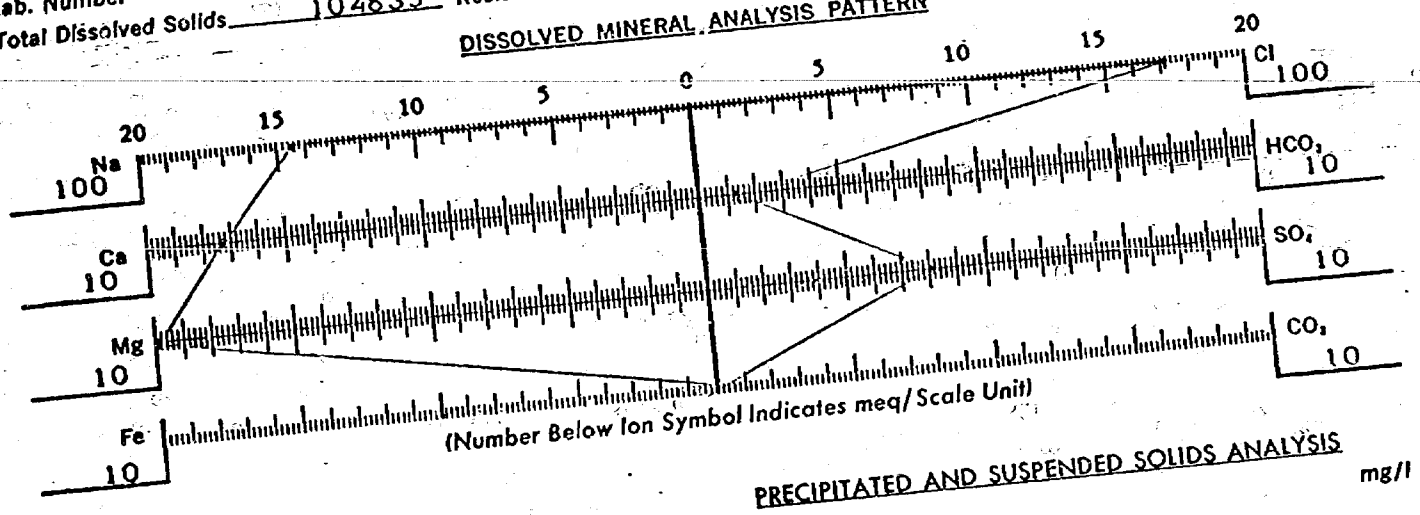
RECEIVED
SEP 30 1974
Oil Conservation Commission
Santa Fe

Client: Atlantic Richfield Company
County: Eddy
State: New Mexico
Lease: Swearingen
Well No.:
Field: Shugart
Depth:
Perf.:
Formation:
Source of Sample: Produced Water
Date Collected: 8-12-74
by:

REPORT OF WATER ANALYSIS

Lab. Number: A-5638
Total Dissolved Solids: 104835
Specific Gravity: 1.0738
Resistivity (Ohmmeters at 68° F.): .088
pH: 7.1
Hydrogen Sulfide: ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	104835	
Sodium (Calc.)	33200	1442.3
Iron (Dissolved)	0	0.
Barium	-	-
Calcium	3470	173.1
Magnesium	2430	199.7
Chloride	61000	1720.2
Bicarbonate	805	13.2
Carbonate	0	0.
Sulfate	3930	81.7

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

		mg/l
Total Undissolved Solids		
Oil (Solvent Soluble)		
Acid Solubles		
Iron	as	
Calcium	as	
Magnesium	as	
Sulfate	as	
Organic (Ignition Loss)		
Acid Insolubles		
Sand & Clay	(Quan.)	
Barium Sulfate	(Qual.)	

TOTAL IRON: 2

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: .78
Calcium Sulfate Stability at 95° F
Concentration: 81.74 meq/l. Calc. Solubility: 69.81 meq/l.
Barium Sulfate Stability at 95° F
Concentration: meq/l. Calc. Solubility: meq/l.

Scaling Tendency: POS.
Percent Saturation: 100.00
Percent Saturation:

REMARKS

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1710
Hobbs, New Mexico 88240
Telephone 505 393 7163

June 12, 1974

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Produced water samples required by Commission Order R-2969 entered in Case No. 3302, concerning Atlantic Richfield Company - Swearingen - Shugart Waterflood Project

Gentlemen:

As per the above order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen Shugart waterflood project.

Yours very truly,

L. C. Hudry

LCH:rm

Attachment

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

North American Producing Division

June 12, 1974

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Produced water samples required by Commission Order R-2969 entered in Case No. 3302, concerning Atlantic Richfield Company - Swearingen - Shugart Waterflood Project

Gentlemen:

As per the above order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen Shugart waterflood project.

Yours very truly,

L. C. Hudry

L. C. Hudry

LCH:rm

Attachment

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1710
Hobbs, New Mexico 88240
Telephone 505 393 7161

June 12, 1974

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Corrosion Coupon Results as per Commission Order R-2969 entered in Case No. 3302, concerning Atlantic Richfield Company Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above order, we submit the results of laboratory analyses of the latest exposed corrosion coupons.

Yours very truly,

L. C. Hudry

L. C. Hudry

LCH:rm

Attachment

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

CORROSION COUPON EXPOSURE RESULTS

LEASE OR UNIT: 6493301 SWEARINGEN WATERFLOOD

WELL OR PLANT: S-3 COUPON LOCATION: INJECTION WELLHEAD

89012345678

TYPE SYSTEM: WATER INJECTION POSITION: VERTICAL, VERTICAL FLOW TYPE: BAR

COUPON #	EXPOSURE DATES	DAYS	DAILY PRODUCTION	WEIGHT LOSS:GMS	OVERALL CORROSION RATE:MPY	BODY PITS DPTH IN	BODY PITS RATE MPY	END PITS DPTH MILS	END PITS RATE MPY	REMARKS	
C-536 C-537	7-1[illegible]-72 11-22-72	134	0.080 610.[illegible]BW 0.[illegible]MCF	0.0441 0.0637	0.2 0.3	.008	21	.0	0	CPN BDY ATTACK: SPOTTY ETCH HLDR BLK ATTACK: NONE	.ISOLATED PITS
D-58[illegible] D-581	11-22-72 3-26-73	126	0.080 400.[illegible]BW 0.3MCF	0.1144 0.1080	0.5 0.4	.0[illegible]5	14	.0	0	CPN BDY ATTACK: SPOTTY ETCH HLDR BLK ATTACK: ATTACK	.AREAS OF PITS
D-567 D-568	3-26-73 9-24-73	181	.080 4[illegible].[illegible]BW 0.0MCF	0.0262 0.0245	0.1 0.1	.0[illegible]7	14	.0[illegible]	16	CPN BDY ATTACK: SPOTTY ETCH HLDR BLK ATTACK: NONE	.AREAS OF PITS
E-984 E-985	9-24-73 3-25-74	184	0.080 412.[illegible]BW 0.7MCF	0.0083 0.0145	0.1 0.1	.0	0	.0	0	CPN BDY ATTACK: NONE HLDR BLK ATTACK: NONE	.NO PITS.

CORROSION COUPON EXPOSURE RESULTS

LEASE OR UNIT: 6493301 SWEARINGEN WATERFLOOD

WELL OR PLANT: E.HEADR COUPON LOCATION: INJECTION HEADER SUPPLY WATER

89012345678

TYPE SYSTEM: WATER INJECTION POSITION: HORIZONTAL, HORIZONTAL FLOW TYPE: BAR

COUPON #	EXPOSURE DATES	DAYS	DAILY PRODUCTION	WEIGHT LOSS:GMS	OVERALL CORROSION RATE:MPY	BODY PITS DPTH IN	BODY PITS RATE MPY	END PITS DPTH MILS	END PITS RATE MPY	REMARKS	
A-889	9-30-70	96	0.050	1.0502	5.0	.0	0	.0	0	CPN BDY ATTACK: SPOTTY ETCH	
A-890	1- 4-71		684.08W	0.7226	3.4					HLDR BLK ATTACK: ATTACK	.NO PITS.
			0.0MCF								95
B-166	1- 4-71	95	0.050	0.8978	4.2	.004	15	.0	0	CPN BDY ATTACK: HEAVY ETCH	
B-167	4- 8-71		0.08W	0.9919	4.6					HLDR BLK ATTACK: NONE	.ISOLATED PITS
			0.0MCF								95
B-566	4- 8-71	127	0.080	2.0405	7.2	.0	0	.004	11	CPN BDY ATTACK: OVERALL ATTACK	
B-567	8-13-71		0.08W	1.7611	6.3					HLDR BLK ATTACK: NONE	.PITTING
			0.0MCF								90
B-672	8-13-71	267	0.080	7.9121	17.0	.0	0	.0	0	CPN BDY ATTACK: SEVERE OVERALL ATTACK	
B-673	3- 7-72		0.08W	8.1381	17.4					HLDR BLK ATTACK: NONE	.NO PITS.
			0.0MCF							SEVERE THINNING	561
C-385	3- 7-72	125	0.080	0.6268	2.3	.003	8	.001	2	CPN BDY ATTACK: SPOTTY ETCH	
C-386	7-10-72		542.08W	1.4900	5.3					HLDR BLK ATTACK: ATTACK	.ISOLATED PITS
			0.0MCF								904
C-538	7-10-72	134	0.050	0.2817	0.7	.001	2	.004	10	CPN BDY ATTACK: SPOTTY ETCH	
C-539	11-22-72		750.50W	0.1483	0.5					HLDR BLK ATTACK: ATTACK	.AREAS OF PITS
			0.0MCF								963

CORROSION COUPON EXPOSURE RESULTS

LEASE OR UNIT: 6493361 SWEARINGEN WATERFLOOD

WELL OR PLANT: E.HEADR COUPON LOCATION: INJECTION HEADER ALT. PRODUCE-SUPPLY

89012345678

TYPE SYSTEM: WATER INJECTION POSITION: HORIZONTAL, HORIZONTAL FLOW TYPE: BAR

COUPON #	EXPOSURE DATES	DAYS	DAILY PRODUCTION	WEIGHT LOSS:GMS	OVERALL CORROSION RATE:MPY	BODY PITS DPTH IN	BODY PITS RATE MPY	UNDR PITS DPTH MILS	UNDR PITS RATE MPY	REMARKS	
D-019	11-22-72	126	0.080	0.0581	0.3	.0	0	.0	0	CPN BDY ATTACK: SPOTTY ETCH	
D-020	3-26-73		600.08W	0.0494	0.2					HLDR BLK ATTACK: NONE	.NO PITS.
			0.0MCF								
D-560	3-26-73	181	0.080	5.9227	14.6	.022	44	.010	20	CPN BDY ATTACK: SEVERE OVERALL ATTACK	
D-561	9-24-73		600.08W	6.2520	15.4					HLDR BLK ATTACK: SEVERE ATTACK	.SKOAD PITS
			0.0MCF							EAST PUMP	
E-988	9-24-73	184	0.080	2.8691	7.0	.0	0	.0	0	CPN BDY ATTACK: OVERALL ATTACK	
E-989	3-25-74		702.08W	2.5868	6.3					HLDR BLK ATTACK: ATTACK	.NO PITS.
			0.0MCF								

CORROSION COUPON EXPOSURE RESULTS

LEASE OR UNIT: 649330L SWEARINGEN WATERFLOOD

WELL OR PLANT: W.HEADR COUPON LOCATION: INJECTION HEADER SUPPLY WATER

89012345678

TYPE SYSTEM: WATER INJECTION POSITION: HORIZONTAL, VERTICAL FLOW TYPE: BAR

COUPON #	EXPOSURE DATES	DAYS	DAILY PRODUCTION	WEIGHT LOSS:GMS	OVERALL CORROSION RATE:MPY	BODY PITS DPTH IN	BODY PITS RATE MPY	END PITS DPTH MILS	END PITS RATE MPY	REMARKS	
D-017	11-22-72	126	0.350	2.6726	9.4	.004	11	.0		0 CPN BDY ATTACK: OVERALL ATTACK	
D-018	3-26-73		600.0BW	1.6662	5.9					HLDR BLK ATTACK: ATTACK	.AREAS OF PITS
			0.0MCF								967
			THE POSITION OF THE COUPON STATION HAS BEEN CHANGED TO HORIZONTAL, HORIZONTAL FLOW								
D-558	3-26-73	191	0.080	0.0132	0.1	.010	20	.010	20	CPN BDY ATTACK: SPOTTY ETCH	
D-559	9-24-73		400.0BW	0.0127	0.1					HLDR BLK ATTACK: NONE	.PITTING
			0.0MCF							WEST PUMP	968
E-986	9-24-73	184	0.350	0.0076	0.1	.0	0	.0		0 CPN BDY ATTACK: OVERALL ATTACK	
E-987	3-25-74		412.0BW	0.0061	0.1					HLDR BLK ATTACK: ATTACK	.NO PITS.
			0.0MCF								969

CORROSION COUPON EXPOSURE RESULTS

LEASE OR UNIT: 6493341 SWEARINGEN WATERFLOOD

WELL OR PLANT: W.HEADR COUPON LOCATION: INJECTION HEADER ALT. PRODUCE-SUPPLY

89012345678

TYPE SYSTEM: WATER INJECTION POSITION: HORIZONTAL, HORIZONTAL FLOW TYPE: BAR

COUPON #	EXPOSURE DATES	DAYS	DAILY PRODUCTION	WEIGHT LOSS:GMS	OVERALL CORROSION RATE:MPY	BODY PITS DPTH IN	BODY PITS RATE MPY	END PITS DPTH MILS	END PITS RATE MPY	REMARKS	
A-888	9-30-70	96	0.000	0.5247	0.2	.009	34	.0	0	CPN BDY ATTACK: EVEN ETCH	
A-896	1- 4-71		684.0BW	0.0164	0.1					HLDR BLK ATTACK: NONE	,ISOLATED PITS
			0.0MCF								97
B-168	1- 4-71	95	0.000	0.0617	0.3	.005	19	.0	0	CPN BDY ATTACK: AREAS OF ATTACK	
B-169	4- 8-71		0.0BW	0.0530	0.3					HLDR BLK ATTACK: NONE	,ISOLATED PITS
			0.0MCF								971
B-557	4- 8-71	127	0.000	0.1588	0.6	.007	20	.0	0	CPN BDY ATTACK: HEAVY ETCH	
B-558	8-13-71		0.0BW	0.1625	0.6					HLDR BLK ATTACK: NONE	,AREAS OF PITS
			0.0MCF								972
B-670	8-13-71	207	0.000	0.1597	0.4	.004	7	.0	0	CPN BDY ATTACK: SPOTTY ETCH	
B-671	3- 7-72		0.0BW	0.2134	0.5					HLDR BLK ATTACK: NONE	,AREAS OF PITS
			0.0MCF								973
THE POSITION OF THE COUPON STATION HAS BEEN CHANGED TO NOT DEFINED YET											
C-762	3- 7-72	125	0.000	0.2186	0.8	.005	14	.009	23	CPN BDY ATTACK: SPOTTY ETCH	
C-384	7-10-72		542.0BW	0.2307	0.9					HLDR BLK ATTACK: ATTACK	,PITTING
			0.0MCF								974
THE POSITION OF THE COUPON STATION HAS BEEN CHANGED TO HORIZONTAL, HORIZONTAL FLOW											
C-540	7-10-72	134	0.000	0.1096	0.4	.005	13	.0	0	CPN BDY ATTACK: SPOTTY ETCH	
C-541	11-22-72		410.0BW	0.1220	0.5					HLDR BLK ATTACK: NONE	,PITTING
			0.0MCF								975

CORROSION COUPON EXPOSURE RESULTS

LEASE OR UNIT: 6493301 SWEARINGEN WATERFLOOD

WELL OR PLANT: WIW A-6 COUPON LOCATION: INJECTION WELLHEAD

89 12345678

TYPE SYSTEM: WATER INJECTION POSITION: NOT DEFINED YET TYPE: BAR

COUPON #	EXPOSURE DATES	DAYS	DAILY PRODUCTION	WEIGHT LOSS:GMS	OVERALL CORROSION RATE:MPY	BODY PITS DPTH IN	BODY PITS RATE MPY	END PITS DPTH MILS	END PITS RATE MPY	REMARKS	
A-891 A-892	9-30-70 1- 4-71	96	0.080 117.0BW 0.0MCF	0.0056 0.0049	0.1 0.1	.0	0	.0	0	CPN BDY ATTACK: EVEN ETCH HLDR BLK ATTACK: NONE A-6 ON EST LEG OFSYS	,NO PITS. 976
B-170 B-171	1- 4-71 4- 8-71	95	0.080 0.0BW 0.0MCF	0.1729 0.0446	7.9 0.3	.006	22	.0	0	CPN BDY ATTACK: SPOTTY ETCH HLDR BLK ATTACK: NONE	,AREAS OF PITS 977
B-674 B-675	8-13-71 3- 7-72	207	0.080 0.0GW 0.0MCF	0.0116 0.0036	0.1 0.1	.005	8	.0	0	CPN BDY ATTACK: EVEN ETCH HLDR BLK ATTACK: NONE WELL SHUT IN 6-25-71	,PITTING 976

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1710
Hobbs, New Mexico 88240
Telephone 505 393 7163

File Case 3302

RECEIVED
MAR - 6 1974
OIL CONSERVATION COMM.
Santa Fe

March 7, 1974

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Produced water samples required by Commission Order R-2969 entered in Case No. 3302, concerning Atlantic Richfield Company - Swearingen - Shugart Waterflood Project

Gentlemen:

As per the above order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen Shugart waterflood project.

Yours very truly,

L. C. Hudry

LCH:rm

Attachment

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

AtlanticRichfieldCompany Internal Correspondence

Date: February 22, 1974

To: Mr. James Cogburn - Hobbs, New Mexico

From: James P. McDonald, Jr. - Room E131 PRC, Dallas, Texas

Subject: Water Analysis
Swearingen Lease Waterflood
Shugart Field, Eddy County, New Mexico

Letter: 40-130

Attached is a water analysis (A-5373) on produced water collected in January 1974 from the Swearingen Lease.

This sample was collected in compliance with the request by the New Mexico Oil Conservation Commission for analysis to be made quarterly on this produced water.

A copy of the attached invoice approved for payment has been sent to Accounts Payable.

James P. McDonald Jr.

James P. McDonald, Jr.

JPM/jc

ARCO-1

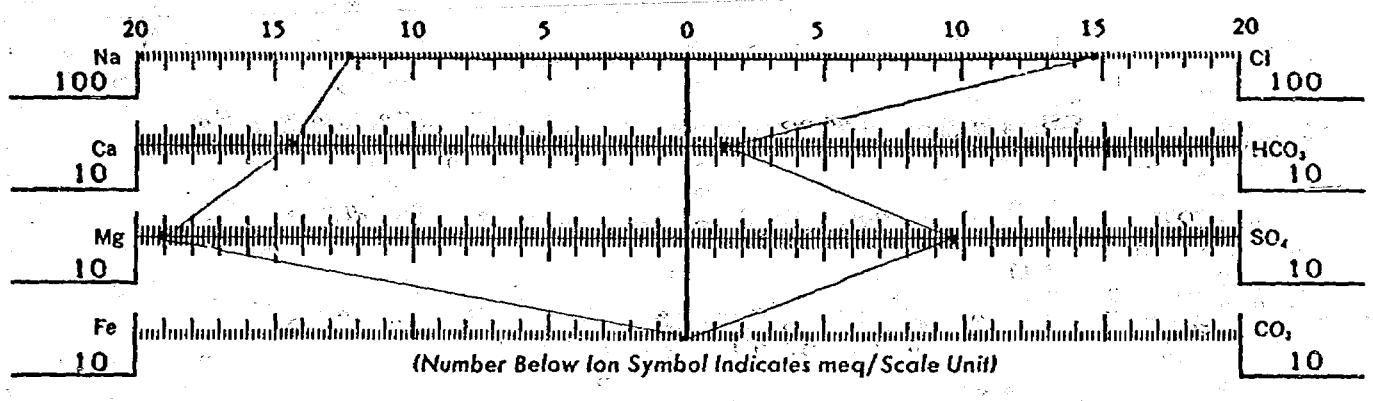
PRODUCTION PROFITS
DIVISION OF SONICS INTERNATIONAL, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

Client: Atlantic Richfield Company
County: Eddy State: New Mexico
Field: Shugart Lease: Swearingen Waterflood Well No.:
Formation: Depth: Perf.:
Source of Sample:
Date Collected: Rec: 2-1-74 by:

REPORT OF WATER ANALYSIS

Lab. Number: A-5373 Specific Gravity: 1.0638 pH: 7.4
Total Dissolved Solids: 91438 Resistivity (Ohmmeters at 68° F.): .098 Hydrogen Sulfide: ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	91438	
Sodium (Calc.)	28600	1242.6
Iron (Dissolved)	0	0.
Barium	-	-
Calcium	2890	144.2
Magnesium	2350	193.2
Chloride	52100	1469.2
Bicarbonate	798	13.1
Carbonate	0	0.
Sulfate	4700	97.8

TOTAL IRON: 2

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

	mg/l
Total Undissolved Solids	
Oil (Solvent Soluble)	
Acid Solubles	
Iron ____ as ____	
Calcium ____ as ____	
Magnesium ____ as ____	
Sulfate ____ as ____	
Organic (Ignition Loss)	
Acid Insolubles	
Sand & Clay	
Barium Sulfate (Quan.)	
(Qual.)	

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: .92 Scaling Tendency: POS.
Calcium Sulfate Stability at 95°F
Concentration: 97.76 meq/l. Calc. Solubility: 82.30 meq/l. Percent Saturation: 100.00
Barium Sulfate Stability at 95° F
Concentration: ____ meq/l. Calc. Solubility: ____ meq/l. Percent Saturation: ____

REMARKS

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1710
Hobbs, New Mexico 88240
Telephone 505 393 7163

Case No. 3302

December 18, 1973

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Produced water samples required by Commission Order R-2969 entered in Case No. 3302, concerning Atlantic Richfield Company - Swearingen - Shugart Waterflood Project

Gentlemen:

As per the above order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen Shugart waterflood project.

Yours very truly,

L. C. Hudry

Attachment

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

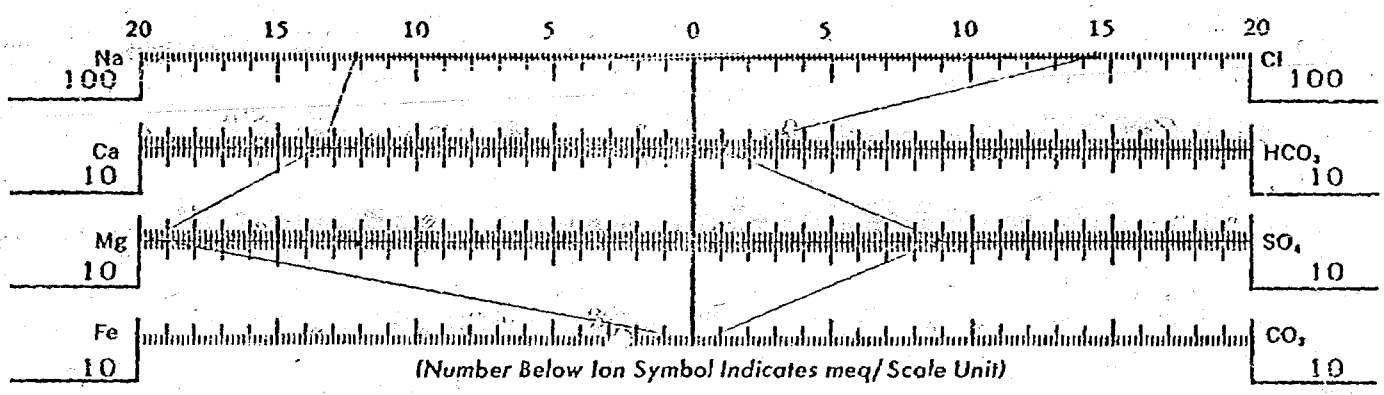
PRODUCTION PROFITS
DIVISION OF SONICS INTERNATIONAL, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

Client: Atlantic Richfield Company
County: Eddy State: New Mexico
Field: Shugart Lease: Swearingen Well No.:
Formatic: Depth: Perf.:
Source of Sample: Produced Water
Date Collected: Rec: 11-6-73 by:

REPORT OF WATER ANALYSIS

Lab. Number: A-5295 Specific Gravity: 1.0644 pH: 7.2
Total Dissolved Solids: 89864 Resistivity (Ohmmeters at 68° F.): .101 Hydrogen Sulfide: ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	89864	
Sodium (Calc.)	28200	1225.3
Iron (Dissolved)	0	0.
Barium	-	-
Calcium	2700	134.7
Magnesium	2390	196.5
Chloride	51700	1457.9
Bicarbonate	634	10.4
Carbonate	0	0.
Sulfate	4240	88.2

TOTAL IRON: -

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

		mg/l
Total Undissolved Solids		
Oil (Solvent Soluble)		
Acid Solubles		
Iron	as	
Calcium	as	
Magnesium	as	
Sulfate	as	
Organic (Ignition Loss)		
Acid Insolubles		
Sand & Clay		
Barium Sulfate	(Quan.)	
	(Qual.)	

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: .58 Scaling Tendency: POS.
Calcium Sulfate Stability at 95°F
Concentration: 88.19 meq/l. Calc. Solubility: 81.81 meq/l. Percent Saturation: 100.00
Barium Sulfate Stability at 95° F
Concentration: meq/l. Calc. Solubility: meq/l. Percent Saturation:

REMARKS

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1710
Hobbs, New Mexico 88240
Telephone 505 393 7163

Case file 3302

November 9, 1973

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Corrosion Coupon Results as per Commission Order R-2969 entered in Case No. 3302, concerning Atlantic Richfield Company Swearingen Shugart Waterflood Project

Gentlemen:

As per the above order, we submit the results of laboratory analyses of the latest exposed corrosion coupons.

Yours very truly,

L. C. Hudry

L. C. Hudry

LCH:rm

Attachment

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

CORROSION COUPON EXPOSURE RESULTS

LEASE OR UNIT: 6493301 SWEARINGEN WATERFLOOD

WELL OR PLANT: B-3 COUPON LOCATION: INJECTION WELLHEAD

89012345678

TYPE SYSTEM: WATER INJECTION POSITION: VERTICAL, VERTICAL FLOW TYPE: BAR

COUPON #	EXPOSURE DATES	DAYS	DAILY PRODUCTION	WEIGHT LOSS:GMS	OVERALL CORROSION RATE:MPY	BODY PITS DPTH IN	BODY PITS RATE MPY	END PITS DPTH MILS	END PITS RATE MPY	REMARKS	
A-893	9-30-70	96	0.080	0.0260	0.2	.020	75	.0	0	CPN BDY ATTACK: SPOTTY ETCH	
A-895	1- 4-71		254.0BW	0.0476	0.3					HLDR BLK ATTACK: NONE	*AREAS OF PITS
			0.0MCF							ON WEST LEG OF SYSTM	745
B-172	1- 4-71	95	0.080	0.1471	0.7	.005	19	.0	0	CPN BDY ATTACK: SPOTTY ETCH	
B-173	4- 8-71		0.0BW	0.0754	0.4					HLDR BLK ATTACK: NONE	*AREAS OF PITS
			0.0MCF								746
B-508	4- 8-71	127	0.080	0.1846	0.6	.009	25	.0	0	CPN BDY ATTACK: SPOTTY ETCH	
B-800	8-13-71		235.0BW	0.1705	0.6					HLDR BLK ATTACK: NONE	*AREAS OF PITS
			0.0MCF								747
B-676	8-13-71	207	0.080	0.3809	0.9	.014	24	.0	0	CPN BDY ATTACK: HEAVY ETCH	
B-677	3- 7-72		400.0BW	0.3825	0.9					HLDR BLK ATTACK: NONE	*ISOLATED PITS
			0.0MCF								748
C-761	3- 7-72	125	0.080	0.6141	2.2	.012	34	.0	0	CPN BDY ATTACK: HEAVY ETCH	
C-765	7-10-72		425.0BW	0.6312	2.3					HLDR BLK ATTACK: NONE	*PITTING
			0.0MCF								749
C-536	7-10-72	134	0.080	0.0441	0.2	.008	21	.0	0	CPN BDY ATTACK: SPOTTY ETCH	
C-537	11-22-72		410.0BW	0.0637	0.3					HLDR BLK ATTACK: NONE	*ISOLATED PITS
			0.0MCF								750
D-560	11-22-72	126	0.080	0.1144	0.5	.005	14	.0	0	CPN BDY ATTACK: SPOTTY ETCH	
D-581	3-26-73		400.0BW	0.1080	0.4					HLDR BLK ATTACK: ATTACK	*AREAS OF PITS
			0.0MCF								751
D-567	3-26-73	181	0.080	0.0262	0.1	.007	14	.008	16	CPN BDY ATTACK: SPOTTY ETCH	
D-568	9-24-73		400.0BW	0.0245	0.1					HLDR BLK ATTACK: NONE	*AREAS OF PITS
			0.0MCF								752

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. 3302
Order No. R-2969

APPLICATION OF THE ATLANTIC REFINING
COMPANY FOR A WATERFLOOD PROJECT, EDDY
COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on September 8, 1965, at Santa Fe, New Mexico, before Examiner Elvis A. Utz.

NOW, on this 28th day of September, 1965, the Commission, a quorum being present, 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 Commission has jurisdiction of this cause and the subject matter thereof.

(2) That the applicant, The Atlantic Refining Company, seeks permission to institute a waterflood project in the Shugart Pool by the injection of water into the Queen formation through six injection wells in Sections 11 and 14, Township 18 South, Range 31 East, NMPM, Eddy County, New Mexico.

(3) That the applicant also seeks the establishment of an administrative procedure whereby the Secretary-Director of the Commission is authorized to approve expansion of the waterflood project and additional water injection wells.

(4) That the wells in the project area are in an advanced state of depletion and should properly be classified as "stripper" wells.

(5) That the proposed waterflood project should result in the recovery of otherwise unrecoverable oil, thereby preventing waste.

(6) That the subject application should be approved and the project should be governed by the provisions of Rules 701, 702, and 703 of the Commission Rules and Regulations.

IT IS THEREFORE ORDERED:

(1) That the applicant, The Atlantic Refining Company, is hereby authorized to institute a waterflood project in the Shugart Pool by the injection of water into the Queen formation through the following-described wells in Township 18 South, Range 31 East, NMPM, Eddy County, New Mexico:

Atlantic-Johnson Federal Well No. 1, Unit P, Section 11
Atlantic-Swearingen "A" Well No. 3, Unit B, Section 14
Atlantic-Swearingen "A" Well No. 5, Unit H, Section 14
Atlantic-Swearingen "A" Well No. 6, Unit J, Section 14
Atlantic-Swearingen "B" Well No. 3, Unit E, Section 14
Atlantic-Swearingen "B" Well No. 4, Unit P, Section 14

(2) That the subject waterflood project shall be governed by the provisions of Rules 701, 702, and 703 of the Commission Rules and Regulations; provided, however, that the Secretary-Director of the Commission may approve expansion of the waterflood project and such other additional injection wells at such locations as may be necessary to complete an efficient water injection pattern.

(3) That monthly progress reports of the waterflood project herein authorized shall be submitted to the Commission in accordance with Rules 704 and 1120 of the Commission Rules and Regulations.

(4) 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

Jack M Campbell

JACK M. CAMPBELL, Chairman

Guyton B. Hays

GUYTON B. HAYS, Member

A. L. Porter, Jr.

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

esr/

BEFORE EXAMINER UTZ
OIL CONSERVATION COMMISSION
Apollo EXHIBIT NO. 8
CASE NO. 3308

Exhibit No 8

OVERRIDING ROYALTY POOLING AGREEMENT

THIS AGREEMENT made this 17th day of July, 1965, by and between E. A. Paton and wife, Hattie Paton, and Doris Paton, a widow, hereinafter called "Patons", and Bob Johnson and wife, Sibyl Johnson, hereinafter called "Johnsons".

W I T N E S S E T H:

WHEREAS, the Patons represent that they own an overriding royalty of twenty percent (20%) of the oil, gas and other kindred substances produced, saved and marketed under United States Oil and Gas Lease LC 029388(b) from the E½SE¼ Section 11, Township 18 South, Range 31 East, N.M.P.M., Eddy County, New Mexico, to a depth of 3,900 feet below the surface (said land being hereinafter called "Paton land"), as reserved in that certain Operating Agreement dated September 25, 1964, recorded in Book 147 at page 335, from the Patons to The Atlantic Refining Company;

WHEREAS, the Johnsons represent that they own an overriding royalty of twenty percent (20%) of the oil, gas and other kindred substances produced, saved and marketed under United States Oil and Gas Leases LC 047633(a) and LC 047633(b) from all of Section 14, Township 18 South, Range 31 East, N.M.P.M., Eddy County, New Mexico, to a depth of 3,900 feet below the surface (said lands being hereinafter called "Johnson land"), as reserved in that certain Operating Agreement dated September 26, 1964, recorded in Book 147 at page 348, from the Johnsons to The Atlantic Refining Company; and,

WHEREAS, the Patons and the Johnsons desire to pool their respective overriding royalty interests as to all oil, gas and other kindred substances to be produced from the Queen Formation underlying the above described lands by means of a contemplated secondary recovery program.

NOW, THEREFORE, in consideration of the premises, the parties agree as follows:

1. This Pooling Agreement shall be applicable only to the production of oil, gas and other kindred substances recovered from the Queen Formation underlying the above described lands by means of a secondary recovery program.

2. The total production attributable to said overriding royalty interests shall be apportioned between the Patons and the Johnsons in the following manner: each party shall be entitled to that portion of said production as the number of wells located on said party's land bears to the total number of wells on the Paton and Johnson lands. In other words, if one well is located on the Paton land and twelve wells are located on the Johnson land, the Patons shall be entitled to 1/13 and the Johnsons shall be entitled to 12/13

of the production attributable to said overriding royalty interests. Said ratios and apportionment of production shall be subject to change as additional wells are drilled or existing wells are plugged and abandoned. A well within the meaning hereof shall be either a production or injection well in the Queen Formation.

3. In the event the overriding royalty interest of either party is less than as represented above, the allocation of production between the parties shall be adjusted accordingly.

4. The overriding royalty production allocated to the Patons shall be owned one-half by E. A. Paton and Hattie Paton, his wife, and one-half by Doris Paton.

5. The Patons and the Johnsons do hereby grant and convey to each other such interest and title as may be necessary to constitute the above apportionment of their overriding royalty interests.

This Agreement is binding upon the parties hereto, their heirs, personal representatives and assigns, and shall be effective as of the date of first production from the Queen Formation by means of a secondary recovery program.

E. A. Paton
E. A. PATON

Hattie Paton
HATTIE PATON

Doris Paton
DORIS PATON

Bob Johnson
BOB JOHNSON

Sibyl Johnson
SIBYL JOHNSON

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

The foregoing instrument was acknowledged before me this 21st day of July, 1965, by E. A. Paton and Hattie Paton, his wife.

Lela Elliott
Notary Public

My Commission Expires:
Oct 8, 1966

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

The foregoing instrument was acknowledged before me this 21st day of July, 1965, by Doris Paton, a widow.

Lela Elliott
Notary Public

My Commission Expires:
Oct. 8, 1966

STATE OF TEXAS)
) ss.
COUNTY OF SCURRY)

The foregoing instrument was acknowledged before me this 17th day of July, 1965 by Bob Johnson and Sibyl Johnson, his wife.

Virginia M. Lewis
Notary Public

My Commission Expires:
June 1, 1967

ATLANTIC

THE ATLANTIC REFINING COMPANY
INCORPORATED - 1870
PETROLEUM PRODUCTS

April 26, 1966

NORTH AMERICAN PRODUCING GROUP
NEW MEXICO - ARIZONA DISTRICT
S. L. SMITH, DISTRICT MANAGER
JACK RIARD, DISTRICT LANDMAN
E. R. DOUGLAS, DISTRICT GEOLOGIST
A. D. KLOXIN, DISTRICT DRLG. & PROD. SUP'T.
M. D. ROBERTS, DISTRICT GEOPHYSICIST
W. P. TOMLINSON, DISTRICT ENGINEER
B. R. WARE, DISTRICT ADMINISTRATIVE SUP'V.

