Amoco Production Company
Southeast Business Unit
501 WestLake Park Boulevard
Post Office Box 3092
Houston, Texas 77253-3092

James F. Trickett
Manager, Environmental Safety & Regulatory Affairs

October 8, 1991

New Mexico Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87504

Case 10406

Attn: Mr. Michael Stogner

Request for Hearing on October 31 Docket

Amoco Production Company respectfully requests a hearing for the October 31, 1991, docket, styled as follows:

> "Application of Amoco Production Company to initiate waterflooding for secondary recovery, Lea County, New Mexico. Applicant seeks an order to waterflood the Upper Yeso within the South Mattix Unit, underlying all of Section 15 and the E/2 NW/4, NE/4, N/2 SE/4, and the SE/4 SE/4 of Section 22, T24S, R37E, Fowler - Upper Yeso Pool. Applicant will drill one producing oil well, 4 water injection wells and convert 3 existing oil producing wells to water injection. All secondary recovery wells will be located in Section 15, T24S, R37E. Said unit is located approximately 5 miles from Jal, New Mexico.

Please contact Mr. Jim Collier at (713) 556-3371 or Mr. Dan Janik at (713) 556-3930 if questions arise.

Yours very truly,

James F. Trickett

JWC/kf

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT

OIL CONSERVATION DIVISION
POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501

FORM C-108
Revised 7-1-81

APPLICATION FOR AUTHORIZATION TO INJECT

I. Purpose: [X] Secondary Recovery [ ] Pressure Maintenance [ ] Disposal [ ] Storage
Application qualifies for administrative approval? [ ] yes [X] no

II. Operator: Amoco Production Company

Address: P. O. Box 3092, Houston, TX 77253

Contact party: Billy Abbott Phone: 505/397-8219

III. Well data: Complete the data required on the reverse side of this form for each well proposed for injection. Additional sheets may be attached if necessary.

IV. Is this an expansion of an existing project? [ ] yes [X] no
If yes, give the Division order number authorizing the project _____.

V. Attach a map that identifies all wells and leases within two miles of any proposed injection well with a one-half mile radius circle drawn around each proposed injection well. This circle identifies the well's area of review.

* VI. Attach a tabulation of data on all wells of public record within the area of review which penetrate the proposed injection zone. Such data shall include a description of each well's type, construction, date drilled, location, depth, record of completion, and a schematic of any plugged well illustrating all plugging detail.

VII. Attach data on the proposed operation, including:

1. Proposed average and maximum daily rate and volume of fluids to be injected;
2. Whether the system is open or closed;
3. Proposed average and maximum injection pressure;
4. Sources and an appropriate analysis of injection fluid and compatibility with the receiving formation if other than reinjected produced water; and
5. If injection is for disposal purposes into a zone not productive of oil or gas at or within one mile of the proposed well, attach a chemical analysis of the disposal zone formation water (may be measured or inferred from existing literature, studies, nearby wells, etc.).

*VIII. Attach appropriate geological data on the injection zone including appropriate lithologic detail, geological name, thickness, and depth. Give the geologic name, and depth to bottom of all underground sources of drinking water (aquifers containing waters with total dissolved solids concentrations of 10,000 mg/l or less) overlying the proposed injection zone as well as any such source known to be immediately underlying the injection interval.

IX. Describe the proposed stimulation program, if any.

* X. Attach appropriate logging and test data on the well. (If well logs have been filed with the Division they need not be resubmitted.)

* XI. Attach a chemical analysis of fresh water from two or more fresh water wells (if available and producing) within one mile of any injection or disposal well showing location of wells and dates samples were taken.

XII. Applicants for disposal wells must make an affirmative statement that they have examined available geologic and engineering data and find no evidence of open faults or any other hydrologic connection between the disposal zone and any underground source of drinking water.

XIII. Applicants must complete the "Proof of Notice" section on the reverse side of this form.

XIV. Certification

I hereby certify that the information submitted with this application is true and correct to the best of my knowledge and belief.

Name: Kim A. Colvin Title Asst. Admin. Analyst

Signature: Kim A. Colvin Date: 10/15/91

* If the information required under Sections VI, VIII, X, and XI above has been previously submitted, it need not be duplicated and resubmitted. Please show the date and circumstance of the earlier submittal. _____

DISTRIBUTION: Original and one copy to Santa Fe with one copy to the appropriate Division district office.

III. WELL DATA

A. The following well data must be submitted for each injection well covered by this application. The data must be both in tabular and schematic form and shall include:

(1) Lease name; Well No.; location by Section, Township, and Range; and footage location within the section.

(2) Each casing string used with its size, setting depth, sacks of cement used, hole size, top of cement, and how such top was determined.

(3) A description of the tubing to be used including its size, lining material, and setting depth.

(4) The name, model, and setting depth of the packer used or a description of any other seal system or assembly used.

Division District offices have supplies of Well Data Sheets which may be used or which may be used as models for this purpose. Applicants for several identical wells may submit a "typical data sheet" rather than submitting the data for each well.

B. The following must be submitted for each injection well covered by this application. All items must be addressed for the initial well. Responses for additional wells need be shown only when different. Information shown on schematics need not be repeated.

(1) The name of the injection formation and, if applicable, the field or pool name.

(2) The injection interval and whether it is perforated or open-hole.

(3) State if the well was drilled for injection or, if not, the original purpose of the well.

(4) Give the depths of any other perforated intervals and detail on the sacks of cement or bridge plugs used to seal off such perforations.

(5) Give the depth to and name of the next higher and next lower oil or gas zone in the area of the well, if any.

XIV. PROOF OF NOTICE

All applicants must furnish proof that a copy of the application has been furnished, by certified or registered mail, to the owner of the surface of the land on which the well is to be located and to each leasehold operator within one-half mile of the well location.

Where an application is subject to administrative approval, a proof of publication must be submitted. Such proof shall consist of a copy of the legal advertisement which was published in the county in which the well is located. The contents of such advertisement must include:

(1) The name, address, phone number, and contact party for the applicant;

(2) the intended purpose of the injection well; with the exact location of single wells or the section, township, and range location of multiple wells;

(3) the formation name and depth with expected maximum injection rates and pressures; and

(4) a notation that interested parties must file objections or requests for hearing with the Oil Conservation Division, P. O. Box 2088, Santa Fe, New Mexico 87501 within 15 days.

