CASE NO.

7039

APPLICATION,

TRANSCRIPTS,

SMALL EXHIBITS,

ETC.

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

TONEY ANAYA
GOVERNOR

May 16, 1985

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

Geo Engineering
P. O. Box 2966
Santa Fe, New Mexico 87504-2966

Attention: Jim M. Law, Petroleum Engineer

Re: Pressure Allowable Increase
Chaco Wash Mesaverde Waterflood
Wells Nos. 11 and 19
McKinley County, New Mexico

Dear Mr. Law:

I have completed a review of your request for an increase of injection pressure allowables on the subject wells. The following maximum injection pressure limits have been approved for the subject wells.

Well Number	Maximum Injection Pressure Limit
11	135 PSIG
19	170 PSIG

These limits were approved based on the step-rate tests you submitted to this office and after a 10 PSI safety factor was subtracted from the fracture pressure limit of each well.

Sincerely,

Gilbert P. Quintana

GILBERT P. QUINTANA
UIC Director/Petroleum Engineer

GPQ/fd

cc: R. L. Stamets, Division Director
File WFX-525
Case File 7039 ✓
Frank Chavez, Aztec District

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
DIVISION FOR THE PURPOSE OF
CONSIDERING:

CASE NO. 7039
Order No. R-6538

APPLICATION OF RED MOUNTAIN &
ASSOCIATES FOR A WATERFLOOD
PROJECT, McKINLEY COUNTY,
NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 9 a.m. on October 1, 1980, at Santa Fe, New Mexico, before Examiner Daniel S. Nutter.

NOW, on this 17th day of December, 1980, the Division Director, having considered the testimony, the record, and the recommendations of the Examiner, and being fully advised in the premises,

FINDS:

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

(2) That the applicant, Red Mountain & Associates, seeks authority to institute a waterflood project in the Chaco Wash-Mesaverde Oil Pool by the injection of water into the Chaco Wash Sand of the Mesaverde formation through seven injection wells at various orthodox and unorthodox locations in Section 28, Township 20 North, Range 9 West, NMPM, McKinley County, New Mexico, as follows:

Lease Name	Well No.	Well Location
State	5	660 feet from north line, 660 feet from east line
State	6	330 feet from north line, 990 feet from east line
State	8	660 feet from north line, 1315 feet from east line
State	9	330 feet from north line, 1650 feet from east line
State	14	1315 feet from north line, 660 feet from east line
State	16	990 feet from north line, 330 feet from east line
State	18	330 feet from north line, 330 feet from east line

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

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

(5) That the operator should take all steps necessary to ensure that the injected water enters only the proposed injection interval and is not permitted to escape to other formations or onto the surface from injection, production, or plugged and abandoned wells.

(6) That the injection wells or injection pressurization system should be so equipped as to limit injection pressure at the wellhead to no more than 68 psi, but the Division Director should have authority to increase said pressure limitation, should circumstances warrant.

(7) That an administrative procedure should be adopted whereby the operator may obtain approval for producing wells and injection wells at orthodox and unorthodox locations in addition to or in lieu of the wells herein approved.

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

(9) That the locations of those wells described in Finding No. (2) above which are unorthodox, as well as the locations of the following proposed producing wells in Section 28, Township 20 North, Range 9 West, NMPM, should be approved:

Lease Name	Well No.	Well Location
State	10	5 feet from north line, 1315 feet from east line
State	13	1315 feet from north line, 990 feet from east line
State	15	1315 feet from north line, 330 feet from east line
State	20	990 feet from north line, 1315 feet from east line

IT IS THEREFORE ORDERED:

(1) That the applicant, Red Mountain & Associates, is hereby authorized to institute a waterflood project in the Chaco Wash-Mesaverde Oil Pool, by the injection of water into the Chaco Wash Sand of the Mesaverde formation through the following-

described wells in Section 28, Township 20 North, Range 9 West, NMPM, McKinley County, New Mexico:

Lease Name	Well No.	Well Location
State	5	660 feet from north line, 660 feet from east line
State	6	330 feet from north line, 990 feet from east line
State	8	660 feet from north line, 1315 feet from east line
State	9	330 feet from north line, 1650 feet from east line
State	14	1315 feet from north line, 660 feet from east line
State	16	990 feet from north line, 330 feet from east line
State	18	330 feet from north line, 330 feet from east line

(2) That injection into each of said wells shall be through tubing, set in a packer which shall be located as near as practicable to the uppermost perforation; that the casing-tubing annulus of each injection well shall be loaded with an inert fluid and equipped with an approved pressure gauge or attention-attracting leak detection device.

(3) That the operator shall immediately notify the supervisor of the Division's Aztec district office of the failure of the tubing or packer in any of said injection wells, the leakage of water or oil from or around any producing well, or the leakage of water or oil from any plugged and abandoned well within the project area and shall take such timely steps as may be necessary or required to correct such failure or leakage.

(4) That the injection wells herein authorized and/or the injection pressurization system shall be so equipped as to limit injection pressure at the wellhead to no more than 68 psi, provided however, the Division Director may authorize a higher surface injection pressure upon satisfactory showing that such pressure will not result in fracturing of the confining strata.

(5) That the locations of those wells described in Order No. (1) above as well as the following unorthodox locations, all in Section 28, Township 20 North, Range 9 West, NMPM, McKinley County, New Mexico, are hereby approved:

Lease Name	Well No.	Well Location
State	10	5 feet from north line, 1315 feet from east line
State	13	1315 feet from north line, 990 feet from east line
State	15	1315 feet from north line, 330 feet from east line
State	20	990 feet from north line, 1315 feet from east line

(6) That the subject waterflood project is hereby designated the RHA Chaco Wash NW Waterflood Project and shall be governed by the provisions of Rules 701, 702, and 703 of the Division Rules and Regulations.

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

(8) That an administrative procedure is hereby established whereby the operator of the subject project may obtain approval for the drilling of injection wells or production wells in the NE/4 of Section 28, Township 20 North, Range 9 West, NMPM, McKinley County, New Mexico, at orthodox or unorthodox locations in addition to or in lieu of the wells hereinabove authorized. The provisions of paragraphs 2 and 3 of Rule 104 F of the Division Rules and Regulations shall be applicable to obtain administrative approval for the drilling of any unorthodox location, and the provisions of Rule 701 of the Rules and Regulations shall be applicable to obtain authority for the placing of any well, whether at an orthodox or unorthodox location, on water injection.

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

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

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION

JOE D. RAMEY
Director

S E A L

fd/

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
STATE LAND OFFICE BLDG.
SANTA FE, NEW MEXICO

1 October 1980

EXAMINER HEARING

IN THE MATTER OF:

Application of Red Mountain & Associates for a waterflood project, McKinley County, New Mexico.

CASE 7039

BEFORE: Daniel S. Nutter

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the Oil Conservation Division: Ernest L. Padilla, Esq.
Legal Counsel to the Division
State Land Office Bldg.
Santa Fe, New Mexico 87501

For the Applicant: James E. Thomson, Esq.
THOMSON & UDALL
323 West San Francisco
Santa Fe, New Mexico 87501

I N D E X

MOHAMMED ZENATI

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E X H I B I T S

Applicant Exhibit One, Report 6

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MR. NUTTER: We'll call Case 7039.

MR. PADILLA: Application of Red Mountain & Associates for a waterflood project, McKinley County, New Mexico.

MR. THOMSON: Mr. Nutter, my name's James E. Thomson. I'm an attorney here in Santa Fe, and I represent Red MOuntain Associates. We have one witness, Mohammed Zenati from Denver.

(Witness sworn.)

MOHAMMED ZENATI

being called as a witness and having been duly sworn upon his oath, testified as follows, to-wit:

DIRECT EXAMINATION

BY MR. THOMSON:

Q. Would you state your name, please?

A. My name is Mohammed Zenati.

Q. Where do you live, sir?

A. Denver, Colorado.

Q. What is your occupation?

A. Petroleum engineer.

Q. For whom are you employed?

A. Keplinger and Associates.

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Q. Would you please give the Commission a background of your education and training?

A. I have a Bachelor's in mathematics and a professional degree in petroleum engineering, and I do hold also a marginal PhD degree, which is upon completion within the next few months.

Q. Okay, what school have you received your degree in petroleum engineering?

A. Colorado School of Mines.

Q. Where are you in the process of completing your PhD in petroleum engineering?

A. I have completed everything but the thesis.

Q. All right, in which school?

A. Colorado School of Mines.

Q. Okay. Have you had other positions, teaching positions?

A. Yes, I have.

Q. With what institution?

A. With Colorado School of Mines.

Q. Okay. How long have you been employed by Keplinger and Associates?

A. Three years.

Q. And in what capacity?

A. As a petroleum engineer and I was also

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in charge of the softwear development.

Q. The softwear development?

A. Computer softwear, for our engineering packages.

Q. Have you done consulting work in the field of petroleum engineering?

A. Yes, I have.

Q. For what companies have you worked?

A. Keplinger and Scientific Softwear.

Q. Do you have any experience in waterflooding?

A. Yes, I have.

Q. And what is that experience, please?

A. I've -- within the course of my employment with Keplinger, I've worked on four waterflood projects.

MR. THOMSON: Mr. Nutter, I submit Mr. Zenati as an expert petroleum engineer.

MR. NUTTER: Mr. Zenati is qualified.

MR. THOMSON: Okay, thank you, sir.

Q. Mr. Zenati, have you been employed by Red Mountain and Associates with regard to application Number 7039?

A. Yes, I'm acting as their consulting engineer.

Q. Okay.

A. For the waterflood.

Q. Okay, and when were you employed, generally?

A. I started in September 1st, 1980.

Q. Can you tell the hearing officer in this case generally what you propose in your application in Case Number 7039?

A. Yes. I'm seeking the Commission to initiate a waterflood in the Chaco Wash Oil Pool, and related to that the permission to drill in some unorthodox well locations.

Q. Okay, we have submitted to the Commission Exhibit Number One. In that exhibit, Mr. Zenati, did you -- did you prepare that exhibit?

A. Yes.

Q. All right. Could you give the Commission a brief summary of the history of the area involved?

A. The Chaco Wash Oil Pool is located in Section 21, 22, 27, and 28 of Township 20 North, Range 9 West, in McKinley County, New Mexico. This pool was discovered in the late 1930's and the early attempts to develop that pool were unsuccessful, primarily due to the lack of energy in the pool. The reported pressures were approximately 125 psi to 100 psi. There is no field gas to speak of. Since it's a very shallow well there is no energy stored in the rocks, and up to -- from 1968 to 1971 the well has produced approximately 4000 barrels of oil from an average of four wells, with most of the production in the first two years. And from that time --

from that time till about July, 1979, the lease has produced on primary an average of less than a barrel a day per well.

Q. What is generally the geological foundation -- formation, excuse me, existing in this area?

A. The Chaco Wash is producing from the Menefee formation, which is a series of sandstone, shales, and coal beds. It extends about -- the Menefee extends about -- to about a depth of 1600 feet, and to my interpretation, the Chaco Wash pay is a fluvial channel averaging from 9 to 19 feet in thickness that is draped over a structural nose.

The trapping is both stratigraphic and structural in that part of the pool.

Q. Mr. Zenati, as part of your Exhibit Number One, did you prepare documentation with regard to the reservoir characteristics and production performance?

A. Yes, I did.

Q. What did you prepare in your Exhibit Number One, please?

A. I have included -- we've summarized the history of the well, a geological summary, plus the reservoir characteristics and some of the production performance that I was able to gather.

Q. Okay, is there any information on this page three of Exhibit One that you wish to point out to the Commission with regard to this application that stands out?

A. Maybe not with page three but with page two.

Q. All right. Okay, going back to page two.

A. Okay, this oil pay has to be stressed that it is a lenticular sandstone and what we've been able to determine is that it has at least an extent of about 20 to 40 acres, and the particular sand that we're looking at is at a depth of about 340 feet.

It has very good permeabilities. They were measured to dry air and the order was 300 millidarcies; a good porosity, 27 percent, and the initial oil saturation is estimated at 50 percent.