SECURITY NATIONAL BANK BLDG.
MAILING ADDRESS
P. O. BOX 1978
ROSWELL, NEW MEXICO 88201

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico

File

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

Re: Corrosion coupon results
as per Commission Order R-2969
entered in Case #3302, concerning
The Atlantic Refining Company
Swearingen-Shugart Waterflood
Project

Gentlemen:

As per the above order, we are required to submit the results of the rate of corrosion of the coupons in the Swearingen-Shugart Waterflood Project. Attached are the results from our laboratory concerning the corrosion rate for the next three month period.

Yours very truly,

W. P. Tomlinson

W. P. Tomlinson

WPT:jcb

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico

Mr. Frank Irby

SWEARINGEN LEASE WF, SHUGART FLD, NEW MEXICO
WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Supply Water (Bar-type Stations at Water Plant)							
West Leg of Manifold	E-861 E-862	11-6-65--12-2-65	26	800 BWPD	0.2978 0.3018	5.2 5.2	Surface roughened Scattered shallow pits.
	E-873	12-2-65--3-2-66	90	1244 BWPD	1.0252	5.0	Scattered Attack w/ a few deposits & gouges
East Leg of Manifold	E-863 E-864	11-6-65--12-2-65	26	1200 BWPD	0.2642 0.2538	4.5 4.3	Even etch w/some edge attack & minor pitting
	E-875	12-2-65--3-2-66	90	1244 BWPD	0.8430	4.2	Scattered attack w/ a few deep pits & gouges

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume	WEIGHT LOSS (gms)	CORROSION RATE (mpy)	TYPE ATTACK
Water Injection Wells (Bar-type Stations at Wellhead)							
A-6 WIW	E-865 E-866	11-13-65--1-18-66	66	450 BWPD	0.9738 0.9628	6.5 6.5	General corrosion w/broad shallow pits.
	E-869	1-18-66--3-2-66	43	478 BWPD	0.3820	4.0	Scattered Pitted Areas.
B-3 WIW	E-867 E-868	11-13-65--1-18-65	66	288 BWPD	0.7034 0.8032	4.7 5.4	Even etch w/areas of surface roughening
	E-827	1-18-66--3-2-66	43	271 BWPD	0.2265	2.4	Scattered shallow pits w/general corrosion at ends.

AtlanticRichfieldCompany
Formerly
THE ATLANTIC REFINING COMPANY
INCORPORATED - 1870
PETROLEUM PRODUCTS

June 14, 1966

NORTH AMERICAN PRODUCING GROUP
NEW MEXICO - ARIZONA DISTRICT
S. L. SMITH, DISTRICT MANAGER
JACK BIARD, DISTRICT LANDMAN
E. R. DOUGLAS, DISTRICT GEOLOGIST
A. D. KLOXIN, DISTRICT DRLG. & PROD. SUP'T.
M. D. ROBERTS, DISTRICT GEOPHYSICIST
W. P. TOMLINSON, DISTRICT ENGINEER
B. R. WARE, DISTRICT ADMINISTRATIVE SUP'V.

SECURITY NATIONAL BANK BLDG.
MAILING ADDRESS
P. O. BOX 1978
ROSWELL, NEW MEXICO 88201

3302

State of New Mexico
Oil Conservation Commission
Santa Fe, New Mexico

Attention: Mr. Dan Nutter

Re: Swearingen Pool Waterflood

Gentlemen:

Several weeks ago I furnished you with copies of Overriding Roylaty Pooling Agreements executed by all overriding royalty owners except Tenneco Oil Company. We now enclose a ratification which has been executed by Tenneco, Continental Oil Company, and New York Life Insurance Company. Tenneco felt this was only proper inasmuch as they owned a common interest with Continental which was not reflected in the division order, and New York Life held a mortgage on a portion of the royalty. This apparently is a result of the Delhi-Taylor purchase. At any rate, we now have instruments signed by all of the owners. This should close your file.

Yours very truly,

ATLANTIC RICHFIELD COMPANY

Fred N. Millsap Jr.

Fred N. Millsap, Jr.
Land Department

FM/dlm
Encl.

JDM:lp
3-29-66

RATIFICATION OF OVERRIDING ROYALTY POOLING AGREEMENT
SWEARINGEN WATERFLOOD PROJECT
EDDY COUNTY, NEW MEXICO

THIS RATIFICATION, made and entered into this 1st day of April, 1966, by and between The Atlantic Refining Company, a Pennsylvania corporation, whose address is Box 1978, Roswell, N.M., hereinafter called "Operator", and Tenneco Oil Company, a Delaware corporation, whose address is Fourth Floor, 201 Wall Building, Midland, Texas, and Continental Oil Company, a Delaware corporation, whose address is P. O. Box 431, Midland, Texas, hereinafter called "Overriding Royalty Owners", and New York Life Insurance Company, a New York corporation, whose address is 51 Madison Ave., New York City, New York, hereinafter called "Mortgagee".

W I T N E S S E T H, T H A T:

WHEREAS, that certain Overriding Royalty Pooling Agreement dated March 15, 1966, was made and entered into by and between Leroy English, et al, as Owners, and Operator, covering the oil, gas and kindred substances recoverable from the Queen formation underlying the East One-Half of the Southeast Quarter (E/2 SE/4) of Section 11 and all of Section 14, Township 18 South, Range 31 East, N.M.P.M., Eddy County, New Mexico; and

WHEREAS, the Queen formation underlying the above described lands is hereinafter referred to as "Pooled Lands"; and

WHEREAS, the interest shown to be owned by New York Life Insurance Company Account No. MI 1008 and Tenneco Oil Company in said Overriding Royalty Pooling Agreement is in fact owned in equal undivided shares by Overriding Royalty Owners subject to a mortgage in favor of Mortgagee; and

WHEREAS, Overriding Royalty Owners and Mortgagee desire to ratify said Overriding Royalty Pooling Agreement insofar as it covers their respective interests in the Pooled Lands.

NOW, THEREFORE, for and in consideration of the premises, the parties hereto do hereby covenant, contract and agree as follows:

I.

The parties hereto do hereby adopt, ratify and confirm said Overriding Royalty Pooling Agreement dated March 15, 1966 in all of its terms, provisions and conditions.

II.

It is understood and agreed that notwithstanding any recitals contained in said Overriding Royalty Pooling Agreement to the contrary, the interests shown to be owned by New York Life Insurance Company Account No. MI 1008 and Tenneco Oil Company are owned as follows:

Tenneco Oil Company	.8750%
Continental Oil Company	.8750%

subject to a valid and subsisting mortgage in favor of Mortgagee.

III.

The effective date of this Ratification is the date of first production upon the Pooled Lands by means of a secondary recovery program and this Ratification shall remain in full force and effect for so long thereafter as oil, gas and other kindred substances are recovered from the Pooled Lands by means of a secondary recovery program.

IN WITNESS WHEREOF, the parties hereto have executed this Ratification as of the day and year first above written, but effective as hereinabove provided.

THE ATLANTIC REFINING COMPANY

By S. F. Smith
~~ATTORNEY~~ IN FACT

"OPERATOR"

DIVISION PROPERTIES BUREAU
DISTRICT LANDMAN REW
DISTRICT PRODUCTION SUPT.
FORM APPROVED

TENNECO OIL COMPANY

By J. D. Rosel
Agent and Attorney-in-Fact

CONTINENTAL OIL COMPANY

ATTEST:

Fay Helton
Assistant Secretary

By Roy M. Mays
VICE PRESIDENT ~~Attorney-in-Fact~~

FORM APPROVED
ATTORNEY

"OVERRIDING ROYALTY OWNERS"

ATTEST:

NEW YORK LIFE INSURANCE COMPANY

Robert P. Steiglitz
Assistant Secretary

By Charles F. Loeche
Vice President

"MORTGAGEE"

THE STATE OF New Mexico X
COUNTY OF Chaves X ss

The foregoing instrument was acknowledged before me this 2ND day of May, 1966, by S. L. Smith, ATTORNEY IN FACT of The Atlantic Refining Company, a Pennsylvania corporation, on behalf of said corporation and in the capacity and for the consideration therein stated.

My commission expires: 1-2-70

Fred N. Mellish Jr.
Notary Public in and for Chaves County, N.M.

THE STATE OF TEXAS X
COUNTY OF MIDLAND X ss

The foregoing instrument was acknowledged before me this 1st day of April, 1966, by J. P. Roach, Agent and Attorney-in-Fact of Tenneco Oil Company, a Delaware corporation, on behalf of said corporation and in the capacity and for the consideration therein stated.

My commission expires: June 1, 1967.

Joy J. Allison
Notary Public in and for Midland County, Texas

JOY J. ALLISON
201 WALL BLDG. 4TH FLOOR
MIDLAND, TEXAS
NOTARY PUBLIC IN & FOR
MIDLAND COUNTY, TEXAS

THE STATE OF Texas X
COUNTY OF Tarrant X ss

The foregoing instrument was acknowledged before me this 8th day of June, 1966, by ROY M. MAYS VICE PRESIDENT, ~~Attorney-in-Fact~~ of Continental Oil Company, a Delaware corporation, on behalf of said corporation and in the capacity and for the consideration therein stated.

My commission expires: 6-1-67

Barbara Lee Young
Notary Public in and for Tarrant County, Texas

THE STATE OF NEW YORK X
COUNTY OF NEW YORK X ss

The foregoing instrument was acknowledged before me this 5th day of May, 1966, by GERALD B. HAECKEL, Vice President of New York Life Insurance Company, a New York corporation, on behalf of said corporation and in the capacity and for the consideration therein stated.

My commission expires:

Frances Pfaff
Notary Public in and for County

FRANCES PFAFF
Notary Public, State of New York
No. 41-8350350
Qualified in Queens County
Term Expires March 30, 1968

ATLANTIC RICHFIELD COMPANY
FORMERLY

ATLANTIC

THE ATLANTIC REFINING COMPANY
INCORPORATED - 1870
PETROLEUM PRODUCTS

August 10, 1966

NORTH AMERICAN PRODUCING GROUP
NEW MEXICO - ARIZONA DISTRICT
S. L. SMITH, DISTRICT MANAGER
JACK BIARD, DISTRICT LANDMAN
E. R. DOUGLAS, DISTRICT GEOLOGIST
A. D. KLOXIN, DISTRICT DRLG. & PROD. SUP'T.
M. D. ROBERTS, DISTRICT GEOPHYSICIST
W. P. TOMLINSON, DISTRICT ENGINEER
B. R. WARE, DISTRICT ADMINISTRATIVE SUP'V.

SECURITY NATIONAL BANK BLDG.
MAILING ADDRESS
P. O. BOX 1978
ROSWELL, NEW MEXICO 88201

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico

Attention: Mr. A. L. Porter
Secretary Director

Rec

MAIN OFFICE OCC
66 AUG 11 PM 1 30

Re: Corrosion coupon results
as per Commission Order R-2969
entered in Case #3302, concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood
Project

Gentlemen:

As per the above order, we are required to submit the results of the rate of corrosion of the coupons in the Swearingen-Shugart Waterflood Project. Attached are the results of laboratory analyses of recently exposed coupons.

Yours very truly,

W. P. Tomlinson

W. P. Tomlinson

WPT:jcb

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico
Attention: Mr. Frank Irby

SWEARINGEN LEASE WF, SHUGART FLD, NEW MEXICO

WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BWPD)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Supply Water (Bar-type Stations at Water Plant)	E-863 E-864	11/6/65--12/2/65	26	1200	0.2642 0.2538	4.5 4.3	Even etch w/some edge attack & minor pitting.
East Leg of Manifold	E-875	12/2/65--3/2/66	90	1244	0.8430	4.2	Scattered attack w/a few deep pits & gouges.
	E-876	12/2/65--4/15/66	134	See Remarks	1.1316	3.7	Scattered attack w/gouges & pitting.
	E-992	4/15/66--7/12/66	88	"	0.8301	4.2	Scattered attack w/some deep pits.
	E-999	5/25/66--7/12/66	48	"	0.3564	3.3	Scattered attack w/pitted areas.

SWEARINGEN LEASE WF, SHUGART FLD, NEW MEXICO
WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BWPD)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Supply Water (Bar-type Stations at Water Plant)	E-861	11/6/65--12/2/65	26	800	0.2978	5.2	Surface roughened. Scattered shallow pits.
	E-862				0.3018	5.2	
West Leg of Manifold	E-873	12/2/65--3/2/66	90	1244	1.0252	5.0	Scattered attack w/a few deep pits & gouges.
	E-874	12/2/65--4/15/66	134	See Remarks	1.1030	3.6	Scattered attack w/gouges & pitting.
	E-990	4/15/66--7/12/66	88	"	0.7201	3.6	Scattered attack w/pitted areas.
	E-1000	5/25/66--7/12/66	48	"	0.3612	3.4	Scattered attack w/some deep pits.

SWEARINGEN LEASE WF, SHUGART FLD, NEW MEXICO

WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BWPD)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Water Injection Wells (Bar-type Stations at Wellhead)	E-867 E-868	11/13/65--1/18/66	66	288	0.8032 0.7034	5.4 4.7	Even etch w/areas of surface roughening.
B-3 WIW	E-872	1/18/66--3/2/66	43	271	0.2265	2.4	Scattered shallow pits w/general corrosion at ends.
	E-871	1/18/66--4/15/66	87	See Remarks	0.7359	3.7	Scattered attack w/a few deep pits & broad areas of no attack on one side.
	E-995	4/15/66--7/12/66	88	"	0.7289	3.7	Scattered attack w/deep pits.
	E-998	5/25/66--7/12/66	48	"	0.4276	4.0	Even etch w/areas of deep pits.

SWEARINGEN LEASE WF, SHUGART FLD, NEW MEXICO
WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BWPD)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Water Injection Wells (Bar-type Stations at Wellhead)	E-865	11/13/65--1/18/66	66	450	0.9738	6.5	General corrosion w/broad shallow pits.
	E-866				0.9628	6.5	
A-6 WIW	E-869	1/18/66--3/2/66	43	478	0.3820	4.0	Scattered pitted areas.
	E-870	1/18/66--4/16/66	88	See Remarks	0.5915	3.0	Scattered pitted areas w/some broad, deep pits.
	E-996	4/15/66--7/12/66	88	"	0.9469	4.8	Scattered attack w/some sharp, deep pits.
	E-997	5/25/66--7/12/66	48	"	0.5154	4.8	Scattered attack w/some pitting & broad areas no attack.

3302

August 17, 1966

Atlantic Richfield Company
P. O. Box 1978
Roswell, N. M.

Attn. Mr. W. P. Tomlinson

Gentlemen:

Receipt of a copy of your letter to the Oil Conservation Commission dated August 10, 1966 and the attached results of your coupon tests in the Swearingen-Shugart Waterflood Project are gratefully acknowledged.

Yours truly,

S. E. Reynolds
State Engineer

By:
Frank E. Irby
Chief
Water Rights Div.

FEI/ma
cc-Oil Conservation Commission

AtlanticRichfieldCompany

North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

'67 FEB 20 AM 8 35

File Case 3302

February 17, 1967

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico

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

Re: Corrosion Coupon Results as per Commission Order R-2969 Entered in Case No. 3302, Concerning Atlantic Richfield Company Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we are required to submit the corrosion rates as obtained from coupon tests in the Swearingen-Shugart Waterflood Project. Attached are the results of laboratory analyses of the latest exposed coupons.

Yours very truly,

W. P. Tomlinson

W. P. Tomlinson

WPT:jcb

Attachments

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico

New Mexico State Engineers Office
State Capitol
Santa Fe, New Mexico
Attention: Mr. Frank Irby

SWEARINGEN LEASE WF, SHUGART FLD., NEW MEXICO
WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BW)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Water Injection Wells (Bar-type Stations at Wellhead)	F-148	10/7/66--11/18/66	42	See Remarks	0.0756	0.81	Even etch w/isolated sharp pits.
	F-149				0.0727	0.78	
A-6 WIW	F-186	11-18-66--1-24-67	67	15,596	0.0202	0.13	Even etch with small area of minor attack.
	F-187				0.0199	0.13	

SWEARINGEN LEASE WF, SHUGART FLD., NEW MEXICO

WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BW)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Water Injection Wells (Bar-type Stations at Wellhead)	F-150	10/7/66--11/18/66	42	See Remarks	0.0551	0.58	Even etch w/ scattered pitted areas.
	F-151				0.0669	0.71	
B-3 WIW	F-184	11-18-66--1-24-67	67	3,921	0.0046	0.030	Even etch
	F-185				0.0045	0.030	

SWEARINGEN LEASE WF, SHUGART FLD, NEW MEXICO

WATER INJECTION SYSTEM

Page

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BW)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK	
Supply Water (Bar-type Stations at Water Plant)	F-144	10/7/66--11/18/66	42	See remarks.	0.0608	0.64	Scattered attack w/minor pitting.	G F T
	F-145				0.0635	0.68		
WEST LEG OF MANIFOLD	F-190	11-18-66--1-24-67		59,749	0.0243	0.16	Even etch with scattered areas of minor pits.	
	F-191				0.0301	0.20		

SWEARINGEN LEASE WF, SHUGART FLD., NEW MEXICO

WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BW)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Supply Water (Bar-type Stations at Water Plant)	F-146	10/7/66--11/18/66	42	See remarks.	0.1160	1.2	Scattered attack w/pits.
	F-147				0.1335	1.4	
EAST LEG OF MANIFOLD	F-188	11-18-66--1-24-67	67	59,749	0.0080	0.053	Even etch.
	F-189				0.0076	0.050	

AtlanticRichfieldCompany

North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer.

Case 3302

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico

Attention: Mr. A. L. Porter, Jr.

Re: Swearingen Waterflood Project
Shugart Pool
Eddy County, New Mexico

Gentlemen:

This is to advise you that as of February 13, 1967, Swearingen "A" No. 3 Water Injection Well has been shut-in pending further evaluation. We did this because the well has failed to take any appreciable volume of water since its conversion to injection in November, 1965, even though available surface pressure has ranged as high as 1450 psi. It is concluded that the indicated low permeability in the vicinity of this well will be an effective barrier to the migration of oil to the north.

Attached is a map showing the location of the subject well with respect to the project. If any additional information is desired please let us know.

Yours very truly,

W. P. Tomlinson

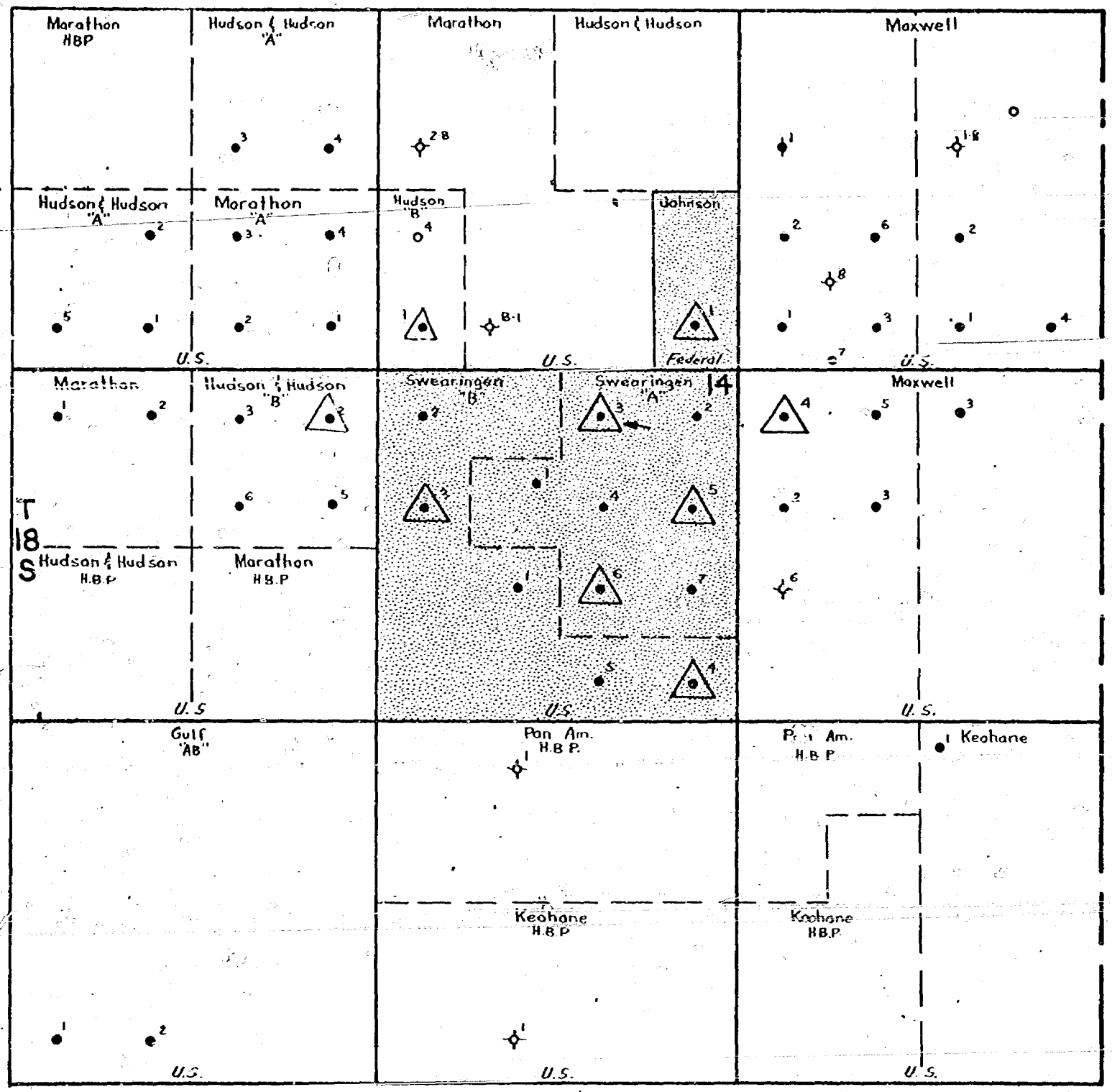
W. P. Tomlinson

WPT:jcb

Attachment

cc: U.S.G.S.
P. O. Drawer "U"
Artesia, New Mexico
Attention: Mr. J. A. Knauf

R-31-E



Shugart Queen Field
SWEARINGEN PROJECT
Eddy Co. N. Mex.

AtlanticRichfieldCompany

North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

November 4, 1966

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico

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

Re: Corrosion Coupon Results as per
Commission Order R-2069 Entered
in Case #3302, Concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we are required to submit the corrosion rates as obtained from coupon tests in the Swearingen-Shugart Waterflood Project. Attached are the results of laboratory analysis of the latest exposed coupons.

Yours very truly,

W. P. Tomlinson

W. P. Tomlinson

WPT:jcb

Attachment

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico
Attention: Mr. Frank Irby

SWEARINGEN LEASE WF, SHUGART FLD, NEW MEXICO

WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BWPD)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Water Injection Wells (Bar-type Stations at Wellhead)	E-867 E-868	11/13/65--1/18/66	66	288	0.8032 0.7034	5.4 4.7	Even etch w/areas of surface roughening.
B-3 WIW							
	E-872	1/18/66--3/2/66	43	271	0.2265	2.4	Scattered shallow pits w/general corrosion at ends.
	E-871	1/18/66--4/15/66	87	See Remarks	0.7359	3.7	Scattered attack w/a few deep pits & broad areas of no attack on one side.
	E-995	4/15/66--7/12/66	88	"	0.7289	3.7	Scattered attack w/deep pits.
	E-998	5/25/66--7/12/66	48	"	0.4276	4.0	Even etch w/areas of deep pits to .025".
	F-1	7/12/66--10/7/66	87	"	0.6863	3.5	Scattered pitted attack w/areas of deep pits to .025"

SWEARINGEN LEASE WF, SHUGART FLD, NEW MEXICO
WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BWPD)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Supply Water (Bar-type Stations at Water Plant)	E-861 E-862	11/6/65--12/2/65	26	800	0.2978 0.3018	5.2 5.2	Surface roughened Scattered shallow pits.
West Leg of Manifold	E-873	12/2/65--3/2/66	90	1244	1.0252	5.0	Scattered attack w/a few deep pits & gouges.
	E-874	12/2/65--4/15/66	134	See Remarks	1.1030	3.6	Scattered attack w/gouges & pittin
	E-990	4/15/66--7/12/66	88	"	0.7201	3.6	Scattered attack w/pitted areas.
	E-1000	5/25/66--7/12/66	48	"	0.3612	3.4	Scattered attack w/some deep pits.
	F-3	7-12-66--10-7-66	87	See Remarks	0.6167	3.2	Severe attack w/sharp deep pits to .025"

SWEARINGEN LEASE WF, SHUGART FLD, NEW MEXICO

WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BWPD)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Supply Water (Bar-type Stations at Water Plant)	E-863 E-864	11/6/65--12/2/65	26	1200	0.2642 0.2538	4.5 4.3	Even etch w/some edge attack & minor pitting.
East Leg of Manifold	E-875	12/2/65--3/2/66	90	1244	0.8430	4.2	Scattered attack w/a few deep pits & gouges.
	E-876	12/2/65--4/15/66	134	See Remarks	1.1316	3.7	Scattered attack w/gouges & pitting.
	E-992	4/15/66--7/12/66	88	"	0.8301	4.2	Scattered attack w/some deep pits.
	E-999	5/25/66--7/12/66	48	"	0.3564	3.3	Scattered attack w/pitted areas.
	F-4	7/12/66--10/7/66	87	"	0.3395	1.7	Scattered attack w/sharp pits.

SWEARINGEN LEASE WF, SHUGART FLD, NEW MEXICO
WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BWPD)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Water Injection Wells (Bar-type Stations at Wellhead)	E-865	11/13/65--1/18/66	66	450	0.9738	6.5	General corrosion w/broad shallow pits.
	E-866				0.9628	6.5	
A-6 WIW	E-869	1/18/66--3/2/66	43	478	0.3820	4.0	Scattered pitted areas.
	E-870	1/18/66--4/16/66	88	See Remarks	0.5915	3.0	Scattered pitted areas w/some broad, deep pits.
	E-996	4/15/66--7/12/66	88	"	0.9469	4.8	Scattered attack w/some sharp, deep pits.
	E-997	5/25/66--7/12/66	48	"	0.5154	4.8	Scattered attack w/some pitting & broad areas no attack.
	F-2	7/12/66--10/7/66	87	"	1.1922	6.1	Severe attack w/sharp deep pits to .020"

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

December 19, 1966

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico

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

File

Re: Corrosion Coupon Results as per
Commission Order R-2969 Entered
in Case No. 3302, Concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

'66 DEC 21 AM 8 09

Gentlemen:

As per the above Order, we are required to submit the corrosion rates as obtained from coupon tests in the Swearingen-Shugart Waterflood Project. Attached are the results of laboratory analyses of the latest exposed coupons.

Yours very truly,

W. P. Tomlinson

W. P. Tomlinson

WPT:jcb

Attachments

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico
Attention: Mr. Frank Irby

SWEARINGEN LEASE WF, SHUGART FLD., NEW MEXICO

WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BW)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Water Injection Wells (Bar-type Stations at Wellhead)	F-150	10/7/66--11/18/66	42	See Remarks	0.0551	0.58	Even etch w/ scattered pitted areas.
	F-151				0.0669	0.71	

D-3 WIW

SWEARINGEN LEASE WF, SHUGART FLD., NEW MEXICO
WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BW)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Water Injection Wells (Bar-type Stations at Wellhead)	F-148	10/7/66--11/18/66	42	See Remarks	0.0756	0.81	Even etch w/isolated sharp pits.
	F-149				0.0727	0.78	

A-6 WIW

SWEARINGEN LEASE WF, SHUGART FLD, NEW MEXICO

WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BW)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Supply Water (Bar-type Stations at Water Plant)	F-144	10/7/66--11/18/66	42	See remarks.	0.0608	0.64	Scattered attack w/minor pitting.
	F-145				0.0635	0.68	
WEST LEG OF MANIFOLD							

SWEARINGEN LEASE WF, SHUGART FLD., NEW MEXICO

WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BW)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Supply Water (Bar-type Stations at Water Plant)	F-146	10/7/66--11/18/66	42	See remarks.	0.1160	1.2	Scattered attack w/pits.
	F-147				0.1335	1.4	
EAST LEG OF MANIFOLD							

AtlanticRichfieldCompany

North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

MAIN OFFICE OCC
'67 MAY 23 AM 8 06

May 22, 1967

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico

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

File

Re: Corrosion Coupon Results as per
Commission Order R-2969 Entered in
Case No. 3302, Concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above order, we are required to submit the corrosion rates as obtained from coupon tests in the Swearingen-Shugart Waterflood Project. Attached are the results of laboratory analyses of the latest exposed coupons.

Yours very truly,

W. P. Tomlinson

W. P. Tomlinson

WPT:jcb

Attachment

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico
Attention: Mr. Frank Irby

SWEARINGEN LEASE WF, SHUGART FLD., NEW MEXICO

WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BW)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Supply Water (Bar-type Stations at Water Plant)	F-146	10/7/66--11/18/66	42	See remarks.	0.1160	1.2	Scattered attack w/pits.
	F-147				0.1335	1.4	
EAST LEG OF MANIFOLD	F-188	11-18-66--1-24-67	67	59,749	0.0080	0.053	Even etch.
	F-189				0.0076	0.050	
	F-300	1-24-67--3-22-67	57	36,099	0.0166	0.13	Even etch. w/few small areas of attack
	F-301				0.0160	0.12	

SWEARINGEN LEASE WF, SHUGART FLD, NEW MEXICO

WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BW)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Supply Water (Bar-type Stations at Water Plant)	F-144	10/7/66--11/18/66	42	See remarks.	0.0608	0.64	Scattered attack w/minor pitting.
	F-145				0.0635	0.68	
WEST LEG OF MANIFOLD	F-190	11-18-66--1-24-67		59,749	0.0243	0.16	Even etch with scattered areas of minor pits.
	F-191				0.0301	0.20	
	F-298	1-24-67--3-22-67	57	36,099	0.1060	0.82	Scattered attack w/gouges & pitting
	F-299				0.1521	1.18	

SWEARINGEN LEASE WF, SHUGART FLD., NEW MEXICO
WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BW)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Water Injection Wells (Bar-type Stations at Wellhead)	F-148	10/7/66--11/18/66	42	See Remarks	0.0756	0.81	Even etch w/isolated sharp pits.
	F-149				0.0727	0.73	
A-6 WIW	F-186	11-18-66--1-24-67	67	15,596	0.0202	0.13	Even etch with small area of minor attack.
	F-187				0.0199	0.13	
	F-302	1-24-67--3-22-67	57	18,041	0.1378	1.07	Scattered pitted areas w/some deep pits
	F-305				0.1663	1.29	

SWEARINGEN LEASE WF, SHUGART FLD., NEW MEXICO

WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BW)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Water Injection Wells (Bar-type Stations at Wellhead)	F-150	10/7/66--11/18/66	42	See Remarks	0.0551	0.58	Even etch w/ scattered pitted areas.
	F-151				0.0669	0.71	
B-3 WIW	F-184	11-18-66--1-24-67	67	3,921	0.0046	0.030	Even etch
	F-185				0.0045	0.030	
	F-303	1-24-67--3-22-67	57	3,558	0.0225	0.17	Even etch. w/scattered areas of very minor attack
	F-304				0.0237	0.18	

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

August 4, 1967

New Mexico Oil Conservation Commission
P.O. Box 2088
Santa Fe, New Mexico

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

Re: Corrosion Coupon Results as per
Commission Order R-2969 Entered
in Case No. 3302, Concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we are required to submit the corrosion rates as obtained from coupon tests in the Swearingen-Shugart Waterflood Project. Attached are the results of laboratory analyses of the latest exposed coupons.

Yours very truly,

W.P. Tomlinson

W.P. Tomlinson

WPT/mm

Attachments

cc: New Mexico OilConservation Commission
P.O. Drawer "DD"
Artesia, New Mexico

New Mexico State Engineers Office
State Capitol
Santa Fe, New Mexico
Attention: Mr. Frank Irby

SWEARINGEN LEASE WF, SHUGART FLD., NEW MEXICO

WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BW)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Supply Water (Bar-type Stations at Water Plant)	F-146	10/7/66--11/18/66	42	See remarks.	0.1160	1.2	Scattered attack w/pits.
	F-147				0.1335	1.4	
EAST LEG OF MANIFOLD	F-188	11-18-66--1-24-67	67	59,749	0.0080	0.053	Even etch.
	F-189				0.0076	0.050	
	F-300	1-24-67--3-22-67	57	36,099	0.0166	0.13	Even etch. w/few small areas of attack
	F-301				0.0160	0.12	
	F-280	3-22-67--5-19-67	58	61,649	0.0515	0.39	Scattered pitted attack w/some deep pits
	F-316				0.0456	0.35	

SWEARINGEN LEASE WF, SHUGART FLD, NEW MEXICO

WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BW)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Supply Water (Bar-type Stations at Water Plant)	F-144	10/7/66--11/18/66	42	See remarks.	0.0608	0.64	Scattered attack w/minor pitting.
	F-145				0.0635	0.68	
WEST LEG OF MANIFOLD	F-190	11-18-66--1-24-67		59,749	0.0243	0.16	Even etch with scattered areas of minor pits.
	F-191				0.0301	0.20	
	F-298	1-24-67--3-22-67	57	36,099	0.1060	0.82	Scattered attack w/gouges & pittin
	F-299				0.1521	1.18	
	F-314	3-22-67--5-19-67	58	61,649	0.2565	1.96	Overall pitting attack
	F-315				0.2249	1.72	

SWEARINGEN LEASE WF, SHUGART FLD., NEW MEXICO

WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BW)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Water Injection Wells (Bar-type Stations at Wellhead)	F-150	10/7/66--11/18/66	42	See Remarks	0.0551	0.58	Even etch w/ scattered pitted areas.
	F-151				0.0669	0.71	
B-3 WIW	F-184	11-18-66--1-24-67	67	3,921	0.0046	0.030	Even etch
	F-185				0.0045	0.030	
	F-303	1-24-67--3-22-67	57	3,558	0.0225	0.17	Even etch. w/scattered areas of very minor attack
	F-304				0.0237	0.18	
	F-319	3-22-67--5-19-67	58	3,211	0.0148	0.11	Even etch w/ several areas of slight attack
	F-320				0.0146	0.11	

SWEARINGEN LEASE WF, SHUGART FLD., NEW MEXICO
WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BW)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Water Injection Wells (Bag-type Stations at Wellhead)	F-148	10/7/66--11/18/66	42	See Remarks	0.0756	0.81	Even etch w/isolated sharp pits.
	F-149				0.0727	0.78	
A-6 WIW	F-186	11-18-66--1-24-67	67	15,596	0.0202	0.13	Even etch with small area of minor attack.
	F-187				0.0199	0.13	
	F-302	1-24-67--3-22-67	57	18,041	0.1378	1.07	Scattered pitted areas w/some deep pits
	F-305				0.1663	1.29	
	F-317	3-22-67--5-19-67	58	19,597	0.2564	1.96	Scattered areas of pitting
	F-318				0.2365	1.81	

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

November 2, 1967

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico

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

'67 Nov 3 PM 1 19

Re: Corrosion Coupon Results as per
Commission Order R-2969 Entered
in Case No. 3302, Concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we are required to submit the corrosion rates as obtained from coupon tests in the Swearingen-Shugart Waterflood Project. Attached are the results of laboratory analyses of the latest exposed coupons.