NO ACTION WILL BE TAKEN ON THE APPLICATION UNTIL PROPER PROOF OF NOTICE HAS BEEN SUBMITTED.

NOTICE: Surface owners or offset operators must file any objections or requests for hearing of administrative applications within 15 days from the date this application was mailed to them.

SOUTH MATTIX UNIT - Proposed Waterflood Project
Application for Injection (Form C-108)

V. See attached map of the South Mattix area

VI. See attached tabulation of the wells in the area of review

VII.

1. Estimated Average Daily Injection Rate = **400** BWIPD/Well

Estimated Maximum Daily Injection Rate = **800** BWIPD/Well

2. The proposed injection system will be **closed**.

3. Estimated Average Injection Pressure = **200** psig

Estimated Maximum Injection Pressure = **800** psig

4. Sources of injected water include: *Upper Yeso Produced Wtr*
Ellenburger Produced Wtr
Texaco Jal Water System

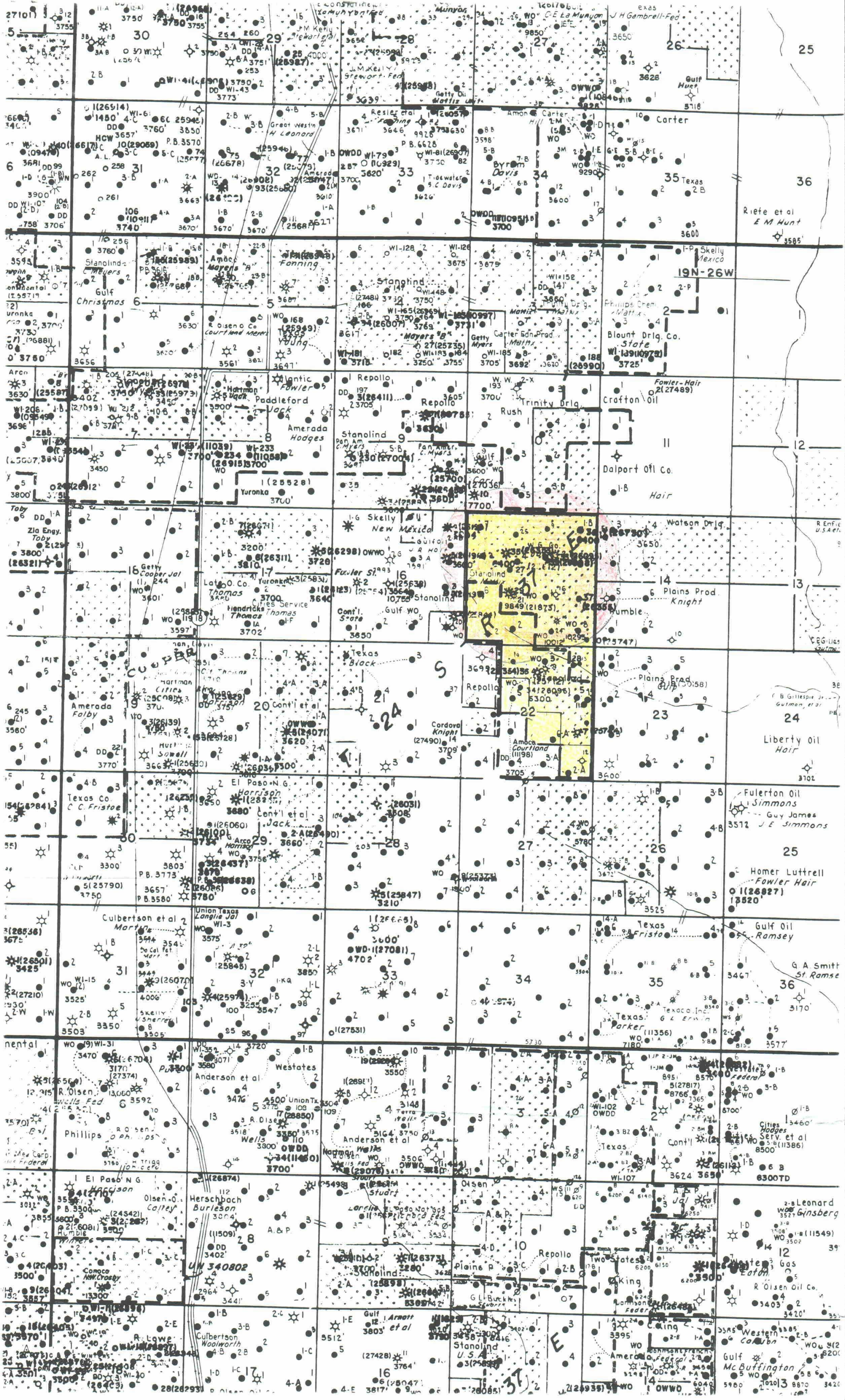
with attached Chemical & Compatibility Analyses.

VIII. See attached Geological Data

IX. Proposed Stimulation Program-
Fracture stimulate the Upper Yeso Formation using approx. 32,500 gallons of gelled brine water containing a total of 80,000 pounds of 12/20 mesh sand to be pumped as follows:

15,000 gallons gelled water PAD
5,000 gallons @ 2 ppg sand
5,000 gallons @ 4 ppg sand
5,000 gallons @ 6 ppg sand
2,500 gallons @ 8 ppg sand
Follow with FLUSH of 30 BBL gelled brine

X. Existing logs previously filed with the Division.



19N-26W
Carter
Riefe et al
E M Hunt
Gulf
Christmas
Blount Drlg. Co.
State
Phillips Chem.
Skelly
New Mexico
Repollo
Stanolind
Rush
Trinity Drlg.
Crafton Oil
Fowler-Hair
Dalport Oil Co.
Hair
Paddleford
Jack
Amerada
Hodges
Watson Drlg.
Plains Prod.
Knight
Humble
Cordova
Knight
Amoco
Courtland
Liberty Oil
Hair
Amerada
Falby
Texas Co.
C. C. Fristoe
El Paso N.G.
Cont'l et al
Jack
Fulerton Oil
Simmons
Homer Luttrell
Fowler Hair
Culbertson et al
Martin
Gulf Oil
Ramsey
G. A. Smith
Westates
Anderson et al
Phillips
Leonard
Ginsberg
Herschbach
Burleson
Stanolind
U.S.A.
Gulf
McBuffington