Q. How was that estimation arrived at?

A. Well, it was a measure of the oil saturation after retrieval of the core, but the core was probably not handled properly, so some of the oil was --

Q. What are the objectives of this waterflood project that you propose?

A. They are basically twofold. Because of the lack of energy of the reservoir, we're proposing to first inject the water as a way of repressuring the oil and allowing it to move to the producers. And then, as in any waterflood, flush the oil out of the oil pay. And because of this objective in trying to repressure the reservoir, it is crucial that a waterflood project starts as soon as possible.

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Q. What pressure do you anticipate in this -- in this injection pressure?

A. The surface pressure, we're planning to stay within the limit of .2 psi per foot.

Q. And how much volume of water is involved per well?

A. We're talking about a very low volume, 20 barrels a day per formation.

Q. Okay. How are you able, or can you explain why the volume is low and the pressure is relatively low; how will that provide the satisfactory recovery?

A. Because the permeability are so good and the wells are close to each other. The average distance is about -- from a producer to an injector is about 467 feet. By injecting too fast you would have -- you would probably channel the water pretty fast to the producers, plus the fact that the oil is of a low gravity, 45 degree -- it varies from 40 to 45 degree API. The water will have a tendency to underrun that oil if it was injected at a too fast rate.

Q. Has there been a pilot project conducted in this area?

A. There's been a pilot project conducted in Section 27 and it is basically the same sand with the same properties. It may not be connected to each other and we don't know because there hasn't been any drilling to prove

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it.

MR. NUTTER: Do you have a map in here, Mr. Zenati, that shows where that would be?

A. I think there is a map showing the location of the wells within a two mile radius, and the well showing in that Section 27 would be the well that are part of Exhibit A.

MR. NUTTER: Okay, now I've got this plat that's marked Exhibit A.

A. Yes, and the wells --

MR. NUTTER: Now, where is the waterflood proposed to be?

A. It's also the smaller map in Exhibit A, which is a blowup of the area that we propose.

MR. THOMSON: Mr. Nutter, there's another map in that folder, right there, and that's a blowup of this area that indicates the injection wells.

A. Some of these wells are the ones that we propose to drill.

Q. Mr. Nutter wondered if -- if any of your drawings, I think, indicated in Section 27 where the pilot project is?

A. Yeah, there will be on Exhibit A, on that large map in Exhibit A.

MR. NUTTER: Okay, now on the large map,

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where is this area that's shown on the blowup?

A. It would be the northeast quarter.

MR. NUTTER: Well, the numbering systems don't correlate, so this is going to be renumbered, is that it?

A. Okay, no, no. The plat -- the plat, we also, because of the large number of wells within the two miles radius, which amount to about 300 wells, what we have done was to include an identification number to the well, to each well within a two mile radius; then assign these -- these numbers to a tabular summary. It would have been too impractical to list the location of the well, the exact location of the well, on the plat.

MR. NUTTER: Okay. Well, if I take the blowup and look at Well No. 3-A over here on the blowup, which would that well be here on the --

A. I would have to go through the summary to find the one. But these -- these numbers are the number listed under the official name of the well.

MR. NUTTER: Uh-huh.

A. The State, they're all called State and depending on the number.

MR. NUTTER: But your pilot project will be here in the northeast quarter of Section 28?

A. Uh-huh, that's right.

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MR. NUTTER: And the pilot project that was conducted previously --

A. Was in Section 27.

MR. NUTTER: In what part of 27 would that have been?

A. In the northwest quarter, in the very --

MR. NUTTER: In the extreme corner there?

A. Yeah, in the extreme corner.

MR. NUTTER: Okay.

Q. Mr. Zenati, how many proposed injection wells do you have in mind?

A. On the -- right now we're talking about five -- or eight injection wells, and fourteen production -- producing wells.

Q. All right.

A. What we're trying to do is, first, on the area that we -- we have noted the presence of the pay, we're trying to complete the waterflood as a five-spot, with a five-spot pattern, with a five acre spacing. That is one of the reasons now why we're also applying for some of the unorthodox well locations, so we'd be able to drill very close to the quarter quarter lines and section lines as possible.

Q. What is the source of the water for this injection?

A. The water is -- the supply comes from the

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Hopash-Gallup water sand, which is located -- which is in that area is about 2600 feet deep, and we -- think it's on page six.

Q. Page six.

MR. NUTTER: All right.

A. And we presently -- there is a waterflood going on and has been going on since the 1960's, which also belonged to Red Mountain Associates, and it's the Red Mountain waterflood, located in Section 20 and 29.

Q. Okay, are you familiar with the Red Mountain waterflood, not to be confused with Red Mountain Associates' application today?

A. Yes.

Q. What -- is there any similarity between what was done there and what you propose to do here?

A. There are great similarities and basically it is the same sand that is producing from the same formation, from the Menefee formation. The sands are also good permeabilities; there is, as in the Chaco Wash, very low energy to the reservoir, and until -- on primary it has produced, I think it's in Exhibit J, --

Q. Referring you to Exhibit J in Exhibit A -- or Exhibit One?

A. On primary it has produced, I think, less than 60,000 barrels. When it was put under water injection

it produced up to 236,000 barrels.

MR. NUTTER: I think on Exhibit J you said it's one mile east of the Chaco Wash Field. That would be one mile west, wouldn't it?

A. Okay, yeah, that should be one mile west.

Q. Okay, Mr. Zenati, going through the various exhibits that are a part of your Exhibit Number One, I'd like to address your attention to Exhibit A first and could you please explain what Exhibit A, the large Exhibit A is?

A. This show the locations of the well within a two mile radius of the Chaco Wash.

Q. How did you determine the existance of these wells that are within a two mile radius?

A. We basically went through the records of the Oil Conservation Commission in Aztec.

Q. Have you visited this area?

A. Yes, I have.

Q. Addressing your attention to the additional Exhibit A, which is called location proposed injection wells, can you describe what you have on that exhibit, please?

A. What we have there is the location of the different production and injection wells. And as you can see, it follows basically a five-spot pattern. Part of the -- these wells are located in the -- in the top of the structure.

Q. What do you mean by a five-spot pattern?

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A. Well, basically producing wells surrounded by injectors.

Q. Is there -- you mentioned that you have a five-spot pattern and it's one reason why you're asking for unorthodox well locations. Can you explain that, please?

A. The five-spot pattern, after some engineering calculations, show that it would be the most efficient pattern in that sand. The unorthodox locations is to allow us to get the five-spot pattern, because of the quarter quarter lines running through the oil pay.

Q. Directing your attention to Exhibit B of Exhibit One, could you explain what that is, please?

A. That is a plat showing the ownership within that two mile radius; also not to confuse, because of the number of owners in some of the sections, we've plotted that on two different plats, one showing the location of the well and one showing the ownership in that area.

And to my knowledge, there is no production -- there is no produced area right now but for the Red Mountain Waterflood and the Chaco Wash, in the Menefee Sand.

Q. What is Exhibit C, sir?

A. Exhibit C is the tabular summary of all the wells that are located in the two-mile radius -- within the two-mile radius, with the identification number that would

refer them to the map.

Q. Okay, and you talked about the map, that's Exhibit D?

A. Exhibit A.

Q. A, excuse me, the large Exhibit A.

Did you make that tabulation?

A. Somebody did under my supervision.

Q. Okay. What is Exhibit D?

A. Exhibit D is the tabular summary of the wells located within a half mile radius and they would indicate also the casing string and setting depth, the number of sacks of cement used, the cement tops, if available, and their present status.

Q. And Exhibit E, please?

A. Exhibit E is the location of, at least I think, an extension of Exhibit -- of the previous exhibit.

We're planning in the future to apply for, maybe, an extension of the waterfloods on the other properties.

Q. All right, and Exhibit F?

A. And Exhibit F is the summary of the ownership within a two mile radius, which correspond to the map, too, to I believe Exhibit B.

Q. And what is Exhibit G?

A. Exhibit G is the typical schematic of the plugged well in that Chaco Wash area.

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Q. And what does it show?

A. It shows the number of plugs, the type of plugs that were set, as I -- as the records in the Oil and Gas Conservation Commission shows, with a bottom plug, an intermediate plug, that is optional, depending on the type of well and where they were perforated, and plus the surface plug.

Q. Okay, and the last exhibit, Exhibit H, what does that show?

A. That is a typical schematic of the injection well that we propose in the Chaco Wash area.

Q. Now, Mr. Zenati, you said you have been out to the site of this project?

A. Uh-huh, yes.

Q. Mr. Zenati, will this waterflooding project, in your opinion, adversely affect any of the water in adjoining properties?

A. I do not believe so for several reasons. One is the fact that the pay is a lenticular sandstone; the fact that the pressure at which we propose to inject are very low; and the flow rates also being low.

Q. Okay. Do you believe that this project will adversely affect oil resources, either on the subject property or adjoining properties?

A. No, I do not believe so for the same reason as -- as before. Plus when you look at the result of

the pilot waterflood that was done on the Chaco Wash, and looking at the result from the Red Mountain waterflood, it will increase the production.

Q. Are you familiar with the term stripper, stripper well?

A. Yes, I am.

Q. Do you feel that the wells in the area are depleted to the point where they would be considered or commonly referred to as stripper wells?

A. They will be referred as stripper. I do not believe that the area is depleted.

Q. Mr. Zenati, do you have an opinion whether or not the granting of this application will be in the interest of conservation and protection of correlative rights in the area?

A. No, I don't believe.

Q. It will be in the best interests?

A. It will be in the best interest, yes.

Q. Will the wells that are used for the injection of water be so cased as to prevent damage to subsurface rights?

A. Yes, they will.

Q. All right, in your Exhibit One, you have also submitted logs, have you not?

A. Yes, I have.

Q. And these are logs of what?

A. They are logs of the wells that we've drilled in some of the authorized locations, and I've included three logs. Those are the only ones that we have available at this time.

MR. THOMSON: At this time we submit for consideration the Exhibit Number One.

MR. NUTTER: Applicant's Exhibit One in this case will be admitted in evidence.

MR. THOMSON: I have no further questions.

CROSS EXAMINATION

BY MR. NUTTER:

Q. Mr. Zenati, now, your proposal is for a flood in the extreme northeast corner of Section 28.

A. That's right.

Q. You said there's an old pilot in the extreme northwest corner of Section 27, and also you mentioned that there was a flood over in Sections 20 and 29, which is about a mile to the west. Now is the one in Sections 20 and 29 the old Birdseye flood?

A. Yeah.

Q. Okay, now I notice from the ownership map that Red Mountain Associates also controls that acreage.

A. That's right.

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Q. Is that flood in operation at this time?

A. Yes, it is.

Q. It is? And are you producing from the wells there?

A. We are producing some of the wells.

Q. Is that flood being errective in that area?

A. Yes.

Q. It is?

A. We believe there is still a lot of oil left in the Red Mountain --

Q. And Henry Birdseye initiated that flood quite a number of years ago, didn't he?

A. Yeah, in 1961, I believe.

Q. Uh-huh. And it's still producing?

A. It's still producing, and like I say, I think the reservoir limits have never been delineated to the southeast -- southwest.

Q. Now referring to your proposed flood and to another flood, I don't know if it's the one to the west or the one in Section 27, you said you thought it was probably on different structure.

A. Okay, the one in Section 27.

Q. You think that's a different structure there, even though all these wells are clustered so closely together?

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A. Yes.

Q. Okay.

A. They do not -- in analyzing the previous record that I've been able to gather, they do not show the response that other wells show.

Q. What do you have, a pair of small anticlines right there close together?

A. Well, I -- I don't think there are any anticlines. I think there, like I said, a structural nose; basically a small fault. They do not show an anticline, plus they are very lenticular.

Q. Uh-huh, so they'd just be separate little sand bodies?

A. Yes, I think so. I'm positive about the Red Mountain waterflood being separated from the Chaco Wash, located in Section 28. The --

Q. Now Chaco Wash, that would be the one over in 20 and 29?

A. No, that would be the one on 28, Chaco Wash is.

Q. Okay.

A. Red Mountain is in Section 20 and 29.

Q. Oh, that's the Red Mountain Pool?

A. That's the Red Mountain Pool.

Q. And this is the Chaco Wash Pool?

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A. This is the Chaco Wash Pool. I'm --

Q. And those are definitely separate.

A. These are, yeah, they are definitely separate. I'm trying to keep the same terminology as it was used previously.

Q. Uh-huh. Now you mentioned that you thought your injection pressure could stay within our guideline of .2 of a pound per foot of depth. Didn't you say that your average pay is 340 feet?