Yours very truly,

W. P. Tomlinson (SMC)

W. P. Tomlinson

JLT:jcb

Attachments

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico
Attention: Mr. Frank Irby

SWEARINGEN LEASE WF, SHUGART FLD., NEW MEXICO

WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BW)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Supply Water (Bar-type Stations at Water Plant)	F-146	10/7/66--11/18/66	42	See remarks.	0.1160	1.2	Scattered attack w/pits.
	F-147				0.1335	1.4	
EAST LEG OF MANIFOLD	F-188	11-18-66--1-24-67	67	59,749	0.0080	0.053	Even etch.
	F-189				0.0076	0.050	
	F-300	1-24-67--3-22-67	57	36,099	0.0166	0.13	Even etch. w/few small areas of attack
	F-301				0.0160	0.12	
	F-280	3-22-67--5-19-67	58	61,649	0.0515	0.39	Scattered pitted attack w/some deep pits
	F-316				0.0456	0.35	
	F-292	5-19-67--7-21-67	63	51,173	0.0821	0.58	Scattered areas of attack w/some areas of minor pitting.
	F-293				0.0810	0.57	
	F-515	7-21-67--9-21-67	62	64,618	0.0384	0.27	Scattered areas of pitting attack
	F-518				0.0312	0.22	

SWEARINGEN LEASE WF, SHUGART FLD, NEW MEXICO

WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BW)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Supply Water (Bar-type Stations at Water Plant)	F-144	10/7/66--11/18/66	42	See remarks.	0.0608	0.64	Scattered attack w/minor pitting.
	F-145				0.0635	0.68	
WEST LEG OF MANIFOLD	F-190	11-18-66--1-24-67		59,749	0.0243	0.16	Even etch with scattered areas of minor pits.
	F-191				0.0301	0.20	
	F-298	1-24-67--3-22-67	57	36,099	0.1060	0.82	Scattered attack w/gouges & pitting
	F-299				0.1521	1.18	
	F-314	3-22-67--5-19-67	58	61,649	0.2565	1.96	Overall pitting attack.
	F-315				0.2249	1.72	
	F-294	5-19-67--7-21-67	63	51,173	0.1902	1.34	Scattered attack
	F-295				0.1844	1.30	
	F-516	7-21-67--9-21-67	62	64,618	0.0473	0.34	Scattered areas of pitting attack
	F-517				0.0423	0.30	

SWEARINGEN LEASE WF, SHUGART FLD., NEW MEXICO
WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BW)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Water Injection Wells (Bar-type Stations at Wellhead)	F-148	10/7/66--11/18/66	42	See Remarks	0.0756	0.81	Even etch w/isolated sharp pits.
	F-149				0.0727	0.78	
A-6 WIW	F-186 F-187	11-18-66--1-24-67	67	15,596	0.0202 0.0199	0.13 0.13	Even etch with small area of minor attack.
	F-302 F-305	1-24-67--3-22-67	57	18,041	0.1378 0.1663	1.07 1.29	Scattered pitted areas w/some deep pits
	F-317 F-318	3-22-67--5-19-67	58	19,597	0.2564 0.2365	1.96 1.81	Scattered areas of pitting
	F-250 F-251	5-19-67--7-21-67	63	20,472	0.1835 0.1793	1.29 1.26	Scattered pitting attack w/sharp pits
	F-519 F-520	7-21-67--9-21-67	62	19,963	0.2792 0.3182	2.0 2.3	Scattered pitting attack w/some broad deep pits to 0.012".

SWEARINGEN LEASE WF, SHUGART FLD., NEW MEXICO

WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BW)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Water Injection Wells (Bar-type Stations at Wellhead)	F-150	10/7/66--11/18/66	42	See Remarks	0.0551	0.58	Even etch w/ scattered pitted areas.
	F-151				0.0669	0.71	
B-3 WIW	F-184	11-18-66--1-24-67	67	3,921	0.0046	0.030	Even etch
	F-185				0.0045	0.030	
	F-303	1-24-67--3-22-67	57	3,558	0.0225	0.17	Even etch. w/scattered areas of very minor attack
	F-304				0.0237	0.18	
	F-319	3-22-67--5-19-67	58	3,211	0.0148	0.11	Even etch w/ several areas of slight attack
	F-320				0.0146	0.11	
	F-252	5-19-67--7-21-67	63	3,150	0.0061	0.04	Even etch.
	F-253				0.0061	0.04	
	F-507	7-21-67--9-21-67	62	11,376	0.1419	1.02	Scattered pitting attack w/some broad deep pits to 0.008".
	F-508				0.1249	0.90	

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

MAIN OFFICE
'68 JAN 17 AM 8 39

January 16, 1968

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Produced Water Samples Required by
Commission Order R-2969 Entered
In Case No. 3302, Concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen-Shugart Waterflood Project.

Yours very truly,

W. P. Tomlinson

W. P. Tomlinson

JLT:jcb

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

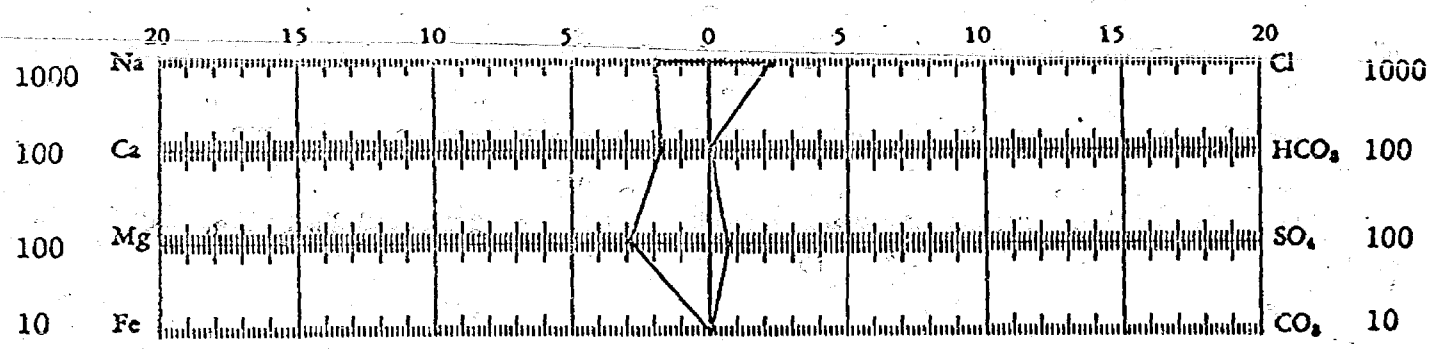
PRODUCTION PROFITS, INC.
Petroleum Service Laboratory
7101 CARPENTER FREEWAY
DALLAS, TEXAS

REPORT OF WATER ANALYSIS

SAMPLE NO. A-2132
TOTAL SOLIDS 135,878

CLIENT Atlantic Richfield Company OPERATOR Atlantic Richfield Company
FIELD Shugart COUNTY Lea STATE New Mexico
LEASE AND WELL NO. Swearingen Waterflood PROD. FORM.
SOURCE OF SAMPLE Heater Treater DEPTH: TOTAL PERF.
SAMPLE OF: PRODUCED WATER ☐ INJECTION SYSTEM WATER ☐ OTHER ☐
DATE COLLECTED 12-20-67 by Ed Ingram ANALYST

MINERAL ANALYSIS PATTERN
(NUMBER BELOW ION NAME INDICATES MEQ./SCALE UNIT)



PRECIPITATED AND SUSPENDED SOLIDS

CONSTITUENT	MG/L (PPM)
TOTAL UNDISSOLVED SOLIDS	
IRON OXIDE	
CALCIUM CARBONATE	
CALCIUM SULFATE	
MAGNESIUM CARBONATE	
BARIUM SULFATE	
SILICA	
ORGANIC	

PHYSICAL PROPERTIES

SP. GRAVITY 1.094
pH 6.9
RESISTIVITY 0.075 OHMMETERS @ 68°
STABILITY INDEX @ 41°F
@ 86°F
$CaSO_4$ SOLUBILITY @ 41°F MEQ/L
@ 86°F MEQ/L
MAX. $CaSO_4$ POSSIBLE MEQ/L

DISSOLVED SOLIDS

CONSTITUENT		MG/L (PPM)
TOTAL SOLIDS	(CALC.)	135,878
SODIUM	(CALC.)	44,100
IRON	(TOTAL)	-
MANGANESE		-
BARIUM		-
CALCIUM		3,380
MAGNESIUM		3,430
CHLORIDE		81,200
BICARBONATE		198
CARBONATE		0
SULFATE		3,570

DISSOLVED GASES

CONSTITUENT	MG/L (PPM)
HYDROGEN SULFIDE	
CARBON DIOXIDE	
OXYGEN	

REMARKS: The sample consisted of one 1 quart plastic bottle of water with tan precipitate.

AtlanticRichfieldCompany

North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

December 18, 1967

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Corrosion Coupon Results as per Commission Order R-2969 Entered in Case No. 3302, Concerning Atlantic Richfield Company Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we are required to submit the corrosion rates as obtained from coupon tests in the Swearingen-Shugart Waterflood Project. Attached are the results of laboratory analyses of the latest exposed coupons.

Yours very truly,

W. P. Tomlinson

W. P. Tomlinson

JLT:jcb

Attachments

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501
Attention: Mr. Frank Irby

SWEARINGEN LEASE WE, SHUGART FLD., NEW MEXICO

WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BW)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Water Injection Wells (Bar-type Stations at Wellhead)	F-150	10/7/66---11/18/66	42	See Remarks	0.0551	0.58	Even etch w/ scattered pitted areas.
	F-151				0.0669	0.71	
B-3 WIW	F-184 F-185	11-18-66---1-24-67	67	3,921	0.0046 0.0045	0.030 0.030	Even etch
	F-303 F-304	1-24-67--3-22-67	57	3,558	0.0225 0.0237	0.17 0.18	Even etch. w/scattered areas of very minor attack
	F-319 F-320	3-22-67--5-19-67	58	3,211	0.0148 0.0146	0.11 0.11	Even etch w/ several areas of slight attack
	F-252 F-253	5-19-67--7-21-67	63	3,150	0.0061 0.0061	0.04 0.04	Even etch.
	F-507 F-508	7-21-67--9-21-67	62	11,376	0.1419 0.1249	1.02 0.90	Scattered pitting attack w/some broad deep pits to 0.008". (equiv. to 47 MPY)
	F-527 F-528	9/21/67--11/14/67	54	20,610	0.1656 0.1748	1.40 1.45	Scattered pitting w/ pits to 0.012" (equiv. to approx. 80 MPY)

SWEARINGEN LEASE WF, SHUGART FLD., NEW MEXICO
WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BW)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Water Injection Wells (Bar-type Stations at Wellhead)	F-148	10/7/66-11/18/66	42	See Remarks	0.0756	0.81	Even etch w/isolated sharp pits.
	F-149				0.0727	0.78	
A-6 WIW	F-186	11-18-66--1-24-67	67	15,596	0.0202	0.13	Even etch with small area of minor attack.
	F-187				0.0199	0.13	
	F-302	1-24-67--3-22-67	57	18,041	0.1378	1.07	Scattered pitted areas w/some deep pits
	F-305				0.1663	1.29	
	F-317	3-22-67--5-19-67	58	19,597	0.2564	1.96	Scattered areas of pitting
	F-318				0.2365	1.81	
	F-250	5-19-67--7-21-67	63	20,472	0.1835	1.29	Scattered pitting attack w/sharp pits
	F-251				0.1793	1.26	
	F-519	7-21-67--9-21-67	62	19,963	0.2792	2.0	Scattered pitting attack w/some broad deep pits to 0.012". (equiv. to approx. 70 MPY)
	F-520				0.3182	2.3	
	F-525	9/21/67--11/14/67	54	15,349	0.1817	1.50	Scattered pitting w/ pits to 0.010" (equiv. to approx. 70 MPY)
	F-526				0.1647	1.40	

SWEARINGEN LEASE WF, SHUGART FLD, N.M. MALCO

WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BW)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Supply Water (Bar-type Stations at Water Plant)	F-144	10/7/66--11/18/66	42	See remarks.	0.0608	0.64	Scattered attack w/minor pitting.
	F-145				0.0635	0.68	
WEST LEG OF MANIFOLD	F-190	11-18-66--1-24-67		59,749	0.0243	0.16	Even etch with scattered areas of minor pits.
	F-191				0.0301	0.20	
	F-298	1-24-67--3-22-67	57	36,099	0.1060	0.82	Scattered attack w/gouges & pitting
	F-299				0.1521	1.18	
	F-314	3-22-67--5-19-67	58	61,649	0.2565	1.96	Overall pitting attack
	F-315				0.2249	1.72	
	F-294	5-19-67--7-21-67	63	51,173	0.1902	1.34	Scattered attack
	F-295				0.1844	1.30	
	F-516	7-21-67--9-21-67	62	64,618	0.0473	0.34	Scattered areas of pitting attack
	F-517				0.0423	0.30	
	F-523	9/21/67--11/14/67	54	73,143	0.0988	0.82	Scattered areas of minor pitting
	F-524				0.0989	0.82	

SWEARINGEN LEASE WF, SHUGART FLD., NEW MEXICO

WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume (BW)	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK
Supply Water (Bar-type Stations at Water Plant)	F-146	10/7/66--11/18/66	42	See remarks.	0.1160	1.2	Scattered attack w/pits.
	F-147				0.1335	1.4	
EAST LEG OF MANIFOLD	F-188	11-18-66--1-24-67	67	59,749	0.0080	0.053	Even etch.
	F-189				0.0076	0.050	
	F-300	1-24-67--3-22-67	57	36,099	0.0166	0.13	Even etch. w/few small areas of attack
	F-301				0.0160	0.12	
	F-280	3-22-67--5-19-67	58	61,649	0.0515	0.39	Scattered pitted attack w/some deep pits
	F-316				0.0456	0.35	
	F-292	5-19-67--7-21-67	63	51,173	0.0821	0.58	Scattered areas of attack w/some areas of minor pitting.
	F-293				0.0810	0.57	
	F-515	7-21-67--9-21-67	62	64,618	0.0384	0.27	Scattered areas of pitting attack
	F-518				0.0312	0.22	
	F-521	9/21/67--11/14/67	54	73,143	0.0738	0.61	Scattered areas of minor pitting
	F-522				0.0899	0.74	

AtlanticRichfieldCompany

North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

April 10, 1968

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Corrosion Coupon Results as per
Commission Order R-2969 Entered
In Case No. 3302, Concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we are required to submit the corrosion rates as obtained from coupon tests in the Swearingen-Shugart Waterflood Project. Attached are the results of laboratory analyses of the latest exposed coupons.

Yours very truly,

W. P. Tomlinson

W. P. Tomlinson

JLT:jcb

Attachments

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico 88120

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease WF, Shugart Field, Eddy Co., New Mexico

LOCATION: West Header

SYSTEM: Water Injection

TYPE STATION: Bar Type at Water Pla

REMARKS:

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-590	11/14/67--1/15/68	62	925,298	0.1577	1.1	Overall Shallow pitting
F-592				0.1835	1.3	
F-610	1/15/68-3/13/68	57		0.0399	0.32	Even etch w/ areas of minor pitting and pitting under holder blocks
F-611				0.0312	0.24	

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease WF, Shugart Field, Eddy Co., New Mexico

LOCATION: East Header

SYSTEM: Water Injection

TYPE STATION: Bar Type at Water Pl

REMARKS:

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-591	11/14/67--1/15/68	62	925,298	0.1135	0.82	Scattered minor pitting
F-593				0.1152	0.83	
F-612	1/15/68--3/13/68	57		Lost.		
F-613				Lost.		

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease W.F., Shugart Field, Eddy Co., New Mexico

LOCATION: Water Injection Wells A-6

SYSTEM: Water Injection Sys

TYPE STATION: Bar Type at Wellhead

REMARKS:

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-594	11/14/67--1/15/68	62	226,523	0.1962	1.4	Scattered pitting attack to at least .008" (47MPY)
F-596				0.2005	1.4	
F-608	1/15--3/13-68	57		0.0651	0.51	Scattered pitting attack to at least .006" (38MPY)
F-609				0.0586	0.46	

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

March 19, 1968

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Produced Water Samples Required by
Commission Order R-2969 Entered
In Case No. 3302, Concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen-Shugart Waterflood Project.

Yours very truly,

W. P. Tomlinson

W. P. Tomlinson

JLT:jcb

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

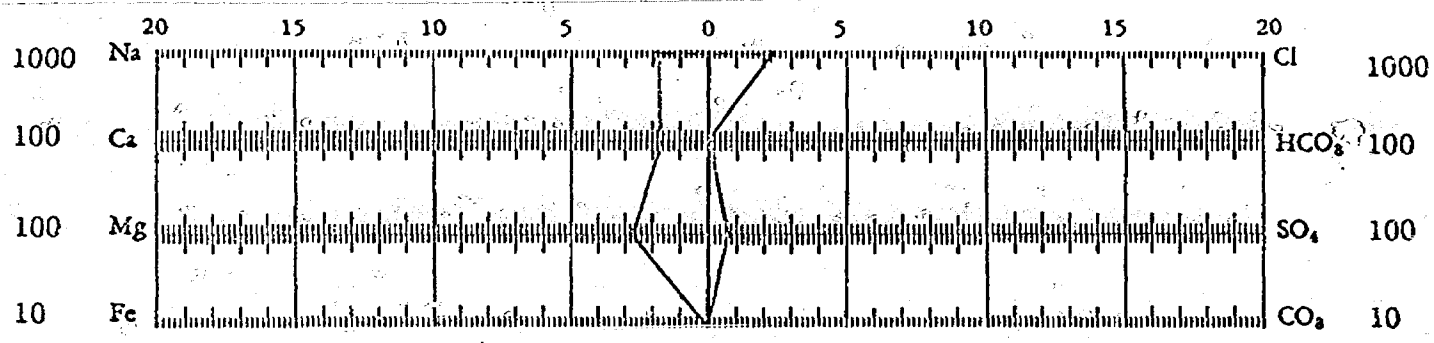
PRODUCTION PROFITS, INC.
Petroleum Service Laboratory
7101 CARPENTER FREEWAY
DALLAS, TEXAS

REPORT OF WATER ANALYSIS

SAMPLE NO. A-2146
TOTAL SOLIDS 132,998

CLIENT Atlantic Richfield Company OPERATOR Atlantic Richfield Company
FIELD Shugart COUNTY Lea STATE New Mexico
LEASE AND WELL NO. Swearinger PROD. FORM.
SOURCE OF SAMPLE Produced Water DEPTH: TOTAL PERF.
SAMPLE OF: PRODUCED WATER ☐ INJECTION SYSTEM WATER ☐ OTHER ☐
DATE COLLECTED 1-10-68 by Ed Ingram ANALYST

MINERAL ANALYSIS PATTERN
(NUMBER BELOW ION NAME INDICATES MEQ./SCALE UNIT)



PRECIPITATED AND SUSPENDED SOLIDS

CONSTITUENT	MG/L (PPM)
TOTAL UNDISSOLVED SOLIDS	
IRON OXIDE	
CALCIUM CARBONATE	
CALCIUM SULFATE	
MAGNESIUM CARBONATE	
BARIUM SULFATE	
SILICA	
ORGANIC	

PHYSICAL PROPERTIES

SP. GRAVITY 1.092
PH 7.0
RESISTIVITY 0.07 OHMMETERS @ 68°
STABILITY INDEX @ 41°F
@ 86°F
$CaSO_4$ SOLUBILITY @ 41°F MEQ/L
@ 86°F MEQ/L
MAX. $CaSO_4$ POSSIBLE MEQ/L

DISSOLVED SOLIDS

CONSTITUENT		MG/L (PPM)
TOTAL SOLIDS	(CALC.)	132,998
SODIUM	(CALC.)	43,100
IRON	(TOTAL)	-
MANGANESE		-
BARIUM		0
CALCIUM		3,380
MAGNESIUM		3,320
CHLORIDE		79,400
BICARBONATE		198
CARBONATE		0
SULFATE		3,600

DISSOLVED GASES

CONSTITUENT	MG/L (PPM)
HYDROGEN SULFIDE	Absent
CARBON DIOXIDE	
OXYGEN	

REMARKS: The sample was one 1 quart plastic bottle of water with a moderate amount of tan sediment solids.

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

File

April 8, 1968

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Produced Water Samples Required by
Commission Order R-2969 Entered
In Case No. 3302, Concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen-Shugart Waterflood Project.

Yours very truly,

W. P. Tomlinson

W. P. Tomlinson

JLT:jcb

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

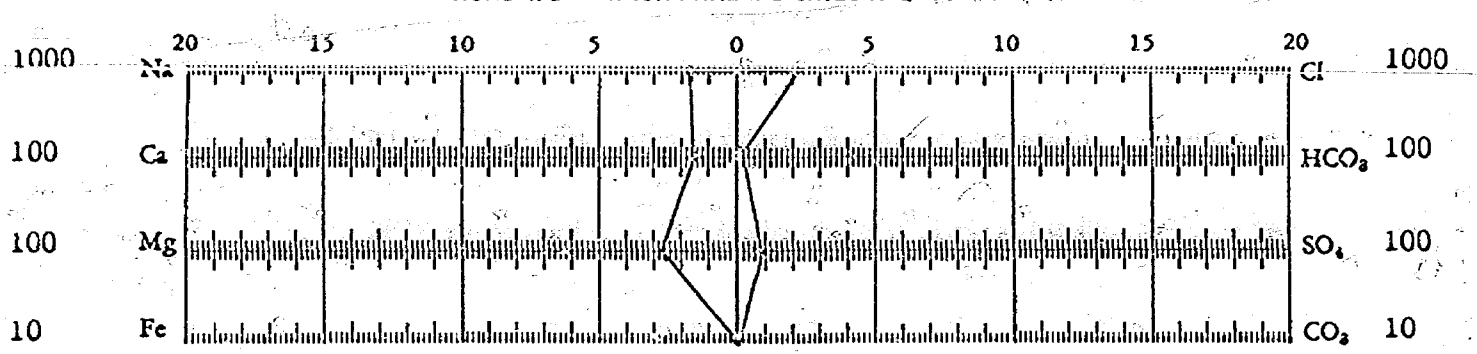
PRODUCTION PROFITS, INC.
Petroleum Service Laboratory
7101 CARPENTER FREEWAY
DALLAS, TEXAS

REPORT OF WATER ANALYSIS

SAMPLE NO. A-2204
TOTAL SOLIDS 123,303

CLIENT Atlantic Richfield Company OPERATOR Atlantic Richfield Company
FIELD Shugart COUNTY Lea STATE New Mexico
LEASE AND WELL NO. Swearingen PROD. FORM.
SOURCE OF SAMPLE Produced Water DEPTH: TOTAL PERF.
SAMPLE OF: PRODUCED WATER ☐ INJECTION SYSTEM WATER ☐ OTHER ☐
DATE COLLECTED 3-13-68 by Ed. Ingram ANALYST

MINERAL ANALYSIS PATTERN
(NUMBER BELOW ION NAME INDICATES MEQ./SCALE UNIT)



PRECIPITATED AND SUSPENDED SOLIDS

CONSTITUENT	MG/L (PPM)
TOTAL UNDISSOLVED SOLIDS	
IRON OXIDE	
CALCIUM CARBONATE	
CALCIUM SULFATE	
MAGNESIUM CARBONATE	
BARIUM SULFATE	
SILICA	
ORGANIC	

PHYSICAL PROPERTIES

SP. GRAVITY 1.087
PH 7.1
RESISTIVITY 0.08 OHMMETERS @ 68°
STABILITY INDEX @ 41°F
@ 86°F
$CaSO_4$ SOLUBILITY @ 41°F MEQ/L
@ 86°F MEQ/L
MAX. $CaSO_4$ POSSIBLE MEQ/L

DISSOLVED SOLIDS

CONSTITUENT		MG/L (PPM)
TOTAL SOLIDS	(CALC.)	123,303
SODIUM	(CALC.)	39,800
IRON	(TOTAL)	-
MANGANESE		-
BARIUM		-
CALCIUM		3,170
MAGNESIUM		3,130
CHLORIDE		73,200
BICARBONATE		203
CARBONATE		0
SULFATE		3,800

DISSOLVED GASES

CONSTITUENT	MG/L (PPM)
HYDROGEN SULFIDE	Absent
CARBON DIOXIDE	
OXYGEN	

'68 APR 9 AM 8 30

REMARKS: The sample was one 1 qt. plastic bottle of water with a small amount of tan sediment solids.

AtlanticRichfieldCompany

North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

December 20, 1967

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

File Case 3302

Re: Re-injection of Produced Water
Swearingen Waterflood, Shugart Field
Eddy County, New Mexico

Gentlemen:

We are re-injecting produced water in the Swearingen Waterflood. An analysis of this water will be obtained soon and sent to you as required by Order R-2969.

Yours very truly,

W. P. Tomlinson

W. P. Tomlinson

WPT:jcb

'67 DEC 21 PM 1 32

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501
Attention: Mr. Frank Irby

United States Geological Survey
P. O. Drawer "U"
Artesia, New Mexico 88210
Attention: Mr. J. A. Knauf

AtlanticRichfieldCompany North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

February 15, 1968

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

File

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

Re: Corrosion Coupon Results as per
Commission Order R-2969 Entered
In Case No. 3302, Concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we are required to submit the corrosion rates as obtained from coupon tests in the Swearingen-Shugart Waterflood Project. Attached are the results of laboratory analyses of the latest exposed coupons.

Yours very truly,

W. P. Tomlinson

W. P. Tomlinson

JLT:jcb

Attachments

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico 88120

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501
Attention: Mr. Frank Irby

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease W.F., Shugart Field, Eddy Co., New Mexico

LOCATION: Water Injection Wells B-3

SYSTEM: Water Injection

TYPE STATION: Bar Type at Wellhead

REMARKS:

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-589	11/14/67--1/15/68	62	111,588	0.2797	2.0	Scattered pitting attack
F-595				0.2724	2.0	to at least .004" (24 MPY)

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease W.F., Shugart Field, Eddy Co., New Mexico

LOCATION: Water Injection Wells A

SYSTEM: Water Injection Sys

TYPE STATION: Bar Type at Wellhea

REMARKS:

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-594	11/14/67--1/15/68	62	226,523	0.1962	1.4	Scattered pitting attack to at least .008" (47MPY)
F-596				0.2005	1.4	

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease WF, Shugart Field, Eddy Co., New Mexico

LOCATION: West Header

SYSTEM: Water Injection

TYPE STATION: Bar Type at Water Pl

REMARKS:

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-590	11/14/67--1/15/68	62	925,298	0.1577	1.1	Overall Shallow pitting
F-592				0.1835	1.3	

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease WF, Shugart Field, Eddy Co., New Mexico

LOCATION: East Header

SYSTEM: Water Injection

TYPE STATION: Bar Type at Water P

REMARKS:

COUPON NUMBER	EXPOSURE DATES	EXPOSURE DAYS	EXPOSURE VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-591	11/14/67--1/15/68	62	925,298	0.1135	0.82	Scattered minor pitting
F-593				0.1152	0.83	

AtlanticRichfieldCompany

North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

June 6, 1968

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

File

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

Re: Corrosion Coupon Results as per
Commission Order R-2969 Entered
In Case No. 3302, Concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we are required to submit the corrosion rates as obtained from coupon tests in the Swearingen-Shugart Waterflood Project. Attached are the results of laboratory analyses of the latest exposed coupons.

Yours very truly,

W. P. Tomlinson

W. P. Tomlinson

JLT:JCB

Attachments

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico 88120

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease W.F., Shugart Field, Eddy Co., New Mexico

LOCATION: Water Injection Wells B-

TYPE STATION: Bar Type at Wellhea

SYSTEM: Water Injection

REMARKS: On West Leg of system (Su

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-589 F-595	11/14/67--1/15/68	62	111,588	0.2797 0.2724	2.0 2.0	Scattered pitting attack to at least .004" (24 MPY)
F-614 F-615	1/15/68--3/13/68	57		0.0491 0.0509	0.38 0.40	Even etch
F-810 F-811	3/13/68--5/15/68	63		0.0073 0.0061	0.05 0.04	Even etch

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease WF, Shugart Field, Eddy Co., New Mexico

LOCATION: West Header

SYSTEM: Water Injection

TYPE STATION: Bar Type at Water P

REMARKS: Produced Water Injected otherwise, inject supply

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-590 F-592	11/14/67--1/15/68	62	925,298	0.1577 0.1835	1.1 1.3	Overall Shallow pitting
F-610 F-611	1/15/68-3/13/68	57		0.0399 0.0312	0.32 0.24	Even etch w/ areas of minor pitting and pitting under holder blocks
F-814 F-815	3/13/68--5/15/68	63		0.2859 0.3650	2.0 2.6	Scattered pitting to at least 0.004" (about 23 MPY)

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease WF, Shugart Field, Eddy Co., New Mexico

SYSTEM: Water Injection

LOCATION: East Header

TYPE STATION: Bar Type at Water P

REMARKS: Supply Water

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-591	11/14/67--1/15/68	62	925,298	0.1135	0.82	Scattered minor pitting
F-593				0.1152	0.83	
F-612	1/15/68--3/13/68	57		Lost		
F-613				Lost		
F-816	3/13/68--5/15/68	63		0.2567	1.8	Scattered shallow pitting and gouges
F-817				0.4888	3.4	

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease W.F., Shugart Field, Eddy Co., New Mexico

LOCATION: Water Injection Wells A-

SYSTEM: Water Injection

TYPE STATION: Bar Type at Wellhead

REMARKS: On East Leg at System

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-594	11/14/67--1/15/68	62	226,523	0.1962	1.4	Scattered pitting attack
F-596				0.2005	1.4	to at least .008" (47MPY)
F-608	1/15/68--3/13/68	57		0.0651	0.51	Scattered pitting attack
F-609				0.0586	0.46	to at least .006" (38MPY)
F-812	3/13/68--5/15/68	63		0.1123	0.78	Spotty etch w/some edge
F-813				0.1179	0.85	pitting

AtlanticRichfieldCompany

North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

September 5, 1968

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

File

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

Re: Produced Water Samples Required by
Commission Order R-2969 Entered
In Case No. 3302, Concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen-Shugart Waterflood Project.

Yours very truly,

W. P. Tomlinson

W. P. Tomlinson

JLT:jcb

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

'68 SEP 6 AM 8 32

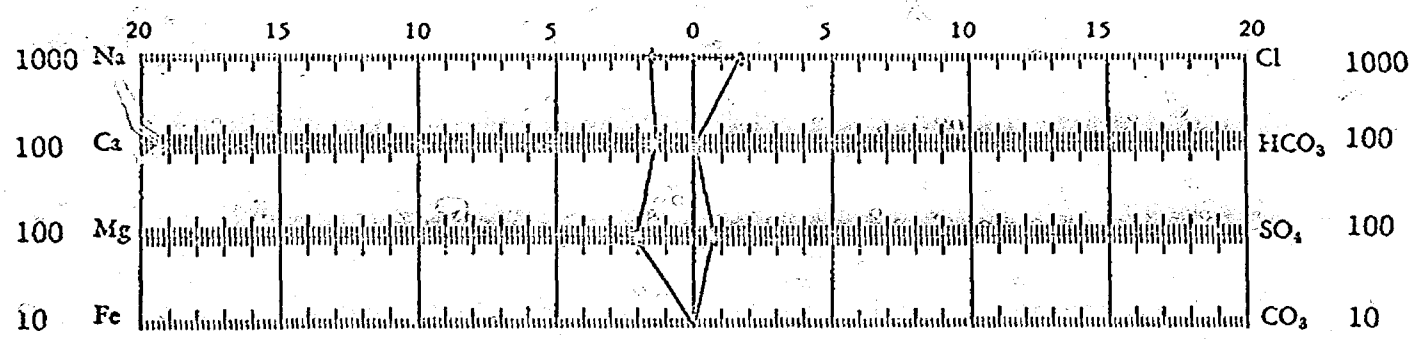
PRODUCTION PROFITS, INC.
Consultants in Petroleum Production
7101 CARPENTER FREEWAY
DALLAS, TEXAS

REPORT OF WATER ANALYSIS

SAMPLE NO. A-2321
TOTAL SOLIDS 107,470

CLIENT Atlantic Richfield Company OPERATOR DO
FIELD Shugart COUNTY Eddy STATE New Mexico
LEASE AND WELL NO. Swearingen PROD. FORM.
SOURCE OF SAMPLE Produced Water DEPTH: TOTAL PERF.
SAMPLE OF: PRODUCED WATER ☐ INJECTION SYSTEM WATER ☐ OTHER ☐
DATE COLLECTED 7-15-68 by Ed Ingram ANALYST

MINERAL ANALYSIS PATTERN
(NUMBER BELOW ION NAME INDICATES MEQ./SCALE UNIT)



PRECIPITATED AND SUSPENDED SOLIDS

CONSTITUENT	MG/L (PPM)
Total Undissolved Solids	
Iron Oxide	
Calcium Carbonate	
Calcium Sulfate	
Magnesium Carbonate	
Barium Sulfate	
Silica	
Organic	

PHYSICAL PROPERTIES

Sp. Gravity 1.074
pH 7.3
Resistivity 0.090 Ohmmeters @ 68°
Stability Index @ 41°F
@ 86°F
$CaSO_4$ Solubility @ 41°F MEQ/L
@ 86°F MEQ/L
Max. $CaSO_4$ Possible MEQ/L

DISSOLVED SOLIDS

CONSTITUENT		MG/L (PPM)
Total Solids	(Calc.)	107,470
Sodium	(Calc.)	34,700
Iron	(Total)	-
Manganese		-
Barium		-
Calcium		2,850
Magnesium		2,650
Chloride		63,300
Bicarbonate		230
Carbonate		0
Sulfate		3,740

DISSOLVED GASES

CONSTITUENT	MG/L (PPM)
Hydrogen Sulfide	Absent
Carbon Dioxide	
Oxygen	

Remarks: The sample consisted of one 1 quart plastic bottle of water with a small amount of sediment solids.

'68 SEP 6 AM

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

June 25, 1968

File

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Produced Water Samples Required by
Commission Order R-2969 Entered
In Case No. 3302, Concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen-Shugart Waterflood Project.

Yours very truly,

W. P. Tomlinson

W. P. Tomlinson

JLT:jcb

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

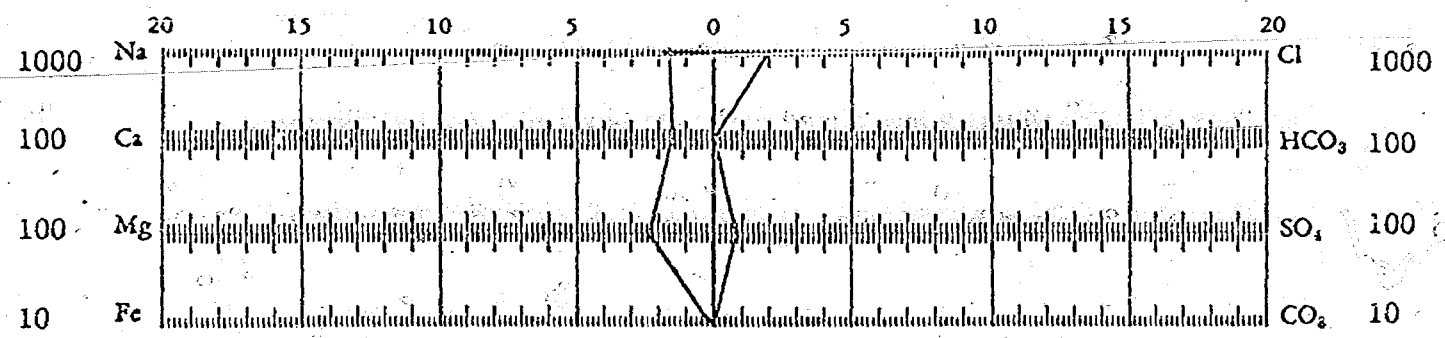
PRODUCTION PROFITS, INC.
Petroleum Service Laboratory
7101 CARPENTER FREEWAY
DALLAS, TEXAS

REPORT OF WATER ANALYSIS

SAMPLE NO. A-2255
TOTAL SOLIDS 116,576

CLIENT Atlantic Richfield Company OPERATOR Atlantic Richfield Company
FIELD Shugart COUNTY Eddy STATE New Mexico
LEASE AND WELL NO. Swearinger PROD. FORM.
SOURCE OF SAMPLE Produced Water DEPTH: TOTAL PERF.
SAMPLE OF: PRODUCED WATER ☐ INJECTION SYSTEM WATER ☐ OTHER ☐
DATE COLLECTED 5-14-68 ANALYST

MINERAL ANALYSIS PATTERN
(NUMBER BELOW ION NAME INDICATES MEQ./SCALE UNIT)



PRECIPITATED AND SUSPENDED SOLIDS

CONSTITUENT	MG/L (PPM)
TOTAL UNDISSOLVED SOLIDS	
IRON OXIDE	
CALCIUM CARBONATE	
CALCIUM SULFATE	
MAGNESIUM CARBONATE	
BARIUM SULFATE	
SILICA	
ORGANIC	

PHYSICAL PROPERTIES

SP. GRAVITY 1.082
pH 7.0
RESISTIVITY 0.086 OHMMETERS @ 68°
STABILITY INDEX @ 41°F
@ 86°F
$CaSO_4$ SOLUBILITY @ 41°F MEQ/L
@ 86°F MEQ/L
MAX. $CaSO_4$ POSSIBLE MEQ/L

DISSOLVED SOLIDS

CONSTITUENT		MG/L (PPM)
TOTAL SOLIDS	(CALC.)	116,576
SODIUM	(CALC.)	37,700
IRON	(TOTAL)	-
MANGANESE		-
BARIUM		-
CALCIUM		3,060
MAGNESIUM		2,840
CHLORIDE		68,800
BICARBONATE		217
CARBONATE		0
SULFATE		3,959

DISSOLVED GASES

CONSTITUENT	MG/L (PPM)
HYDROGEN SULFIDE	Absent
CARBON DIOXIDE	
OXYGEN	

REMARKS: The sample consisted of one 1 quart plastic bottle of water.