Tabulation of wells (Within 1/2 mile Radius)

Well No.	Type	Date Drilled	Location	Total Depth	Record of Completion
S. Mattix Sec. 15					
7 (D)	P	4/52	660 FN x 660 FW	10,761'	Y 5174-5697
22 (C)	P	11/66	710 FN x 1930 FW	5,750'	Y 5430-5662
25 (C)	P	10/68	910 FN x 1980 FW	9,980'	E 9925-9942
9 (B)	P	3/53	660 FN x 1980 FE	10,438'	Y 5293-5683
38 Y	P(A)	2/80	750 FN x 700 FE	6,400'	Y 5068-5362
20 (E)	P	3/66	1980 FN x 660 FW	5,750'	Y 5430-5688
35 (F)	P	7/79	1650 FN x 1650 FW	6,400'	Dr6246-6318
27 (F)	P	9/77	2030 FN x 1880 FW	5,764'	Y 5144-5658
4 (F)	P	12/50	1980 FN x 1980 FW	10,270'	E 10142-10270
39 (G)	P	12/79	1890 FN x 2070 FE	6,400'	Y 5117-5638
17 (G)	P	10/63	1980 FN x 1980 FE	10,040'	E 9883-9921
33 (G)	P	1/79	1650 FN x 1650 FE	6,100'	P 4857-4939
10 (H)	P	5/53	1980 FN x 810 FE	10,525'	E 10350-10414
37 (I)	P	6/79	1840 FS x 660 FE	6,400'	Dr6091-6297
1 (J)	P	11/48	1980 FS x 1980 FE	9,705'	E 9487-9705
21 (K)	P	9/66	1873 FS x 2086 FW	9,849'	E 9790-9830
14 (K)*	P	6/62	1980 FS x 1980 FW	6,403'	Y 4849-6115
6 (L)	P	12/51	1980 FS x 660 FW	10,544'	E 10320-10360
26 (M)	P	9/73	660 FS x 660 FW	5,803'	Y 5202-5552
2 (N)	P	11/49	660 FS x 1980 FW	10,305'	E 10250-10305
16 (O)	P	9/63	990 FS x 1648 FE	6,150'	P,T 4833-5940
23 (O)	P	7/67	660 FS x 1830 FE	5,701'	BL 5406-5645
24 (O)	P	4/68	510 FS x 1830 FE	10,012'	E 9554-9588
8 (P)	P	9/52	660 FS x 660 FE	10,295'	E 10001-10295
30 (P)	P	11/77	330 FS x 330 FE	6,000'	Y 5106-5702
NM AB State (Exxon) Sec. 16					
1 (H)	P	5/52	1980 FN x 660 FE	10,762'	E 10610-10640
2 (H)	P	7/64	1400 FN x 510 FE	10,310'	E 10285-10289
3 (I)	P	1/74	2080 FS x 560 FE	5,800'	Y 5279-5716
4 (A)	P	4/79	660 FN x 660 FE	5,804'	Y 5234-5691
ST. D Tr. 14 (Amoco) Sec. 16					
1 (P)	P	9/37	660 FS x 660 FE	5,807'	
Fowler Hair (Crown Central) Sec. 14					
1 }	Shallow				
3 }	Wells (7-Rivers/Queen)				
5 }					

Well No.	Type	Date Drilled	Location	Total Depth	Record of Completion
J. A. Knight (Exxon) Sec. 14					
2 M	P	7/64	330 FS x 330 FWL	10,147'	E 9875-9879
1 (L)	P	2/53	1980 FS x 550 FW	11,198'	DXA
Jamison (Arco) Sec. 22					
1 D	P	1/53	554 FN X 766 FW	10,800'	None
S. J. Carr (Gulf) Sec. 10					
8 (M)	P	1/72	555 FS x 555 FW	5,700'	Y 5214-5655
5 (N)	P	11/52	555 FS x 2085 FW	10,570	E 10300-10450
1 (O)	P	10/72	660 FS x 1830 FE	5,800'	Y 5232-5739

SOUTH MATTIX UNIT FEDERAL

Waterflood Project Application for Injection (Form C-108)

Geological Data

The Fowler Upper Yeso Pool is located in southeastern Lea County, New Mexico, about 35 miles south of the city of Hobbs. This pool is a combination of the former Fowler Blinebry and Fowler Paddock Pools; composed of four zones characterized by the alternation of subtidal and intertidal depositional environments. The approximate depth is 5300', with an average gross thickness of 750' and an average permeability of 3.4 millidarcies.

The Upper Yeso is a north-south anticlinal structure approximately 2.5 miles long and 1.5 miles wide. It is located alongside the western edge of the Central Basin Platform, bordering theDelaware Basin. This structure is considered a northern extension of the Justis Blinebry Pool which extends to the south. Yeso production is from the porous and permeable Blinebry and Lower Paddock intervals of Permian Age, which are carbonate formations deposited in a shallow water marine shelf environment. The Blinebry is a massive dolomite which averages 580' in gross thickness, and the overlying Lower Paddock formation has an average thickness of about 150'.

A binocular microscope and thin-section analysis was used for all lithological descriptions. Detailed lithologic and textural descriptions of core thin-sections were made on samples selected to reflect each depositional environment associated with the Fowler Upper Yeso pay. The Upper Yeso pay is a shallowing upward geological sequence with numerous cycles. It was deposited on a wide shelf of structural relief on which organic, chemical and detrital sediments were deposited. The weight of the deposits caused the shelf to sink intermittently, creating a cycling effect. The shelf would build up from subtidal to intertidal deposition and then sink, returning to subtidal deposition again. The Upper Yeso can be subdivided into four zones, based on these cycles.