A. No. I said the sand that we've planned to flood is at an average depth of 340 feet. The average thickness of the pay is about 10 to 12 feet.

Q. Well now, if your average depth is 340 feet, the .2 would only give you 68 pounds of injection pressure.

A. Uh-huh.

Q. Yet on page four you say your injection pressure would be 150 psi.

A. No, I'm talking about the surface injection pressure.

Q. Oh, well now, this 150 pounds, this is at the -- at the perforated interface there.

A. No, that is the surface injection pressure. The, as I understood the memorandum, that was communicated to me, the .2 psi per foot refers to the surface injection pres-

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sure.

Q. That's correct.

A. And I understand that is to try to prevent fracturing the formation.

Q. Right.

A. Which we have no intention to do.

Q. Well, that would be 68 pounds at the surface.

A. That would be 68 pounds.

Q. And then this 150 pounds psi --

A. Okay.

Q. -- would be in the wellbore.

A. In the wellbore.

Q. That would be your 68 plus your hydrostatic.

A. That's correct, uh-huh.

Q. Okay.

A. And we are --

Q. And you don't want to inject too fast, so you're going to hold your injection down to about 25 barrels per well per day.

A. Uh-huh. I believe that at first, like I said, the waterflood has two objectives. First, the repressuring of the oil system.

Q. Uh-huh.

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A. And then it would be like in any other waterflood, flushing the oil out.

Q. Moving the oil.

MR. NUTTER: Are there any other questions of Mr. Zonati? He may be excused.

Do you have anything further, Mr. Thomson?

MR. THOMSON: NO, sir.

MR. NUTTER: Does anyone have anything they wish to offer in Case Number 7039?

We'll take the case under advisement.

(Hearing concluded.)

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C E R T I F I C A T E

I, SALLY W. BOYD, C.S.R., DO HEREBY CERTIFY that the foregoing Transcript of Hearing before the Oil Conservation Division was reported by me; that the said transcript is a full, true, and correct record of the hearing, prepared by me to the best of my ability.

Sally W. Boyd C.S.R.

I do hereby certify that the foregoing is
a complete record of the proceedings in
the Examiner hearing of Case No. 7039,
heard by me on 10/1 1980,

_____, Examiner
Oil Conservation Division

SALLY W. BOYD, C.S.R.
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Santa Fe, New Mexico 87501
Phone (505) 455-7409

Florene -
Send Order
to

JAMES E. THOMSON
ATTORNEY AT LAW

OFFICE (505) 988-8046
HOME (505) 983-7870

323 W. SAN FRANCISCO STREET
SANTA FE, NEW MEXICO 87501

DRAFT

dr/

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
DIVISION FOR THE PURPOSE OF
CONSIDERING:

CASE NO. 7039

Order No. R-6538

APPLICATION OF RED MOUNTAIN & ASSOCIATES

FOR A WATERFLOOD PROJECT, McKINLEY

COUNTY, NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 9 a.m. on October 1, 1980, at Santa Fe, New Mexico, before Examiner Daniel S. Nutter.

NOW, on this _____ day of ~~October~~ December, 1980, the Division Director, having considered the testimony, the record, and the recommendations of the Examiner, and being fully advised in the premises,

FINDS:

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

(2) That the applicant, Red Mountain & Associates, seeks authority to institute a waterflood project ~~on its~~ in the Chaco Wash-Mesaverde Oil ~~Pool~~, Pool by the injection of water into the Chaco Wash Sand of the Mesaverde formation through ~~eight~~ seven at various orthodox and unorthodox locations injection wells in Section 28, Township 20 North, Range 9 West, NMPM, McKinley County, New Mexico, as follows:

Lease Name	Well No.	Well Location
State	5	660 feet from north line, 660 feet from east line
"	6	330 " " " " 990 " " " "
"	8	660 " " " " 1315 " " " "
"	9	330 " " " " 1650 " " " "
"	11	1315 " " " " 660 " " " "
"	16	990 " " " " 330 " " " "
"	18	330 " " " " 330 " " " "

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

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

(5) That the operator should take all steps necessary to ensure that the injected water enters only the proposed injection interval and is not permitted to escape to other formations or onto the surface from injection, production, or plugged and abandoned wells.

(6) That the injection wells or injection pressurization system should be so equipped as to limit injection pressure at the wellhead to no more than 68 psi, but the Division Director should have authority to increase said pressure limitation, should circumstances warrant.

(7) That an administrative procedure should be adopted whereby the operator may obtain approval for producing wells and injection wells at orthodox and unorthodox locations in addition to or in lieu of the wells herein approved.

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

(9) That the locations of those wells described in Finding No. (2) above which are unorthodox, as well as the locations of the following proposed producing wells in Section 23, Township 20 North, Range 9 West, NMPM, should be approved:

Lease Name	Well No	Well Location
Stacy	10	5 feet from north line, 1315 feet from east line
"	13	1315 " " " " , 990 " " " "
"	15	1315 " " " " , 330 " " " "
"	20	990 " " " " , 1315 " " " "

IT IS THEREFORE ORDERED:

(1) That the applicant, Red Mountain & Associates, is hereby authorized to institute a waterflood project ~~xxxxxxx~~ in the Chaco Wash-Mesaverde ~~xxxx~~ Oil Pool, by the injection of water into the Chaco Wash Sand of the Mesaverde formation through the following-described wells in Section 23, Township 20 North, Range 9 West, NMPM, McKinley County, New Mexico:

finding No. (2) above which was as well as the location of the following proposed producing wells in Section 28, Township 20 North, Range 9 West, NMPM, should be approved:

Lease Name	Well No	Well Location
State	10	5 feet from north line, 1315 feet from east line
"	13	1315 " " " " , 990 " " " "
"	15	1315 " " " " , 330 " " " "
"	20	990 " " " " , 1315 " " " "

IT IS THEREFORE ORDERED:

(1) That the applicant, Red Mountain & Associates, is hereby authorized to institute a waterflood project ~~xxxxxxx~~ in the Chaco Wash-Mesaverde ~~xxxxx~~ Oil Pool, by the injection of water into the Chaco Wash Sand of the Mesaverde formation through the following-described wells in Section 28, Township 20 North, Range 9 West, NMPM, McKinley County, New Mexico:

Lease Name	Well No.	Well Location
State	5	660 feet from north line, 660 feet from east line
"	6	330 " " " " , 990 " " " "
"	8	660 " " " " , 1315 " " " "
"	9	330 " " " " , 1650 " " " "
"	14	1315 " " " " , 660 " " " "
"	16	990 " " " " , 330 " " " "
"	18	30 " " " " , 330 " " " "

(2) That injection into each of said wells shall be through ~~internally coated~~ tubing, set in a packer which shall be located as near as practicable to the uppermost perforation; that the casing-tubing annulus of each injection well shall be loaded with an inert fluid and equipped with an approved pressure gauge or attention-attracting leak detection device.

(3) That the operator shall immediately notify the supervisor of the Division's Aztec district office of the failure of the tubing or packer in any of said injection wells,

the leakage of water or oil from around any producing well, or the leakage of water or oil from any plugged and abandoned well within the project area and shall take such timely steps as may be necessary or required to correct such failure or leakage.

(4) That the injection wells herein authorized and/or the injection pressurization system shall be so equipped as to limit injection pressure at the wellhead to no more than 69 psi, provided however, the Division Director may authorize a higher surface injection pressure upon satisfactory showing that such pressure will not result in fracturing of the confining strata.

(5) That the locations of those wells described in Order No. (1) above as well as the following unorthodox locations, all in Section 28, Township 20 North, Range 9 West, NMPM, McKinley County, New Mexico, are hereby approved:

Lease Name	Well No	Well Location
State	10	65 feet from north line, 1315 feet from east line
"	13	1315 " " " " , 990 " " " "
"	15	1315 " " " " , 330 " " " "
"	20	990 " " " " , 1315 " " " "

(6) That the subject waterflood project is hereby designated the RMA Chaco Wash MV Waterflood Project and shall be governed by the provisions of Rules 701, 702, and 703 of the Division Rules and Regulations.

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

(8) That an administrative procedure is hereby established whereby the operator of the subject project may obtain approval for the drilling of injection wells or production wells in the NE/4 of Section 28, Township 20 North, Range 9 West, NMPM, McKinley County, New Mexico, at orthodox or unorthodox locations in addition to or in lieu of the wells hereinabove authorized. The provisions of ~~Rule 104~~ paragraphs 2 and 3 of Rule 104 F of the Division Rules and Regulations

Lease Name	Well No	Well Location
State	10	1650 feet from north line, 1315 feet from east line
"	13	1315 " " " " " , 990 " " " "
"	15	1315 " " " " " , 330 " " " "
"	20	990 " " " " " , 1315 " " " "

(6) That the subject waterflood project is hereby designated the RMA Chaco Wash MV Waterflood Project and shall be governed by the provisions of Rules 701, 702, and 703 of the Division Rules and Regulations.

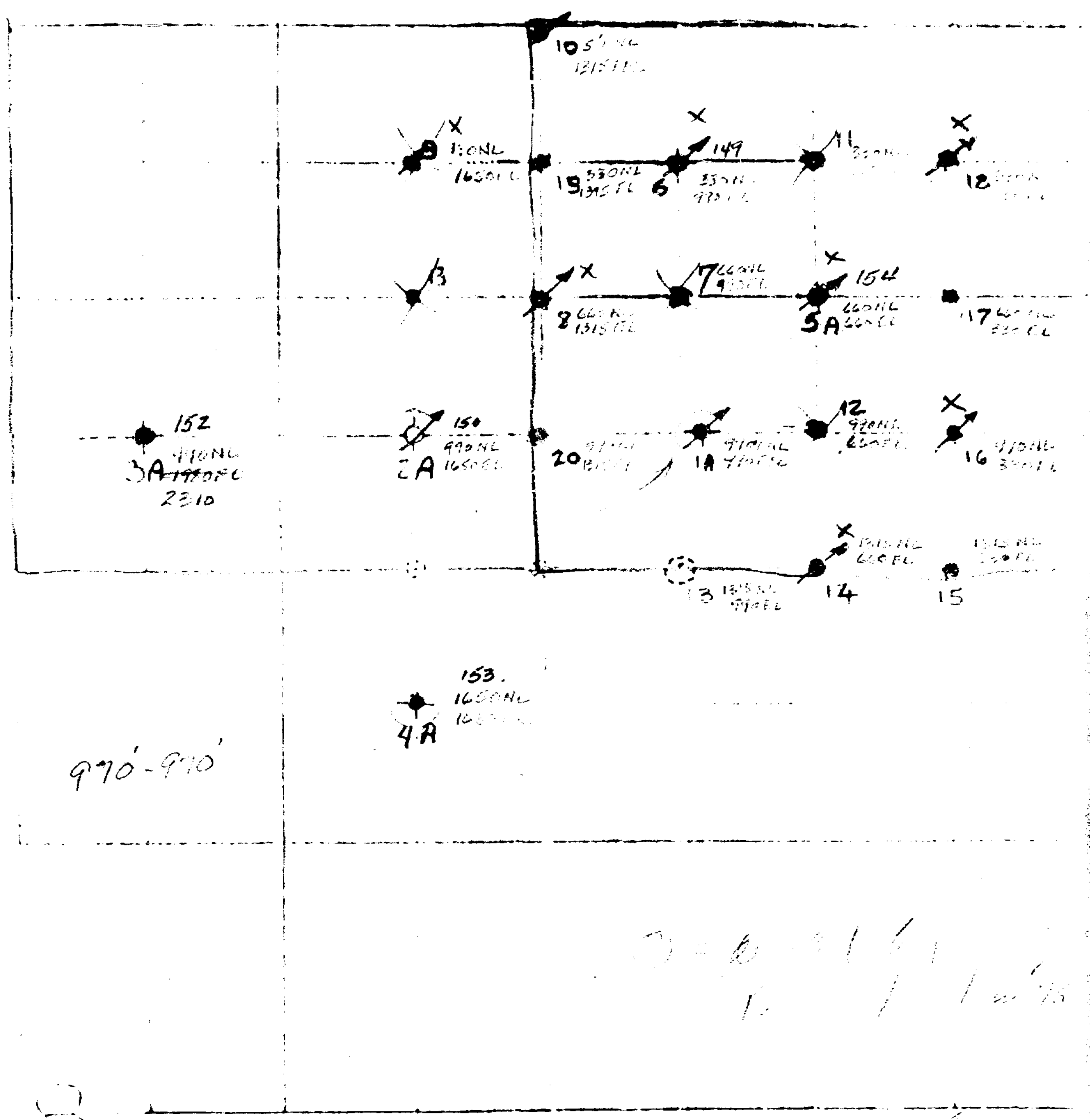
(7) That monthly progress reports of the waterflood project herein authorized shall be submitted to the Division in accordance with Rules 704 and 1120 of the Division Rules and Regulations.