AtlanticRichfieldCompany

North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

October 14, 1968

File

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Corrosion Coupon Results as per
Commission Order R-2969 Entered
In Case No. 3302, Concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we are required to submit the corrosion rates as obtained from coupon tests in the Swearingen-Shugart Waterflood Project. Attached are the results of laboratory analyses of the latest exposed coupons.

Yours very truly,

W P Tomlinson

W. P. Tomlinson

JLT:jcb

Attachments

'68 OCT 15 AM 8 25

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico 88120

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease W.F., Shugart Field, Eddy Co., New Mexico LOCATION: Water Injection Wells B-3

SYSTEM: Water Injection TYPE STATION: Bar Type at Wellhead

REMARKS: On West Leg of system (Supp

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK	R
F-589	11/14/67--1/15/68	62	111,588	0.2797	2.0	Scattered pitting attack	(
F-595				0.2724	2.0	to at least .004" (24 MPY)	(
F-614	1/15/68--3/13/68	57		0.0491	0.38	Even etch	G
F-615				0.0509	0.40		o
F-810	3/13/68--5/15/68	63		0.0073	0.05	Even etch	(
F-811				0.0061	0.04		F
F-826	5/15/68--7/15/68	61		0.0105	0.08	Even etch w/some pitting	(
F-827				0.0095	0.07	at corners and end	F
F-924	7/15/68--9/16/68	63	12,521	0.1281	0.92	Even etched body w/a few	(
F-925				0.2505	1.8	scattered pitted areas and severe pitting under holder blocks to at least 0.016" (about 95 MPY)	F

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease WF, Shugart Field, Eddy Co., New Mexico

LOCATION: West Header

SYSTEM: Water Injection

TYPE STATION: Bar Type at Water Pl

REMARKS: Produced Water injected wl otherwise, inject supply

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-590 F-592	11/14/67--1/15/68	62	925,298	0.1577 0.1835	1.1 1.3	Overall Shallow pitting
F-610 F-611	1/15/68-3/13/68	57		0.0399 0.0312	0.32 0.24	Even etch w/ areas of minor pitting and pitting under holder blocks
F-814 F-815	3/13/68--5/15/68	63		0.2859 0.3650	2.0 2.6	Scattered pitting to at least 0.004" (about 23 MPY)
F-818 F-819	5/15/68--7/15/68	61	1,244,577	0.1283 0.1691	0.95 1.2	Scattered pitting w/one to at least 0.016" (about 96 MPY) under holder blocks
F-926 F-928	7/15/68--9/16/68	63	1,244,577	0.6036 0.9277	4.3 6.5	Scattered broad severe pits w/one to at least 0.018" (about 100 MPY)

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease W.F., Shugart Field, Eddy Co., New Mexico

LOCATION: Water Injection Wells A-6

SYSTEM: Water Injection

TYPE STATION: Bar Type at Wellhead

REMARKS: On East Leg at System

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-594 F-596	11/14/67--1/15/68	62	226,523	0.1962 0.2005	1.4 1.4	Scattered pitting attack to at least .008" (47MPY)
F-608 F-609	1/15/68--3/13/68	57		0.0651 0.0586	0.51 0.46	Scattered pitting attack to at least .006" (38MPY)
F-812 F-813	3/13/68--5/15/68	63		0.1123 0.1179	0.78 0.85	Spotty etch w/some edge pitting
F-961 F-962	5/15/68--7/15/68	61		0.1582 0.1269	1.2 .95	Spotty etch w/some edge pitting
F-923 F-969	7/15/68--9/16/68	63	13,656	0.0311 0.0265	0.22 0.19	Smooth spotty etch w/some very minor pitting under holder block

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease WF, Shugart Field, Eddy Co., New Mexico

LOCATION: East Header

SYSTEM: Water Injection

TYPE STATION: Bar Type at Water Pl

REMARKS: Supply Water

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-591 F-593	11/14/67--1/15/68	62	925,298	0.1135 0.1152	0.82 0.83	Scattered minor pitting
F-612 F-613	1/15/68--3/13/68	57		Lost Lost		
F-816 F-817	3/13/68--5/15/68	63		0.2567 0.4888	1.8 3.4	Scattered shallow pitting and gouges
F-825 F-970	5/15/68--7/15/68	61	1,244,577	0.4102 0.3737	3.0 2.7	Overall shallow pitting
F-927 F-929	7/15/68--9/16/68	63	1,244,577	0.0827 0.1165	0.59 0.85	Spotty etch w/some minor edge and end pitting

AtlanticRichfieldCompany

North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

September 3, 1968

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

file

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

Re: Corrosion Coupon Results as per
Commission Order R-2969 Entered
In Case No. 3302 Concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we are required to submit the corrosion rates as obtained from coupon tests in the Swearingen-Shugart Waterflood Project. Attached are the results of laboratory analyses of the latest exposed coupons.

Yours very truly,

W. P. Tomlinson

W. P. Tomlinson

JLT:jcb

Attachments

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico 88120

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

68 SEP 5 PM 1 04

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease W.F., Shugart Field, Eddy Co., New Mexico

LOCATION: Water Injection Wells A-(

SYSTEM: Water Injection

TYPE STATION: Bar Type at Wellhead

REMARKS: On East Leg at System

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-594	11/14/67--1/15/68	62	226,523	0.1962	1.4	Scattered pitting attack
F-596				0.2005	1.4	to at least .008" (47MPY)
F-608	1/15/68--3/13/68	57		0.0651	0.51	Scattered pitting attack
F-609				0.0586	0.46	to at least .006" (38MPY)
F-812	3/13/68--5/15/68	63		0.1123	0.78	Spotty etch w/some edge
F-813				0.1179	0.85	pitting
F-961	5/15/68--7/15/68	61		0.1582	1.2	Spotty etch w/some edge
F-962				0.1269	.95	pitting

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease WF, Shugart Field, Eddy Co., New Mexico

LOCATION: East Header

SYSTEM: Water Injection

TYPE STATION: Bar Type at Water Pla

REMARKS: Supply Water

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-591	11/14/67--1/15/68	62	925,298	0.1135	0.82	Scattered minor pitting
F-593				0.1152	0.83	
F-612	1/15/68--3/13/68	57		Lost		
F-613				Lost		
F-816	3/13/68--5/15/68	63		0.2567	1.8	Scattered shallow pitting
F-817				0.4888	3.4	and gouges
F-825	5/15/68--7/15/68	61	1,244,577	0.4102	3.0	Overall shallow pitting
F-970				0.3737	2.7	

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease W.F., Shugart Field, Eddy Co., New Mexico

LOCATION: Water Injection Wells B-3

TYPE STATION: Bar Type at Wellhead

SYSTEM: Water Injection

REMARKS: On West Leg of system (Sup

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-589 F-595	11/14/67--1/15/68	62	111,588	0.2797 0.2724	2.0 2.0	Scattered pitting attack to at least .004" (24 MPY)
F-614 F-615	1/15/68--3/13/68	57		0.0491 0.0509	0.38 0.40	Even etch
F-810 F-811	3/13/68--5/15/68	63		0.0073 0.0061	0.05 0.04	Even etch
F-826 F-827	5/15/68--7/15/68	61		0.0105 0.0095	0.08 0.07	Even etch w/some pitting at corners and end

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease WF, Shugart Field, Eddy Co., New Mexico

LOCATION: West Header

TYPE STATION: Bar Type at Water Pl

SYSTEM: Water Injection

REMARKS: Produced Water injected w otherwise, inject supply

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-590 F-592	11/14/67--1/15/68	62	925,298	0.1577 0.1835	1.1 1.3	Overall Shallow pitting
F-610 F-611	1/15/68-3/13/68	57		0.0399 0.0312	0.32 0.24	Even etch w/ areas of minor pitting and pitting under holder blocks
F-814 F-815	3/13/68--5/15/68	63		0.2859 0.3650	2.0 2.6	Scattered pitting to at least 0.004" (about 23 MPY)
F-818 F-819	5/15/68--7/15/68	61	1,244,577	0.1283 0.1691	0.95 1.2	Scattered pitting w/one to at least 0.016" (about 96 MPY) under holder blocks

ATLANTIC

THE ATLANTIC REFINING COMPANY
INCORPORATED – 1870
PETROLEUM PRODUCTS

MAIN OFFICE OCC

February 18, 1966

FEB 21 AM 8:04

NORTH AMERICAN PRODUCING DEPARTMENT
NEW MEXICO – ARIZONA DISTRICT
S. L. SMITH, DISTRICT MANAGER
JACK BIARD, DISTRICT LANDMAN
E. R. DOUGLAS, DISTRICT GEOLOGIST
A. D. KLOXIN, DISTRICT DRLG. & PROD. SUP'T.
M. D. ROBERTS, DISTRICT GEOPHYSICIST
W. P. TOMLINSON, DISTRICT ENGINEER
B. R. WARE, DISTRICT ADMINISTRATIVE SUP'V.

SECURITY NATIONAL BANK BLDG.
MAILING ADDRESS
P. O. BOX 1978
ROSWELL, NEW MEXICO

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico

File

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

Re: Corrosion coupon results
as per Commission Order #R-2969
entered in Case #3302, concerning
The Atlantic Refining Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above order, we are required to submit the results of the rate of corrosion of the coupons in the Swearingen-Shugart Waterflood Project. Attached are the results from our laboratory concerning the corrosion rate for the first three month period.

Yours very truly,

W. P. Tomlinson

W. P. Tomlinson

lCH:jcb

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico

Mr. Frank Irby

INTERNAL CORRESPONDENCE

DATE February 17, 1966

TO Mr. W. P. Tomlinson

FROM Mr. R. L. McAdams

MAIN OFFICE OCC

OFFICE Roswell, New Mexico

OFFICE Chemical Engineering Section -- Dallas

FEB 21 AM 8 01

YOUR LETTER FILE

Letter No. 60478

SUBJECT Swearingen Lease Waterflood
Shugart Field, New Mexico
Corrosion Monitoring

MY FILE

Attached are the corrosion coupon results that were reported by telephone to you and L. C. Hudry by H. G. Byars. Also attached is an analysis (No. A-974) of deposits from the plant manifold coupons. These results are a part of the corrosion monitoring in the Ogallala water injection system. Coupon stations have been installed at two locations in the plant manifold and at two injection wells.

This is the initial coupon exposure at each location. The plant and well exposure periods were not the same but were overlapping. The indicated corrosion rates were all in the same range (4.3 to 6.5 Mils Per Year). Deposits removed from the coupons were mostly acid soluble and were predominantly iron oxides.

Although the corrosion rate of these exposures were somewhat high, the pitting was not severe. This corrosive indication does not justify immediate corrosion control. Further monitoring is being done to determine this system's corrosion control requirements.

Currently installed coupons at all four locations are scheduled to be changed out in early March. It has been agreed, at Hudry's suggestion, that only one of the two coupons at each location be changed at that time. The longer exposure might verify the low long-term corrosion rate reported to him by a New Mexico water supplier. Reportedly they have had no serious corrosion when handling Ogallala water in bare pipe.

Another method of verifying long-term corrosion rates would be the installation of Test Nipples in the injection well piping. If you will furnish us with the proper nipples for your well piping, we will prepare them. Nipples in sizes from 1" through 2" diameter and 4" to 1' in length have been used for this purpose. Such nipples would be exposed from six months to a year. If you have any questions concerning this program, please contact us. A copy of the invoice approved for payment has been forwarded to Accounts Payable.

R. L. McAdams

R. L. McAdams

RLM:sjw
cc: Mr. B. J. Lancaster
Mr. L. C. Hudry
Accounts Payable (invoice only)

JHW

PLEASE CONFINE EACH LETTER TO ONE SUBJECT

Attachments

SWEARINGEN LEASE WF, SHUGART FLD, NEW MEXICO
WATER INJECTION SYSTEM

CORROSION COUPON EXPOSURE RESULTS

LOCATION	COUPON NUMBER	EXPOSURE Dates	EXPOSURE Days	EXPOSURE Volume	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK	REMARKS
Supply Water (Bar-type Stations at Water Plant)								
West Leg of Manifold	E-861 E-862	11-6-65--12-2-65	26	800BWPD	0.2978 0.3018	5.2 5.2	Surface roughened Scattered shallow pits	General appearance fair. When received coupons coated w/red deposit (see Analysis A-974).
East Leg of Manifold	E-863 E-864	11-6-65--12-2-65	26	1200BWPD	0.2642 0.2538	4.5 4.3	Even etch w/some edge attack & minor pitting	General appearance good. Coupons coated w/red deposit (see Analysis A-974).

LOCATION	COUPON NUMBER	EXPOSURE Dates	Days	Volume	WEIGHT LOSS (gms)	CORROSION RATE (MPY)	TYPE ATTACK	REMARKS
Water Injection Wells (Bar-type Stations at Wellhead)								
A-6 WIW	E-865 E-866	11-13-65--1-18-66	66	450BWPD	0.9738 0.9628	6.5 6.5	General corrosion w/broad shallow pits	General appearance poor. Total of 29,682BWI Coupons coated w/red deposit.
B-3 WIW	E-867 E-868	11-13-65--1-18-65	66	288BWPD	0.7034 0.8032	4.7 5.4	Even etch w/areas of surface roughening	General appearance fair. Total of 19,003BWI Coupons coated w/red deposit.

PRODUCTION PROFITS, INC.

SCALE ANALYSIS

Client: The Atlantic Refining Co. Lab. No. : A-974

Field: Shugart County: Eddy State: New Mexico

Date of Sample: 12-2-65 Date of Analysis: 12-10-65

Source of Sample: Coupons E-861-862- West Leg Manifold (Injection System)
Coupons E-863-854- East Leg Manifold (Injection System)

Description of Sample: The sample consisted of a four ounce ampule containing a small amount of red scale.

Preparation of Sample in Lab.: A portion of the scale was transferred to an extraction crucible and dried. Sample weight 0.4935 grams.

CHEMICAL ANALYSIS

	%	%
TOTAL ORGANIC CONTENT:		3.1
Extraction by Solvent	0.0	
Ignition Loss After Acid Extraction	3.1	
WATER SOLUBLE CONTENT AFTER SOLVENT EXTRACTION:		3.1
Calcium as	0.0	
Chloride as	-	
Sulfate as	0.0	
ACID SOLUBLE CONTENT AFTER SOLVENT EXTRACTION:		81.8
Iron as Iron Oxide	66.0	
Calcium as Calcium Carbonate	4.5	
Magnesium as	0.0	
Sulfate as	0.0	
Unidentified	11.3	
ACID INSOLUBLE CONTENT: (Non-ignitable)		10.9
Silica	-	
Barium Sulfate	-	
Other		

AtlanticRichfieldCompany

North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

HAIR OFFICE OCC
'68 DEC 12 PM 1 11

December 11, 1968

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Corrosion Coupon Results as per
Commission Order R-2969 Entered
In Case No. 3302, Concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we are required to submit the corrosion rates as obtained from coupon tests in the Swearingen-Shugart Waterflood Project. Attached are the results of laboratory analyses of the latest exposed coupons.

Yours very truly,

W. P. Tomlinson

JLT:jcb

Attachments

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico 88120

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease WF, Shugart Field, Eddy Co., New Mexico

LOCATION: East Header

SYSTEM: Water Injection

TYPE STATION: Bar Type at Water Pl

REMARKS: Supply Water

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-593 F-593	11/14/67--1/15/68	62	925,298	0.1135 0.1152	0.82 0.83	Scattered minor pitting
F-612 F-613	1/15/68--3/13/68	57		Lost Lost		
F-816 F-817	3/13/68--5/15/68	63		0.2567 0.4888	1.8 3.4	Scattered shallow pitting and gouges
F-825 F-970	5/15/68--7/15/68	61	1,244,577	0.4102 0.3737	3.0 2.7	Overall shallow pitting
F-927 F-929	7/15/68--9/16/68	63	1,244,577	0.0827 0.1165	0.59 0.85	Spotty etch w/some minor edge and end pitting
G-231 G-232	9/16/68--11/15/68	60		0.0711 0.0725	0.53 0.54	Spotty etch w/some shallow pits to at least 0.002" (about 12 MPY)

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease W.F., Shugart Field, Eddy Co., New Mexico

LOCATION: Water Injection Wells A-

SYSTEM: Water Injection

TYPE STATION: Bar Type at Wellhead

REMARKS: On East Leg at System

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-594 F-596	11/14/67--1/15/68	62	226,523	0.1962 0.2005	1.4 1.4	Scattered pitting attack to at least .008" (47MPY)
F-608 F-609	1/15/68--3/13/68	57		0.0651 0.0586	0.51 0.46	Scattered pitting attack to at least .006" (38MPY)
F-812 F-813	3/13/68--5/15/68	63		0.1123 0.1179	0.78 0.85	Spotty etch w/some edge pitting
F-961 F-962	5/15/68--7/15/68	61		0.1582 0.1269	1.2 .95	Spotty etch w/some edge pitting
F-923 F-969	7/15/68--9/16/68	63	13,656	0.0311 0.0265	0.22 0.19	Smooth spotty etch w/some very minor pitting under holder block
G-233 G-236	9/16/68--11/15/68	60	15,422	0.0450 0.0455	0.33 0.33	Spotty etch w/some tiny pits at blocks

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease WF, Shugart Field, Eddy Co., New Mexico

LOCATION: West Header

SYSTEM: Water Injection

TYPE STATION: Bar Type at Water F

REMARKS: Produced Water injected otherwise, inject suppl

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-590 F-592	11/14/67--1/15/68	62	925,298	0.1577 0.1835	1.1 1.3	Overall Shallow pitting
F-610 F-611	1/15/68-3/13/68	57		0.0399 0.0312	0.32 0.24	Even etch w/ areas of minor pitting and pitting under holder blocks
F-814 F-815	3/13/68--5/15/68	63		0.2859 0.3650	2.0 2.6	Scattered pitting to at least 0.004" (about 23 MPY)
F-818 F-819	5/15/68--7/15/68	61	1,244,577	0.1283 0.1691	0.95 1.2	Scattered pitting w/one to at least 0.016" (about 96 MPY) under holder blocks
F-926 F-928	7/15/68--9/16/68	63	1,244,577	0.6036 0.9277	4.3 6.5	Scattered broad severe pits w/one to at least 0.018" (about 100 MPY)
G-229 G-230	9/16/68--11/15/68	60		0.1129 0.1398	0.83 1.0	Many shallow pits w/some isolated pits to at least 0.009" (about 55 MPY) and some severe pitting under holder blocks

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease W.F., Shugart Field, Eddy Co., New Mexico LOCATION: Water Injection Wells B-3

SYSTEM: Water Injection TYPE STATION: Bar Type at Wellhead

REMARKS: On West Leg of system (Sup

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-589	11/14/67--1/15/68	62	111,588	0.2797	2.0	Scattered pitting attack
F-595				0.2724	2.0	to at least .004" (24 MPY)
F-614	1/15/68--3/13/68	57		0.0491	0.38	Even etch
F-615				0.0509	0.40	
F-810	3/13/68--5/15/68	63		0.0073	0.05	Even etch
F-811				0.0061	0.04	
F-826	5/15/68--7/15/68	61		0.0105	0.08	Even etch w/some pitting
F-827				0.0095	0.07	at corners and end
F-924	7/15/68--9/16/68	63	12,521	0.1281	0.92	Even etched body w/a few
F-925				0.2505	1.8	scattered pitted areas and severe pitting under holder blocks to at least 0.016" (about 95 MPY)
G-234	9/16/68--11/15/68	60	12,482	0.0710	0.53	Even etch w/severe pitting
G-235				0.0891	0.66	under holder blocks to at least 0.013" (about 80 MPY)

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

January 15, 1969

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Produced Water Samples Required by Commission Order R-2969 Entered In Case No. 3302, Concerning Atlantic Richfield Company Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen-Shugart Waterflood Project.

Yours very truly,

W. P. Tomlinson
by: E. M. Pringle

JLT:jcb

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

PRODUCTION PROFITS, INC.
Consultants in Petroleum Production
7101 CARPENTER FREEWAY
DALLAS, TEXAS

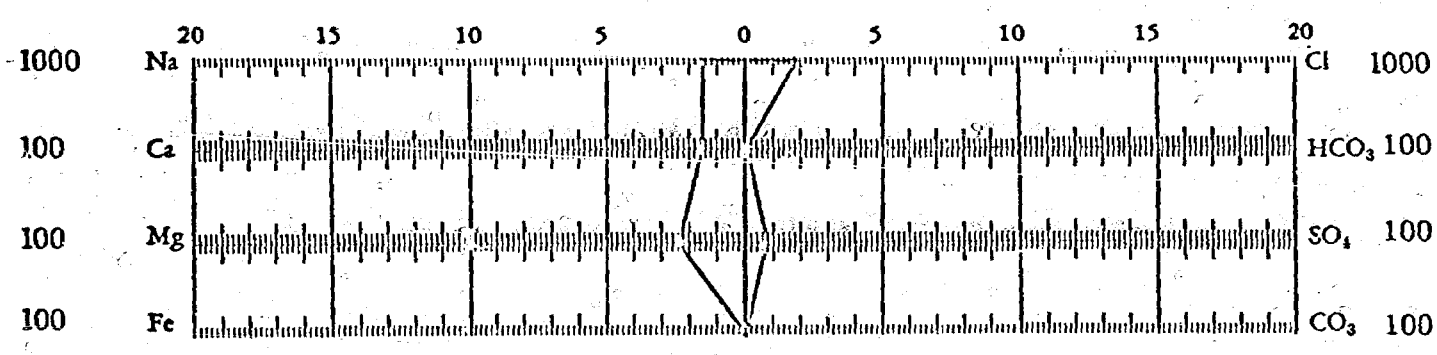
REPORT OF WATER ANALYSIS

MAIN OFFICE 69 JAN 16 AM 8 28

SAMPLE NO. A-2804
TOTAL SOLIDS 108,720

CLIENT Atlantic Richfield Company OPERATOR do
FIELD Shugart COUNTY Eddy STATE New Mexico
LEASE AND WELL NO. Swearingen PROD. FORM.
SOURCE OF SAMPLE Produced Water DEPTH: TOTAL PERF.
SAMPLE OF: PRODUCED WATER ☐ INJECTION SYSTEM WATER ☐ OTHER ☐
DATE COLLECTED 12-16-68 ANALYST.

MINERAL ANALYSIS PATTERN
(NUMBER BELOW ION NAME INDICATES MEQ./SCALE UNIT)



PRECIPITATED AND SUSPENDED SOLIDS

CONSTITUENT	MG/L (PPM)
TOTAL UNDISSOLVED SOLIDS	
IRON OXIDE	
CALCIUM CARBONATE	
CALCIUM SULFATE	
MAGNESIUM CARBONATE	
BARIUM SULFATE	
SILICA	
ORGANIC	

PHYSICAL PROPERTIES

SP. GRAVITY 1.078
pH 7.3
RESISTIVITY 0.084 OHMMETERS @ 68°
STABILITY INDEX @ 41°F
@ 86°F
$CaSO_4$ SOLUBILITY @ 41°F MEQ/L
@ 86°F MEQ/L
MAX. $CaSO_4$ POSSIBLE MEQ/L

DISSOLVED SOLIDS

CONSTITUENT		MG/L (PPM)
TOTAL SOLIDS	(CALC.)	108,720
SODIUM	(CALC.)	34,800
IRON	(TOTAL)	-
MANGANESE		-
BARIUM		0
CALCIUM		2,980
MAGNESIUM		2,800
CHLORIDE		64,200
BICARBONATE		260
CARBONATE		0
SULFATE		3,680

DISSOLVED GASES

CONSTITUENT	MG/L (PPM)
HYDROGEN SULFIDE	Absent
CARBON DIOXIDE	
OXYGEN	

REMARKS: This sample consisted of one 1 quart plastic bottle of water.

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

'69 FEB 19 AM 8 16

February 18, 1969

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Corrosion Coupon Results as per
Commission Order R-2969 Entered
In Case No. 3302, Concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we are required to submit the corrosion rates as obtained from coupon tests in the Swearingen-Shugart Waterflood Project. Attached are the results of laboratory analyses of the latest exposed coupons.

Yours very truly,

W P Tomlinson

W. P. Tomlinson

JLT:jcb

Attachments

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico 88120

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease WF, Shugart Field, Eddy Co., New Mexico

LOCATION: West Header

SYSTEM: Water Injection

TYPE STATION: Bar Type at Water Pl

REMARKS: Produced Water injected w otherwise, inject supply

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-590	11/14/67--1/15/68	62	925,298	0.1577	1.1	Overall Shallow pitting
F-592				0.1835	1.3	
F-610	1/15/68-3/13/68	57		0.0399	0.32	Even etch w/ areas of minor pitting and pitting under holder blocks
F-611				0.0312	0.24	
F-814	3/13/68--5/15/68	63		0.2859	2.0	Scattered pitting to at least 0.004" (about 23 MPY)
F-815				0.3650	2.6	
F-818	5/15/68--7/15/68	61	1,244,577	0.1283	0.95	Scattered pitting w/one to at least 0.016" (about 96 MPY) under holder blocks
F-819				0.1691	1.2	
F-926	7/15/68--9/16/68	63	1,244,577	0.6036	4.3	Scattered broad severe pits w/one to at least 0.018" (about 100 MPY)
F-928				0.9277	6.5	
G-229	9/16/68--11/15/68	60		0.1129	0.83	Many shallow pits w/some isolated pits to at least 0.009" (about 55 MPY) and some severe pitting under holder blocks
G-230				0.1398	1.0	
G-239	11/15/68--1/15/69	61		0.0110	0.08	Even etch w/scattered areas of minor pitting.
G-240				0.0137	0.10	

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease W.F., Shugart Field, Eddy Co., New Mexico LOCATION: Water Injection Wells B-

SYSTEM: Water Injection TYPE STATION: Bar Type at Wellhea

REMARKS: On West Leg of system (Su

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-589 F-595	11/14/67--1/15/68	62	111,588	0.2797 0.2724	2.0 2.0	Scattered pitting attack to at least .004" (24 MPY)
F-614 F-615	1/15/68--3/13/68	57		0.0491 0.0509	0.38 0.40	Even etch
F-810 F-811	3/13/68--5/15/68	63		0.0073 0.0061	0.05 0.04	Even etch
F-826 F-827	5/15/68--7/15/68	61		0.0105 0.0095	0.08 0.07	Even etch w/some pitting at corners and end
F-924 F-925	7/15/68--9/16/68	63	12,521	0.1281 0.2505	0.92 1.8	Even etched body w/a few scattered pitted areas and severe pitting under holde blocks to at least 0.016" (about 95 MPY)
G-234 G-235	9/16/68--11/15/68	60	12,482	0.0710 0.0891	0.53 0.66	Even etch w/severe pitting under holder blocks to at least 0.013" (about 80 MPY
G-243 G-244	11/15/68--1/15/69	61	12,824	0.0311 0.0302	0.22 0.22	Even etch w/shallow scatte body pitting and pitting under holder blocks to at least 0.010" (about 60 MPY

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease WF, Shugart Field, Eddy Co., New Mexico

LOCATION: East Header

SYSTEM: Water Injection

TYPE STATION: Bar Type at Water Pl

REMARKS: Supply Water

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-591 F-593	11/14/67--1/15/68	62	925,298	0.1135 0.1152	0.82 0.83	Scattered minor pitting
F-612 F-613	1/15/68--3/13/68	57		Lost Lost		
F-816 F-817	3/13/68--5/15/68	63		0.2567 0.4888	1.8 3.4	Scattered shallow pitting and gouges
F-825 F-970	5/15/68--7/15/68	61	1,244,577	0.4102 0.3737	3.0 2.7	Overall shallow pitting
F-927 F-929	7/15/68--9/16/68	63	1,244,577	0.0827 0.1165	0.59 0.85	Spotty etch w/some minor edge and end pitting
G-231 G-232	9/16/68--11/15/68	60		0.0711 0.0725	0.53 0.54	Spotty etch w/some shallow pits to at least 0.002" (about 12 MPY)
G-237 G-238	11/15/68--1/15/69	61		0.3058 0.2543	2.3 1.8	Overall shallow pitting

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease W.F., Shugart Field, Eddy Co., New Mexico

LOCATION: Water Injection Wells A-

SYSTEM: Water Injection

TYPE STATION: Bar Type at Wellhead

REMARKS: On East Leg at System

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-594 F-596	11/14/67--1/15/68	62	226,523	0.1962 0.2005	1.4 1.4	Scattered pitting attack to at least .008" (47MPY)
F-608 F-609	1/15/68--3/13/68	57		0.0651 0.0586	0.51 0.46	Scattered pitting attack to at least .006" (38MPY)
F-812 F-813	3/13/68--5/15/68	63		0.1123 0.1179	0.78 0.85	Spotty etch w/some edge pitting
F-961 F-962	5/15/68--7/15/68	61		0.1582 0.1269	1.2 .95	Spotty etch w/some edge pitting
F-923 F-969	7/15/68--9/16/68	63	13,656	0.0311 0.0265	0.22 0.19	Smooth spotty etch w/some very minor pitting under holder block
G-233 G-236	9/16/68--11/15/68	60	15,422	0.0450 0.0455	0.33 0.33	Spotty etch w/some tiny pits at blocks
G-241 G-242	11/15/68--1/15/69	61	14,004	0.4653 0.3862	3.4 2.9	Overall tiny shallow pits

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

MAIN OFFICE
'69 JUL 10 PM 1 45

July 9, 1969

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

File

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

Re: Corrosion Coupon Results as per
Commission Order R-2969 Entered
In Case No. 3302, Concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we are required to submit the corrosion rates as obtained from coupon tests in the Swearingen-Shugart Waterflood Project. Attached are the results of laboratory analyses of the latest exposed coupons.

Yours very truly,

W. P. Tomlinson

W. P. Tomlinson

JLT:jcb

Attachments

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico 88120

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease W. F., Shugart Field, Eddy Co., New Mexico

SYSTEM: Water Injection

LOCATION: Water Injection Wells B-

TYPE STATION: Bar Type at Wellhead

REMARKS: On West Leg of System (Su

COUPON NUMBER	EXPOSURE DATES	EXPOSURE DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
G-486	3/19/69-	62	217BWPD	0.0491	0.36	Scattered shallow pitting
G-487	5/20/69			0.0250	0.18	

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease WF, Shugart Field, Eddy Co., New Mexico

SYSTEM: Water Injection

LOCATION: West Header

TYPE STATION: Bar Type at Water P

REMARKS: Produced Water Injected wh otherwise, inject supply w

COUPON NUMBER	EXPOSURE DATES	EXPOSURE DAYS	EXPOSURE VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
G-482 G-483	3/19/69- 5/20/69	62		0.0447 0.0565	0.33 0.40	Scattered broad pits to at least 0.005" (about 31 MPY)

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease W. F.,Shugart Field, Eddy Co., New Mexico

SYSTEM: Water Injection

LOCATION: Water Injection Wells A-6

TYPE STATION: Bar Type at Wellhead

REMARKS: On East Leg at System

COUPON NUMBER	EXPOSURE DATES	EXPOSURE DAYS	EXPOSURE VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK	R
G-488	3/19/69-	62	288 BWPD	0.0609	0.44	Scattered shallow pitting	G
G-489	5/20/69			0.0620	0.45		G

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease WF, Shugart Field, Eddy Co., New Mexico

SYSTEM: Water Injection

LOCATION: East Header

TYPE STATION: Bar Type at Water Plan

REMARKS: Supply Water

COUPON NUMBER	EXPOSURE DATES	EXPOSURE DAYS	EXPOSURE VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK	
G-484	3/19/69-	62		0.8839	6.4	Overall shallow pitting	(
G-485	5/20/69			0.6643	4.8	to at least 0.002". (About 12 MPY)	(

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

'69 APR 15 AM 8 16

April 14, 1969

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Produced Water Samples Required by
Commission Order R-2969 Entered
In Case No. 3302 Concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

Gentlemen:

file

As per the above Order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen-Shugart Waterflood Project.

Yours very truly,

W. P. Tomlinson

JLT:jcb

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

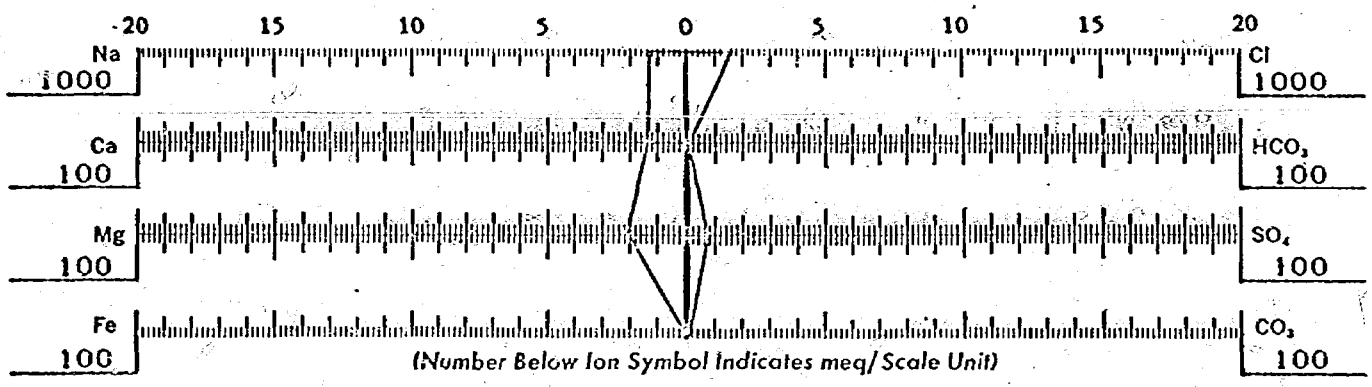
PRODUCTION PROFITS, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

Client: Atlantic Richfield Company
County: Eddy State: New Mexico
Field: Shugart Lease: Swearinger Produced Water Well No.:
Formation: Depth: Perf.:
Source of Sample:
Date Collected: 3-19-69 by:

REPORT OF WATER ANALYSIS

Lab. Number: A-2948 Specific Gravity: 1.075 pH: 7.3
Total Dissolved Solids: 106905 Resistivity (Ohmmeters at 68° F.): 0.088 Hydrogen Sulfide: ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	106905	
Sodium (Calc.)	34300	1492.1
Iron (Dissolved)	-	-
Barium	-	-
Calcium	2930	146.2
Magnesium	2670	219.5
Chloride	62900	1773.8
Bicarbonate	315	5.2
Carbonate	0	0.0
Sulfate	3790	78.8

TOTAL IRON: -

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

	mg/l
Total Undissolved Solids	
Oil (Solvent Soluble)	
Acid Solubles	
Iron as	
Calcium as	
Magnesium as	
Sulfate as	
Organic (Ignition Loss)	
Acid Insolubles	
Sand & Clay	
Barium Sulfate (Quan.)	
(Qual.)	