The sonic log from the South Mattix Unit No. 16 (located in the SW/4 of the SE/4, Section 15, T-24-S, R-37E) as shown in the attached Figure, was designated as the type log for the area. The subdivisions of Lower Paddock and Blinebry are shown, as well as the subdivisions by zone. Each zone shows an arithmetic average porosity and a geometric average permeability based the native-state core of South

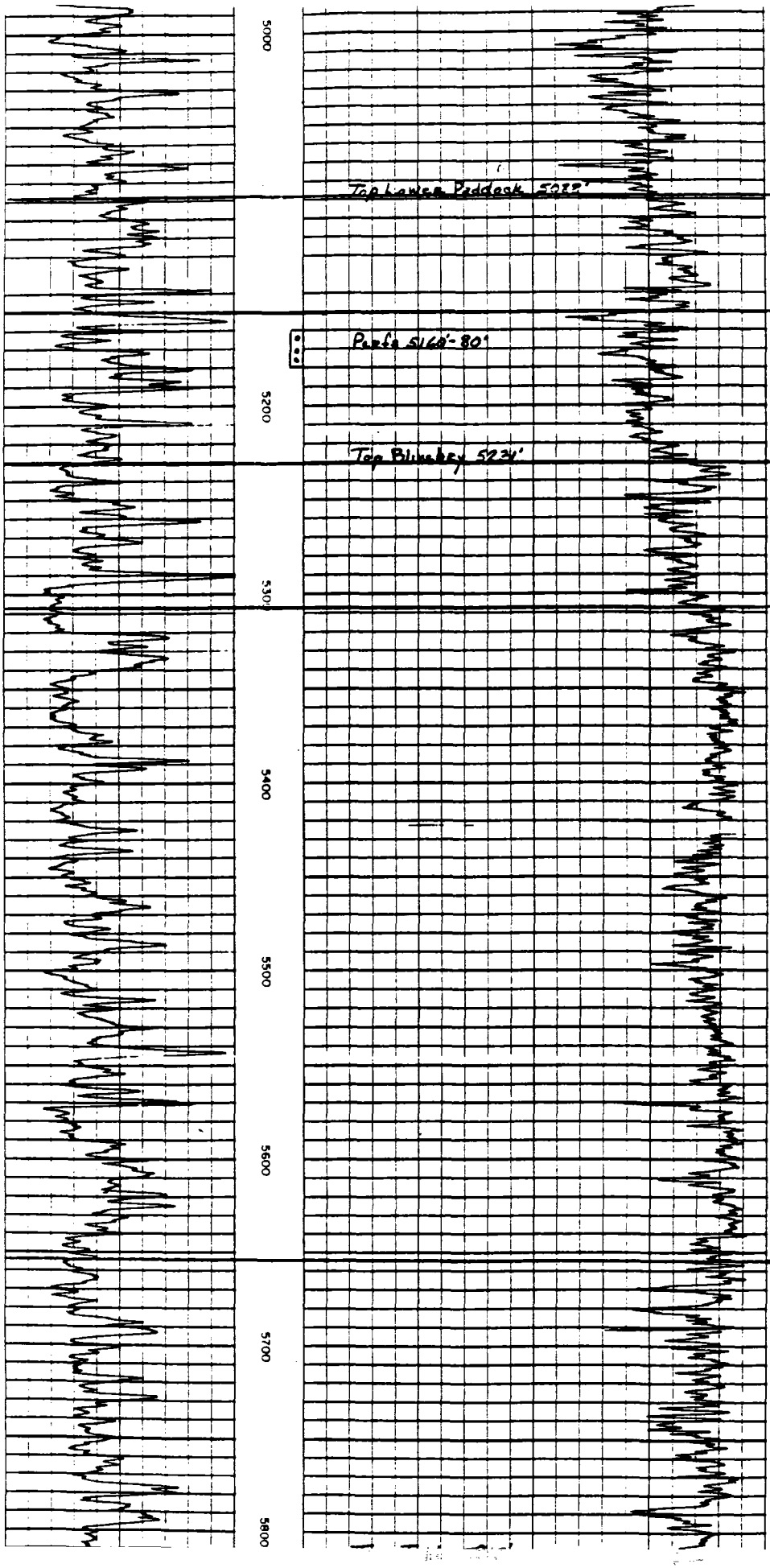
Mattix Unit No. 27. These parameters do not represent fieldwide averages, but were included to illustrate typical differences in reservoir quality of the zones. The recommended injection interval for the project includes all the Upper Yeso formation from the top of the Lower Paddock to the top of the Tubb.

Zones I and II comprise the Lower Paddock formation. The average thickness is about 150'. The type log (see Figure) shows average matrix permeabilities of 1.55 md. and 1.14 md. for Zone I and Zone II, respectively. These zones consist of both packstones and mudstones with the grains being mainly pellets and spines. These small grains have been leached out. The packstones generally develop 5 to 9% porosities, but the pay quality depends on the development of intercrystalline porosity to interconnect the moldic pores. This pattern of Lower Paddock pay development is similar throughout the field.

The Blinebry interval is composed of Zones III and IV. Zone III is a massive dolomite which is approximately 400' thick. For convenience, Zone III is subdivided into Zones IIIa and IIIb. The average arithmetic porosities for the zonal subdivisions from the South Mattix Unit No. 27 core data are 6.4% and 8.1% for Zones IIIa and IIIb, respectively. The respective geometric average permeabilities are 0.64 md. and 1.10 md. Zone IIIa is approximately 70' thick and consists of a series of short geologic cycles with relative poor pay development. Zone IIIb is a major subtidal depositional environment. While pay quality in the Lower Paddock and Zone IIIa depended on diagenesis, pay quality in Zone IIIb depended more heavily on the location of high energy environments, shoals and channels. These areas are typified by deposits of large-grained grainstones and packstones. Thus, while pay in the Lower Paddock and Zone IIIa is similarly developed over the field, the pay of Zone IIIb varies considerably over the area. In the high energy environment areas, the porosity and permeability are the most favorable found in the Upper Yeso formation.