(8) That an administrative procedure is hereby established whereby the operator of the subject project may obtain approval for the drilling of injection wells or production wells in the NE/4 of Section 28, Township 20 North, Range 9 West, NMPM, McKinley County, New Mexico, at orthodox or unorthodox locations in addition to or in lieu of the wells hereinabove authorized. The provisions of ~~Rule 104~~ paragraphs 2 and 3 of Rule 104 F of the Division Rules and Regulations shall be applicable to obtain administrative approval for the drilling of any unorthodox location, and the provisions of Rule 701 ~~shall apply to~~ of the Rules and Regulations shall be applicable to obtain authority for the placing of any well, whether at an orthodox or unorthodox location, on water injection.

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

DONE at Santa Fe, New Mexico, on the day and year herein-above designated.

28-209-



28

X = Injection wells now being requested

#5
#6
#8
#9
#14
#16
#18

CHACO WASH AREA

• WELL LOCATIONS

INJECTORS

● PRODUCERS

LOCATION PROPOSED
INJECTION WELLS
[redacted]

KEPLINGER and Associates, Inc.
INTERNATIONAL ENERGY CONSULTANTS

2200 SECURITY LIFE BUILDING
16TH AND GLENARM STREET
DENVER, COLORADO 80202
AREA 303 / 825-7722
CABLE: KEPPET TELEX: 762-324

September 19, 1980

State of New Mexico
Energy and Minerals Department
Oil Conservation Division
State Land Office Building
P.O. Box 2088
Santa Fe, New Mexico 87501

Re: Application of Red Mountain Associates
for Injection Project
Case No. 7039

Gentlemen:

Red Mountain Associates is hereby applying for a five spot waterflood permit and some unorthodox well locations in the Chaco Wash Pool, Township 20 North, Range 9 West, McKinley County, New Mexico. Enclosed is the proposed injection well list.

Sincerely,

Mohamed Zenati (MZ)

Mohamed Zenati
Project Engineer

MZ:nlb

Enclosure

PROPOSED INJECTION WELLS

To obtain the waterflood pattern, several wells will have to be drilled in unorthodox locations. The following list is a tabular summary of the proposed injection and production wells.

WELL NAME	LOCATION	STATUS
State #1	990/FNL	P
State #2	990/FNL 1650/FEL	P
State #3	990/FNL 1980/FEL	-
State #4	1650/FNL 1650/FEL	-
State #5	660/FNL 660/FEL	I
State #6	330/FNL 990/FEL	I
State #7	660/FNL 990/FEL	P
State #8	660/FNL 1315/FEL	I
State #9	330/FNL 1650/FEL	I
State #10	5/FNL 1315/FEL	P
State #11	330/FNL 660/FEL	P
State #12	990/FNL 660/FEL	P
State #13	1315/FNL 990/FEL	P
State #14	1315/FNL 660/FEL	I
State #15	1315/FNL 330/FEL	P
State #16	990/FNL 330/FEL	I
State #17	660/FNL 330/FEL	P
State #18	330/FNL 330/FEL	I
State #19	330/FNL 1315/FEL	P
State #20	990/FNL 1315/FEL	P

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

BRUCE KING
GOVERNOR

LARRY KEHOE
SECRETARY

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501
(505) 827-2434

December 19, 1980

Re: CASE NO. ~~7033~~
ORDER NO. R-6538

Mr. James E. Thomson
Thomson & Udall
Attorneys at Law
323 West San Francisco
Santa Fe, New Mexico

Applicant:

~~Red Mountain & Associates~~

Dear Sir:

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

Yours very truly,

JOE D. RAMEY
Director

JDR/fd

Copy of order also sent to:

Hobbs OCD ____x____
Artesia OCD ____x____
Aztec OCD ____x____

Other _____

Dockets Nos. 31-80 and 32-80 are tentatively set for October 15 and 29, 1980. Applications for hearing must be filed at least 22 days in advance of hearing date.

DOCKET: EXAMINER HEARING - WEDNESDAY - OCTOBER 1, 1980

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

The following cases will be heard before Daniel S. Nutter, Examiner, or Richard L. Stamets, Alternate Examiner:

CASE 7029: In the matter of the hearing called by the Oil Conservation Division on its own motion to consider amendments to its special rules and procedures for the designation of "tight formation", promulgated by Division Order No. R-6388, to comply with FERC Order No. 99, issued August 15, 1980, promulgating final regulations with respect to Section 107 of the NGPA.

CASE 7030: In the matter of the hearing called by the Oil Conservation Division on its own motion to consider amendments to its SPECIAL RULES FOR APPLICATIONS FOR WELLHEAD PRICE CEILING CATEGORY DETERMINATIONS as promulgated by Division Order No. R-5878, as amended. The proposed amendments relate to individual well filings for price category determination as "right formation" gas under Section 107 of the NGPA.

CASE 7031: Application of Coronado Exploration Corp. for a unit agreement, Guadalupe County, New Mexico. Applicant, in the above-styled cause, seeks approval for the Mesa Leon Unit Area, comprising 15,680 acres, more or less, of State, Federal, and fee lands in Township 6 North, Range 17 East.

CASE 7007: (Continued from September 3, 1980, Examiner Hearing)

Application of Harvey E. Yates Company for downhole commingling, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval for the downhole commingling of Morrow and Atoka production in the wellbore of its North Travis 12 Deep Well No. 1 located in Unit O of Section 12, Township 18 South, Range 28 East.

CASE 7023: (Continued from September 17, 1980, Examiner Hearing)

Application of Shell Oil Company for pool creation and temporary special pool rules, Roosevelt County, New Mexico. Applicant, in the above-styled cause, seeks the creation of a new Pennsylvanian oil pool for its Askew Well No. 1 located in Unit L of Section 2, Township 5 South, Range 33 East, and the promulgation of special pool rules therefor, including a provision for 80-acre spacing.

CASE 7019: (Continued from September 17, 1980, Examiner Hearing)

Application of Amoco Production Company for compulsory pooling, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Pennsylvanian formation underlying the W/2 of Section 30, Township 23 South, Range 25 East, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well.

CASE 7032: Application of Dalport Oil Corporation for an exception to Order No. R-3221, Chaves County, New Mexico. Applicant, in the above-styled cause, seeks an exception to Order No. R-3221 to permit disposal of produced brine into an unlined surface pit located between Units L and M of Section 9, Township 15 South, Range 30 East.

CASE 7033: Application of Adams Exploration Inc. for three non-standard proration units, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval of three 80-acre non-standard proration units in the Vada-Pennsylvanian Pool, comprising the following acreage: SE/4 NE/4 and NE/4 SE/4 of Section 12, N/2 NE/4 of Section 12, and S/2 SE/4 of Section 2, all in Township 9 South, Range 34 East.

CASE 6940: (Continued from August 20, 1980, Examiner Hearing)

Application of Adobe Oil Company for compulsory pooling, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests down through the [illegible]camp formation underlying the NW/4 SE/4 for oil and the SE/4 for gas, Section 23, Township 20 South, Range 38 East, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well.

CASE 6996: (Continued from September 3, 1980, Examiner Hearing)

Application of John E. Schalk for compulsory pooling, Rio Arriba County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Blanco Mesaverde Pool underlying the NE/4 of Section 8, Township 25 North, Range 3 West, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well.

CASE 7034: Application of Merrion & Bayless for downhole commingling, Rio Arriba County, New Mexico. Applicant, in the above-styled cause, seeks approval for the downhole commingling of South Blanco-Pictured Cliffs and Otero-Chacra production in the wellbore of its Atlantic Well No. 1 located in Unit O of Section 32, Township 26 North, Range 6 West.

CASE 7035: Application of Merrion & Bayless for downhole commingling, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks approval for the downhole commingling of Gallegos-Gallup and Basin-Dakota production in the wellbore of its Delhi Taylor Well No. 1 located in Unit M of Section 4, Township 26 North, Range 11 West.

CASE 7036: Application of J. Gregory Merrion for compulsory pooling, Rio Arriba County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Pictured Cliffs formation underlying the SE/4 of Section 34, Township 25 North, Range 6 West, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well.

CASE 7037: Application of Mesa Petroleum Co. for downhole commingling, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks approval for the downhole commingling of Chacra and Mesaverde production in the wellbore of its State Com AF Well No. 28 located in Unit I of Section 36, Township 29 North, Range 10 West.

CASE 7020: (Continued from September 3, 1980, Examiner Hearing)

Application of Mesa Petroleum Co. for pool creation, special pool rules and an oil discovery allowable, Rio Arriba and San Juan Counties, New Mexico. Applicant, in the above-styled cause, seeks the creation of a new Gallup oil pool for its South Blanco Federal Well No. 1-6 located in Unit A of Section 6, Township 23 North, Range 7 West, and special rules therefor, including a provision for 80-acre spacing units. Applicant further seeks a discovery allowable for the aforesaid well.

CASE 6822: (Continued from September 17, 1980, Examiner Hearing)

In the matter of Case 6822 being reopened pursuant to the provisions of Order No. R-6293 which order created the West Double X-Wolfcamp Gas Pool as a retrograde gas condensate pool and set special production limitations therein. Operator(s) may appear and present evidence to establish the true nature of the reservoir and proper rates of withdrawal therefrom.

CASE 7038: Application of Natura Energy Corporation for compulsory pooling, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the San Andres formation underlying the NE/4 NE/4 of Section 6, Township 19 South, Range 39 East, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well.

CASE 7039: Application of Red Mountain & Associates for a waterflood project, McKinley County, New Mexico. Applicant, in the above-styled cause, seeks authority to institute a waterflood project in the Chaco Wash-Mesaverde Oil Pool by the injection of water into the Chaco Wash Sand formation through eight wells at various orthodox and unorthodox locations in Section 28 of Township 20 North, Range 9 West.

CASE 7040: Application of Belco Petroleum Corporation for reclassification or a new gas pool and a non-standard proration unit, Lea County, New Mexico. Applicant, in the above-styled cause, seeks the reclassification of the Wilson Strawn Pool as a gas pool or, in the alternative, the creation of a new gas pool for its State 12 Well No. 1 located in Unit G of Section 12, Township 21 South, Range 34 East; applicant further seeks approval of a standard gas proration unit for said well comprising the E/2 of said Section 12, or in the alternative, a non-standard unit comprising the NE/4, N/2 SE/4 and SE/4 SE/4 of said Section 12.

CASE 6618: (Reopened and Readvertised)

In the matter of Case 6618 being reopened pursuant to the provisions of Order No. R-6103 which order created the Travis-Yates Gas Pool in Eddy County, New Mexico, with temporary special rules and regulations including a provision for 80-acre spacing units. Operators in said pool may appear and show cause why the pool should not be developed on 160-acre spacing units.

CASE 6648: (Reopened and Readvertised)

In the matter of Case 6648 being reopened pursuant to the provisions of Order No. R-6124 which order promulgated temporary special rules and regulations for the North Caprock-Mississippian Pool in Lea County, New Mexico, including a provision for 160-acre spacing and a 4000 to one gas-oil ratio limitation. Operators in said pool may appear and show cause why the pool should nor be developed on 40-acre spacing with a 2000 to one GOR.

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
STATE LAND OFFICE BLDG.
SANTA FE, NEW MEXICO

1 October 1980

EXAMINER HEARING

IN THE MATTER OF:

Application of Red Mountain & Associates for a waterflood project, McKinley County, New Mexico.