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: Scaling Tendency:
Calcium Sulfate Stability at 95°F
Concentration: meq/l. Calc. Solubility: meq/l. Percent Saturation:
Barium Sulfate Stability at 95° F
Concentration: meq/l. Calc. Solubility: meq/l. Percent Saturation:

REMARKS

The sample consisted of one 1 quart plastic bottle of water.

AtlanticRichfieldCompany

North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

'69 APR 22 PM 1 20

April 21, 1969

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

File

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

Re: Corrosion Coupon Results as per
Commission Order R-2969 Entered
In Case No. 3302 Concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we are required to submit the corrosion rates as obtained from coupon tests in the Swearingen-Shugart Waterflood Project. Attached are the results of laboratory analyses of the latest exposed coupons.

Yours very truly,

W. P. Tomlinson

W. P. Tomlinson

JLT:jcb

Attachments

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico 88120

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease WF, Shugart Field, Eddy Co., New Mexico

LOCATION: East Header

SYSTEM: Water Injection

TYPE STATION: Bar Type at Water Pl

REMARKS: Supply Water

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-591 F-593	11/14/67--1/15/68	62	925,298	0.1135 0.1152	0.82 0.83	Scattered minor pitting
F-612 F-613	1/15/68--3/13/68	57		Lost Lost		
F-816 F-817	3/13/68--5/15/68	63		0.2567 0.4888	1.8 3.4	Scattered shallow pitting and gouges
F-8[illegible]5 F-9[illegible]0	5/15/68--7/15/68	61	1,244,577	0.4102 0.3737	3.0 2.7	Overall shallow pitting
F-927 F-929	7/15/68--9/16/68	63	1,244,577	0.0827 0.1165	0.59 0.85	Spotty etch w/some minor edge and end pitting
G-231 G-232	9/16/68--11/15/68	60		0.0711 0.0725	0.53 0.54	Spotty etch w/some shallow pits to at least 0.002" (about 12 MPY)
G-237 G-238	11/15/68--1/15/69	61		0.3058 0.2543	2.3 1.8	Overall shallow pitting
G-478 G-479	1/15/69--3/19/69	63		0.7638 0.6926	5.5 4.9	Overall shallow pitting to at least 0.002" (about 12 MPY)

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease W.F., Shugart Field, Eddy Co., New Mexico

LOCATION: Water Injection Wells A-3

SYSTEM: Water Injection

TYPE STATION: Bar Type at Wellhead

REMARKS: On East Leg at System

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-594 F-596	11/14/67--1/15/68	62	226,523	0.1962 0.2005	1.4 1.4	Scattered pitting attack to at least .008" (47MPY)
F-608 F-609	1/15/68--3/13/68	57		0.0651 0.0586	0.51 0.46	Scattered pitting attack to at least .006" (38MPY)
F-812 F-813	3/13/68--5/15/68	63		0.1123 0.1179	0.78 0.85	Spotty etch w/some edge pitting
F-961 F-962	5/15/68--7/15/68	61		0.1582 0.1269	1.2 .95	Spotty etch w/some edge pitting
F-923 F-969	7/15/68--9/16/68	63	13,656	0.0311 0.0265	0.22 0.19	Smooth spotty etch w/some very minor pitting under holder block
G-233 G-236	9/16/68--11/15/68	60	15,422	0.0450 0.0455	0.33 0.33	Spotty etch w/some tiny pits at blocks
G-241 G-242	11/15/68--1/15/69	61	14,004	0.4653 0.3862	3.4 2.9	Overall tiny shallow pits
G-473 G-475	1/15/69--3/19/69	63	13,802	0.4997 0.4411	3.5 3.1	Surface roughening

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease WF, Shugart Field, Eddy Co., New Mexico

SYSTEM: Water Injection

LOCATION: West Header

TYPE STATION: Bar Type at Water P

REMARKS: Produced Water injected otherwise, inject supply

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-590 F-592	11/14/67--1/15/68	62	925,298	0.1577 0.1835	1.1 1.3	Overall Shallow pitting
F-610 F-611	1/15/68-3/13/68	57		0.0399 0.0312	0.32 0.24	Even etch w/ areas of minor pitting and pitting under holder blocks
F-814 F-815	3/13/68--5/15/68	63		0.2859 0.3650	2.0 2.6	Scattered pitting to at least 0.004" (about 23 MPY)
F-818 F-819	5/15/68--7/15/68	61	1,244,577	0.1283 0.1691	0.95 1.2	Scattered pitting w/one to at least 0.016" (about 96 MPY) under holder blocks
F-926 F-928	7/15/68--9/16/68	63	1,244,577	0.6036 0.9277	4.3 6.5	Scattered broad severe pits w/one to at least 0.018" (about 100 MPY)
G-229 G-230	9/16/68--11/15/68	60		0.1129 0.1398	0.83 1.0	Many shallow pits w/some isolated pits to at least 0.009" (about 55 MPY) and some severe pitting under holder blocks
G-239 G-240	11/15/68--1/15/69	61		0.0110 0.0137	0.08 0.10	Even etch w/scattered areas of minor pitting.
G-476 G-477	1/15/69--3/19/69	63		0.2475 0.2658	1.7 1.9	Scattered broad pits to at least 0.009" (about 52 MPY). Severe pitting under holder block coupon G-476.

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease W.F., Shugart Field, Eddy Co., New Mexico LOCATION: Water Injection Wells B-3

SYSTEM: Water Injection TYPE STATION: Bar Type at Wellhead

REMARKS: On West Leg of system (Supp

COUPON NUMBER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
F-589 F-595	11/14/67--1/15/68	62	111,588	0.2797 0.2724	2.0 2.0	Scattered pitting attack to at least .004" (24 MPY)
F-614 F-615	1/15/68--3/13/68	57		0.0491 0.0509	0.38 0.40	Even etch
F-810 F-811	3/13/68--5/15/68	63		0.0073 0.0061	0.05 0.04	Even etch
F-826 F-827	5/15/68--7/15/68	61		0.0105 0.0095	0.08 0.07	Even etch w/some pitting at corners and end
F-924 F-925	7/15/68--9/16/68	63	12,521	0.1281 0.2505	0.92 1.8	Even etched body w/a few scattered pitted areas and severe pitting under holder blocks to at least 0.016" (about 95 MPY)
G-234 G-235	9/16/68--11/15/68	60	12,482	0.0710 0.0891	0.53 0.66	Even etch w/severe pitting under holder blocks to at least 0.013" (about 80 MPY)
G-243 G-244	11/15/68--1/15/69	61	12,824	0.0311 0.0302	0.22 0.22	Even etch w/shallow scatter body pitting and pitting under holder blocks to at least 0.010" (about 60 MPY)
G-472 G-474	1/15/69--3/19/69	63	14,113	0.0653 0.0432	0.46 0.31	Even etch w/minor pitting Severe pitting under holder blocks 0.007" (about 40 MPY

AtlanticRichfieldCompany

North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

'69 JUL 24 PM 1 52

July 23, 1969

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

File

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

Re: Produced Water Samples Required by Commission Order R-2969 Entered In Case No. 3302, Concerning Atlantic Richfield Company Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen-Shugart Waterflood Project.

Yours very truly,

W. P. Tomlinson by S.H.C.

W. P. Tomlinson
by S. H. Christianson

MAO:jcb

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

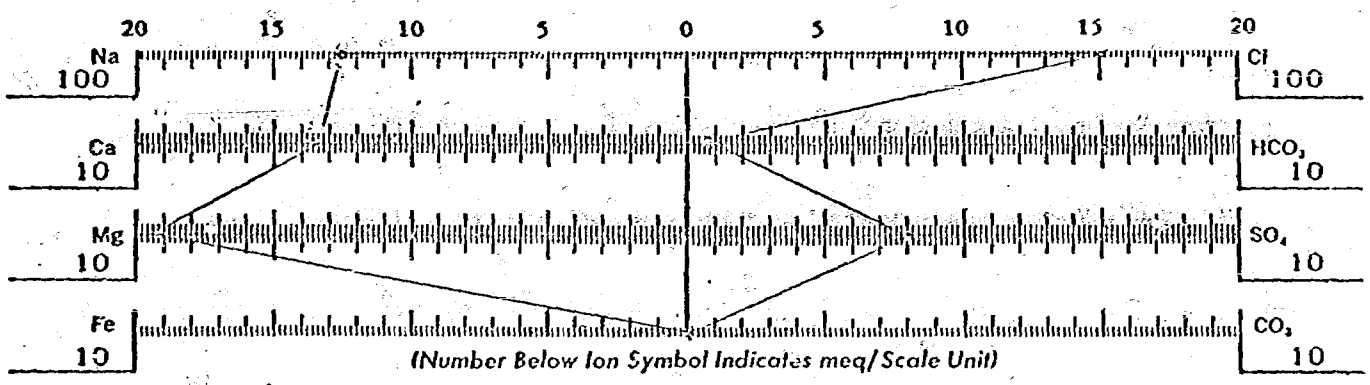
PRODUCTION PROFITS, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

Client: Atlantic Richfield Company
County: Eddy State: New Mexico
Field: Shugart Lease: Swearinger Waterflood Well No.:
Formation: Queen Depth: Perf.:
Source of Sample: Produced Water
Date Collected: 6-19-69 by:

REPORT OF WATER ANALYSIS

Lab. Number: A-3051 Specific Gravity: 1.067 pH: 7.2
Total Dissolved Solids: 92313 Resistivity (Ohmmeters at 68° F.): 0.093 Hydrogen Sulfide: ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	92313	
Sodium (Calc.)	29300	1272.0
Iron (Dissolved)	-	-
Barium	-	-
Calcium	2690	134.2
Magnesium	2370	194.8
Chloride	53700	1514.3
Bicarbonate	393	6.4
Carbonate	0	0.0
Sulfate	3860	80.3

TOTAL IRON: -

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

	mg/l
Total Undissolved Solids	
Oil (Solvent Soluble)	
Acid Solubles	
Iron as	
Calcium as	
Magnesium as	
Sulfate as	
Organic (Ignition Loss)	
Acid Insolubles	
Sand & Clay	
Barium Sulfate (Quan.)	
(Qual.)	

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: Scaling Tendency:
Calcium Sulfate Stability at 95°F
Concentration: meq/l. Calc. Solubility: meq/l. Percent Saturation:
Barium Sulfate Stability at 95° F
Concentration: meq/l. Calc. Solubility: meq/l. Percent Saturation:

REMARKS: The sample consisted of one 1 quart plastic bottle of water.

AtlanticRichfieldCompany

North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

'69 SEP 6 PM 8 25

September 5, 1969

File

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Produced Water Samples Required by
~~Commission Order~~ R-3969 Entered
In Case No. 3302, Concerning
~~Atlantic Richfield~~ Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen-Shugart Waterflood Project.

Yours very truly,

W. P. Tomlinson

MAO:jcb

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

91-810

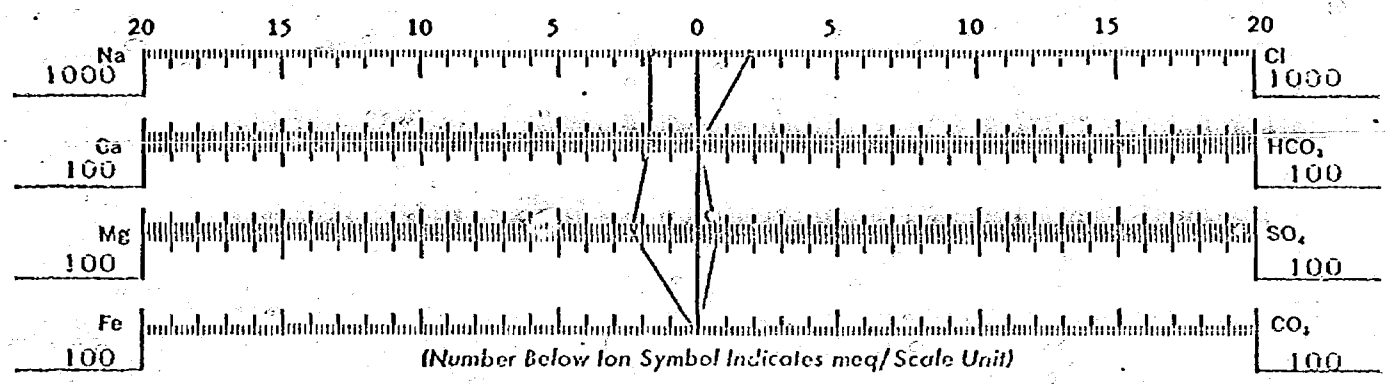
PRODUCTION PROFITS, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

Client: Atlantic Richfield Company
County: Eddy State: New Mexico
Field: Shugart Lease: Swearinger Water Plant - Produced
Formation: Depth: Perf.:
Source of Sample: West Pump Discharge
Date Collected: 8-1-69 by:

REPORT OF WATER ANALYSIS

Lab. Number: A-3167 Specific Gravity: 1.082 pH: 7.2
Total Dissolved Solids: 117262 Resistivity (Ohmmeters at 68° F.): 0.073 Hydrogen Sulfide: ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	117262	
Sodium (Calc.)	37700	1639.9
Iron (Dissolved)	-	-
Barium	-	-
Calcium	3270	163.2
Magnesium	2880	236.7
Chloride	69500	1959.9
Bicarbonate	332	5.4
Carbonate	0	0.0
Sulfate	3580	74.5

TOTAL IRON: -

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

	mg/l
Total Undissolved Solids	
Oil (Solvent Soluble)	
Acid Solubles	
Iron as	
Calcium as	
Magnesium as	
Sulfate as	
Organic (Ignition Loss)	
Acid Insolubles	
Sand & Clay	
Barium Sulfate (Quan.)	
(Qual.)	

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: Scaling Tendency:
Calcium Sulfate Stability at 95°F
Concentration meq/l. Calc. Solubility meq/l. Percent Saturation:
Barium Sulfate Stability at 95° F
Concentration meq/l. Calc. Solubility meq/l. Percent Saturation:

REMARKS

The sample consisted of one 1 quart glass jar of water.

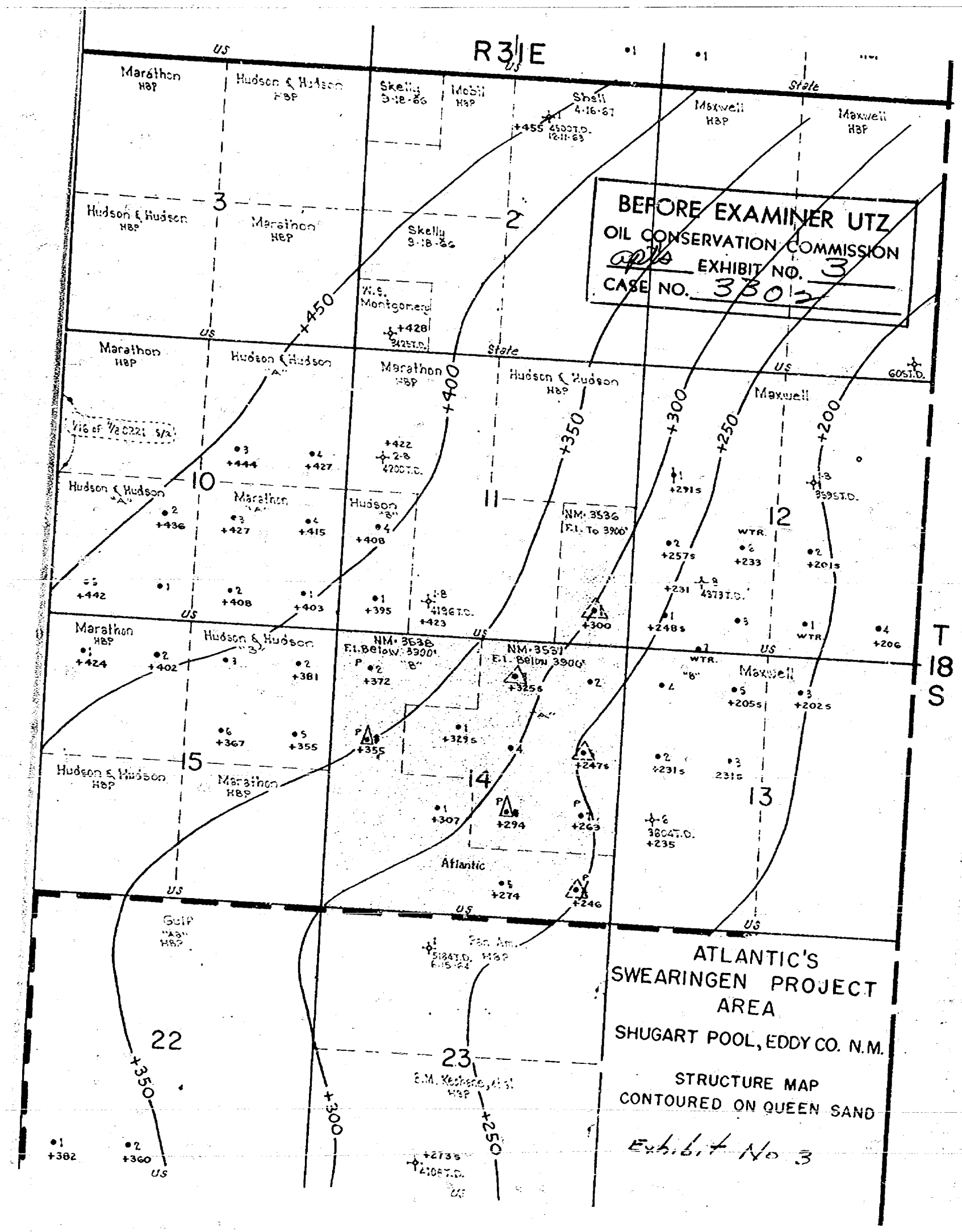

R31E
T 18 S
BEFORE EXAMINER UTZ
OIL CONSERVATION COMMISSION
EXHIBIT NO. 3
CASE NO. 3302
Marathon H&P
Hudson & Hudson H&P
Skelly 9-18-66
Mobil H&P
Shell 4-16-67
+455 4500T.D. 12-11-63
Maxwell H&P
Hudson & Hudson H&P
Marathon H&P
Skelly 9-18-66
W.E. Montgomery
+428 3425T.D.
+450
+400
+350
+300
+250
+200
Marathon H&P
Hudson & Hudson "A"
Marathon H&P
Hudson & Hudson H&P
Maxwell
60ST.D.
1/16 of 1/2 0221 S/2
+422 2-8 4200T.D.
+444
+427
+436
+427
+415
+408
+291s
3595T.D.
NM-3536 F.I. To 3900'
+257s
+233
+201s
+231
4373T.D.
+248s
+206
+442
+408
+403
+395
4196T.D.
+423
+300
WTR.
Marathon H&P
Hudson & Hudson "B"
NM-3638 F.I. Below 3900'
NM-3531 F.I. Below 3900'
+424
+402
+381
+372
+325s
+205s
+202s
+367
+355
+355
+329s
+247s
+231s
2315
Hudson & Hudson H&P
Marathon H&P
+307
+294
+263
3804T.D.
+235
Atlantic
+274
+246
Gulf "A" H&P
Pan Am. H&P
5184T.D. 6-15-64
ATLANTIC'S SWEARINGEN PROJECT AREA
SHUGART POOL, EDDY CO. N.M.
STRUCTURE MAP
CONTOURED ON QUEEN SAND
Exhibit No 3
+382
+360
+273s
4108T.D.

Exhibit No. 2

SWEARINGEN QUEEN
SHUGART POOL
Eddy County, New Mexico

Well		24 Hour Initial Potential Completion Date	Oil	Water	June, 1965 Daily Production Oil	Water	Gas M.C.F.
Section 11-T-18-S, R-31-E							
Atlantic Johnson Federal 1	P	4-4-39	30	0	1.8	0.	----
Section 14-T-18-S, R-31-E							
Atlantic Swearingen "A" Federal 1		1-20-39	73	0	1.2	0.	3.1
Atlantic Swearingen "A" Federal 2		9-13-39	20	0	1.2	0.	----
Atlantic Swearingen "A" Federal 3	B	9-13-39	10	0	.2	0.	----
Atlantic Swearingen "A" Federal 4		2-28-49	25	0	.2	0.	----
Atlantic Swearingen "A" Federal 5	H	8-29-55	120	0	.7	.4	----
Atlantic Swearingen "A" Federal 6	J	5-25-57	170	0	5.1	.3	16.2
Atlantic Swearingen "A" Federal 7	J	7-25-58	100	0	3.7	.1	11.1
Atlantic Swearingen "B" Federal 1		11-15-52	60	0	2.6	.1	3.9
Atlantic Swearingen "B" Federal 2		1-31-57	400	0	1.5	0.	6.8
Atlantic Swearingen "B" Federal 3	E	11-21-57	250	0	3.0	.1	13.8
Atlantic Swearingen "B" Federal 4	P	9-22-59	100	0	5.7	.4	6.6
Atlantic Swearingen "B" Federal 5		10-24-61	55	0	5.5	.3	9.0
					32.4	1.7	70.5

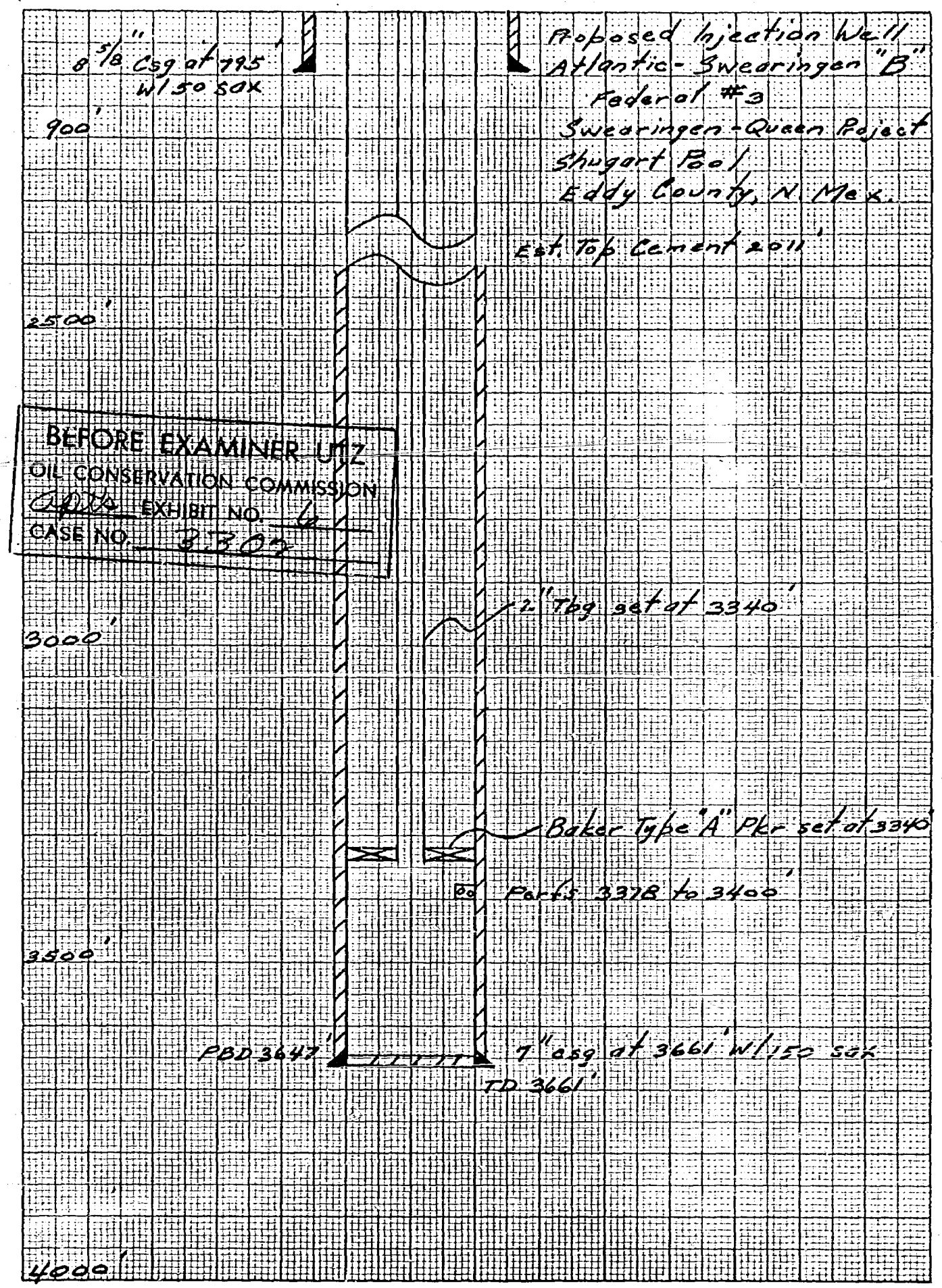
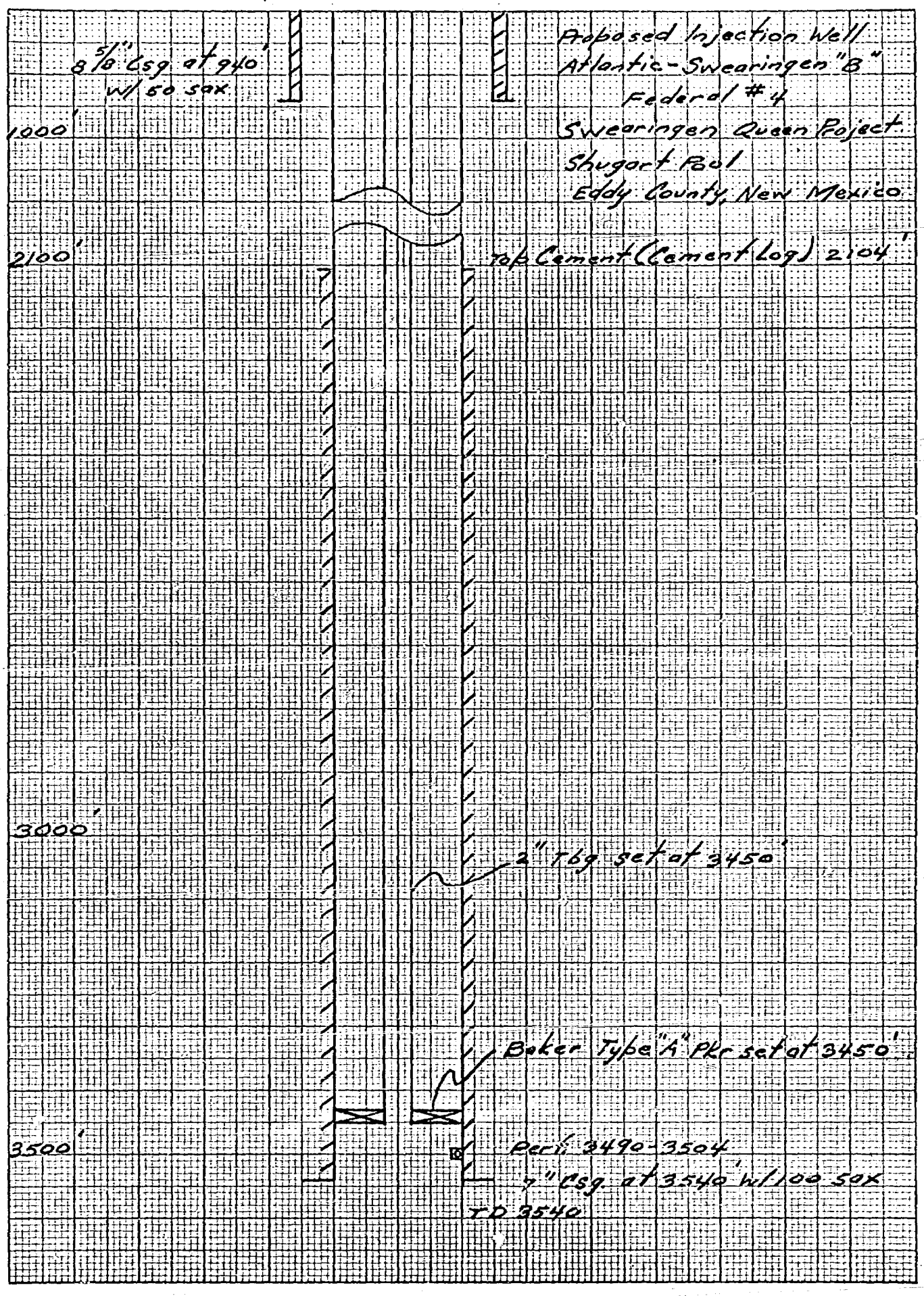
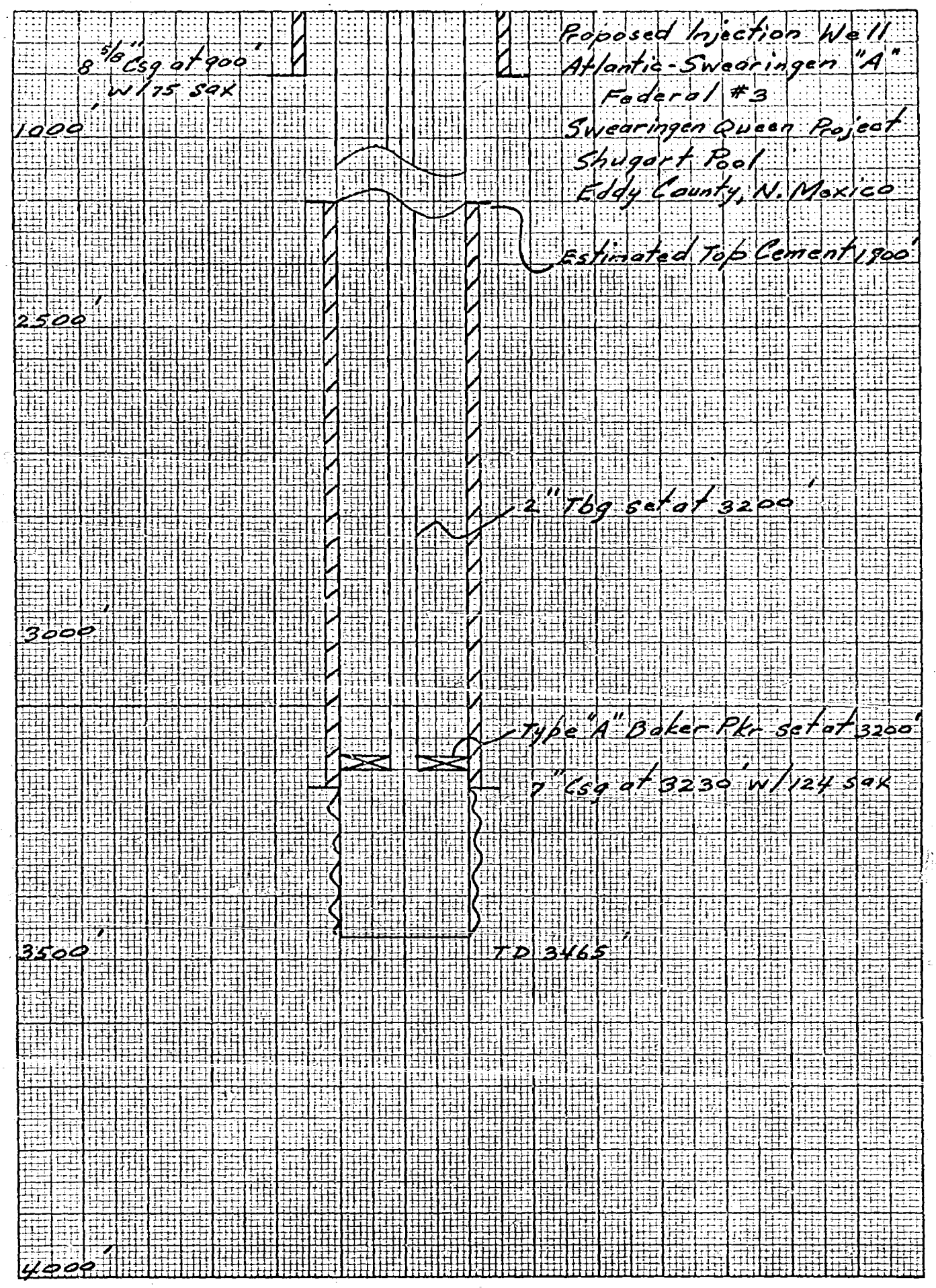
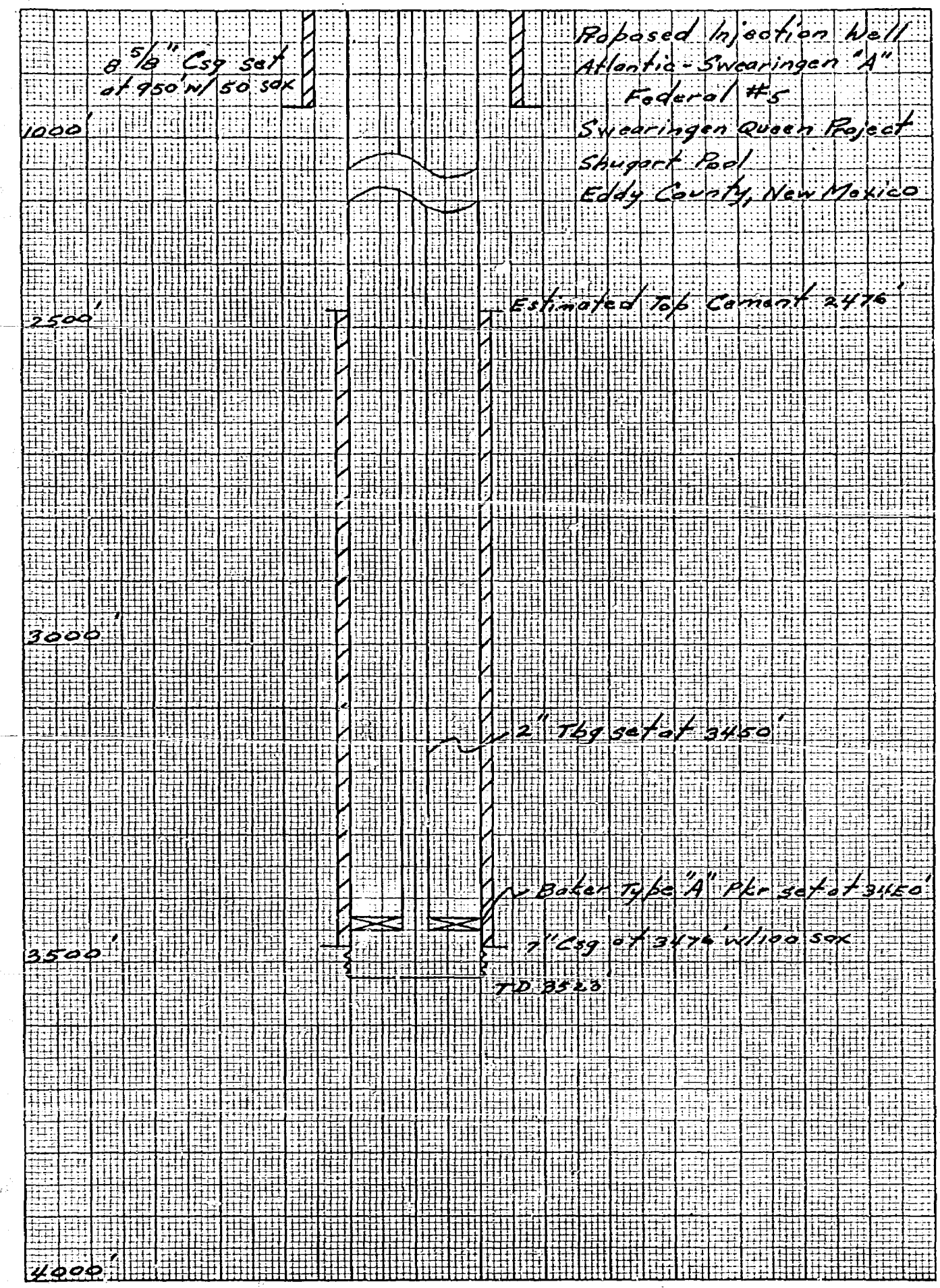
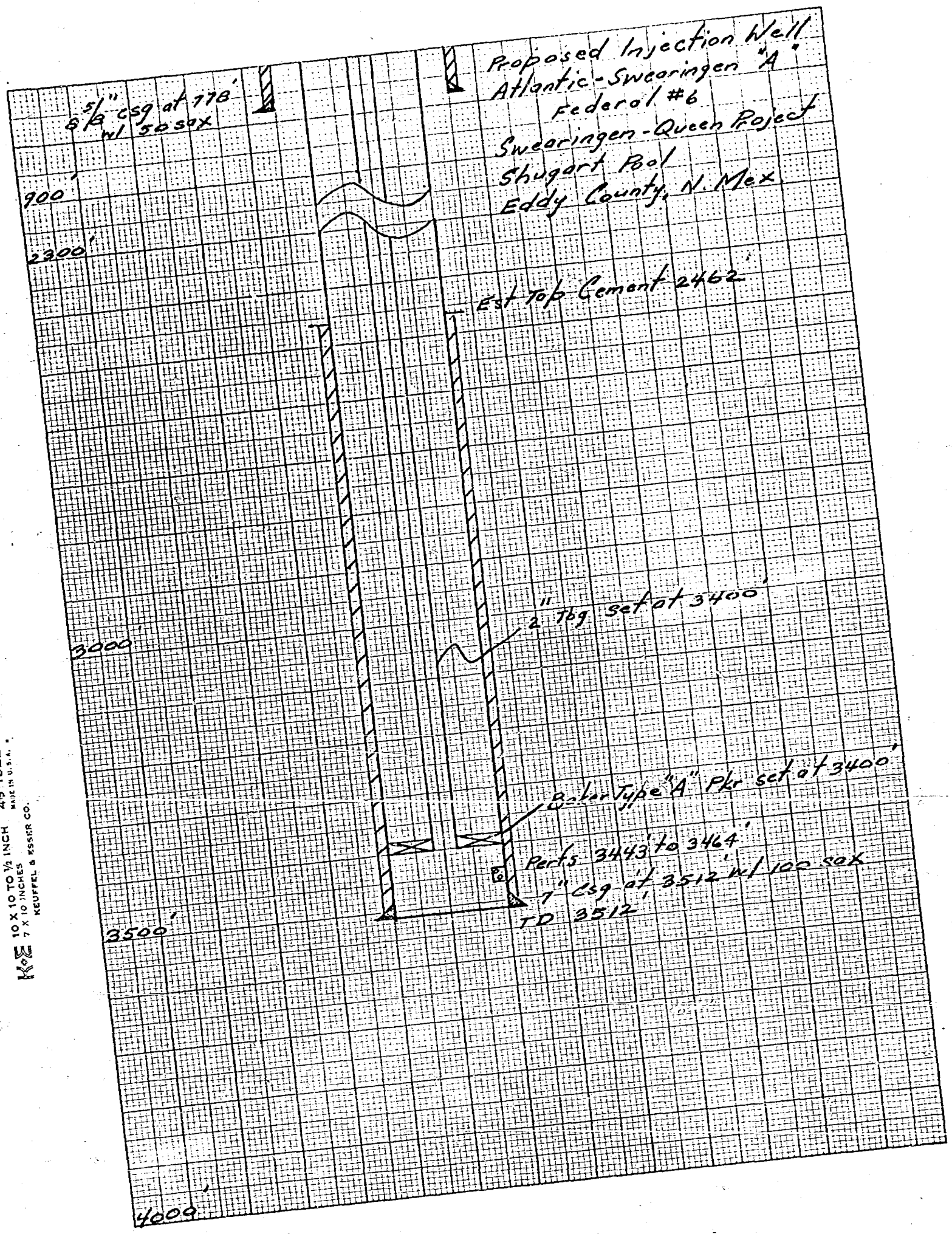