Zone IV comprises the bottom 180' of the Upper Yeso formation. Core data shows little pay-quality rock through this zone, which is comprised of dense mudstones and packstones. Log evaluations of Well #'s 27 and 38Y indicate some possible pay; however, the water saturations appear somewhat higher than typical pay in Zone IIIb.

For this project, it is desireable to inject into the entire Upper Yeso interval, since most existing producers were fracture stimulated in the Lower Paddock. A significant amount of secondary oil could be lost to the "gas cap" unless the gas is repressured along with the oil zone. Since Chevron's Central Drinkard waterflood was successful in collapsing a high GOR that existed prior to waterflooding, it appears the South Mattix "gas cap" does not represent a significant problem. The lower boundary designated as the "Top of Tubb" will utilize the permeability barrier between the Tubb (gas) zone and the Upper Yeso oil to separate the waterflood from the underlying formation.



TYPE LOG

PAN AMERICAN PET. CORP.
SOUTH MATTIX UNIT NO. 16
990' FSL x 990' FWL, SE/4
SECTION 15,T24S-R37E
LEA CO., NM

ZONE I ϕ_{AVG} = 8.02%
K_{AVG} = 1.55 MD.

ZONE II ϕ_{AVG} = 8.16%
K_{AVG} = 1.135 MD.

ZONE IIA ϕ_{AVG} = 6.4%
K_{AVG} = 0.64 MD.

ZONE IIB ϕ_{AVG} = 8.14%
K_{AVG} = 1.1 MD.

ZONE IV ϕ_{AVG} = NA
K_{AVG} = NA

Figure

WELCHEM, INC.
706 N. Main
P.O. Box 179
Seminole, Texas 79360-0179
915-758-5867

LATS NO. 44848

ANALYTICAL SERVICES REPORT
WATER ANALYSIS

Date Received: 08/26/91 By: LS Date Out: 09/03/91

Company: AMOCO PRODUCTION COMPANY
Salesman: WHITE
Lease: S. MATTIX UNIT
Source: WELLHEAD

Date Sampled: 08/21/91
County: LEA
State: NM
Well: 37 (UPPER YESO)

DISSOLVED SOLIDS CATIONS

	mg/l	me/l
Sodium, Na(calc)	50198.0	2182.55
Calcium, Ca	12000	598.8
Magnesium, Mg	5000	409.84
Potassium, K	3000	76.73
Iron, Fe	0.8	0.03
Manganese, Mn	0.1	0.0

OTHER PROPERTIES

pH	6.51
Specific Gravity, 60/60 F	1.127
Nomograph Sp. Gr.	1.120- 1.131
Specific Gravity, Uncorr	1.125
Temperature (F)	71.2
Resistivity, OHMS-CM	11 @ 71.2F

ANIONS

	mg/l	me/l
Chloride, Cl	115600	3256.34
Sulfate, SO4	400	8.33
Carbonate, CO3	0	0.0
Bicarbonate,HCO3	200	3.28

Total Dissolved Solids (calc.) 186,399 ppm

SCALING TENDENCIES(MG/L):

				SCALE INDEX(MG/L)			
TEMP(F)	P(PSI)	CO2(PSI)	PH	CASO4	BASO4	SRSO4	CACO3
50	20.0	20.000	6.6	-826	-0	-476	-1383
50	50.0	20.000	6.6	-819	-0	-487	-1389
50	100.0	20.000	6.6	-826	-0	-489	-1399
50	500.0	20.000	6.6	-887	-0	-502	-1482
50	1000.0	20.000	6.6	-965	-0	-520	-1591
50	2000.0	20.000	6.6	-1131	-0	-555	-1829
50	2800.0	20.000	6.6	-1274	-0	-584	-2038
70	20.0	20.000	6.6	-565	-1	-608	-1153
70	50.0	20.000	6.6	-568	-1	-609	-1158

Remarks & Recommendations:

Calculations based upon entered pH.

WELCHEM Representative Lisa Hunter

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915-758-5867

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WATER ANALYSIS

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Company: AMOCO PRODUCTION COMPANY
Salesman: WHITE
Lease: S. MATTIX UNIT
Source: WELLHEAD

Date Sampled: 08/21/91
County: LEA
State: NM
Well: 37

SCALING TENDENCIES(MG/L):

				SCALE INDEX(MG/L)		
TEMP(F)	P(PSI)	CO2(PSI)	PH	CASO4	BASO4	SRSO4	CACO3
70	100.0	20.000	6.6	-574	-1	-611	-1166
70	500.0	20.000	6.6	-619	-1	-627	-1233
70	1000.0	20.000	6.6	-678	-1	-647	-1319
70	2000.0	20.000	6.6	-802	-1	-688	-1507
70	2800.0	20.000	6.6	-908	-1	-721	-1671
90	20.0	20.000	6.6	-364	-1	-595	-935
90	50.0	20.000	6.6	-367	-1	-596	-939
90	100.0	20.000	6.6	-371	-1	-598	-945
90	500.0	20.000	6.6	-406	-1	-613	-998
90	1000.0	20.000	6.6	-452	-1	-632	-1066
90	2000.0	20.000	6.6	-547	-1	-671	-1212
90	2800.0	20.000	6.6	-627	-1	-702	-1340
110	20.0	20.000	6.6	-225	-2	-531	-753
110	50.0	20.000	6.6	-227	-2	-532	-756
110	100.0	20.000	6.6	-230	-2	-534	-761
110	500.0	20.000	6.6	-258	-2	-547	-803
110	1000.0	20.000	6.6	-295	-2	-563	-857
110	2000.0	20.000	6.6	-372	-2	-597	-973
110	2800.0	20.000	6.6	-436	-2	-625	-1074
130	20.0	20.000	6.6	-135	-2	-487	-601
130	50.0	20.000	6.6	-137	-2	-488	-603
130	100.0	20.000	6.6	-140	-2	-489	-607
130	500.0	20.000	6.6	-164	-2	-501	-641
130	1000.0	20.000	6.6	-195	-3	-516	-684
130	2000.0	20.000	6.6	-261	-3	-546	-777
130	2800.0	20.000	6.6	-316	-3	-571	-858
150	20.0	20.000	6.6	-65	-3	-505	-461
150	50.0	20.000	6.6	-66	-3	-506	-463
150	100.0	20.000	6.6	-69	-3	-507	-466
150	500.0	20.000	6.6	-90	-3	-519	-493
150	1000.0	20.000	6.6	-118	-3	-534	-528
150	2000.0	20.000	6.6	-176	-4	-564	-602
150	2800.0	20.000	6.6	-225	-4	-589	-665
170	20.0	20.000	6.6	-8	-4	-572	-357

Remarks & Recommendations:

Calculations based upon entered pH.