CASE 7039

BEFORE: Daniel S. Nutter

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the Oil Conservation Division: Ernest L. Padilla, Esq.
Legal Counsel to the Division
State Land Office Bldg.
Santa Fe, New Mexico 87501

For the Applicant: James E. Thomson, Esq.
THOMSON & UDALL
323 West San Francisco
Santa Fe, New Mexico 87501

SALLY W. BOYD, C.S.R.
Rt. 1 Box 193-B
Santa Fe, New Mexico 87501
Phone (505) 455-7409

I N D E X

MOHAMMED ZENATI

Direct Examination by Mr. Thomson 3

Cross Examination by Mr. Nutter 19

E X H I B I T S

Applicant Exhibit One, Report 6

SALLY W. BOYD, C.S.R.
Rt. 1 Box 193-B
Santa Fe, New Mexico 87501
Phone (505) 455-7409

MR. NUTTER: We'll call Case 7039.

MR. PADILLA: Application of Red Mountain & Associates for a waterflood project, McKinley County, New Mexico.

MR. THOMSON: Mr. Nutter, my name's James E. Thomson. I'm an attorney here in Santa Fe, and I represent Red MOuntain Associates. We have one witness, Mohammed Zenati from Denver.

(Witness sworn.)

MOHAMMED ZENATI

being called as a witness and having been duly sworn upon his oath, testified as follows, to-wit:

DIRECT EXAMINATION

BY MR. THOMSON:

Q. Would you state your name, please?

A. My name is Mohammed Zenati.

Q. Where do you live, sir?

A. Denver, Colorado.

Q. What is your occupation?

A. Petroleum engineer.

Q. For whom are you employed?

A. Keplinger and Associates.

SALLY W. BOYD, C.S.R.
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Santa Fe, New Mexico 87501
Phone (505) 455-7409

Q. Would you please give the Commission a background of your education and training?

A. I have a Bachelor's in mathematics and a professional degree in petroleum engineering, and I do hold also a marginal PhD degree, which is upon completion within the next few months.

Q. Okay, what school have you received your degree in petroleum engineering?

A. Colorado School of Mines.

Q. Where are you in the process of completing your PhD in petroleum engineering?

A. I have completed everything but the thesis.

Q. All right, in which school?

A. Colorado School of Mines.

Q. Okay. Have you had other positions, teaching positions?

A. Yes, I have.

Q. With what institution?

A. With Colorado School of Mines.

Q. Okay. How long have you been employed by Keplinger and Associates?

A. Three years.

Q. And in what capacity?

A. As a petroleum engineer and I was also

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in charge of the softwear development.

Q. The softwear development?

A. Computer softwear, for our engineering packages.

Q. Have you done consulting work in the field of petroleum engineering?

A. Yes, I have.

Q. For what companies have you worked?

A. Keplinger and Scientific Softwear.

Q. Do you have any experience in waterflooding?

A. Yes, I have.

Q. And what is that experience, please?

A. I've -- within the course of my employment with Keplinger, I've worked on four waterflood projects.

MR. THOMSON: Mr. Nutter, I submit Mr. Zenati as an expert petroleum engineer.

MR. NUTTER: Mr. Zenati is qualified.

MR. THOMSON: Okay, thank you, sir.

Q. Mr. Zenati, have you been employed by Red Mountain and Associates with regard to application Number 7039?

A. Yes, I'm acting as their consulting engineer.

Q. Okay.

A. For the waterflood.

Q Okay, and when were you employed, generally?

A I started in September 1st, 1980.

Q Can you tell the hearing officer in this case generally what you propose in your application in Case Number 7039?

A Yes. I'm seeking the Commission to initiate a waterflood in the Chaco Wash Oil Pool, and related to that the permission to drill in some unorthodox well locations.

Q Okay, we have submitted to the Commission Exhibit Number One. In that exhibit, Mr. Zenati, did you -- did you prepare that exhibit?

A Yes.

Q All right. Could you give the Commission a brief summary of the history of the area involved?

A The Chaco Wash Oil Pool is located in Section 21, 22, 27, and 28 of Township 20 North, Range 9 West, in McKinley County, New Mexico. This pool was discovered in the late 1930's and the early attempts to develop that pool were unsuccessful, primarily due to the lack of energy in the pool. The reported pressures were approximately 125 psi to 100 psi. There is no field gas to speak of. Since it's a very shallow well there is no energy stored in the rocks, and up to -- from 1968 to 1971 the well has produced approximately 4000 barrels of oil from an average of four wells, with most of the production in the first two years. And from that time --

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from that time till about July, 1979, the lease has produced on primary an average of less than a barrel a day per well.

Q. What is generally the geological foundation -- formation, excuse me, existing in this area?

A. The Chaco Wash is producing from the Menefee formation, which is a series of sandstone, shales, and coal beds. It extends about -- the Menefee extends about -- to about a depth of 1600 feet, and to my interpretation, the Chaco Wash pay is a fluvial channel averaging from 9 to 19 feet in thickness that is draped over a structural nose.

The trapping is both stratigraphic and structural in that part of the pool.

Q. Mr. Zenati, as part of your Exhibit Number One, did you prepare documentation with regard to the reservoir characteristics and production performance?

A. Yes, I did.

Q. What did you prepare in your Exhibit Number One, please?

A. I have included -- we've summarized the history of the well, a geological summary, plus the reservoir characteristics and some of the production performance that I was able to gather.

Q. Okay, is there any information on this page three of Exhibit One that you wish to point out to the Commission with regard to this application that stands out?

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A. Maybe not with page three but with page two.

Q. All right. Okay, going back to page two.

A. Okay, this oil pay has to be stressed that it is a lenticular sandstone and what we've been able to determine is that it has at least an extent of about 20 to 40 acres, and the particular sand that we're looking at is at a depth of about 340 feet.

It has very good permeabilities. They were measured to dry air and the order was 300 millidarcies; a good porosity, 27 percent, and the initial oil saturation is estimated at 50 percent.

Q. How was that estimation arrived at?

A. Well, it was a measure of the oil saturation after retrieval of the core, but the core was probably not handled properly, so some of the oil was --

Q. What are the objectives of this waterflood project that you propose?

A. They are basically twofold. Because of the lack of energy of the reservoir, we're proposing to first inject the water as a way of repressuring the oil and allowing it to move to the producers. And then, as in any waterflood, flush the oil out of the oil pay. And because of this objective in trying to repressure the reservoir, it is crucial that a waterflood project starts as soon as possible.

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Q What pressure do you anticipate in this -- in this injection pressure?

A. The surface pressure, we're planning to stay within the limit of .2 psi per foot.

Q And how much volume of water is involved per well?

A. We're talking about a very low volume, 20 barrels a day per formation.

Q Okay. How are you able, or can you explain why the volume is low and the pressure is relatively low; how will that provide the satisfactory recovery?

A. Because the permeability are so good and the wells are close to each other. The average distance is about -- from a producer to an injector is about 467 feet. By injecting too fast you would have -- you would probably channel the water pretty fast to the producers, plus the fact that the oil is of a low gravity, 45 degree -- it varies from 40 to 45 degree API. The water will have a tendency to underrun that oil if it was injected at a too fast rate.

Q Has there been a pilot project conducted in this area?

A. There's been a pilot project conducted in Section 27 and it is basically the same sand with the same properties. It may not be connected to each other and we don't know because there hasn't been any drilling to prove

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it.

MR. NUTTER: Do you have a map in here, Mr. Zenati, that shows where that would be?

A. I think there is a map showing the location of the wells within a two mile radius, and the well showing in that Section 27 would be the well that are part of Exhibit A.

MR. NUTTER: Okay, now I've got this plat that's marked Exhibit A.

A. Yes, and the wells --

MR. NUTTER: Now, where is the waterflood proposed to be?

A. It's also the smaller map in Exhibit A, which is a blowup of the area that we propose.

MR. THOMSON: Mr. Nutter, there's another map in that folder, right there, and that's a blowup of this area that indicates the injection wells.

A. Some of these wells are the ones that we propose to drill.

Q. Mr. Nutter wondered if -- if any of your drawings, I think, indicated in Section 27 where the pilot project is?

A. Yeah, there will be on Exhibit A, on that large map in Exhibit A.

MR. NUTTER: Okay, now on the large map,

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where is this area that's shown on the blowup?

A. It would be the northeast quarter.

MR. NUTTER: Well, the numbering systems don't correlate, so this is going to be renumbered, is that it?

A. Okay, no, no. The plat -- the plat, we also, because of the large number of wells within the two miles radius, which amount to about 300 wells, what we have done was to include an identification number to the well, to each well within a two mile radius; then assign these -- these numbers to a tabular summary. It would have been too impractical to list the location of the well, the exact location of the well, on the plat.

MR. NUTTER: Okay. Well, if I take the blowup and look at Well No. 3-A over here on the blowup, which would that well be here on the --

A. I would have to go through the summary to find the one. But these -- these numbers are the number listed under the official name of the well.

MR. NUTTER: Uh-huh.

A. The State, they're all called State and depending on the number.

MR. NUTTER: But your pilot project will be here in the northeast quarter of Section 28?

A. Uh-huh, that's right.

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MR. NUTTER: And the pilot project that was conducted previously --

A. Was in Section 27.

MR. NUTTER: In what part of 27 would that have been?

A. In the northwest quarter, in the very --

MR. NUTTER: In the extreme corner there?

A. Yeah, in the extreme corner.

MR. NUTTER: Okay.

Q. Mr. Zenati, how many proposed injection wells do you have in mind?

A. On the -- right now we're talking about five -- or eight injection wells, and fourteen production -- producing wells.

Q. All right.

A. What we're trying to do is, first, on the area that we -- we have noted the presence of the pay, we're trying to complete the waterflood as a five-spot, with a five-spot pattern, with a five acre spacing. That is one of the reasons now why we're also applying for some of the unorthodox well locations, so we'd be able to drill very close to the quarter quarter lines and section lines as possible.

Q. What is the source of the water for this injection?

A. The water is -- the supply comes from the

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Hopash-Gallup water sand, which is located -- which is in that area is about 2600 feet deep, and we -- think it's on page six.

Q. Page six.

MR. NUTTER: All right.

A. And we presently -- there is a waterflood going on and has been going on since the 1960's, which also belonged to Red Mountain Associates, and it's the Red Mountain waterflood, located in Section 20 and 29.

Q. Okay, are you familiar with the Red Mountain waterflood, not to be confused with Red Mountain Associates' application today?

A. Yes.

Q. What -- is there any similarity between what was done there and what you propose to do here?

A. There are great similarities and basically it is the same sand that is producing from the same formation, from the Menefee formation. The sands are also good permeabilities; there is, as in the Chaco Wash, very low energy to the reservoir, and until -- on primary it has produced, I think it's in Exhibit J, --

Q. Referring you to Exhibit J in Exhibit A -- or Exhibit One?

A. On primary it has produced, I think, less than 60,000 barrels. When it was put under water injection

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it produced up to 23[illegible],000 barrels.

MR. WORTH: I think on Exhibit J you said it's one mile east of the Chaco Wash Field. That would be one mile west, wouldn't it?

A. Okay, yeah, that should be one mile west.

Q. Okay, Mr. Benati, going through the various exhibits that are a part of your Exhibit Number One, I'd like to address your attention to Exhibit A first and could you please explain what Exhibit A, the large Exhibit A is?

A. This show the locations of the well within a two mile radius of the Chaco Wash.

Q. How did you determine the existance of these wells that are within a two mile radius?

A. We basically went through the records of the Oil Conservation Commission in Aztec.

Q. Have you visited this area?

A. Yes, I have.

Q. Addressing your attention to the additional Exhibit A, which is called location proposed injection wells, can you describe what you have on that exhibit, please?

A. What we have there is the location of the different production and injection wells. And as you can see, it follows basically a five-spot pattern. Part of the -- these wells are located in the -- in the top of the structure.

Q. What do you mean by a five-spot pattern?

A. Well, basically producing wells surrounded by injectors.

Q. Is there -- you mentioned that you have a five-spot pattern and it's one reason why you're asking for unorthodox well locations. Can you explain that, please?

A. The five-spot pattern, after some engineering calculations, show that it would be the most efficient pattern in that sand. The unorthodox locations is to allow us to get the five-spot pattern, because of the quarter quarter lines running through the oil pay.

Q. Directing your attention to Exhibit B of Exhibit One, could you explain what that is, please?

A. That is a plat showing the ownership within that two mile radius; also not to confuse, because of the number of owners in some of the sections, we've plotted that on two different plats, one showing the location of the well and one showing the ownership in that area.

And to my knowledge, there is no production -- there is no produced area right now but for the Red Mountain Waterflood and the Chaco Wash, in the Menefee Sand.