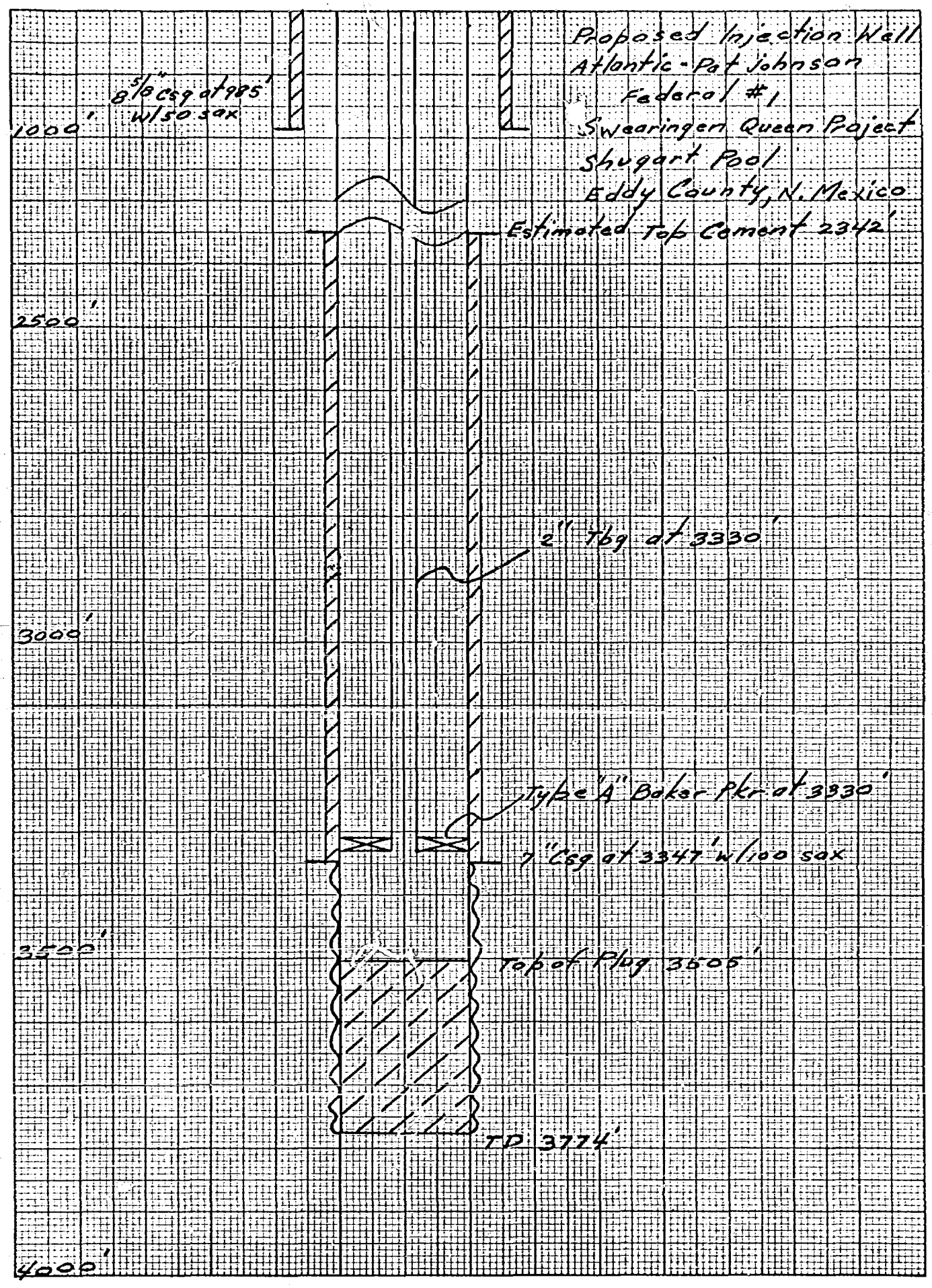
Exhibit No. 6











AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

'69 SEP 6 PM 8 25

September 5, 1969

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

File

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

Re: Corrosion Coupon Results as per
Commission Order R-2969 Entered
In Case No. 3302, Concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we are required to submit the corrosion rates as obtained from coupon tests in the Swearingen-Shugart Waterflood Project. Attached are the results of laboratory analyses of the latest exposed coupons.

Yours very truly,

W. P. Tomlinson

MAO:jcb

Attachments

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico 88120

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

CORROSION COUPON EXPOSURE RESULTS

IELD OR UNIT: Swearingen Lease WF, Shugart Field, Eddy Co., New Mexico

YSTEM: Water Injection

LOCATION: East Header

TYPE STATION: Bar Type at Water Pl

REMARKS: Supply Water

OUPON UMBER	EXPOSURE DATES	EXPOSURE DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
-484	3/19/69-	62		0.8839	6.4	Overall shallow pitting to at least 0.002". (About 12 MPY)
-485	5/20/69			0.6643	4.8	
-795	5/20/69-	62		0.9524	6.8	Overall surface roughening
-796	7/21/69			0.8609	6.2	

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease W. F., Shugart Field, Eddy Co., New Mexico

SYSTEM: Water Injection

LOCATION: Water Injection Wells A-6

TYPE STATION: Bar Type at Wellhead

REMARKS: On East Leg at System

COUPON NUMBER	EXPOSURE DATES	EXPOSURE DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
3-488 3-489	3/19/69- 5/20/69	62	288 BWPD	0.0609 0.0620	0.44 0.45	Scattered shallow pitting
1-789 1-792	5/20/69- 7/21/69	62	204 BWPD	0.4520 0.4614	3.3 3.3	Overall roughening w/pitting to at least 0.004" (about 24 MPY)

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease W. F., Shugart Field, Eddy Co., New Mexico

SYSTEM: Water Injection

LOCATION: Water Injection Wells B-

TYPE STATION: Bar Type at Wellhead

REMARKS: On West Leg of System (S

COUPON NUMBER	EXPOSURE DATES	EXPOSURE DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
-486 -487	3/19/69- 5/20/69	62	217BWPD	0.0491 0.0250	0.36 0.18	Scattered shallow pitting
-790 -791	5/20/69- 7/21/69	62	278BWPD	0.0785 0.0668	0.58 0.48	Scattered tiny body pits w/severe pitting under holder blocks to at least 0.009" (about 53 MPY)

Jan

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease WF, Shugart Field, Eddy Co., New Mexico

SYSTEM: Water Injection

LOCATION: West Header

TYPE STATION: Bar Type at Water P

REMARKS: Produced Water injected wh otherwise, inject supply w

COUPON NUMBER	EXPOSURE DATES	EXPOSURE DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
-482	3/19/69-5/20/69	62		0.0447	0.33	Scattered broad pits to at least 0.005" (about 31 MPY)
-483				0.0565	0.40	
-793	5/20/69-7/21/69	62		0.0658	0.48	Scattered pitting attack to at least 0.003" (about 18 MPY)
-794				0.0776	0.57	

AtlanticRichfieldCompany

North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

OCT 15 1969

October 14, 1969

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

File

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

Re: Corrosion Coupon Results as per
Commission Order R-2989 Entered
In Case No. 3302, Concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we are required to submit the corrosion rates as obtained from coupon tests in the Swearingen-Shugart Waterflood Project. Attached are the results of laboratory analyses of the latest exposed coupons.

Yours very truly,

W P Tomlinson

W. P. Tomlinson

MAO:jcb

Attachments

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico 88120

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

CORROSION COUPON EXPOSURE RESULTS

D OR UNIT: Swearingen Lease W. F.,Shugart Field, Eddy Co., New Mexico

EM: Water Injection

LOCATION: Water Injection Wells A-6

TYPE STATION: Bar Type at Wellhead

REMARKS: On East Leg at System

ON ER	EXPOSURE DATES	DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK	R
38	3/19/69-	62	288 BWPD	0.0609	0.44	Scattered shallow pitting	G
39	5/20/69			0.0620	0.45		G
9	5/20/69-	62	204 BWPD	0.4520	3.3	Overall roughening w/pitting	(
2	7/21/69			0.4614	3.3	to at least 0.004" (about 24 MPY)	(
5	7/21/69	63	150BWPD	0.1437	2.3	etched	(
6	9/22/69			0.1697	1.2		(

CORROSION COUPON EXPOSURE RESULTS

.O OR UNIT: Swearingen Lease W. F., Shugart Field, Eddy Co., New Mexico

TEM: Water Injection

LOCATION: Water Injection Wells E

TYPE STATION: Bar Type at Wellhead

REMARKS: On West Leg of System I

ON ER	EXPOSURE DATES	EXPOSURE DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
36 37	3/19/69- 5/20/69	62	217BWPD	0.0491 0.0250	0.36 0.18	Scattered shallow pitting
10 11	5/20/69- 7/21/69	62	278BWPD	0.0785 0.0668	0.58 0.48	Scattered tiny body pits w/severe pitting under holder blocks to at least 0.009" (about 53 MPY)
09 10	7/21/69 9/22/69	63	300 BWPD	0.1822 0.1011	1.3 0.71	Scattered body pitting w/one broad pit under holder blocks to at least 0.015" (about 87 MPY)

CORROSION COUPON EXPOSURE RESULTS

) OR UNIT: Swearingen Lease WF, Shugart Field, Eddy Co., New Mexico

EM: Water Injection

LOCATION: West Header

TYPE STATION: Bar Type at Wat

REMARKS: Produced Water injecte otherwise, inject supp

ON ER	EXPOSURE DATES	EXPOSURE DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
2	3/19/69-5/20/69	62		0.0447	0.33	Scattered broad pits to at least 0.005" (about 31 MPY)
3				0.0565	0.40	
3	5/20/69-7/21/69	62		0.0658	0.48	Scattered pitting attack to at least 0.003" (about 18 MPY)
4				0.0776	0.57	
1	7/21/69-9/22/69	63		0.0688	0.50	Scattered pitting attack w/ broad pits underholder blocks to at least 0.008" (about 45 MYP)
3				0.0948	0.68	

CORROSION COUPON EXPOSURE RESULTS

D OR UNIT: Swearingen Lease WF, Shugart Field, Eddy Co., New Mexico

EM: Water Injection

LOCATION: East Header

TYPE STATION: Bar Type at Water P

REMARKS: Supply Water

ON ER	EXPOSURE DATES	EXPOSURE DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
	3/19/69-5/20/69	62		0.8839 0.6643	6.4 4.8	Overall shallow pitting to at least 0.002". (About 12 MPY)
5 6	5/20/69-7/21/69	62		0.9524 0.8609	6.8 6.2	Overall surface roughening
	7/21/69 9/22/69	63		1.1494 2.1945	8.1 15.6	Surface roughening

CORROSION COUPON EXPOSURE RESULTS

D OR UNIT: Swearingen Lease WF, Shugart Field, Eddy Co., New Mexico

EM: Water Injection

LOCATION: East Header

TYPE STATION: Bar Type at Water P

REMARKS: Supply Water

ON ER	EXPOSURE DATES	EXPOSURE DAYS	EXPOSURE VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
4 5	3/19/69- 5/20/69	62		0.8839 0.6643	6.4 4.8	Overall shallow pitting to at least 0.002". (About 12 MPY)
5 6	5/20/69- 7/21/69	62		0.9524 0.8609	6.8 6.2	Overall surface roughening
1 1	7/21/69 9/22/69	63		1.1494 2.1945	8.1 15.6	Surface roughening

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

MAIN OFFICE OCC
'70 JAN 26 AM 8 42

File
Case

January 22, 1970

New Mexico Oil Conservation Commission
P.O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Corrosion Coupon Results as per
Commission Order R-2969 Entered
In Case No. 3302, Concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we are required to submit the corrosion rates as obtained from coupon tests in the Swearingen-Shugart Waterflood Project. Attached are the results of laboratory analyses of the latest exposed coupons.

Yours very truly,

W. P. Tomlinson

W. P. Tomlinson

MAO:lfs

Attachments

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease W. F., Shugart Field, Eddy Co., New Mexico

SYSTEM: Water Injection

LOCATION: Water Injection Well A-6

TYPE STATION: Bar type at wellhead

REMARKS: On east leg of system

COUPON NUMBER	EXPOSURE DATES	EXPOSURE DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
G-488 G-489	3/19/69- 5/20/69	62	288 BWPD	0.0609 0.0620	0.44 0.45	Scattered shallow pitting
G-789 G-792	5/20/69- 7/21/69	62	204 BWPD	0.4520 0.4614	3.3 3.3	Overall roughening w/pitting to at least 0.004" (about 24 MPY)
G-895 G-896	7/21/69- 9/22/69	63	150 BWPD	0.1437 0.1697	2.3 1.2	Etched
G-995 G-996	9/22/69- 12/1/69	71	200 BWPD	0.3572 0.3934	2.2 2.5	Overall roughening

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease W. F., Shugart Field, Eddy Co., New Mexico

SYSTEM: Water Injection

LOCATION: Water Injection Well B-3

TYPE STATION: Bar type at wellhea

REMARKS: On west leg of system (s

COUPON NUMBER	EXPOSURE DATES	EXPOSURE DAYS	VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
G-486 G-487	3/19/69- 5/20/69	62	217 BWPD	0.0491 0.0250	0.36 0.18	Scattered shallow pitting
G-790 G-791	5/20/69- 7/21/69	62	278 BWPD	0.0785 0.0668	0.58 0.48	Scattered tiny body pits w/severe pitting under holder blocks to at least 0.009" (about 53 MPY)
G-899 G-900	7/21/69- 9/22/69	63	300 BWPD	0.1822 0.1011	1.3 0.71	Scattered body pitting w/one broad pit under holder blocks to at least 0.015" (about 87 MPY)
G-997 H-7	9/22/69- 12/1/69	71	150 BWPD	0.3127 0.3234	1.9 2.0	Surface roughening w/areas of pitting to at least 0.024" (about 120 MPY)

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease W. F., Shugart Field, Eddy Co., New Mexico
SYSTEM: Water Injection

LOCATION: East Header
TYPE STATION: Bar type at water pla
REMARKS: Supply water

COUPON NUMBER	EXPOSURE DATES	EXPOSURE DAYS	EXPOSURE VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
G-484	3/19/69-	62		0.8839	6.4	Overall shallow pitting
G-485	5/20/69			0.6643	4.8	to at least 0.002" (about 12 MPY)
G-795	5/20/69-	62		0.9524	6.8	Overall surface roughening
G-796	7/21/69			0.8609	6.2	
G-894	7/21/69-	63		1.1494	8.1	Surface roughening
G-901	9/22/69			2.1945	15.6	
G-991	9/22/69-	71		1.1333	7.1	Overall surface roughening
G-994	12/1/69			1.5798	10.0	

CORROSION COUPON EXPOSURE RESULTS

FIELD OR UNIT: Swearingen Lease W. F., Shugart Field
Eddy Co., New Mexico

SYSTEM: Water Injection

LOCATION: West Header

TYPE STATION: Bar type at water pl

REMARKS: Produced water injected wh
inject supply water

COUPON NUMBER	EXPOSURE DATES	EXPOSURE DAYS	EXPOSURE VOLUME (BW)	WEIGHT LOSS (GMS)	CORROSION RATE (MPY)	TYPE ATTACK
G-482 G-483	3/19/69- 5/20/69	62		0.0447 0.0565	0.33 0.40	Scattered broad pits to at least 0.005" (about 31 MPY)
G-793 G-794	5/20/69- 7/21/69	62		0.0658 0.0776	0.48 0.57	Scattered pitting attack to at least 0.003" (about 18 MPY)
G-897 G-898	7/21/69- 9/22/69	63		0.0688 0.0948	0.50 0.68	Scattered pitting attack w/broad pits under holder blocks to at least 0.008" (about 45 MPY)
G-992 G-993	9/22/69- 12/1/69	71		0.0928 0.1193	0.58 0.75	Spotted etch w/pitting under holder block to at least 0.009" (about 46 MPY)

AtlanticRichfieldCompany

North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

'70 APR 8 AM 8 16

April 7, 1970

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Produced Water Samples Required by
Commission Order R-2969 Entered
In Case No. 3302, Concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen-Shugart Waterflood Project.

Yours very truly,

W. P. Tomlinson

W. P. Tomlinson

WPT:jcb

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

(01-0124)

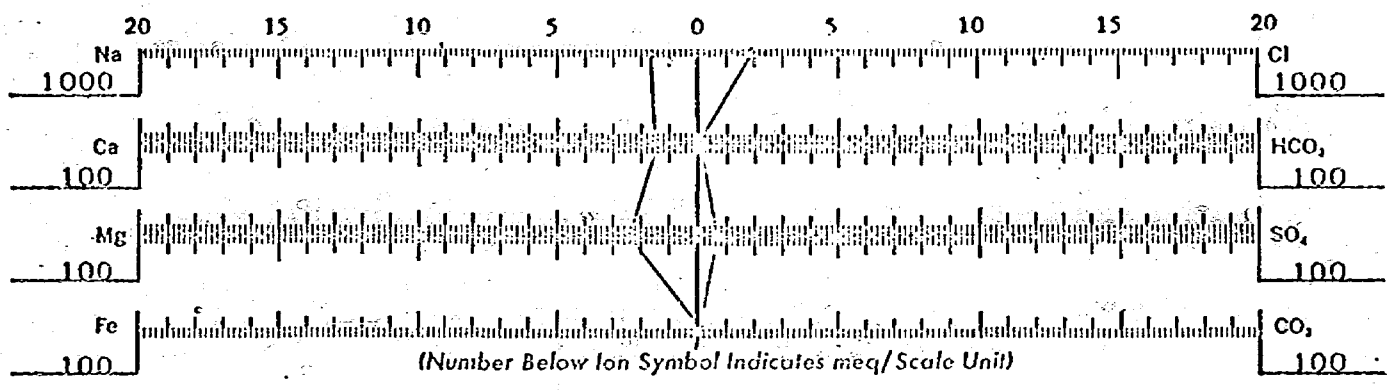
PRODUCTION PROFITS, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

Client: Atlantic Richfield Company
County: Eddy State: New Mexico
Field: Shugart Lease: Swearingen Waterflood Well No.:
Formation: Depth: Perf.:
Source of Sample: Produced Water
Date Collected: 1-27-70 by:

REPORT OF WATER ANALYSIS

Lab. Number: A-3493 Specific Gravity: 1.081 pH: 7.2
Total Dissolved Solids: 115166 Resistivity (Ohmmeters at 68° F.): 0.087 Hydrogen Sulfide: ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	115166	
Sodium (Calc.)	36900	1603.3
Iron (Dissolved)	-	-
Barium	-	-
Calcium	3110	155.2
Magnesium	2980	245.0
Chloride	68100	1920.4
Bicarbonate	386	6.3
Carbonate	0	0.0
Sulfate	3690	76.8

TOTAL IRON: -

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

	mg/l
Total Undissolved Solids	
Oil (Solvent Soluble)	
Acid Solubles	
Iron as	
Calcium as	
Magnesium as	
Sulfate as	
Organic (Ignition Loss)	
Acid Insolubles	
Sand & Clay	
Barium Sulfate (Quan.)	
(Qual.)	

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: Scaling Tendency:
Calcium Sulfate Stability at 95°F
Concentration: meq/l. Calc. Solubility: meq/l. Percent Saturation:
Barium Sulfate Stability at 95° F
Concentration: meq/l. Calc. Solubility: meq/l. Percent Saturation:

REMARKS

The sample consisted of one 1 quart plastic bottle of water

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

W. P. Tomlinson
District Engineer

May 20, 1970

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

File

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

Re: Produced Water Samples Required by
Commission Order R-2969 Entered
In Case No. 3302, Concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen-Shugart Waterflood Project.

Yours very truly,

W P Tomlinson

W. P. Tomlinson

WPT:lfs

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico 88201

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

(01-0376)

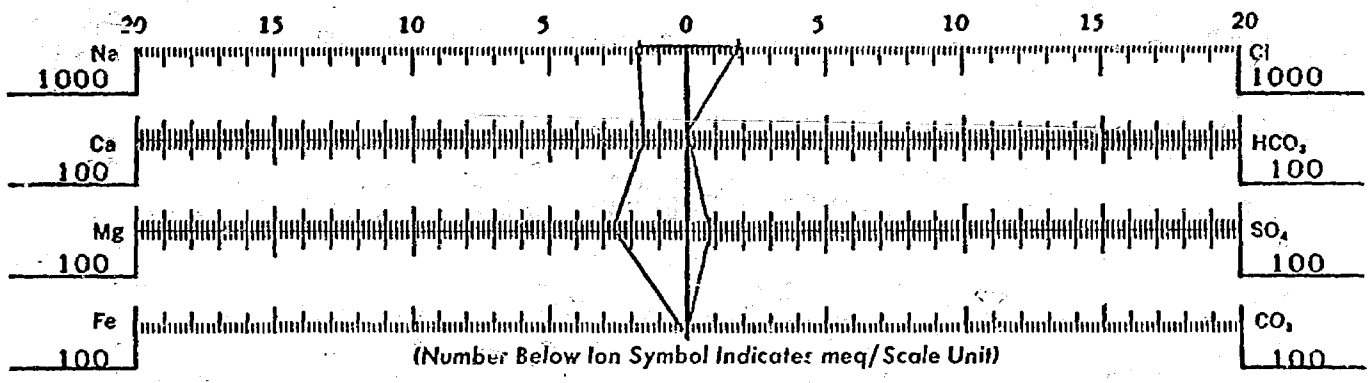
PRODUCTION PROFITS, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

Client: Atlantic Richfield Company
County: Eddy State: New Mexico
Field: Shugart Lease: Swearinger Waterflood Unit Well No.:
Formation: Depth: Perf.:
Source of Sample: Produced Water
Date Collected: 4-22-70 by:

REPORT OF WATER ANALYSIS

Lab. Number: A-3639 Specific Gravity: 1.082 pH: 7.3
Total Dissolved Solids: 117015 Resistivity (Ohmmeters at 68° F.): 0.079 Hydrogen Sulfide: ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	117015	
Sodium (Calc.)	37700	1638.2
Iron (Dissolved)	0	0.0
Barium	-	-
Calcium	2990	149.2
Magnesium	3010	247.4
Chloride	69100	1948.6
Bicarbonate	325	5.3
Carbonate	0	0.0
Sulfate	3890	80.9

TOTAL IRON: -

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

		mg/l
Total Undissolved Solids		
Oil (Solvent Soluble)		
Acid Solubles		
Iron	as	
Calcium	as	
Magnesium	as	
Sulfate	as	
Organic (Ignition Loss)		
Acid Insolubles		
Sand & Clay		
Barium Sulfate	(Quan.)	
	(Qual.)	

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: 0.60 Scaling Tendency: POS.
Calcium Sulfate Stability at 95°F
Concentration: 80.9 meq/l. Calc. Solubility: 79.41 meq/l. Percent Saturation: 100.00
Barium Sulfate Stability at 95° F
Concentration: meq/l. Calc. Solubility: meq/l. Percent Saturation:

REMARKS

The sample consisted of one 1 quart plastic bottle of water.

AtlanticRichfieldCompany
North American Producing Division
Permian District
Post Office Box 1610
Midland, Texas 79701
Telephone 915 682 8631

'70 SEP 15 PM 1 05

September 14, 1970

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

File

Re: Analysis of Produced Water as per Commission Order R-2969 Entered In Case No. 3302, Concerning Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we are required to submit tri-monthly produced water analysis from the Swearingen-Shugart Waterflood Project. Attached are the results of laboratory analyses.

Yours very truly,

W. P. Tomlinson

WTP/agp

Attachements

cc: New Mexico Oil Conservation Commission
P. O. Drawer "DD"
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capital
Santa Fe, New Mexico 87501

01-0675

PRODUCTION PROFITS, INC.

Petroleum Service Laboratory

DALLAS, TEXAS

Client: Atlantic Richfield Company

Field: Shugart — County: Eddy — State: New Mexico

Formation: — Lease: Swearingen — Well No.:

Source of Sample: Produced Water — Depth: — Perf.:

Date Collected: 7-20-70 — by:

REPORT OF WATER ANALYSIS

Lab. Number: A-3826

Total Dissolved Solids: 131802

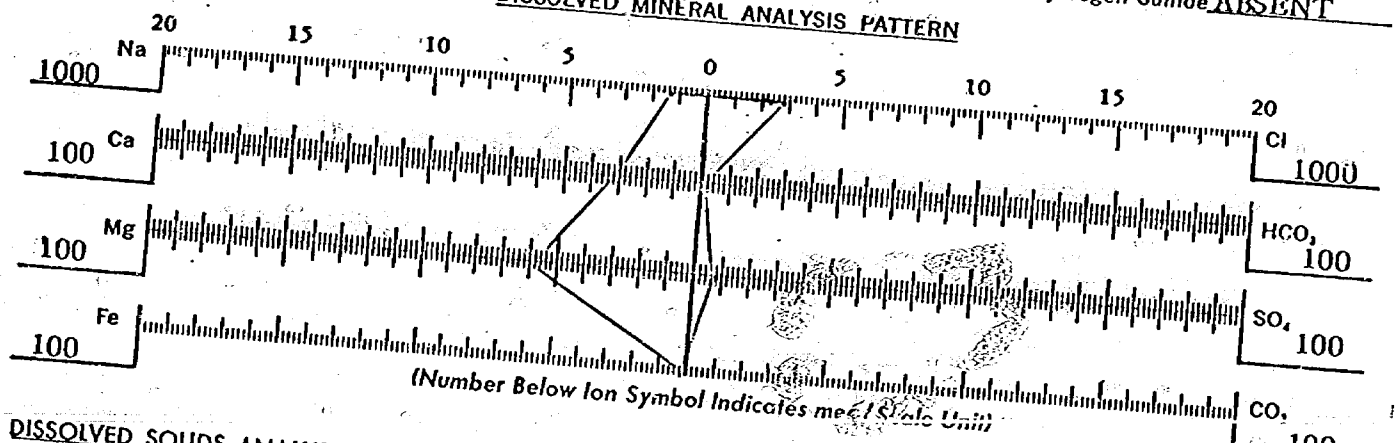
Specific Gravity: 1.095

Resistivity (Ohmmeters at 68° F.): 0.073

pH: 6.9

Hydrogen Sulfide: ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	131802	
Sodium (Calc.)	33300	1449.4
Iron (Dissolved)	0	0.0
Barium	0	0.0
Calcium	6570	327.8
Magnesium	7108	584.3
Chloride	80800	2278.6
Bicarbonate	174	2.9
Carbonate	0	0.0
Sulfate	3850	80.0

TOTAL IRON: -

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

	mg/l
Total Undissolved Solids	
Oil (Solvent Soluble)	
Acid Solubles	
Iron ____ as ____	
Calcium ____ as ____	
Magnesium ____ as ____	
Sulfate ____ as ____	
Organic (Ignition Loss)	
Acid Insolubles	
Sand & Clay	
Barium Sulfate	
(Quan.)	
(Qual.)	

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: ____

Calcium Sulfate Stability at 95°F

Concentration ____ meq/l. Calc. Solubility ____ meq/l. Scaling Tendency ____

Barium Sulfate Stability at 95° F

Concentration ____ meq/l. Calc. Solubility ____ meq/l. Percent Saturation ____

Percent Saturation ____

REMARKS

The sample consisted of one 1 quart plastic bottle of water

1 of

AtlanticRichfieldCompany

North American Producing Division
Permian District — West Area
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

'70 Nov 16 AM 8 16

November 13, 1970

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Produced Water Samples Required by
Commission Order R-2969 Entered
In Case No. 3302, Concerning
Atlantic Richfield Company
Swearingen-Shugart Waterflood Project

file

Gentlemen:

As per the above Order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen-Shugart waterflood project.

Yours very truly,

E. M. Pringle

E. M. Pringle

EMP:rhs
Attach.
cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

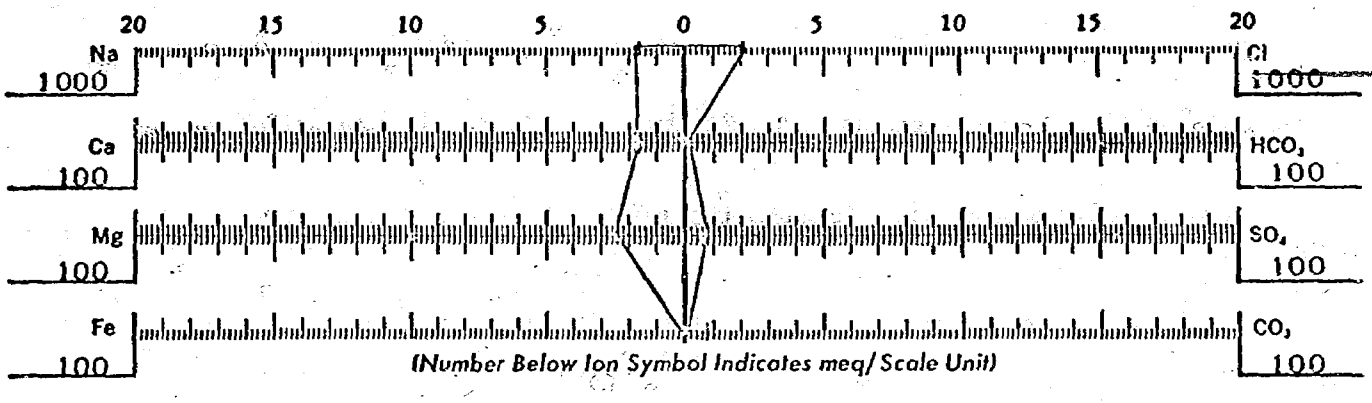
PRODUCTION PROFITS, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

Client: Atlantic Richfield Company
County: Eddy State: New Mexico
Field: Lease: Swearinger Well No.:
Formation: Depth: Perf.:
Source of Sample: Wellhead
Date Collected: 10-20-70 by:

REPORT OF WATER ANALYSIS

Lab. Number: A-3399 Specific Gravity: 1.0855 pH: 6.8
Total Dissolved Solids: 123345 Resistivity (Ohmmeters at 68° F.): 0.077 Hydrogen Sulfide: ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	123345	
Sodium (Calc.)	40000	1739.4
Iron (Dissolved)	0	0.0
Barium	-	-
Calcium	3190	159.2
Magnesium	2990	245.8
Chloride	73000	2058.6
Bicarbonate	195	3.2
Carbonate	0	0.0
Sulfate	3970	82.6

TOTAL IRON: -

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

		mg/l
Total Undissolved Solids		
Oil (Solvent Soluble)		
Acid Solubles		
Iron as		
Calcium as		
Magnesium as		
Sulfate as		
Organic (Ignition Loss)		
Acid Insolubles		
Sand & Clay		
Barium Sulfate	(Quan.)	
	(Qual.)	

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: -.04 Scaling Tendency: NEG.
Calcium Sulfate Stability at 95°F
Concentration: 82.6 meq/l. Calc. Solubility: 77.33 meq/l. Percent Saturation: 100.00
Barium Sulfate Stability at 95° F
Concentration: meq/l. Calc. Solubility: meq/l. Percent Saturation:

REMARKS

The sample consisted of one 1 quart plastic bottle of water.

AtlanticRichfieldCompany

North American Producing Division
Permian District—West Area
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

'71 FEB 9 AM 8 04

February 8, 1971

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Produced Water Samples required by Commission Order R-2969 entered in Case No. 3302, concerning Atlantic Richfield Company -
Swearingen - Shugart Waterflood Project

File

Gentlemen:

As per the above Order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen-Shugart waterflood project.

Yours very truly,

E. M. Pringle

E. M. Pringle

EMP:rhs
Attach.