WELCHEM Representative Lisa Hunter

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LATS NO. 44848

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WATER ANALYSIS

Date Received: 08/26/91 By: LS Date Out: 09/03/91

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Salesman: WHITE
Lease: S. MATTIX UNIT
Source: WELLHEAD

Date Sampled: 08/21/91
County: LEA
State: NM
Well: 37

SCALING TENDENCIES(MG/L):

				SCALE INDEX(MG/L)			
TEMP(F)	P(PSI)	CO2(PSI)	PH	CASO4	BASO4	SRSO4	CACO3
170	50.0	20.000	6.6	-9	-4	-573	-359
170	100.0	20.000	6.6	-11	-4	-574	-361
170	500.0	20.000	6.6	-31	-4	-587	-383
170	1000.0	20.000	6.6	-56	-4	-603	-412
170	2000.0	20.000	6.6	-109	-5	-635	-472
170	2800.0	20.000	6.6	-153	-5	-661	-525

Remarks & Recommendations:

Calculations based upon entered pH.

WELCHEM Representative

WELCHEM, INC.
706 N. Main
P.O. Box 179
Seminole, Texas 79360-0179
915-758-5867

LATS NO. 44846

ANALYTICAL SERVICES REPORT
WATER ANALYSIS

Date Received: 08/26/91 By: LS Date Out: 09/03/91

Company: AMOCO PRODUCTION COMPANY
Salesman: WHITE
Lease: S. MATTIX UNIT
Source: WELLHEAD

Date Sampled: 08/21/91
County: LEA
State: NM
Well: 7 (ELLENBURGER)

DISSOLVED SOLIDS CATIONS

	mg/l	me/l
Sodium, Na(calc)	25872.0	1124.88
Calcium, Ca	5000	249.5
Magnesium, Mg	2000	163.93
Potassium, K	1000	25.58
Iron, Fe	0.9	0.03
Manganese, Mn	0.0	0.0

ANIONS

	mg/l	me/l
Chloride, Cl	53600	1509.86
Sulfate, SO4	1300	27.08
Carbonate, CO3	0	0.0
Bicarbonate,HCO3	1646	26.98

Total Dissolved Solids (calc.) 90,419 ppm

OTHER PROPERTIES

pH	7.01
Specific Gravity, 60/60 F	1.063
Nomograph Sp. Gr.	1.057- 1.067
Specific Gravity, Uncorr	1.061
Temperature (F)	71.2
Resistivity, OHMS-CM	20 @ 71.2F

SCALING TENDENCIES(MG/L):

				SCALE INDEX(MG/L)			
TEMP(F)	P(PSI)	CO2(PSI)	PH	CASO4	BASO4	SRSO4	CACO3
50	20.0	1.250	7.0	-1608	-0	-207	569
50	50.0	1.250	7.0	-1603	-0	-210	566
50	100.0	1.250	7.0	-1621	-0	-211	560
50	500.0	1.250	7.0	-1770	-0	-220	513
50	1000.0	1.250	7.0	-1962	-0	-231	450
50	2000.0	1.250	7.0	-2366	-0	-256	313
50	2800.0	1.250	7.0	-2710	-0	-276	190
70	20.0	1.250	7.0	-972	-0	-255	695
70	50.0	1.250	7.0	-981	-0	-255	692

Remarks & Recommendations:

Calculations based upon entered pH.

WELCHEM Representative Lisa Hunter

WELCHEM, INC.
706 N. Main
P.O. Box 179
Seminole, Texas 79360-0179
915-758-5867

LATS NO. 44846

ANALYTICAL SERVICES REPORT
WATER ANALYSIS

Date Received: 08/26/91 By: LS Date Out: 09/03/91

Company: AMOCO PRODUCTION COMPANY
Salesman: WHITE
Lease: S. MATTIX UNIT
Source: WELLHEAD

Date Sampled: 08/21/91
County: LEA
State: NM
Well: 7

SCALING TENDENCIES(MG/L):

				SCALE INDEX(MG/L)			
TEMP(F)	P(PSI)	CO2(PSI)	PH	CASO4	BASO4	SRSO4	CACO3
70	100.0	1.250	7.0	-995	-0	-257	687
70	500.0	1.250	7.0	-1109	-0	-267	650
70	1000.0	1.250	7.0	-1256	-0	-280	602
70	2000.0	1.250	7.0	-1565	-0	-308	495
70	2800.0	1.250	7.0	-1827	-0	-332	401
90	20.0	1.250	7.0	-505	-0	-270	800
90	50.0	1.250	7.0	-512	-0	-270	798
90	100.0	1.250	7.0	-523	-0	-272	795
90	500.0	1.250	7.0	-614	-0	-282	765
90	1000.0	1.250	7.0	-730	-0	-295	727
90	2000.0	1.250	7.0	-975	-0	-324	644
90	2800.0	1.250	7.0	-1182	-0	-347	570
110	20.0	1.250	7.0	-162	-0	-264	889
110	50.0	1.250	7.0	-167	-0	-264	888
110	100.0	1.250	7.0	-176	-0	-266	885
110	500.0	1.250	7.0	-251	-0	-276	861
110	1000.0	1.250	7.0	-347	-0	-288	831
110	2000.0	1.250	7.0	-548	-0	-315	765
110	2800.0	1.250	7.0	-718	-0	-337	707
130	20.0	1.250	7.0	94	-0	-243	972
130	50.0	1.250	7.0	89	-0	-243	970
130	100.0	1.250	7.0	81	-0	-244	968
130	500.0	1.250	7.0	17	-0	-253	949
130	1000.0	1.250	7.0	-64	-0	-264	925
130	2000.0	1.250	7.0	-236	-0	-288	873
130	2800.0	1.250	7.0	-380	-1	-308	828
150	20.0	1.250	7.0	302	-1	-213	1033
150	50.0	1.250	7.0	298	-1	-213	1032
150	100.0	1.250	7.0	291	-1	-214	1030
150	500.0	1.250	7.0	235	-1	-222	1015
150	1000.0	1.250	7.0	164	-1	-232	995
150	2000.0	1.250	7.0	14	-1	-252	953
150	2800.0	1.250	7.0	-112	-1	-269	916
170	20.0	1.250	7.0	479	-1	-186	1090

Remarks & Recommendations:

Calculations based upon entered pH.