Q. What is Exhibit C, sir?

A. Exhibit C is the tabular summary of all the wells that are located in the two-mile radius -- within the two-mile radius, with the identification number that would

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refer them to the map.

Q. Okay, and you talked about the map, that's Exhibit D?

A. Exhibit A.

Q. A, excuse me, the large Exhibit A.

Did you make that tabulation?

A. Somebody did under my supervision.

Q. Okay. What is Exhibit D?

A. Exhibit D is the tabular summary of the wells located within a half mile radius and they would indicate also the casing string and setting depth, the number of sacks of cement used, the cement tops, if available, and their present status.

Q. And Exhibit E, please?

A. Exhibit E is the location of, at least I think, an extension of Exhibit -- of the previous exhibit.

We're planning in the future to apply for, maybe, an extension of the waterfloods on the other properties.

Q. All right, and Exhibit F?

A. And Exhibit F is the summary of the ownership within a two mile radius, which correspond to the map, too, to I believe Exhibit B.

Q. And what is Exhibit G?

A. Exhibit G is the typical schematic of the plugged well in that Chaco Wash area.

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Q. And what does it show?

A. It shows the number of plugs, the type of plugs that were set, as far as the records in the Oil and Gas Conservation Commission shows, with a bottom plug, an intermediate plug, that is optional, depending on the type of well and where they were perforated, and plus the surface plug.

Q. Okay, and the last exhibit, Exhibit H, what does that show?

A. That is a typical schematic of the injection well that we propose in the Chaco Wash area.

Q. Now, Mr. Zenati, you said you have been out to the site of this project?

A. Uh-huh, yes.

Q. Mr. Zenati, will this waterflooding project, in your opinion, adversely affect any of the water in adjoining properties?

A. I do not believe so for several reasons. One is the fact that the pay is a lenticular sandstone; the fact that the pressure at which we propose to inject are very low; and the flow rates also being low.

Q. Okay. Do you believe that this project will adversely affect oil resources, either on the subject property or adjoining properties?

A. No, I do not believe so for the same reason as -- as before. Plus when you look at the result of

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the pilot waterflood that was done on the Chaco Wash, and looking at the result from the Red Mountain waterflood, it will increase the production.

Q. Are you familiar with the term stripper, stripper well?

A. Yes, I am.

Q. Do you feel that the wells in the area are depleted to the point where they would be considered or commonly referred to as stripper wells?

A. They will be referred as stripper. I do not believe that the area is depleted.

Q. Mr. Senati, do you have an opinion whether or not the granting of this application will be in the interest of conservation and protection of correlative rights in the area?

A. No, I don't believe.

Q. It will be in the best interests?

A. It will be in the best interest, yes.

Q. Will the wells that are used for the injection of water be so cased as to prevent damage to subsurface rights?

A. Yes, they will.

Q. All right, in your Exhibit One, you have also submitted logs, have you not?

A. Yes, I have.

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Q. And these are logs of what?

A. They are logs of the wells that we've drilled in some of the authorized locations, and I've included three logs. Those are the only ones that we have available at this time.

MR. THOMSON: At this time we submit for consideration the Exhibit Number One.

MR. NUTTER: Applicant's Exhibit One in this case will be admitted in evidence.

MR. THOMSON: I have no further questions.

CROSS EXAMINATION

BY MR. NUTTER:

Q. Mr. Zenati, now, your proposal is for a flood in the extreme northeast corner of Section 28.

A. That's right.

Q. You said there's an old pilot in the extreme northwest corner of Section 27, and also you mentioned that there was a flood over in Sections 20 and 29, which is about a mile to the west. Now is the one in Sections 20 and 29 the old Birdseye flood?

A. Yeah.

Q. Okay, now I notice from the ownership map that Red Mountain Associates also controls that acreage.

A. That's right.

Q Is that flood in operation at this time?

A Yes, it is.

Q It is? And are you producing from the wells there?

A We are producing some of the wells.

Q Is that flood being effective in that area?

A Yes.

Q It is?

A We believe there is still a lot of oil left in the Red Mountain ---

Q And Henry Birdseye initiated that flood quite a number of years ago, didn't he?

A Yeah, in 1961, I believe.

Q Uh-huh. And it's still producing?

A It's still producing, and like I say, I think the reservoir limits have never been delineated to the southeast -- southwest.

Q Now referring to your proposed flood and to another flood, I don't know if it's the one to the west or the one in Section 27, you said you thought it was probably on different structure.

A Okay, the one in Section 27.

Q You think that's a different structure there, even though all these wells are clustered so closely together?

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A. Yes.

Q. Okay.

A. They do not -- in analyzing the previous record that I've been able to gather, they do not show the response that other wells show.

Q. What do you have, a pair of small anticlines right there close together?

A. Well, I -- I don't think there are any anticlines. I think there, like I said, a structural nose; basically a small fault. They do not show an anticline, plus they are very lenticular.

Q. Uh-huh, so they'd just be separate little sand bodies?

A. Yes, I think so. I'm positive about the Red Mountain waterflood being separated from the Chaco Wash, located in Section 28. The --

Q. How Chaco Wash, that would be the one over in 20 and 29?

A. No, that would be the one on 28, Chaco Wash is.

Q. Okay.

A. Red Mountain is in Section 20 and 29.

Q. Oh, that's the Red Mountain Pool?

A. That's the Red Mountain Pool.

Q. And this is the Chaco Wash Pool?

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A. This is the Chaco Wash Pool. I'm --

Q. And those are definitely separate.

A. These are, yeah, they are definitely separate. I'm trying to keep the same terminology as it was used previously.

Q. Uh-huh. Now you mentioned that you thought your injection pressure could stay within our guideline of .2 of a pound per foot of depth. Didn't you say that your average pay is 340 feet?

A. No. I said the sand that we've planned to flood is at an average depth of 340 feet. The average thickness of the pay is about 10 to 12 feet.

Q. Well now, if your average depth is 340 feet, the .2 would only give you 68 pounds of injection pressure.

A. Uh-huh.

Q. Yet on page four you say your injection pressure would be 150 psi.

A. No, I'm talking about the surface injection pressure.

Q. Oh, well now, this 150 pounds, this is at the -- at the perforated interface there.

A. No, that is the surface injection pressure. The, as I understood the memorandum, that was communicated to me, the .2 psi per foot refers to the surface injection pres-

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sure.

Q. That's correct.

A. And I understand that is to try to prevent fracturing the formation.

Q. Right.

A. Which we have no intention to do.

Q. Well, that would be 68 pounds at the surface.

A. That would be 68 pounds.

Q. And then this 150 pounds psi --

A. Okay.

Q. -- would be in the wellbore.

A. In the wellbore.

Q. That would be your 68 plus your hydrostatic.

A. That's correct, uh-huh.

Q. Okay.

A. And we are --

Q. And you don't want to inject too fast, so you're going to hold your injection down to about 25 barrels per well per day.

A. Uh-huh. I believe that at first, like I said, the waterflood has two objectives. First, the repressuring of the oil system.

Q. Uh-huh.

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A. And then it would be like in any other waterflood, flushing the oil out.

Q. Moving the oil.

MR. NUTTER: Are there any other questions of Mr. Zenati? He may be excused.

Do you have anything further, Mr. Thomson?

MR. THOMSON: NO, sir.

MR. NUTTER: Does anyone have anything they wish to offer in Case Number 7039?

We'll take the case under advisement.

(Hearing concluded.)

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C E R T I F I C A T E

I, SALLY W. BOYD, C.S.R., DO HEREBY CERTIFY that the foregoing Transcript of Hearing before the Oil Conservation Division was reported by me; that the said transcript is a full, true, and correct record of the hearing, prepared by me to the best of my ability.

_____

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 7039 heard by me on 10/1 1980.

_____, Examiner
Oil Conservation Division

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STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

TONEY ANAYA
GOVERNOR

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501
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July 13, 1984

Geo Engineering, Inc.
P. O. BOX 2966
Santa Fe, NM 87504-2966

Attention: James Law, Petroleum Engineer

Re: Pressure Allowable Increase
Chaco Wash Mesa Verde Waterflood
Well No. 12
990' FNL & 660' FEL
S28,T20N,R9W
McKinley County, NM

Dear Mr. Law,

I have completed a review of your request for an injection pressure allowable increase on the subject well. The step rate test submitted with your request indicated a formation parting pressure at 180 psig. Subtracting a 10 psig safety factor, you are granted approval to inject at a maximum surface pressure of 170 psig. Should you fail to comply with the pressure requirement of this approval, authority granted by this letter may be terminated after notice and hearing in the interest of conservation.

Additional pressure increases in your waterflood project may be granted pending submittal of additional step-rate data.

If you have any questions, do not hesitate to contact me at 827-5807.

Sincerely,

Gilbert P. Quintana

Gilbert P. Quintana

cc: Joe D. Ramey, Division Director
File WFX - 525
Case File 7039
Aztec District - Frank Chavez

GPQ/bok

7-2-84

GEO ENGINEERING INC
STEP RATE TEST
CHACO WASH FIELD
STATE No. 12 WELL

STEP	PRESSURE (PSI)	RATE (BPD)
1	60	11
2	100	21
3	140	46
4	180	64
5	220	360

J. M. Law

GEO ENGINEERING
STEP RATE TEST
CHACO WASH FIELD
STATE No. 12
7-2-84

46 0782

SURFACE PRESSURE, PSI

250
200
150
100
50
0
100
200
300
400
500

NEW MEXICO OIL CONSERVATION COMMISSION

CASE NO. 7039

APPLICATION OF RED MOUNTAIN ASSOCIATES

FOR A FIVE SPOT WATERFLOOD PROJECT

AND SOME UNORTHODOX WELL LOCATIONS

IN THE CHACO WASH POOL

TOWNSHIP 20 NORTH

RANGE 9 WEST

McKINLEY COUNTY

NEW MEXICO

KEPLINGER and Associates, Inc.

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Exhibits:

A - Plat

B - Ownership Plat

C - Tabular Summary of Wells
Located Within a Two Mile Radius

D - Tabular Summary of Wells Located
Within a Half Mile Radius

E - Tabular Summary of Plugged Wells
Within a Half Mile Radius

F - Tabular Summary of Ownership
Within a Two Mile Radius

G - Schematic Diagram of Typical
Plugged Well

H - Schematic Diagram of Typical
Injection Well

I - Well Logs of Typical Well

J - Summary of Red Mountain Waterflood

HISTORY

The Chaco Wash Mesa Verde oil pool is located in Sections 21, 22, 27 and 28 of T20N and R9W, McKinley County, New Mexico.

The Chaco Wash oil pool was discovered in the late 1930's and the early attempts to develop the pool were unsuccessful due primarily to the lack of reservoir energy. Production was very minor and very sporadic until 1967.

Between 1968 and 1971, the field produced approximately 4,000 barrels of oil from an average of four wells with most of the production in the first two years. In 1973, a single inverted five spot pilot waterflood was initiated. This small pilot flood increased the production by sixteen fold until it was discontinued in January, 1975. From that time to July, 1979, the lease has been produced on primary and averaged less than a barrel per day.

GEOLOGIC SUMMARY

The shallow oil pay at Chaco Wash is a lenticular sandstone of the Menefee formation, Mesa Verde Group of Cretaceous age occurring at depths of approximately 340 feet.

The Menefee formation is a series of sandstones, shales and coal beds deposited in a nearshore lagunal or swamp environment. In the Chaco Wash area it extends to a depth of about 1,600 feet. The Chaco Wash pay is a fluvial channel from 9 to 19 feet in thickness drapped over a structural nose.

The trapping is both stratigraphic and structural, to the east and west by the channel edges, and north and south by the structural closure provided by the fold. The Chaco Wash is on the Chaco slope on the south flank of the San Juan basin, with a 400 foot+ northeast trending normal fault downthrown to the west. No oil water contact has been found yet.

In light of the experience acquired through the waterflood of the Red Mountain field located in Sections 20 and 29, T20N and R9W, and the pilot waterflood done on the Chaco Wash oil pool, it is expected that increased recovery will result through repressuring and flushing the producing zone.

RESERVOIR CHARACTERISTICS AND PRODUCTION PERFORMANCE

The core analysis of the Chaco Wash pay shows an average porosity of 27%, permeabilities to dry air of the order of 300 millidarcies. The initial oil saturation is estimated at 50% because the core was considerably flushed during the coring.