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

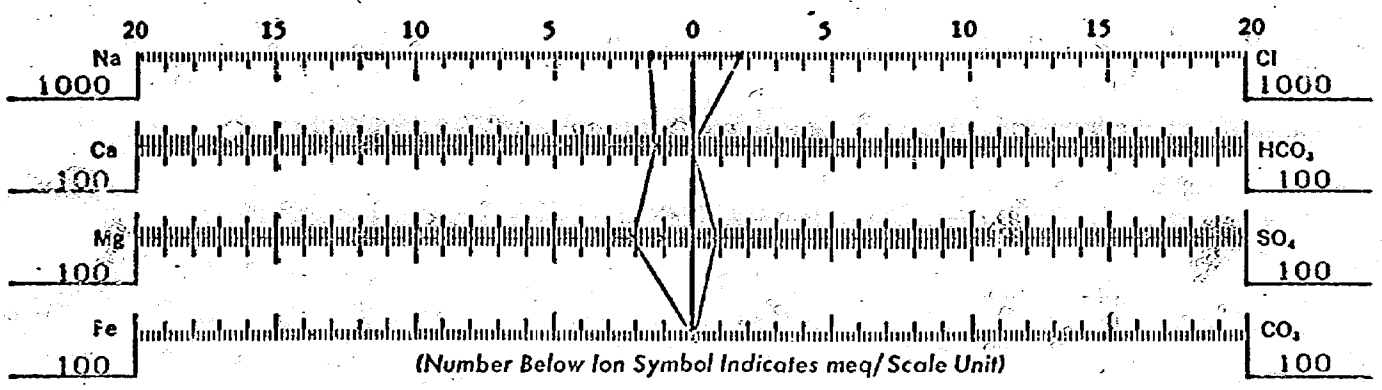
PRODUCTION PROFITS, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

Client: Atlantic Richfield Company
County: Eddy State: New Mexico
Field: Shugart Lease: Swearingen Well No. 1
Formation: Depth: Perf.:
Source of Sample:
Date Collected: Rec: 1-18-71 by:

REPORT OF WATER ANALYSIS

Lab. Number: A-3997 Specific Gravity: 1.0779 pH: 7.1
Total Dissolved Solids: 109289 Resistivity (Ohmmeters at 68° F.): .087 Hydrogen Sulfide: ABSEN

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	109289	
Sodium (Calc.)	35400	1539.2
Iron (Dissolved)	0	0.
Barium	-	-
Calcium	2890	144.2
Magnesium	2580	212.1
Chloride	64000	1804.8
Bicarbonate	259	4.2
Carbonate	0	0.
Sulfate	4160	86.5

TOTAL IRON: -

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

	mg/l
Total Undissolved Solids	
Oil (Solvent Soluble)	
Acid Solubles	
Iron as	
Calcium as	
Magnesium as	
Sulfate as	
Organic (Ignition Loss)	
Acid Insolubles	
Sand & Clay	
Barium Sulfate (Quan.)	
(Qual.)	

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: .17 Scaling Tendency: POS.
Calcium Sulfate Stability at 95°F
Concentration: 86.5 meq/l. Calc. Solubility: 81.86 meq/l. Percent Saturation: 100.00
Barium Sulfate Stability at 95° F
Concentration: meq/l. Calc. Solubility: meq/l. Percent Saturation:

REMARKS

AtlanticRichfieldCompany

North American Producing Division
Permian District—West Area
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

'71 MAY 13 AM 8 13

May 17, 1971

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

File

Re: Produced Water Samples required by Commission Order R-2969 entered in Case No. 3302, concerning Atlantic Richfield Company - Swearingen - Shugart Waterflood Project

Gentlemen:

As per the above Order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen-Shugart waterflood project.

Yours very truly,

E. M. Pringle

E. M. Pringle

EMP:rhs
Attach.

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

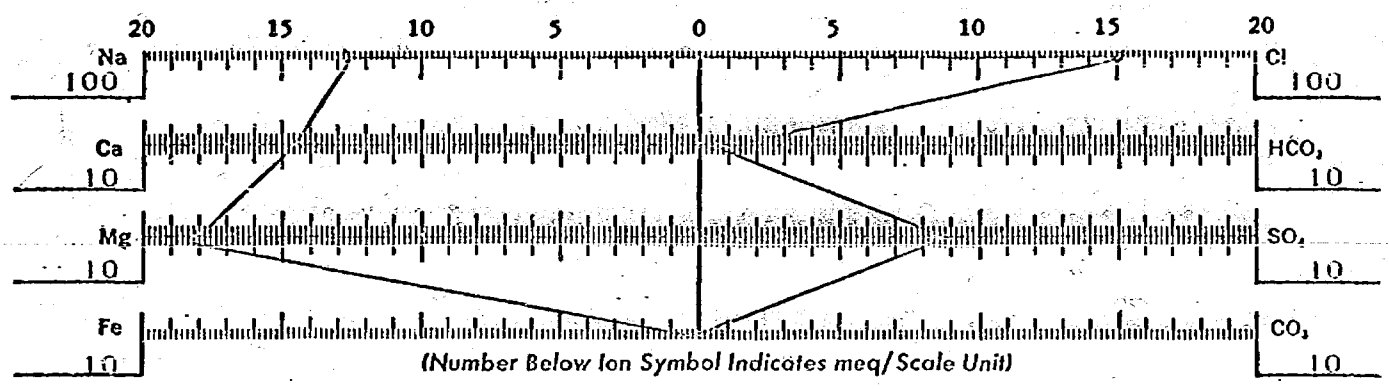
PRODUCTION PROFITS, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

Client: Atlantic Richfield Company
County: Eddy State: New Mexico
Field: Sweainger Lease: Well No.:
Formation: Depth: Perf.:
Source of Sample: Produced Water
Date Collected: Rec: 4-26-71 by:

REPORT OF WATER ANALYSIS

Lab. Number: A-4100 Specific Gravity: 1.0661 pH: 7.6
Total Dissolved Solids: 92599 Resistivity (Ohmmeters at 68° F.): .096 Hydrogen Sulfide: ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	92599	
Sodium (Calc.)	29400	1276.9*
Iron (Dissolved)	0	0.
Barium	-	-
Calcium	2890	144.2
Magnesium	2210	181.7
Chloride	53500	1508.7
Bicarbonate	349	5.7
Carbonate	0	0.
Sulfate	4250	88.4

TOTAL IRON: -

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

	mg/l
Total Undissolved Solids	
Oil (Solvent Soluble)	
Acid Solubles	
Iron as	
Calcium as	
Magnesium as	
Sulfate as	
Organic (Ignition Loss)	
Acid Insolubles	
Sand & Clay	
Barium Sulfate (Quan.)	
(Qual.)	

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: .76 Scaling Tendency: PØS.
Calcium Sulfate Stability at 95°F
Concentration: 88.4 meq/l. Calc. Solubility: 78.93 meq/l. Percent Saturation: 100.00
Barium Sulfate Stability at 95° F
Concentration: meq/l. Calc. Solubility: meq/l. Percent Saturation:

REMARKS

AtlanticRichfieldCompany

North American Producing Division
Permian District — West Area
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

March 9, 1972

New Mexico Oil Conservation
Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Produced Water Samples Required By
~~Commission Order~~ R-2969 entered in
Case No. 3302, concerning Atlantic
Richfield Company - Swearingen -
Shugart Waterflood Project

File

Gentlemen:

As per the above order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen Shugart waterflood project.

Yours very truly,

L. C. Hudry

L. C. Hudry

Attach.

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

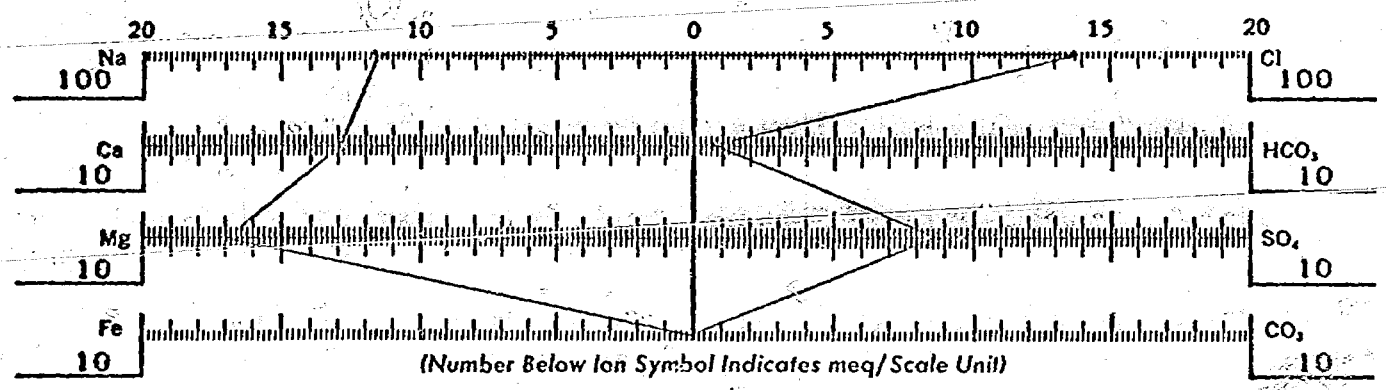
PRODUCTION PROFITS
DIVISION OF SONICS INTERNATIONAL, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

Client: Atlantic Richfield Company
County: Eddy State: New Mexico
Field: Lease: Swearingen Well No.:
Formation: Depth: Perf.:
Source of Sample: Heater Treater - Produced Water
Date Collected: 2-8-72 by:

REPORT OF WATER ANALYSIS

Lab. Number: A-4483 Specific Gravity: 1.0610 pH: 6.7
Total Dissolved Solids: 84581 Resistivity (Ohmmeters at 68° F.): .341 Hydrogen Sulfide: ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	84581	
Sodium (Calc.)	26800	1163.8
Iron * (Dissolved)	0	0.
Barium	0	0.
Calcium	2600	129.7
Magnesium	2060	169.3
Chloride	48600	1370.5
Bicarbonate	381	6.2
Carbonate	0	0.
Sulfate	4140	86.1

TOTAL IRON: -

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

		mg/l
Total Undissolved Solids		
Oil (Solvent Soluble)		
Acid Solubles		
Iron	as	
Calcium	as	
Magnesium	as	
Sulfate	as	
Organic (Ignition Loss)		
Acid Insolubles		
Sand & Clay		
Barium Sulfate	(Quan.)	
	(Qual.)	

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: -.17 Scaling Tendency: NEG.
Calcium Sulfate Stability at 95°F
Concentration: 86.1 meq/l. Calc. Solubility: 81.22 meq/l. Percent Saturation: 100.00
Barium Sulfate Stability at 95° F
Concentration: meq/l. Calc. Solubility: meq/l. Percent Saturation:

REMARKS

AtlanticRichfieldCompany

North American Producing Division
Permian District — West Area
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

RECEIVED
DEC 22 1971
OIL CONSERVATION COMM.
SANTA FE

December 20, 1971

New Mexico Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Produced Water Samples required by Commission Order R-2969 entered in Case No. 3302, concerning Atlantic Richfield Company - Swearingen - Shugart Waterflood Project

File

Gentlemen:

As per the above order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen Shugart waterflood project.

Yours very truly,

L. C. Hudry

L. C. Hudry

LCH:rhs
Attach.

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 88501

PRODUCTION PROFITS, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

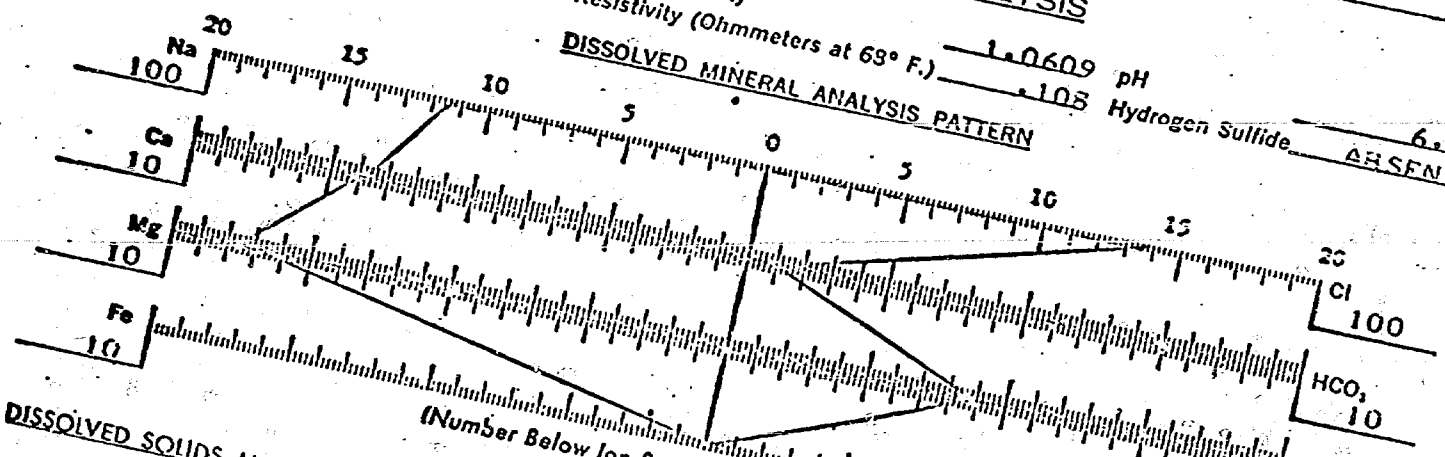
OIL CONSERVATION COMM.
SANTA FE

REPORT OF WATER ANALYSIS

Client: Atlantic Richfield Company
Field: Shugart
Formation:
Source of Sample:
Date Collected: 11-12-71
by:
County: Eddy
Lease: Swearingen
Depth:
State: New Mexico
Well No.: R-6
Perf.:

Lab. Number: A-4338
Total Dissolved Solids: 34529
Specific Gravity: 1.0609
Resistivity (Ohmmeters at 68° F.): .105
pH: 6.8
Hydrogen Sulfide: ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



(Number Below Ion Symbol Indicates meq/Scale Unit)

DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	34529	
Sodium (Calc.)	26400	1146.9
Iron (Dissolved)	0	0.
Barium	-	-
Calcium	2770	138.2
Magnesium	2150	176.7
Chloride	48300	1362.1
Bicarbonate	559	9.2
Carbonate	0	0.
Sulfate	4350	90.5

TOTAL IRON: -

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

		mg/l
Total Undissolved Solids		
Oil (Solvent Soluble)		
Acid Solubles		
Iron	as	
Calcium	as	
Magnesium	as	
Sulfate	as	
Organic (Ignition Loss)		
Acid Insolubles		
Sand & Clay		
Barium Sulfate		

(Quan.)
(Qual.)

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: .12
Calcium Sulfate Stability at 95°F
Concentration 90.5 meq/l. Calc. Solubility 79.77 meq/l.
Barium Sulfate Stability at 95° F
Concentration meq/l. Calc. Solubility meq/l.

Scaling Tendency: POS.
Percent Saturation: 100.00
Percent Saturation:

REMARKS

The sample consisted of one 1 pint bottle of water

AtlanticRichfieldCompany

North American Producing Division
Permian District—West Area
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

RECEIVED
APR - 6 1973
OIL CONSERVATION COMM
Santa Fe

April 4, 1973

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

File

Re: Produced water samples required by Commission Order R-2969 entered in Case No. 3302, concerning Atlantic Richfield Company - Swearingen - Shugart Waterflood Project

Gentlemen:

As per the above order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen Shugart waterflood project.

Yours very truly,

L. C. Hudry

Attach.

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

PRODUCTION PROFITS
DIVISION OF SONICS INTERNATIONAL, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

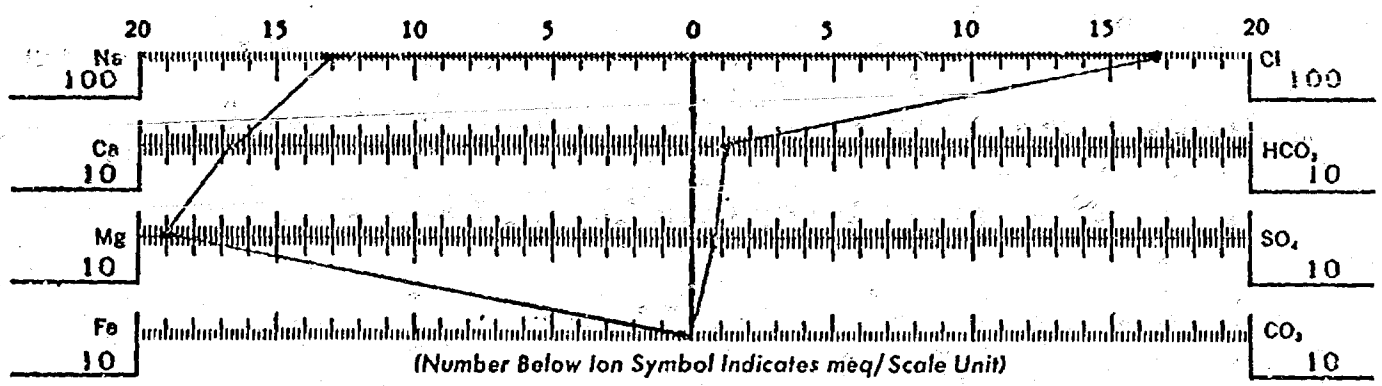
RECEIVED
APR - 6 1973
OIL CONSERVATION COMM.

Client: Atlantic Richfield Company
County: Eddy State: New Mexico
Field: Shugart Lease: Swearingen Lease Well No.:
Formation: Depth: Perf.:
Source of Sample: Produced Water
Date Collected: 2-21-73 by:

REPORT OF WATER ANALYSIS

Lab. Number: A-5015 Specific Gravity: 1.0718 pH: 7.3
Total Dissolved Solids: 96049 Resistivity (Ohmmeters at 68° F.): .092 Hydrogen Sulfide: ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	96049	
Sodium (Calc.)	30400	1323.2
Iron (Dissolved)	0	0.
Barium	0	0.
Calcium	3340	166.7
Magnesium	2330	191.5
Chloride	59000	1663.8
Bicarbonate	644	10.6
Carbonate	0	0.
Sulfate	335	7.0

TOTAL IRON: -

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

	mg/l
Total Undissolved Solids	
Oil (Solvent Soluble)	
Acid Solubles	
Iron ___ as ___	
Calcium ___ as ___	
Magnesium ___ as ___	
Sulfate ___ as ___	
Organic (Ignition Loss)	
Acid Insolubles	
Sand & Clay	
Barium Sulfate (Quan.)	
(Qual.)	

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: .81 Scaling Tendency: POS.
Calcium Sulfate Stability at 95°F
Concentration: 6.97 meq/l. Calc. Solubility: 51.17 meq/l. Percent Saturation: 13.62
Barium Sulfate Stability at 95° F
Concentration: 0. meq/l. Calc. Solubility: .01 meq/l. Percent Saturation: 0.

REMARKS

AtlanticRichfieldCompany

North American Producing Division
Permian District — West Area
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

April 17, 1973

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

File

Re: Corrosion Coupon Results as per
Commission Order R-2969 entered
in Case No. 3302, concerning
Atlantic Richfield Company
Swearingen Shugart Waterflood Project

Gentlemen:

As per the above order, we submit the results of laboratory analyses of the latest exposed corrosion coupons.

Yours very truly,

L. C. Hudry

L. C. Hudry

Attachs.

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

CORROSION COUPON EXPOSURE RESULTS

LEASE OR UNIT: 6493301 SWEARINGEN WATERFLOOD

WELL OR PLANT: 6-3 COUPON LOCATION: INJECTION WELLHEAD

890123456789

TYPE SYSTEM: WATER INJECTION POSITION: VERTICAL, VERTICAL FLOW TYPE: BAR

COUPON #	EXPOSURE DATES	DAYS	DAILY PRODUCTION	WEIGHT LOSS:GMS	OVERALL CORROSION RATE:MPY	BODY PITS DPTH IN	BODY PITS RATE MPY	END PITS DPTH MILS	END PITS RATE MPY	REMARKS	
A-893 A-895	9-30-70 1- 4-71	96	0.080 254.08W 0.0MCF	0.0200 0.0476	0.2 0.3	.020	75	.0	0	CPN BDY ATTACK: SPOTTY ETCH HLDR BLK ATTACK: NONE ON WEST LEG OF SYSTM	•AREAS OF PITS
B-172 B-173	1- 4-71 4- 8-71	95	0.080 0.0W 0.0MCF	0.1471 0.0754	0.7 0.4	.005	19	.0	0	CPN BDY ATTACK: SPOTTY ETCH HLDR BLK ATTACK: NONE	•AREAS OF PITS
B-568 B-569	4- 8-71 8-13-71	127	0.080 236.08W 0.0MCF	0.1046 0.1705	0.6 0.6	.009	25	.0	0	CPN BDY ATTACK: SPOTTY ETCH HLDR BLK ATTACK: NONE	•AREAS OF PITS
B-676 B-677	8-13-71 3- 7-72	207	0.080 400.08W 0.0MCF	0.3809 0.3025	0.9 0.9	.014	24	.0	0	CPN BDY ATTACK: HEAVY ETCH HLDR BLK ATTACK: NONE	•AREAS OF PITS
C-761 C-765	3- 7-72 7-10-72	125	0.080 425.08W 0.0MCF	0.6141 0.6312	2.2 2.3	.012	34	.0	0	CPN BDY ATTACK: HEAVY ETCH HLDR BLK ATTACK: NONE	•ISOLATED PITS
C-536 C-537	7-10-72 11-22-72	134	0.080 410.08W 0.0MCF	0.0441 0.0637	0.2 0.3	.008	21	.0	0	CPN BDY ATTACK: SPOTTY ETCH HLDR BLK ATTACK: NONE	•PITTING
D-560 D-561	11-22-72 3-20-73	126	0.080 400.08W 0.0MCF	0.1144 0.1080	0.5 0.4	.005	14	.0	0	CPN BDY ATTACK: SPOTTY ETCH HLDR BLK ATTACK: ATTACK	•ISOLATED PITS •AREAS OF PITS

CORROSION COUPON EXPOSURE RESULTS

LEASE OR UNIT: 6493301 SHEARINGEN WATERFLOOD

WELL OR PLANT: E.READR COUPON LOCATION: INJECTION HEADER SUPPLY WATER

6901234567S

TYPE SYSTEM: WATER INJECTION POSITION: HORIZONTAL, HORIZONTAL FLOW TYPE: BAR

COUPON #	EXPOSURE DATES	DAYS	DAILY PRODUCTION	WEIGHT LOSS:GMS	OVERALL CORROSION RATE:MPY	BODY PITS DPTH IN	BODY PITS RATE MPY	END PITS DPTH MILS	END PITS RATE MPY	REMARKS		
A-889	9-30-70	90	0.080	1.0802	5.0	.0	0	.0	0	CPN BDY ATTACK: SPOTTY ETCH		
A-890	1- 4-71		684.08W	0.7226	3.4					HLDR BLK ATTACK: ATTACK	.NO PITS.	595
			0.0MCF									
B-166	1- 4-71	92	0.080	0.8979	4.2	.004	15	.0	0	CPN BDY ATTACK: HEAVY ETCH		
B-167	4- 8-71		0.08W	0.9919	4.0					HLDR BLK ATTACK: NONE	.ISOLATED PITS	594
			0.0MCF									
B-566	4- 8-71	127	0.080	2.0405	7.2	.0	0	.004	11	CPN BDY ATTACK: OVERALL ATTACK		
B-567	8-13-71		0.08W	1.7811	6.3					HLDR BLK ATTACK: NONE	.PITTING	593
			0.0MCF									
B-672	8-13-71	207	0.080	7.9121	17.0	.0	0	.0	0	CPN BDY ATTACK: SEVERE OVERALL ATTACK		
B-673	3- 7-72		0.08W	6.1381	17.4					HLDR BLK ATTACK: NONE	.NO PITS.	
			0.0MCF							SEVERE THINNING		592
C-385	3- 7-72	125	0.080	0.6298	2.3	.003	8	.001	2	CPN BDY ATTACK: SPOTTY ETCH		
C-386	7-10-72		542.08W	1.4900	5.3					HLDR BLK ATTACK: ATTACK	.ISOLATED PITS	597
			0.0MCF									
C-538	7-10-72	134	0.080	0.2317	0.7	.001	2	.004	10	CPN BDY ATTACK: SPOTTY ETCH		
C-539	11-22-72		750.08W	0.2483	0.5					HLDR BLK ATTACK: ATTACK	.AREAS OF PITS	588
			0.0MCF									

CORROSION COUPON EXPOSURE RESULTS

LEASE OR UNIT: 0493301 SHEARINGER WATERFLOOD

WELL OR PLANT: E.HEADR COUPON LOCATION: INJECTION HEADER ALT. PRODUCE-SUPPLY

09012345678

TYPE SYSTEM: WATER INJECTION POSITION: HORIZONTAL, HORIZONTAL FLOW TYPE: BAR

COUPON #	EXPOSURE DATES	DAYS	DAILY PRODUCTION	WEIGHT LOSS:GMS	OVERALL CORROSION RATE:MPY	BODY PITS DPTH IN	BODY PITS RATE MPY	END PITS DPTH MILS	END PITS RATE MPY	REMARKS
0-019	11-22-72	126	0.000	0.0001	0.3	.0	0	.0		2 CPN BDY ATTACK: SPOTTY ETCH
0-020	3-26-73		000.0BW	0.0494	0.2					HLOR BLK ATTACK: NONE
			0.0MCE							.NO PITS.

399

CORROSION COUPON EXPOSURE RESULTS

LEASE OR UNIT: 0495301 SWEARINGEN WATERFLOOD

WELL OR PLANT: E.HEADR COUPON LOCATION: INJECTION HEADER SUPPLY WATER

0912345678

TYPE SYSTEM: WATER INJECTION POSITION: HORIZONTAL, VERTICAL FLOW TYPE: BAR

COUPON #	EXPOSURE DATES	DAYS	DAILY PRODUCTION	WEIGHT LOSS:GMS	OVERALL CORROSION RATE:MPY	BODY PITS DPTH IN	BODY PITS RATE MPY	END PITS DPTH MILS	END PITS RATE MPY	REMARKS
0-017	11-22-72	126	0.060	2.6726	9.4	.004	11	.0	0	CPN BDY ATTACK: OVERALL ATTACK
0-018	3-26-73		600.0BW	1.6662	5.9					HLDR SLK ATTACK: ATTACK
			0.0MCF							

*AREAS OF PITS

CORROSION COUPON EXPOSURE RESULTS

LEASE OR UNIT: 6493591 SHEARINGER WATERFLOOD

WELL OR PLANT: W.HEACR COUPON LOCATION: INJECTION HEADER ALT. PRODUCE-SUPPLY

1.9012345678

TYPE SYSTEM: WATER INJECTION POSITION: HORIZONTAL, HORIZONTAL FLOW TYPE: BAR

COUPON #	EXPOSURE DATES	DAYS	DAILY PRODUCTION	WEIGHT LOSS:GMS	OVERALL CORROSION RATE:MPY	BODY PITS DPTH IN	BODY PITS RATE MPY	END PITS DPTH MILS	END PITS RATE MPY	REMARKS	
A-888	9-30-70	96	0.050	0.0207	0.2	.002	34	.0	0	CPN BDY ATTACK: EVEN ETCH	
A-896	1- 4-71		654.0BW	0.0164	0.1					HLDR BLK ATTACK: NONE	,ISOLATED PITS
			0.0MCF								602
B-104	1- 4-71	95	0.060	0.0617	0.3	.002	19	.0	0	CPN BDY ATTACK: AREAS OF ATTACK	
B-105	4- 8-71		0.0BW	0.0930	0.3					HLDR BLK ATTACK: NONE	,ISOLATED PITS
			0.0MCF								603
C-557	4- 8-71	127	0.060	0.1550	0.6	.007	20	.0	0	CPN BDY ATTACK: HEAVY ETCH	
C-558	8-13-71		0.0BW	0.1625	0.6					HLDR BLK ATTACK: NONE	,AREAS OF PITS
			0.0MCF								603
C-670	8-13-71	207	0.050	0.1597	0.4	.004	7	.0	0	CPN BDY ATTACK: SPOTTY ETCH	
C-671	3- 7-72		0.0BW	0.2134	0.5					HLDR BLK ATTACK: NONE	,AREAS OF PITS
			0.0MCF								604
THE POSITION OF THE COUPON STATION HAS BEEN CHANGED TO NOT DEFINED YET											
C-762	3- 7-72	125	0.050	0.2186	0.8	.005	14	.008	23	CPN BDY ATTACK: SPOTTY ETCH	
C-554	7-10-72		542.0BW	0.2307	0.9					HLDR BLK ATTACK: ATTACK	,PITTING
			0.0MCF								605
THE POSITION OF THE COUPON STATION HAS BEEN CHANGED TO HORIZONTAL, HORIZONTAL FLOW											
C-540	7-10-72	134	0.050	0.1006	0.4	.005	13	.0	0	CPN BDY ATTACK: SPOTTY ETCH	
C-541	11-22-72		410.0BW	0.1220	0.5					HLDR BLK ATTACK: NONE	,PITTING
			0.0MCF								606

CORROSION COUPON EXPOSURE RESULTS

LEASE OR UNIT: 0493301 SWARINGEN WATERFLOOD

WELL OR PLANT: WIW A-6 COUPON LOCATION: INJECTION WELLHEAD

6901234567B

TYPE SYSTEM: WATER INJECTION POSITION: NOT DEFINED YET TYPE: BAR

COUPON #	EXPOSURE DATES	DAYS	DAILY PRODUCTION	WEIGHT LOSS:GMS	OVERALL CORROSION RATE:MPY	BODY PITS DPTH IM	BODY PITS RATE MPY	END PITS DPTH MILS	END PITS RATE MPY	REMARKS	
4-391	9-3-70	96	0.000	0.0050	0.1	.0	0	.0	0	CPN BDY ATTACK: EVEN ETCH	
4-392	1-4-71		117.0BW	0.0049	0.1					HLOR BLK ATTACK: NONE	
			0.0MCF							A-6 ON EST LEG OF SYS	
3-170	1-6-71	93	0.000	0.1729	0.9	.006	22	.0	0	CPN BDY ATTACK: SPOTTY ETCH	
3-171	4-8-71		0.0BW	0.0446	0.3					HLOR BLK ATTACK: NONE	
			0.0MCF								
3-074	8-13-71	207	0.000	0.0116	0.1	.005	8	.0	0	CPN BDY ATTACK: EVEN ETCH	
3-075	3-7-72		0.0BW	0.0036	0.1					HLOR BLK ATTACK: NONE	
			0.0MCF							WELL SHUT IN 6-25-71	

*NO PITS.

*AREAS OF PITS

*PITTING

COMMENTS ON LATEST DATA FROM SWEARINGEN WATERFLOOD

OVERALL CORROSION RATES:

WORKAN INJECTION HEADER SUPPLY WATER	OVERALL CORROSION RATE GREATER THAN 5 MPY.

COUPON-END PITTING RATES:

D-3 INJECTION WELLHEAD	PITTING NOTED.
WORKAN INJECTION HEADER SUPPLY WATER	PITTING NOTED.

NO COUPON-END PITTING AT ANY LOCATION.

AtlanticRichfieldCompany

North American Producing Division
Permian District – West Area
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

RECEIVED
MAR 22 1973
OIL CONSERVATION COMM
Santa Fe

March 20, 1973

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

File

Re: Corrosion Coupon Results as per
Commission Order R-2969 entered
in Case No. 3302, concerning
~~Atlantic Richfield~~ Company
Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above order, we submit the results of laboratory analyses of the latest exposed corrosion coupons.

Yours very truly,

L. C. Hudry

L. C. Hudry

Attachs.

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

CORROSION COUPON EXPOSURE RESULTS

LEASE OR UNIT: 6493301 SWEARINGEN WATERFLOOD

WELL OR PLANT: B-3 COUPON LOCATION: INJECTION WELLHEAD

TYPE SYSTEM: WATER INJECTION POSITION: VERTICAL, VERTICAL FLOW TYPE: BAR

COUPON #	EXPOSURE DATES	DAYS	DAILY PRODUCTION	WEIGHT LOSS:GMS	OVERALL CORROSION RATE:MPY	BODY PITS DPTH IN	BODY PITS RATE MPY	END PITS DPTH MILS	END PITS RATE MPY	REMARKS	
A-693	9-30-70	96	0.0BO	0.0260	0.2	.020	75	.0	0	CPN BDY ATTACK: SPOTTY ETCH	
A-695	1- 4-71		254.0BW 0.0MCF	0.0476	0.3					HLDR BLK ATTACK: NONE ON WEST LEG OF SYSTM	•AREAS OF PITS 459
B-172	1- 4-71	95	0.0BO	0.1471	0.7	.005	19	.0	0	CPN BDY ATTACK: SPOTTY ETCH	
B-173	4- 8-71		0.0BW 0.0MCF	0.0754	0.4					HLDR BLK ATTACK: NONE	•AREAS OF PITS 460
B-568	4- 8-71	127	0.0BO	0.1646	0.6	.009	25	.0	0	CPN BDY ATTACK: SPOTTY ETCH	
B-600	8-13-71		238.0BW 0.0MCF	0.1705	0.6					HLDR BLK ATTACK: NONE	•AREAS OF PITS 461
B-676	8-13-71	207	0.0BO	0.3809	0.9	.014	24	.0	0	CPN BDY ATTACK: HEAVY ETCH	
B-677	3- 7-72		400.0BW 0.0MCF	0.3325	0.9					HLDR BLK ATTACK: NONE	•ISOLATED PITS 462
C-761	3- 7-72	125	0.0BO	0.6141	2.2	.012	34	.0	0	CPN BDY ATTACK: HEAVY ETCH	
C-765	7-10-72		425.0BW 0.0MCF	0.6312	2.3					HLDR BLK ATTACK: NONE	•PITTING 463
C-536	7-10-72	134	0.0BO	0.0441	0.2	.008	21	.0	0	CPN BDY ATTACK: SPOTTY ETCH	
C-537	11-22-72		410.0BW 0.0MCF	0.0637	0.3					HLDR BLK ATTACK: NONE	•ISOLATED PITS 464

CORROSION COUPON EXPOSURE RESULTS

LEASE OR UNIT: 6493301 SWEARINGEN WATERFLOOD

WELL OR PLANT: E.HEADR COUPON LOCATION: INJECTION HEADER SUPPLY WATER

TYPE SYSTEM: WATER INJECTION POSITION: HORIZONTAL, HORIZONTAL FLOW TYPE: BAR

COUPON #	EXPOSURE DATES	DAYS	DAILY PRODUCTION	WEIGHT LOSS:GMS	OVERALL CORROSION RATE:MPY	BODY PITS DPTH IN	BODY PITS RATE MPY	END PITS DPTH MILS	END PITS RATE MPY	REMARKS	
A-889	9-30-70	96	0.080	1.0802	5.0	.0	0	.0	0	CPN BDY ATTACK: SPOTTY ETCH	
A-890	1- 4-71		684.0BW 0.0MCF	0.7226	3.4					HLDR BLK ATTACK: ATTACK	,NO PITS. 465
B-166	1- 4-71	95	0.080	0.8978	4.2	.004	15	.0	0	CPN BDY ATTACK: HEAVY ETCH	
B-167	4- 8-71		0.08W 0.0MCF	0.9919	4.6					HLDR BLK ATTACK: NONE	,ISOLATED PITS 465
B-560	4- 8-71	127	0.080	2.0405	7.2	.0	0	.004	11	CPN BDY ATTACK: OVERALL ATTACK	
B-567	8-13-71		0.08W 0.0MCF	1.7811	6.3					HLDR BLK ATTACK: NONE	,PITTING 467
B-672	8-13-71	207	0.080	7.9121	17.0	.0	0	.0	0	CPN BDY ATTACK: SEVERE OVERALL ATTACK	
B-673	3- 7-72		0.08W 0.0MCF	8.1381	17.4					HLDR BLK ATTACK: NONE SEVERE THINNING	,NO PITS. 466
C-385	3- 7-72	125	0.080	0.6268	2.3	.003	8	.001	2	CPN BDY ATTACK: SPOTTY ETCH	
C-386	7-10-72		542.0BW 0.0MCF	1.4900	5.3					HLDR BLK ATTACK: ATTACK	,ISOLATED PITS 469
C-538	7-10-72	134	0.080	0.2017	0.7	.001	2	.004	10	CPN BDY ATTACK: SPOTTY ETCH	
C-539	11-22-72		750.0BW 0.0MCF	0.1483	0.5					HLDR BLK ATTACK: ATTACK	,AREAS OF PITS 47[illegible]

CORROSION COUPON EXPOSURE RESULTS

LEASE OR UNIT: 6493301 SWEARINGEN WATERFLOOD

WELL OR PLANT: W.HEADR COUPON LOCATION: INJECTION HEADER ALT. PRODUCE-SUPPLY

TYPE SYSTEM: WATER INJECTION POSITION: HORIZONTAL, HORIZONTAL FLOW TYPE: BAR

COUPON #	EXPOSURE DATES	DAYS	DAILY PRODUCTION	WEIGHT LOSS:GMS	OVERALL CORROSION RATE:MPY	BODY PITS DPTH IN	BODY PITS RATE MPY	END PITS DPTH MILS	END PITS RATE MPY	REMARKS	
A-868	9-30-70	96	0.0BO	0.0207	0.2	.009	34	.0	0	CPN BDY ATTACK: EVEN ETCH	
A-896	1- 4-71		684.0BW 0.0MCF	0.0164	0.1					HLDR BLK ATTACK: NONE	,ISOLATED PITS 471
B-168	1- 4-71	95	0.0BO	0.0617	0.3	.005	19	.0	0	CPN BDY ATTACK: AREAS OF ATTACK	
B-169	4- 8-71		0.0BW 0.0MCF	0.0530	0.3					HLDR BLK ATTACK: NONE	,ISOLATED PITS 472
B-557	4- 8-71	127	0.0BO	0.1580	0.6	.007	20	.0	0	CPN BDY ATTACK: HEAVY ETCH	
B-558	8-13-71		0.0BW 0.0MCF	0.1625	0.6					HLDR BLK ATTACK: NONE	,AREAS OF PITS 473
B-670	8-13-71	207	0.0BO	0.1597	0.4	.004	7	.0	0	CPN BDY ATTACK: SPOTTY ETCH	
B-671	3- 7-72		0.0BW 0.0MCF	0.2134	0.5					HLDR BLK ATTACK: NONE	,AREAS OF PITS 474
THE POSITION OF THE COUPON STATION HAS BEEN CHANGED TO NOT DEFINED YET											
C-762	3- 7-72	125	0.0BO	0.2186	0.8	.005	14	.008	23	CPN BDY ATTACK: SPOTTY ETCH	
C-384	7-10-72		542.0BW 0.0MCF	0.2307	0.9					HLDR BLK ATTACK: ATTACK	,PITTING 475
THE POSITION OF THE COUPON STATION HAS BEEN CHANGED TO HORIZONTAL, HORIZONTAL FLOW											
C-540	7-10-72	134	0.0BO	0.1006	0.4	.005	13	.0	0	CPN BDY ATTACK: SPOTTY ETCH	
C-541	11-22-72		410.0BW 0.0MCF	0.1220	0.5					HLDR BLK ATTACK: NONE	,PITTING 476

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1710
Hobbs, New Mexico 88240
Telephone 505 393 7163

December 4, 1974

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Produced water samples required by Commission Order R-2969 entered in Case No. 3302, concerning Atlantic Richfield Company - Swearingen - Shugart Waterflood Project

Gentlemen:

As per the above order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen Shugart waterflood project.