WELCHEM Representative Lucy Hunter

WELCHEM, INC.
706 N. Main
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Seminole, Texas 79360-0179
915-758-5867

LATS NO. 44846

ANALYTICAL SERVICES REPORT
WATER ANALYSIS

Date Received: 08/26/91 By: LS Date Out: 09/03/91

Company: AMOCO PRODUCTION COMPANY
Salesman: WHITE
Lease: S. MATTIX UNIT
Source: WELLHEAD

Date Sampled: 08/21/91
County: LEA
State: NM
Well: 7

SCALING TENDENCIES(MG/L):

				SCALE INDEX(MG/L)			
TEMP(F)	P(PSI)	CO2(PSI)	PH	CASO4	BASO4	SRSO4	CACO3
170	50.0	1.250	7.0	475	-1	-186	1089
170	100.0	1.250	7.0	469	-1	-187	1087
170	500.0	1.250	7.0	420	-1	-193	1075
170	1000.0	1.250	7.0	356	-1	-202	1059
170	2000.0	1.250	7.0	223	-1	-219	1025
170	2800.0	1.250	7.0	110	-1	-233	995

Remarks & Recommendations:

Calculations based upon entered pH.

WELCHEM Representative

WELCHEM, INC.
706 N. Main
P.O. Box 179
Seminole, Texas 79360-0179
915-758-5867

LATS NO. 44844

ANALYTICAL SERVICES REPORT
WATER ANALYSIS

Date Received: 08/26/91 By: LS Date Out: 09/03/91

Company: AMOCO PRODUCTION COMPANY
Salesman: WHITE
Lease: TEXACO JAL WATER SYSTEM
Source: WELLHEAD

Date Sampled: 08/23/91
County: LEA
State: NM
Well:

DISSOLVED SOLIDS
CATIONS

	mg/l	me/l
Sodium, Na(calc)	5039.0	219.09
Calcium, Ca	800	39.92
Magnesium, Mg	700	57.38
Potassium, K	170	4.35
Iron, Fe	1.0	0.04
Manganese, Mn	0.1	0.0

OTHER PROPERTIES

pH	6.48
Specific Gravity, 60/60 F	1.012
Nomograph Sp. Gr.	1.010- 1.019
Specific Gravity, Uncorr	1.010
Temperature (F)	71.2
Resistivity, OHMS-CM	54 @ 71.2F

ANIONS

	mg/l	me/l
Chloride, Cl	10200	287.32
Sulfate, SO4	900	18.75
Carbonate, CO3	0	0.0
Bicarbonate,HCO3	897	14.7

Total Dissolved Solids (calc.) 18,707 ppm

SCALING TENDENCIES(MG/L):

				SCALE INDEX(MG/L)			
TEMP(F)	P(PSI)	CO2(PSI)	PH	CASO4	BASO4	SRSO4	CACO3
50	20.0	2.500	6.5	-3834	-0	-95	-145
50	50.0	2.500	6.5	-3843	-0	-96	-149
50	100.0	2.500	6.5	-3864	-0	-96	-156
50	500.0	2.500	6.5	-4032	-0	-101	-218
50	1000.0	2.500	6.5	-4247	-0	-107	-300
50	2000.0	2.500	6.5	-4694	-0	-121	-483
50	2800.0	2.500	6.5	-5069	-0	-133	-651
70	20.0	2.500	6.5	-2970	-0	-124	-16
70	50.0	2.500	6.5	-2980	-0	-124	-19

Remarks & Recommendations:

Calculations based upon entered pH.

WELCHEM Representative Luis Hurtes

LATS NO. 44844

ANALYTICAL SERVICES REPORT
WATER ANALYSIS

Date Received: 08/26/91 By: LS Date Out: 09/03/91

Company: AMOCO PRODUCTION COMPANY
Salesman: WHITE
Lease: TEXACO JAL WATER SYSTEM
Source: WELLHEAD

Date Sampled: 08/23/91
County: LEA
State: NM
Well:

SCALING TENDENCIES(MG/L):

				SCALE INDEX(MG/L)			
TEMP(F)	P(PSI)	CO2(PSI)	PH	CASO4	BASO4	SRSO4	CACO3
70	100.0	2.500	6.5	-2996	-0	-125	-25
70	500.0	2.500	6.5	-3126	-0	-131	-74
70	1000.0	2.500	6.5	-3293	-0	-139	-139
70	2000.0	2.500	6.5	-3637	-0	-155	-284
70	2800.0	2.500	6.5	-3925	-0	-169	-414
90	20.0	2.500	6.5	-2318	-0	-139	120
90	50.0	2.500	6.5	-2326	-0	-140	117
90	100.0	2.500	6.5	-2339	-0	-140	113
90	500.0	2.500	6.5	-2444	-0	-147	75
90	1000.0	2.500	6.5	-2577	-0	-155	24
90	2000.0	2.500	6.5	-2854	-0	-173	-87
90	2800.0	2.500	6.5	-3084	-0	-188	-186
110	20.0	2.500	6.5	-1811	-0	-140	221
110	50.0	2.500	6.5	-1818	-0	-140	219
110	100.0	2.500	6.5	-1829	-0	-141	215
110	500.0	2.500	6.5	-1916	-0	-147	185
110	1000.0	2.500	6.5	-2027	-0	-156	145
110	2000.0	2.500	6.5	-2257	-0	-173	57
110	2800.0	2.500	6.5	-2447	-0	-188	-21
130	20.0	2.500	6.5	-1404	-0	-125	306
130	50.0	2.500	6.5	-1409	-0	-125	304
130	100.0	2.500	6.5	-1418	-0	-126	301
130	500.0	2.500	6.5	-1493	-0	-131	277
130	1000.0	2.500	6.5	-1588	-0	-139	245
130	2000.0	2.500	6.5	-1784	-0	-153	174
130	2800.0	2.500	6.5	-1946	-0	-166	112
150	20.0	2.500	6.5	-1067	-0	-90	384
150	50.0	2.500	6.5	-1072	-0	-90	383
150	100.0	2.500	6.5	-1080	-0	-91	380
150	500.0	2.500	6.5	-1145	-0	-95	361
150	1000.0	2.500	6.5	-1228	-0	-100	335
150	2000.0	2.500	6.5	-1399	-0	-110	279
150	2800.0	2.500	6.5	-1541	-0	-119	230
170	20.0	2.500	6.5	-780	-0	-45	448