The oil is a light brown, low sulphur, low paraffin 45° API with no associated C_1 or C_2, and only very small amounts of C_3 through C_5 have been seen on the chromatograph. Consequently, the quantity of gas produced with the oil has been reported to be too small to be measurable. Moreover, the initial field pressure was reported to have been 140 psi. There is no evidence for a water drive and little or no energy stored in the reservoir.

The typical performance of a well producing from the Chaco Wash sand is characterized by a very rapid decline from 25 BOPD to 1 BOPD.

Production to date:

Primary: 0
Average net pay: 12 feet
Average porosity: 25%
Total acreage: 20 acres (estimated)
Oil saturation: 45% (estimated)
Oil formation volume factor: 1.05 (estimated)
O.O.I.P.: 200,000 bbls.
Remaining oil reserves: 200,000 bbls.

WATERFLOOD

The objective of the waterflood is two fold:

Repressuring the Reservoir

This would prevent gas blockage at the producing well and provide the energy necessary to the oil flow, hence the need for an early water injection program.

Flushing the Remaining Oil

As in any waterflood, the injected water will displace some of the residual oil, thus increasing recovery.

Feasibility

The initiation of a single inverted pilot waterflood in 1973 demonstrated the floodability of the Chaco Wash Sand in this area by increasing the production sixteen fold.

Proposed Waterflood

The relative homogeneity of the reservoir, the low dip of the structure and the location of several wells completed into the pay zone led to the following waterflood design:

Injection pattern - Five spot
Pattern size - 5 acres
Injection pressure - 150 psi
Injection rate - 25 BWPD/well

Estimated Waterflood Recovery

An estimation of the waterflood recovery was obtained using the Dykstra-Parsons method because the reservoir characteristics were compatible with the assumptions of the method and due to the availability of core analysis data.

	M		
WOR	1.0	1.3	2.0
1	.25	.225	.188
5	.352	.317	.273
25	.436	.407	.378
100	.467	.460	.441

M = 1.3 R = .407 Nwp = RxN = 58,000 bbls.
WOR = 25 Ea = .72

KEPLINGER and Associates, Inc.

PROPOSED INJECTION WELLS

To obtain the waterflood pattern, several wells will have to be drilled in unorthodox locations. The following list is a tabular summary of the proposed injection and production wells.

WELL NAME	LOCATION	STATUS	COMPLETION TYPE
State #1	990/FNL	D & A	Producing
State #2	990/FNL 1650/FEL	D & A	Producing
State #3	990/FNL 1980/FEL	D & A	
State #4	1650/FNL 1650/FEL	D & A	
State #5	660/FNL 660/FEL	D & A	Injector
State #6	330/FNL 990/FEL	D & A	Injector
State #7	660/FNL 990/FEL	Waiting on completion	Producing
State #8	660/FNL 1315/FEL	To be drilled	Injector
State #9	330/FNL 1650/FEL	Waiting on completion	Injector
State #10	5/FNL 1315/FEL	To be drilled	Producing
State #11	330/FNL 660/FEL	Waiting on completion	Producing
State #12	990/FNL 660/FEL	To be drilled	Producing
State #13	1315/FNL 990/FEL	To be drilled	Producing
State #14	1315/FNL 660/FEL	To be drilled	Injector
State #15	1315/FNL 330/FEL	To be drilled	Producing
State #16	990/FNL 330/FEL	To be drilled	Injector
State #17	660/FNL 330/FEL	To be drilled	Producing
State #18	330/FNL 330/FEL	To be drilled	Injector
State #19	330/FNL 1315/FEL	To be drilled	Producing
State #20	990/FNL 1315/FEL	To be drilled	Producing

SOURCE OF INJECTION WATER

The Red Mountain Waterflood source water will be used as source water for injection into the Chaco Wash Sand. This source water is produced from the Chaco #20-1, Section 20 20N 9W, well completed in the Hopash-Gallup water sand. It is estimated that these water sands hold 372,000 barrels of water per acre. Furthermore, two tests produced artesian water at the rate of 2,160 BWPD on only 50 feet of the 196 feet of water sand present.

Chemical analyses were made before initiating the Red Mountain Waterflood and indicate a good compatibility with the connate water.

SURFACE EQUIPMENT

The surface equipment should allow monitoring of the injection wells, the production wells and the proper handling of produced water for re-injection.

Injection Facilities

Monitoring of the injection rate and pressure on each well.
Injection of a corrosion inhibitor.
Filtering, if necessary.
Injection lines of plastic to be buried at about 2-3 feet.
Tubing in the injection well, either plastic or plastic lined.
Storage tank to be added, if necessary.

Production Facilities

Monitoring of the production rates on each well.
Production lines in plastic from each well to well test system.
Free water knockout.
Heater treater.
Storage tanks for the produced water and injection pump.
Storage tanks for the oil production.

TABULAR SUMMARY OF WELLS LOCATED WITHIN A TWO MILE RADIUS EXHIBIT "C"

Identification Number	Well Name	Location	Completion Date	Producing Formation	Status
1	#1 Roseta	SW-SW 16-20N-9W (825N/S 330E/W)	7-20-68	Menefee	D & A
2	#1 Santa Fe	SE-SE-NE 19-20N-9W	1-15-37	Menefee	D & A
3	#1 Red Mountain	NE-SW-SE 20-20N-9W	6- 4-44	Menefee	
4	#1 Santa Fe	NE-SW-SE 20-20N-9W	4-18-36	Menefee	
5	#20-1 Red Mountain	C-SE-SE 20-20N-9W (660N/S 660E/W)	7-31-58	Water well for Waterflood	
6	#2 Santa Fe	SW-SE 20-20N-9W	6-11-44	Menefee	
7	#2 Santa Fe	SW-SE-SE 20-20N-9W (83/N 1650/W)	8-26-36	Menefee	
8	#4 Santa Fe	SE-SW-SE 20-20N-9W (320/S 1920/E)	11- 8-36	Menefee	
9	#3 Santa Fe	SE-SW-SE 20-20N-9W (65/S 1713/E)	9-10-36	Menefee	
10	#5 Santa Fe	SW-SE 20-20N-9W	7-19-37	Menefee	
11	#7 Santa Fe	SW-SW-SE 20-20N-9W	8-15-38	Menefee	
12	#47 Santa Fe Pacific	SE-SW-SE 20-20N-9W (580/FNL 1400/FEL)	5-30-79	Menefee	
13	#1 Santa Fe Pacific 20	SE-SW-NW 20-20N-9W (2310/FNL 2310/FWL)	3-31-73	Menefee	P & A

TABULAR SUMMARY OF WELLS LOCATED WITHIN A TWO MILE RADIUS EXHIBIT "C"

Identification Number	Well Name	Location	Completion Date	Producing Formation	Status
14	#22 Santa Fe Pacific RR	SW-SW-SE 20-20N-9W (80N/S 2280W/E)	8-25-61	Menefee	P & A in 2-5-74
15	#36 Santa Fe RR	SW-SW-SE 20-20N-9W (265/FSL 2150/FEL)	5-12-74	Water Injection	
16	#38 Santa Fe RR	SW-SE 20-20N-9W (275/FSL 2510/FEL)	10-19-74	Menefee	
17	#23 Santa Fe Pacific RR	SW-SW-SE 20-20N-9W (490/S 2300/E)	9-14-61	Water Injection	
18	I-16 Santa Fe Pacific RR	NW-SW-SE 20-20N-9W (945N/S 2590W/E)	5- 2-62	Menefee	P & A 8-3-79
19	I-17 Santa Fe Pacific RR	SW-SW-SE 20-20N-9W (442N/S 2430E/W)	7-31-62	Water Injection	P & A 8-3-79
20	#D-2 Santa Fe Pacific RR	SW-SE 20-20N-9W (330N/S 1550W/E)	6- 1-63	Menefee	
21	#20-9 Santa Fe Railway	SW-SE 20-20N-9W (110N/S 1910W/E)	7-15-59	Menefee	
22	#23 SFP	SW-SW-SE 20-20N-9W (490/S 2300/E)	9-14-61	Menefee	
23	#24 SFP	SW-SE-SE 20-20N-9W (450/S 1145/E)	6- 9-60	Menefee	
24	#28 SFP	SE-SW-SE 20-20N-9W (1550/E 330/S)	4-30-62	Menefee	

TABULAR SUMMARY OF WELLS LOCATED WITHIN A TWO MILE RADIUS EXHIBIT "C"

Identification Number	Well Name	Location	Completion Date	Producing Formation	Status
25	SFP I-12	NW-SE-SE 20-20N-9W (1085/S 860/E)	3-26-61	Menefee	
26	SFP I-11	SE-NW-SE 20-20N-9W (1330/S 1490/E)	7-15-60	Menefee	P & A 8-3-79
27	SFP #4	SE-SW-SE 20-20N-9W (338/S 1865/E)		Menefee	
28	SFP #6	SW-SE 20-20N-9W	4- 5-38	Menefee	
29	SFP I-1	NW-SW-SE 20-20N-9W (980/S 2025/E)	11- 8-61	Menefee	P & A 8-3-79
30	SFP #1-9	SW-SE-SE 20-20N-9W (450/S 1145/E)	6- 9-60	Menefee	
31	State #1	NE-SW 20-20N-9W	1-15-37	Menefee	
32	SFP #25	SW-SW-SE 20-20N-9W (2575/E 80/S)	4-17-62	Menefee	P & A 2-5-74
33	#1 Blackeye	NE-SW-SW 29-20N-9W (990/FSL 990/FWL)	3-30-72	Menefee	
34	#2 Blackeye	SW-NE-SW 29-20N-9W (1650/FSL 1650/FWL)	9-24-72	Dakota "D"	P & A 9-24-72
35	#1 FEE	NE-NW-NE 29-20N-9W	7-10-36	Menefee	
36	#4 FEE	NE-NW-NE 29-20N-9W	8-30-36	Menefee	
37	#1 Jackson	SE-NW 29-20N-9W (330/FSL 1650/FWL)	10-16-72	Menefee	P & A 10-16-72

TABULAR SUMMARY OF WELLS LOCATED WITHIN A TWO MILE RADIUS EXHIBIT "C"

Identification Number	Well Name	Location	Completion Date	Producing Formation	Status
38	#2 Jackson	SE-SW-SW 29-20N-9W (330/FSL 990/FWL)	4- 1-76	Menefee	P & A 11-3-75
39	#6 Red Mountain	NE-NW-NE 29-20N-9W (450/S 1530/W)	5-25-55	Menefee	
40	#7 Red Mountain	NW-NW-NE 29-20N-9W (100/S 2475/W)	5-25-55	Menefee	
41	#1 RR Land	NE-NE-NW 29-20N-9W (250/S 2390/E)	7-17-36	Menefee	Loc. moved to #2 RR Land
42	#2 RR Land	NE-NE-NW 29-20N-9W (990/S 330/W)	1-15-37	Menefee	
43	#20 SFP	NE-NW-NE 29-20N-9W (300/N 1800/E)	1-10-59	Menefee	
44	#33 SFP	NW-NW-NE 29-20N-9W (600/N 2450/E)	9- 3-64	Menefee	
45	#35 SFP	NW-NW-NE 29-20N-9W (160/N 2135/E)	6-13-74	Menefee	
46	#43 SFP	NE-NW-NE 29-20N-9W (420/N 1940/E)	10-31-79	Menefee	2-15-80
47	SFP I-5	NE-NW-NE 29-20N-9W (615/N 1920/E)	3-27-62	Menefee	
48	#3 SFP Jackson	NW-SW-SW 29-20N-9W (990/S 330/W)	8-25-77	Dakota	P & A 8-31-77

TABULAR SUMMARY OF WELLS LOCATED WITHIN A TWO MILE RADIUS EXHIBIT "C"