Yours very truly,

L. C. Hudry

L. C. Hudry

LCH:rm

Attachment

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

AtlanticRichfieldCompany Internal Correspondence

Date: November 26, 1974

To: Mr. Cecil Johnson, Hobbs, New Mexico

From: J.P. McDonald, Jr., PRC-E144, Dallas, Texas

Subject: Produced Water Analysis
Swearingen Waterflood
Shugart Field, Eddy County, New Mexico

Letter: 40-739

Attached is a water analysis (A 5852) of produced water from this lease as requested.

This analysis is performed on a quarterly basis in compliance with the request from the New Mexico Oil Conservation Commission.

A copy of the attached invoice, approved for payment, has been sent to Accounts Payable.

James P. McDonald, Jr.

James P. McDonald, Jr.

JPMcD/jap

Attachment

ARCO-1

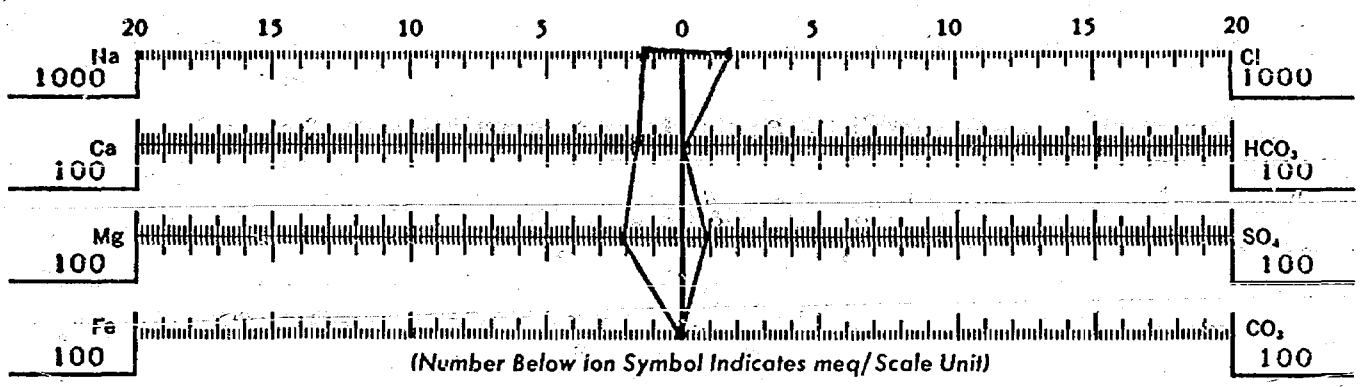
PRODUCTION PROFITS
DIVISION OF SONICS INTERNATIONAL, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

Client: Atlantic Richfield Company
County: Eddy State: New Mexico
Field: Shugart Lease: Swearingen Well No.:
Formation: Depth: Perf.:
Source of Sample: Produced Water
Date Collected: Rec: 11-14-74 by:

REPORT OF WATER ANALYSIS

Lab. Number: A-5852 Specific Gravity: 1.0726 pH: 7.2
Total Dissolved Solids: 103896 Resistivity (Ohmmeters at 68° F.): .085 Hydrogen Sulfide: ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	103896	
Sodium (Calc.)	32700	1422.9
Iron (Dissolved)	0	0.
Barium	-	-
Calcium	3260	162.7
Magnesium	2620	215.4
Chloride	60300	1700.5
Bicarbonate	876	14.4
Carbonate	0	0.
Sulfate	4140	86.1

TOTAL IRON: 11

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

	mg/l
Total Undissolved Solids	
Oil (Solvent Soluble)	
Acid Solubles	
Iron as	
Calcium as	
Magnesium as	
Sulfate as	
Organic (Ignition Loss)	
Acid Insolubles	
Sand & Clay	
Barium Sulfate (Quan.)	
(Qual.)	

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: .88 Scaling Tendency: POS.
Calcium Sulfate Stability at 95°F
Concentration: 86.11 meq/l. Calc. Solubility: 74.41 meq/l. Percent Saturation: 100.00
Barium Sulfate Stability at 95° F
Concentration: meq/l. Calc. Solubility: meq/l. Percent Saturation:

REMARKS

Atlantic Richfield Company
North American Producing Division
New Mexico-Arizona District
Post Office Box 1710
Hobbs, New Mexico 88240
Telephone 505 393 7163

RECEIVED
SEP 26 1973
OIL CONSERVATION COMM
Santa Fe

September 25, 1973

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Produced water samples required by Commission Order R-2969 entered in Case No. 3302, concerning Atlantic Richfield Company - Swearingen - Shugart Waterflood Project

Gentlemen:

As per the above order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen Shugart waterflood project.

Yours very truly,

L. C. Hudry

LCH:rm
Attachment
cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

PRODUCTION PROFITS
DIVISION OF SONICS INTERNATIONAL, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

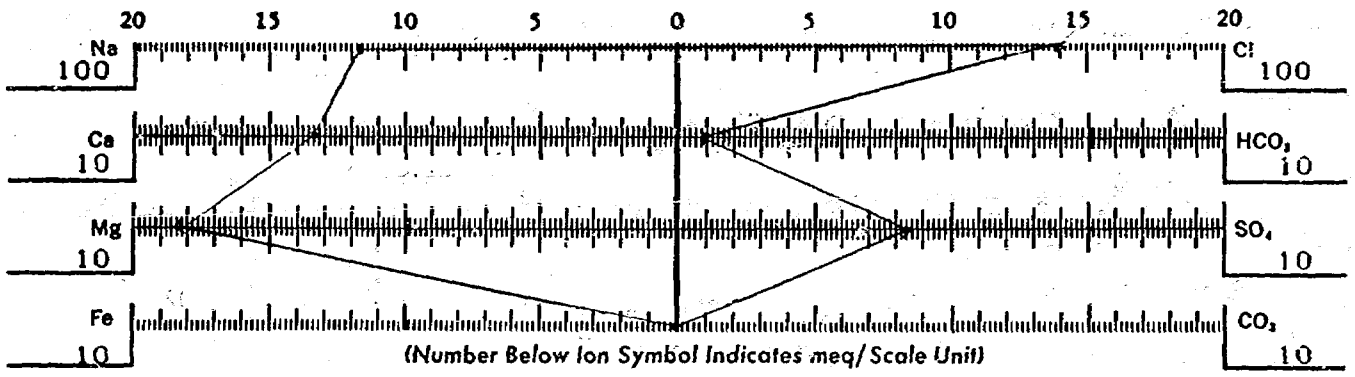
OIL CONS. Santa Fe

Client Atlantic Richfield Company
County Eddy State New Mexico
Field Shugert Lease Swearingen WF Well No.
Formation Depth Perf.
Source of Sample Produced Water
Date Collected Rec: 8-2-73 by

REPORT OF WATER ANALYSIS

Lab. Number A-5182 Specific Gravity 1.0610 pH 7.4
Total Dissolved Solids 86575 Resistivity (Ohmmeters at 68° F.) .089 Hydrogen Sulfide ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	86575	
Sodium (Calc.)	27200	1181.4
Iron (Dissolved)	0	0.
Barium	0	0.
Calcium	2700	134.7
Magnesium	2220	182.5
Chloride	49800	1404.4
Bicarbonate	595	9.8
Carbonate	0	0.
Sulfate	4060	84.

TOTAL IRON -

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

		mg/l
Total Undissolved Solids		
Oil (Solvent Soluble)		
Acid Solubles		
Iron	as	
Calcium	as	
Magnesium	as	
Sulfate	as	
Organic (Ignition Loss)		
Acid Insolubles		
Sand & Clay		
Barium Sulfate	(Quan.)	
	(Qual.)	

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F .74 Scaling Tendency POS.
Calcium Sulfate Stability at 95°F
Concentration 84.45 meq/l. Calc. Solubility 79.35 meq/l. Percent Saturation 100.00
Barium Sulfate Stability at 95° F
Concentration meq/l. Calc. Solubility meq/l. Percent Saturation

REMARKS

20

AtlanticRichfieldCompany

North American Producing Division
Permian District — West Area
Post Office Box 1978
Roswell, New Mexico 88201
Telephone 505 622 4041

THEN

RECEIVED
MAR 20 1973
OIL CONSERVATION COMM.
Santa Fe

March 19, 1973

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

File

Re: Produced water samples required by Commission Order R-2969 entered in Case No. 3302, concerning Atlantic Richfield Company - Swearingen-Shugart Waterflood Project

Gentlemen:

As per the above Order, we submit the results of laboratory analyses of the latest produced water samples from the Swearingen-Shugart waterflood project.

Yours very truly,

L. C. Hudry

Attachs.

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

DIVISION OF SONICS INTERNATIONAL, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

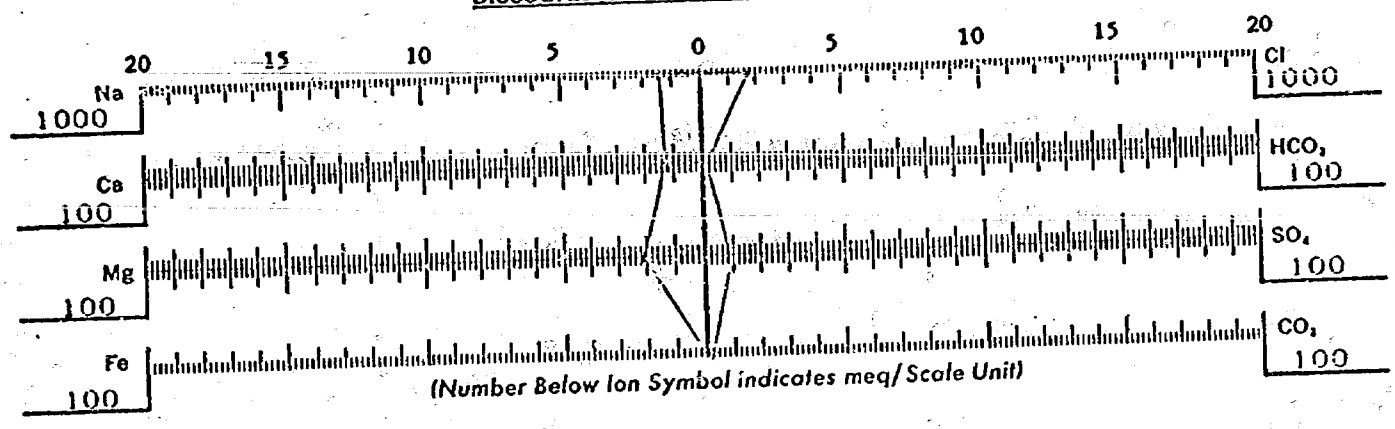
RECEIVED
MAR 20 1973
OIL CONSERVATION COMM.
Santa Fe

Client: Atlantic Richfield Company
County: Eddy
State: New Mexico
Field: Shugart
Lease: Swearingen
Well No.:
Formation:
Depth:
Ref.:
Source of Sample: Produced water
Date Collected: 11-15-72
by:

REPORT OF WATER ANALYSIS

Lab. Number: A-4961
Total Dissolved Solids: 105540
Specific Gravity: 1.0743
Resistivity (Ohmmeters at 68° F.): .093
pH: 7.1
Hydrogen Sulfide: ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	105540	
Sodium (Calc.)	33800	1468.4
Iron (Dissolved)	0	0.
Barium	-	-
Calcium	2900	144.7
Magnesium	2670	219.5
Chloride	61900	1745.6
Bicarbonate	410	6.7
Carbonate	0	0.
Sulfate	3860	80.3

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

		mg/l
Total Undissolved Solids		
Oil (Solvent Soluble)		
Acid Solubles		
Iron as		
Calcium as		
Magnesium as		
Sulfate as		
Organic (Ignition Loss)		
Acid Insolubles		
Sand & Clay		
Barium Sulfate	(Quan.)	
	(Qual.)	

TOTAL IRON: -

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: .41
Scaling Tendency: POS.

Calcium Sulfate Stability at 95°F
Concentration: 80.29 meq/l. Calc. Solubility: 78.79 meq/l. Percent Saturation: 100.00

Barium Sulfate Stability at 95° F
Concentration: meq/l. Calc. Solubility: meq/l. Percent Saturation:

REMARKS

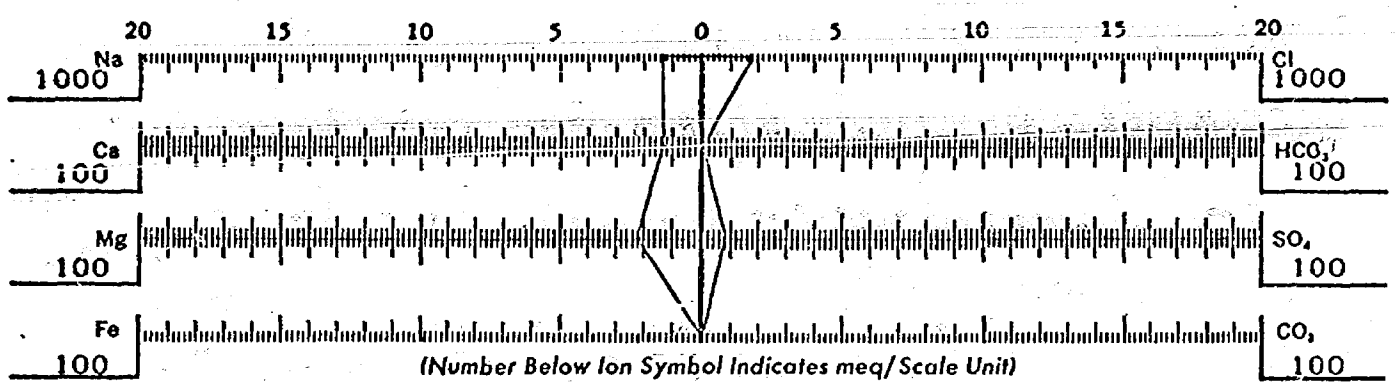
Petroleum Service Laboratory
DALLAS, TEXAS

Client: Atlantic Richfield Company
County: Eddy State: New Mexico
Field: Shugart Lease: Swearinger Well No.:
Formation: Depth: Perf.:
Source of Sample: Produced Water - Heater Treater
Date Collected: 8-11-72 by:

REPORT OF WATER ANALYSIS

Lab. Number: P-4879 Specific Gravity: 1.0746 pH: 6.9
Total Dissolved Solids: 104898 Resistivity (Ohmmeters at 68° F.): .089 Hydrogen Sulfide: ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	104898	
Sodium (Calc.)	33300	1449.8
Iron (Dissolved)	0	0.
Barium	-	-
Calcium	2990	149.2
Magnesium	2740	225.2
Chloride	61600	1737.1
Bicarbonate	388	6.4
Carbonate	0	0.
Sulfate	3880	80.7

TOTAL IRON: -

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

	mg/l
Total Undissolved Solids	
Oil (Solvent Soluble)	
Acid Solubles	
Iron as	
Calcium as	
Magnesium as	
Sulfate as	
Organic (Ignition Loss)	
Acid Insolubles	
Sand & Clay	
Barium Sulfate (Quan.)	
(Qual.)	

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: .20 Scaling Tendency: POS.
Calcium Sulfate Stability at 95°F
Concentration: 80.70 meq/l. Calc. Solubility: 77.33 meq/l. Percent Saturation: 100.00
Barium Sulfate Stability at 95° F
Concentration: meq/l. Calc. Solubility: meq/l. Percent Saturation:

REMARKS

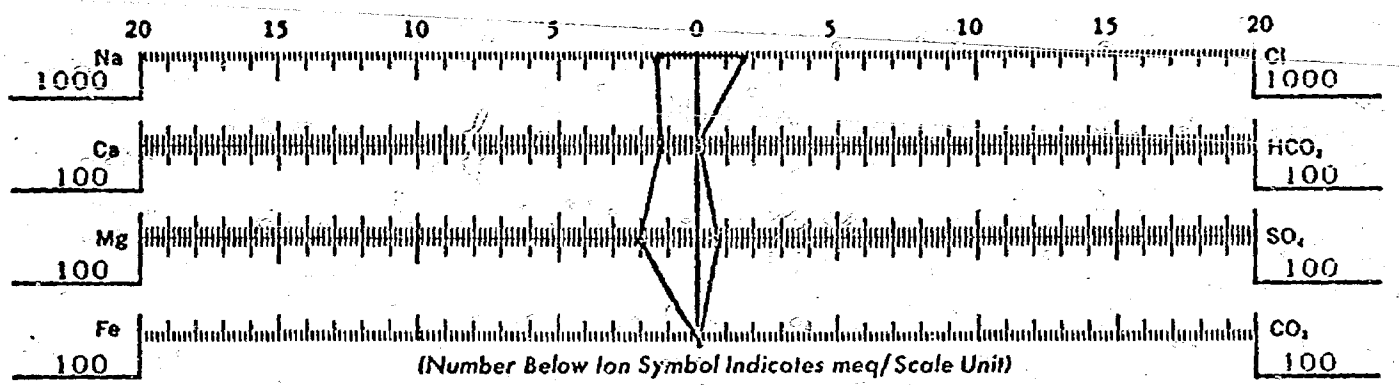
Petroleum Service Laboratory
DALLAS, TEXAS

Client: Atlantic Richfield Company
County: Eddy State: New Mexico
Field: Shugart Lease: Swearingen Waterflood Well No.:
Formation: Depth: Perf.:
Source of Sample: produced water
Date Collected: 5-9-72 by:

REPORT OF WATER ANALYSIS

Lab. Number: A-4750 Specific Gravity: 1.0707 pH: 6.9
Total Dissolved Solids: 101257 Resistivity (Ohmmeters at 68° F.): .096 Hydrogen Sulfide: ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



(Number Below Ion Symbol Indicates meq/Scale Unit)

DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	101257	
Sodium (Calc.)	32400	1409.9
Iron (Dissolved)	0	0.
Barium	-	-
Calcium	2780	138.7
Magnesium	2550	209.6
Chloride	59300	1672.3
Bicarbonate	447	7.3
Carbonate	0	0.
Sulfate	3780	78.6

TOTAL IRON: -

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

		mg/l
Total Undissolved Solids		
Oil (Solvent Soluble)		
Acid Solubles		
Iron	as	
Calcium	as	
Magnesium	as	
Sulfate	as	
Organic (Ignition Loss)		
Acid Insolubles		
Sand & Clay		
Barium Sulfate	(Quan.)	
	(Qual.)	

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: .20 Scaling Tendency: POS.
Calcium Sulfate Stability at 95°F
Concentration: 78.6 meq/l. Calc. Solubility: 79.42 meq/l. Percent Saturation: 98.96
Barium Sulfate Stability at 95° F
Concentration: meq/l. Calc. Solubility: meq/l. Percent Saturation:

REMARKS

DIVISION OF SCHLUMBERGER INTERNATIONAL, INC.

Petroleum Service Laboratory

DALLAS, TEXAS

Client: Atlantic Richfield Company

County: Eddy State: New Mexico

Field: Lease: Swearingen Well No.:

Formation: Depth: Perf.:

Source of Sample: Heater Treater - Produced Water

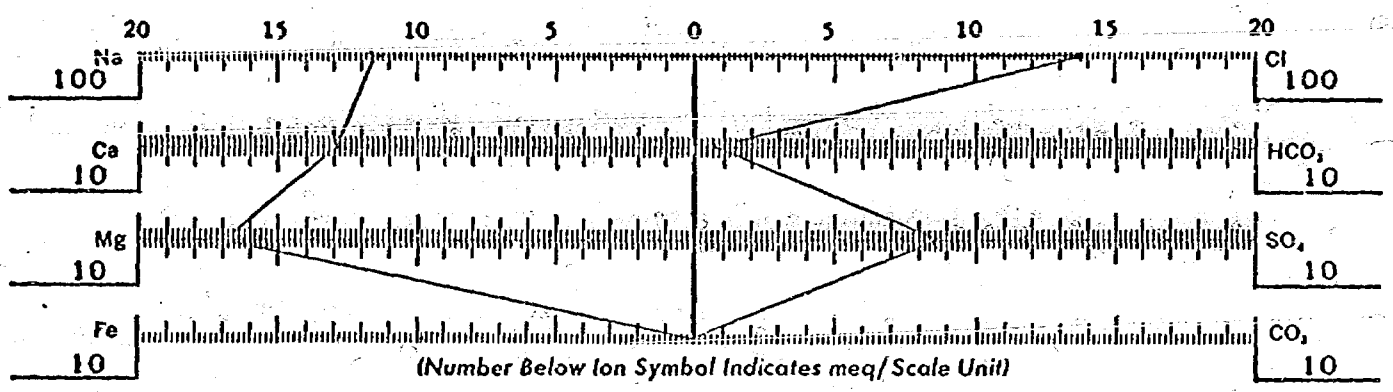
Date Collected: 2-8-72 by:

REPORT OF WATER ANALYSIS

Lab. Number: A-4483 Specific Gravity: 1.0610 pH: 6.7

Total Dissolved Solids: 84581 Resistivity (Ohmmeters at 68° F.): .341 Hydrogen Sulfide: ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	84581	
Sodium (Calc.)	26800	1163.8
Iron (Dissolved)	0	0.
Barium	0	0.
Calcium	2600	129.7
Magnesium	2060	169.3
Chloride	48600	1370.5
Bicarbonate	381	6.2
Carbonate	0	0.
Sulfate	4140	86.1

TOTAL IRON: -

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

		mg/l
Total Undissolved Solids		
Oil (Solvent Soluble)		
Acid Solubles		
Iron	as	
Calcium	as	
Magnesium	as	
Sulfate	as	
Organic (Ignition Loss)		
Acid Insolubles		
Sand & Clay		
Barium Sulfate	(Quan.)	
	(Qual.)	

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: -.17 Scaling Tendency: NEG.

Calcium Sulfate Stability at 95°F

Concentration: 86.1 meq/l. Calc. Solubility: 81.22 meq/l. Percent Saturation: 100.00

Barium Sulfate Stability at 95° F

Concentration: meq/l. Calc. Solubility: meq/l. Percent Saturation:

REMARKS

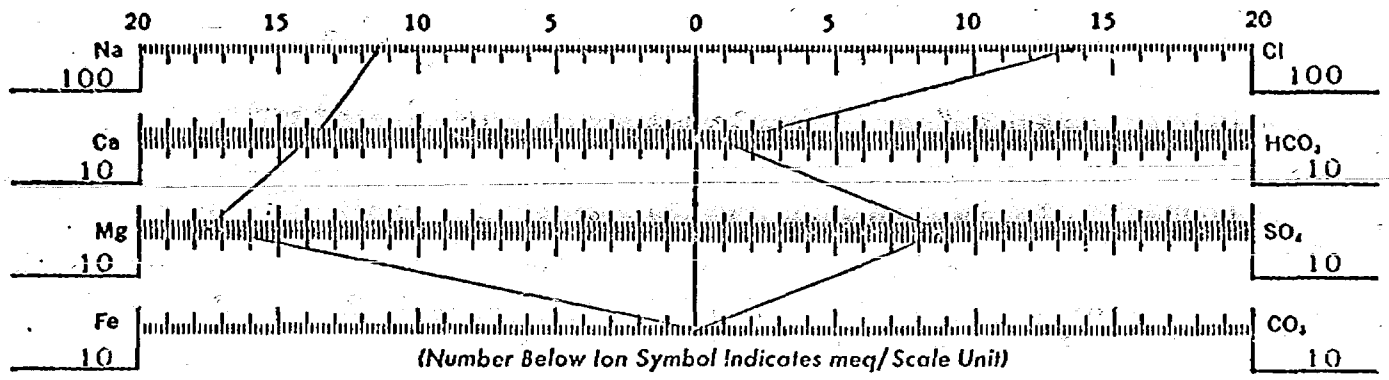
Petroleum Service Laboratory
DALLAS, TEXAS

Client: Atlantic Richfield Company
County: Eddy State: New Mexico
Field: Shugart Lease: Swearingen Well No.: B-6
Formation: Depth: Perf.:
Source of Sample:
Date Collected: 11-12-71 by:

REPORT OF WATER ANALYSIS

Lab. Number: A-4338 Specific Gravity: 1.0609 pH: 6.8
Total Dissolved Solids: 84529 Resistivity (Ohmmeters at 68° F.): .108 Hydrogen Sulfide: ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	84529	
Sodium (Calc.)	26400	1146.9
Iron (Dissolved)	0	0.
Barium	-	-
Calcium	2770	138.2
Magnesium	2150	176.7
Chloride	48300	1362.1
Bicarbonate	559	9.2
Carbonate	0	0.
Sulfate	4350	90.5

TOTAL IRON: -

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

		mg/l
Total Undissolved Solids		
Oil (Solvent Soluble)		
Acid Solubles		
Iron as		
Calcium as		
Magnesium as		
Sulfate as		
Organic (Ignition Loss)		
Acid Insolubles		
Sand & Clay		
Barium Sulfate	(Quan.)	
	(Qual.)	

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: .12 Scaling Tendency: POS.
Calcium Sulfate Stability at 95°F
Concentration: 90.5 meq/l. Calc. Solubility: 72.17 meq/l. Percent Saturation: 100.00
Barium Sulfate Stability at 95° F
Concentration: meq/l. Calc. Solubility: meq/l. Percent Saturation:

REMARKS

The sample consisted of one 1 pint bottle of water

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1710
Hobbs, New Mexico 88240
Telephone 505 393 7163

Case 3302

April 16, 1975

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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

Re: Produced water samples required by Commission Order R-2969 entered in Case No. 3302, concerning Atlantic Richfield Company - Swearingen - Shugart Waterflood Project

Gentlemen:

As per the above order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen Shugart waterflood project.

Yours very truly,

L. C. Hudry

L. C. Hudry

LCH:rm

Attachment

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, New Mexico 87501

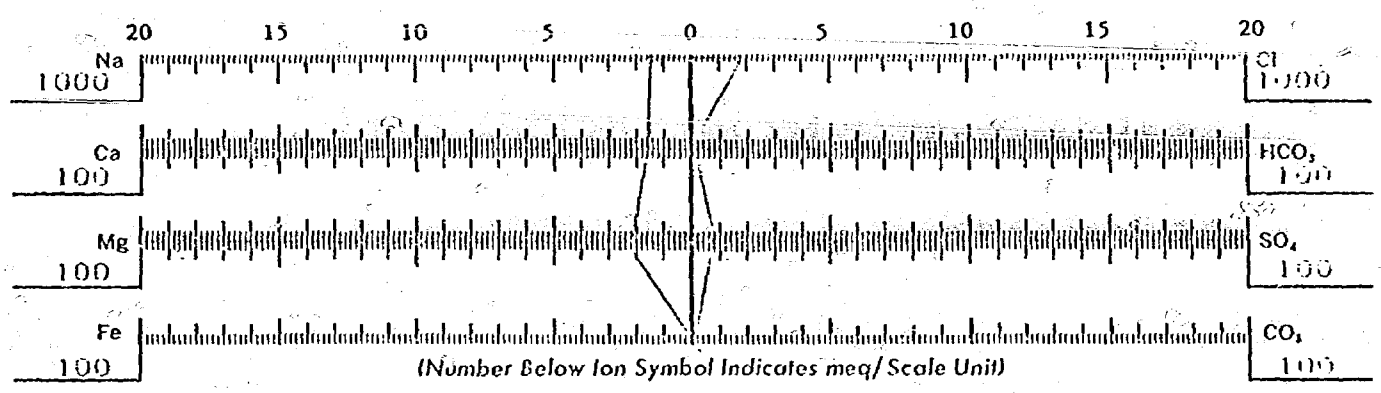
PRODUCTION PROFITS
DIVISION OF SONICS INTERNATIONAL, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

Client Atlantic Richfield Company
County Eddy State New Mexico
Field Shugart Lease Swearingen Well No.
Formation Depth Perf.
Source of Sample Produced Water
Date Collected Rec: 3-4-75 by

REPORT OF WATER ANALYSIS

Lab. Number A-6067 Specific Gravity 1.0733 pH 7.1
Total Dissolved Solids 106196 Resistivity (Ohmmeters at 68° F.) .093 Hydrogen Sulfide PRESENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	106196	
Sodium (Calc.)	33500	1457.5
Iron (Dissolved)	0	0.
Barium	-	-
Calcium	3290	164.2
Magnesium	2630	216.2
Chloride	61500	1734.3
Bicarbonate	936	16.2
Carbonate	0	0.
Sulfate	4200	87.4

TOTAL IRON 3

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

	mg/l
Total Undissolved Solids	
Oil (Solvent Soluble)	
Acid Solubles	
Iron as	
Calcium as	
Magnesium as	
Sulfate as	
Organic (Ignition Loss)	
Acid Insolubles	
Sand & Clay	
Barium Sulfate (Quan.)	
(Qual.)	

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F .85 Scaling Tendency FAS.
Calcium Sulfate Stability at 95°F
Concentration 87.36 meq/l. Calc. Solubility 74.72 meq/l. Percent Saturation 100.00
Barium Sulfate Stability at 95° F
Concentration meq/l. Calc. Solubility meq/l. Percent Saturation

REMARKS

The sample consisted of one quart bottle of cloudy water with black sediment.

AtlanticRichfieldCompany
North American Producing Division
New Mexico-Arizona District
Post Office Box 1710
Hobbs, New Mexico 88240
Telephone 505 393 7163

June 15, 1976

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, NM 87501

Attention: Mr. J. Ramey, Jr.
Secretary-Director

Re: Produced water samples required by Commission Order R-2969 entered in Case No. 3302, concerning Atlantic Richfield Company - Swearingen - Shugart Waterflood Project

Gentlemen:

As per the above order, we submit the results of laboratory analysis of the latest produced water sample from the Swearingen Shugart waterflood project.

Yours very truly,

L. C. Hudry

LCH/rd
Attachment

cc: New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, NM 88210

New Mexico State Engineer's Office
State Capitol
Santa Fe, NM 87501

PRODUCTION PROFITS, INC.
Petroleum Service Laboratory
DALLAS, TEXAS

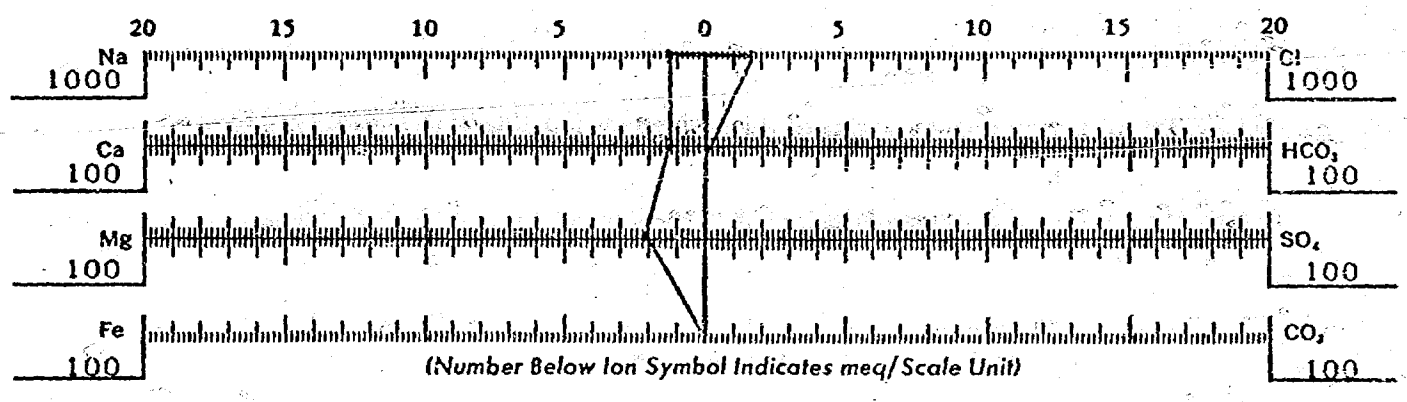
Client: Atlantic Richfield Company
County: Eddy State: New Mexico
Field: Shugart Lease: Swearingen Well No.:
Formation: Depth: Perf.:
Source of Sample: Produced Water Sample
Date Collected: 5/76 by:

JUN 10 1976
OIL CONSERVATION COMM.
Santa Fe

REPORT OF WATER ANALYSIS

Lab. Number: A-6490 Specific Gravity: 1.0709 pH: 6.9
Total Dissolved Solids: 100356 Resistivity (Ohmmeters at 68° F.): .087 Hydrogen Sulfide: ABSENT

DISSOLVED MINERAL ANALYSIS PATTERN



DISSOLVED SOLIDS ANALYSIS

	mg/l	meq/l
Total Solids (Calc.)	100356	
Sodium (Calc.)	31800	1382.2
Iron (Dissolved)	0	0.
Barium	-	-
Calcium	2770	138.2
Magnesium	2700	221.9
Chloride	58600	1652.5
Bicarbonate	786	12.9
Carbonate	0	0.
Sulfate	3700	77.0

TOTAL IRON: 17

PRECIPITATED AND SUSPENDED SOLIDS ANALYSIS

	mg/l
Total Undissolved Solids	
Oil (Solvent Soluble)	
Acid Solubles	
Iron ____ as ____	
Calcium ____ as ____	
Magnesium ____ as ____	
Sulfate ____ as ____	
Organic (Ignition Loss)	
Acid Insolubles	
Sand & Clay	
Barium Sulfate (Quan.)	
(Qual.)	

SOLUBILITY CALCULATIONS

Calcium Carbonate Stability Index at 77° F: .44 Scaling Tendency: POS.
Calcium Sulfate Stability at 95°F
Concentration: 76.96 meq/l. Calc. Solubility: 78.88 meq/l. Percent Saturation: 97.56
Barium Sulfate Stability at 95° F
Concentration: ____ meq/l. Calc. Solubility: ____ meq/l. Percent Saturation: ____

REMARKS