Remarks & Recommendations:

Calculations based upon entered pH.

WELCHEM Representative Lisa Hunter

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LATS NO. 44844

ANALYTICAL SERVICES REPORT
WATER ANALYSIS

Date Received: 08/26/91 By: LS Date Out: 09/03/91

Company: AMOCO PRODUCTION COMPANY
Salesman: WHITE
Lease: TEXACO JAL WATER SYSTEM
Source: WELLHEAD

Date Sampled: 08/23/91
County: LEA
State: NM
Well:

SCALING TENDENCIES(MG/L):

				SCALE INDEX(MG/L)			
TEMP(F)	P(PSI)	CO2(PSI)	PH	CASO4	BAS04	SRSO4	CACO3
170	50.0	2.500	6.5	-784	-0	-46	447
170	100.0	2.500	6.5	-792	-0	-46	445
170	500.0	2.500	6.5	-850	-0	-48	429
170	1000.0	2.500	6.5	-924	-0	-50	409
170	2000.0	2.500	6.5	-1076	-0	-56	364
170	2800.0	2.500	6.5	-1203	-0	-60	324

Remarks & Recommendations:

Calculations based upon entered pH.

WELCHEM Representative

SCALE PREDICTION. MIXTURE NO. 1: 5.0 PERCENT SMU UPPER YESO-HEATER TREATER
11.0 PERCENT SMU ELLENBERGER-HEATER TREATER
84.0 PERCENT TEXACO-JAL WATER SYSTEM

CALCULATED COMPOSITION OF MIXTURE NO. 1 IN MG/L:

(NA)=	8608.	(CL)=	17659.
(CA)=	2257.	(SO4)=	1394.
(MG)=	474.	(HCO3)=	1060.
(BA)=	0.	(CO3)=	0.
(SR)=	14.	PH=	6.7

MOLAL IONIC STRENGTH= 0.650
SPECIFIC GRAVITY= 1.022

SCALING TENDENCIES(MG/L):

TEMP(F)	P(PSI)	CO2(PSI)	SCALE INDEX(MG/L) CASO4	BASO4	SRSO4	CACO3
60.	14.7	0.000	-1838.	0.	-75.	831.
80.	14.7	0.000	-1222.	0.	-97.	835.
120.	14.7	0.000	-371.	0.	-105.	841.
140.	14.7	0.000	-72.	0.	-95.	845.

SCALE INDEX = ANALYZED CONCENTRATION - EQUILIBRIUM SOLUBILITY
A POSITIVE SCALE INDEX INDICATES SCALE PRECIPITATION CAN OCCUR WITH THE MAGNITUDE OF THE SCALE INDEX INDICATING THE MAXIMUM AMOUNT WHICH COULD PRECIPITATE. A NEGATIVE SCALE INDEX INDICATES THE WATER IS UNSATURATED AND NO SCALE PRECIPITATION WILL OCCUR.

SMUF C-108

III. **WELL DATA**

New Drills

A. (1) South Mattix Unit #40: 2200 FWL X 2373 FSL of Sec. 15, T-24-S, R-37-E, NMPM, Lea County, NM

South Mattix Unit #41: 2524 FEL X 1650 FNL of Sec. 15, T-24-S, R-37-E, NMPM, Lea County, NM

South Mattix Unit #42: 2450 FNL X 1600 FWL of Sec. 15, T-24-S, R-37-E, NMPM, Lea County, NM

South Mattix Unit #43: 2524 FEL X 2500 FNL of Sec. 15, T-24-S, R-37-E, NMPM, Lea County, NM

South Mattix Unit #44: 2500 FNL X 1650 FEL of Sec. 15, T-24-S, R-37-E, NMPM, Lea County, NM

Conversions

South Mattix Unit #21: 1873.3 FSL X 2086.7 FWL of Sec. 15, T-24-S, R-37-E, NMPM, Lea County, NM

South Mattix Unit #33: 1650 FNL X 1650 FEL of Sec. 15, T-24-S, R-37-E, NMPM, Lea County, NM

South Mattix Unit #35: 1650 FNL X 1650 FWL of Sec. 15, T-24-S, R-37-E, NMPM, Lea County, NM

(2) Proposed Casing & Cementing Program of New Drills

Size of Hole	Size of Casing	Setting Depth	Sacks of Cement	Top of Cement
12-1/4"	8-5/8"	1200'	900 Class "C"	Surface (Circ.)
7-7/8"	5-1/2"	5600'	1350 Class "C"/Poz	Surface (Circ.)

Conversion Wells: Casing and cementing record will remain the same.

III. **WELL DATA**

A. (3) Tubing size 2-3/8" lined with plastic coating and set at 5300'.

(4) Guiberson Uni VI packer set at 5200'.

B. (1) Injection Formations: Lower Paddock and Blinebry.
Pool: Fowler (Upper Yeso).

(2) Injection interval 5100'-5600' will be perforated.

(3) New drills will be drilled for injection. The wells being converted to injectors were previously drilled for production.

(4) Not applicable.

(5) Next higher zone: Upper Paddock (5000')
Next lower zone: Tubb Gas (5800')