Identification Number	Well Name	Location	Completion Date	Producing Formation	Status
49	#3 Santa Fe	NW-NW-NE 29-20N-9W (330/N 2310/W)	6-12-36	Menefee	
50	#5 Santa Fe	NE-NE-NW 29-20N-9W (2310/W 330/S)	1-25-38	Menefee	
51	#2 Santa Fe-Monback	SE-NW-SE 29-20N-9W (1650/FSL 1650/FEL)	6-13-73	Menefee	P & A 9-28-73
52	#42 Santa Fe Pacific	NE-NW-NE 29-20N-9W (105/FNL 1610/FEL)	4-19-79	Menefee	
53	#30 Santa Fe Railroad	NE-NW-NE 29-20N-9W (410S/N 1930W/E)	5-30-65	Menefee	P & A 6-9-79
54	#31 Santa Fe Railroad	SE-NE-NW 29-20N-9W (775S/N 2380E/W)	4-19-64	Menefee	P & A 1967
55	#37 Santa Fe Railroad	NW-NW-NE 29-20N-9W (350/FNL 2590/FEL)	9-27-74	Menefee	P & A 10-1-74
56	SFP #21	NW-NW-NE 29-20N-9W (310S/N 2290W/E)	6- 3-61	Menefee	P & A 6-10-79
57	1-18 Santa Fe Railroad	NE-NE-NW 29-20N-9W (90S/N 2410E/W)	7-28-62	Menefee	1967
58	#1 Santa Fe Railroad-D	NE-NW-NE 29-20N-9W (330S/N 1630W/E)	4- 1-62	Menefee	P & A 5-31-79
59	#34 Santa Fe RR	NW-NW-NE 29-20N-9W (95/FNL 2600/FSL)	4-25-74	Menefee	
60	#29-18 Santa Fe RR	NW-NE 29-20N-9W (100S/N 1380W/E)	1- 3-59	Menefee	P & A 8-8-79

TABULAR SUMMARY OF WELLS LOCATED WITHIN A TWO MILE RADIUS EXHIBIT "C" Page 6

Identification Number	Well Name	Location	Completion Date	Producing Formation	Status
61	SFP I-7	NW-NE-NE 29-20N-9W (225/N 1265/E)	6-19-60	Menefee	
62	SFP I-8	NW-NE-NE 29-20N-9W (5/N 1130/E)	6- 3-60	Menefee	
63	SFP I-13	NE-NE-NW 29-20N-9W (452/N 2740/E)	10- 6-61	Menefee	
64	SFP I-20	NW-SW-NE 29-20N-9W (1344/N 2555/W)	6-23-62	Menefee	
65	SFP I-21	SW-NW-NE 29-20N-9W (834/N 2113/W)	6-21-62	Menefee	
66	SFP I-22	SW-NW-NE 29-20N-9W (1115/N 2325/W)	7-31-62	Menefee	
67	#2 RR Land	NE-NE-NW 29-20N-9W	1-15-37	Menefee	
68	Red Mountain #2	29-20N-9W		Menefee	
69	SFP #35	NW-NE-NE 29-20N-9W (160/N 2135/E)	6-13-74	Menefee	
70	SFP I-6	NW-NE-NE 29-20N-9W (395/N 1265/E)	3-21-61	Menefee	P & A 8-3-79
71	SFP #1	NE-NW-NE 29-20N-9W (330/N 1620/E)	4-15-62	Menefee	
72	SFP #27	SW-NW-NE 29-20N-9W (730/N 2505/E)	5-24-62	Menefee	P & A 2-74

TABULAR SUMMARY OF WELLS LOCATED WITHIN A TWO MILE RADIUS EXHIBIT "C"

Identification Number	Well Name	Location	Completion Date	Producing Formation	Status
73	SFP #32	NW-NW-NE 29-20N-9W (45/N 2060/E)	9-28-64	Menefee	P & A 6-10-79
74	SFPRR #1	SW-SE-SE 29-20N-9W (330/N 990/E)	10-13-71	Menefee	
75	#29-19 Santa Fe RR	NE-NW-NE 29-20N-9W (100S/N 1800W/E)	1- 9-59	Menefee	P & A 2-3-76
76	#1 Federal	SW-NE-SE 29-20N-9W (1900N/S 40W/E)	4- 9-63	Menefee	P & A 6-6-63
77	#1-A Federal	NE-SE-NE 30-20N-9W (1930/FNL 660/FEL)	5- 8-72	Menefee	
78	#1 Federal 8-30	C-SE-NE 30-20N-9W (1980/FNL 660/FEL)	4-14-72	Menefee	P & A 4-15-72
79	#2 Santa Fe	SE-NE-NE 30-20N-9W		Menefee	
80	#1 Santa Fe	C-NE-NE 31-20N-9W (660/FNL 660/FEL)	4- 5-74	Dakota	P & A 4-5-74
81	#1 Santa Fe	NE-NE-NE 31-20N-9W (330/S 330/W)	1- 9-37	Menefee	
82	#1 Santa Fe Pacific Blackjack	N-NW-NE 31-20N-9W (330/FNL 1980/FEL)	4-23-75	Menefee	P & A 4-23-75
83	#51 Jaco	NW-NW-NW 32-20N-9W (330/FNL 330/FWL)	5-19-73	Menefee	P & A 4-4-75
84	#54 Jaco	NW-NW-NW 32-20N-9W (330/FNL 630/FWL)	7-27-73	Menefee	P & A 8-8-73

TABULAR SUMMARY OF WELLS LOCATED WITHIN A TWO MILE RADIUS EXHIBIT "C"

Identification Number	Well Name	Location	Completion Date	Producing Formation	Status
85	#58 Y Jaco	SE-NW-NW 32-20N-9W (726/FNL 863/FWL)	9-19-73	Menefee	
86	#59 Jaco	S-NW-NW 32-20N-9W (990/FNL 660/FWL)	7-23-74	Menefee	P & A 7-25-74
87	#83 Y Jaco	NW-SE-NW 32-20N-9W (1660/FNL 1650/FWL)	3-25-74	Menefee	P & A 4-17-74
88	#83 Jaco	NW-SE-NW 32-20N-9W (1650/FNL 1650/FWL)	5-28-73	Menefee	P & A 5-28-73
89	#115 Jaco	NW-SE-NE 32-20N-9W (1650/FNL 836/FEL)	10-22-73	Menefee	P & A 4-12-75
90	#173 Jaco	N-NW-SW 32-20N-9W (2310/FSL 660/FWL)	12- 7-75	Menefee	P & A 3-5-75
91	#55 Jaco-Slaughter	NE-NW-NW 32-20N-9W (340/FNL 810/FWL)	5-30-72	Dakota	P & A 5-30-72
92	#57 Jaco-Slaughter	SE-NW-NW 32-20N-9W (990/FNL 990/FWL)	7-28-72	Menefee	P & A 3-19-75
93	#55 Y Jaco	NE-NW-NW 32-20N-9W (390/FNL 960/FWL)	6-18-72	Menefee	
94	Jaco Slaughter #A-22	NW-NW-NE 32-20N-9W (340/FNL 2300/FEL)	7- 2-72	Menefee	P & A 9-20-74
95	Jaco Slaughter #1	NE-NW-NW 32-20N-9W (340/FNL 960/FWL)	5- 6-72	Menefee	P & A 2-28-73
96	#6 State	NE-NW-NE 32-20N-9W (220/FNL 1485/FEL)	6- 1-69	Menefee	P & A 8-30-73

TABULAR SUMMARY OF WELLS LOCATED WITHIN A TWO MILE RADIUS · EXHIBIT "C"

Identification Number	Well Name	Location	Completion Date	Producing Formation	Status
97	State #A-1	NW-NE-NE 32-20N-8W (440/FNL 990/FEL)	9- 5-69	Menefee	P & A 8-30-73
98	State #4	NW-NW-NE 32-20N9W (330/N 2310/E)		Menefee	
99	State #6Y	NE-NE-NE 32-20N-9W (225/N 1485/E)		Menefee	
100	Santa Fe Pacific #33-1	NW-NW-NW 33-20N-9@ (330/FNL 330/FWL)	6-29-76	Menefee	P & A 6-30-76
101	#1 FEE	NW-NW-SE 35-20N-9W	10- 1-36	Menefee	
102	Santa Fe #35-1	NE-NE-NW 35-20N-9W (500/FNL 2000/FWL)	7-28-78	Menefee	P & A 7-29-78

TABULAR SUMMARY OF WELLS LOCATED WITHIN A HALF MILE RADIUS — EXHIBIT "D" —

Identification Number	Well Name	Location	Completion Date	Total Depth	Casing String & Setting Depth	Sacks of Cement	Cement Tops	Status
103	#3 Santa Fe	SW-SE-SE 21-20N-9W	6-25-44	354	8 @ 315 12 @ 60			
104	#1 Santa Fe	SW-SW-SW 21-20N-9W	11- 7-35	540	2 @ 315 5-1/2 @ 900	5		
105	#4 Santa Fe	E-SE-SE 21-20N-9W (660N/S 330W/E)	11- 6-61	330	4 @ 320W/10			P & A 4-7-67
106	#8 Santa Fe	SE-SE 21-20N-9W (495N/S 660W/E)	1-11-62	325	6-5/8 @ 32W/10 4 @ 315W/10			P & A 1966
107	#1 Santa Fe	SE-SE 21-20N-9W (165FSL 965FEL)	4- 3-75	502 PB:316	4-1/2 @ 306W/25 2-3/8 @ 307			
108	#18 Santa Fe Pacific	SW-SE-SW 21-20N-9W (175FSL 1365FEL)	10-19-75	1,583	Not Reported			P & A 10-22-75
109	#3 Santa Fe Pacific RR	SW-SE-SW 21-20N-9W (165FSL 1815FWL)	10- 1-69	539	None			P & A 5-22-71
110	#4 Santa Fe RR or SFP #104	SE-SE-SE 21-20N-9W (165FSL 565FEL)	10- 1-68	340	5-1/2 @ 308W/25 2-3/8 @ 330			
111	#5 Santa Fe RR	NE-SE-SE 21-20N-9W (990N/S 330W/E)	10-31-61	360	5-1/2 @ 360W/10			P & A 4-7-67
112	#1 Santa Fe RR	SE-SE-SW 21-20N-9W (330FSL 2310FWL)	10- 9-69	565	None			P & A 5-17-71
113	#2 Santa Fe RR or SFP #102	SE-SE-SE 21-20N-9W (565FSL 165FEL)	10- 1-69	340	5-1/2 @ 310W/25			
114	#2 Santa Fe RR	SE-SW 21-20N-9W (165FNL 2145FWL)	6- 5-69	563	None			P & A 4-3-72
115	#3 Santa Fe RR or SFP #103	SE-SE-SE 21-20N-9W (165N/S 165W/E)	11- 8-68	340	5-1/2 @ 323W/15 2 @ 330			

TABULAR SUMMARY OF WELLS LOCATED WITHIN A HALF MILE RADIUS — EXHIBIT "D" —

Identification Number	Well Name	Location	Completion Date	Total Depth	Casing String & Setting Depth & Sacks of Cement	Cement Tops	Status
116	#10 Santa Fe RR	SW-SE-NE 21-20N-9W (2310S/N 990W/E)	8-16-62	350	5-1/2 @ 310W/10		P & A 4-7-67
117	#1-1 Santa Fe RR	SE-SE 21-20N-9W (360FSL 360FEL)	7-19-68	340	5-1/2 @ 316W/25 2 @ 322		
118	#17 Scannion	SE-SE 21-20N-9W (990N/S 660W/E)	3-31-68	350(a)			P & A 3-31-65
119	SFP #1	SE-SE-SE 21-20N-9W (565S 565E)	10-26-68	340	5-1/2 @ 326W/20 2-3/8 @ 330		
120	SFP #1	SW-SE-SE 21-20N-9W (990E 330S)	5-25-60	450			P & A 4-7-67
121	SFP #3	SE-SE-SE 21-20N-9W (330E 330S)	9- 1-61	320	5-1/2 @ 295W/10 4 @ 314W/10		P & A 4-17-67
122	SFP #7	S-SE-SE 21-20N-9W (165S 660E)	1-16-62	333	4-1/2 @ 318W/10 2 @ 312		P & A 4-7-67
123	SFP #101	SE-SE-SE 21-20N-9W (565S 565E)	10-26-68	340	5-1/2 @ 326W/20 2-3/8 @ 330		
124	SFP #113	SE-SE-SE 21-20N-9W (165S 965E)	4- 1-75	500(316)	4-1/2 @ 306W/10 2-3/8 @ 306		
125	SFPRR #2	SW-NW-SW 21-20N-9W (1650S 330W)	11- 1-60	405			P & A 4-7-67
126	#1 Santa Fe	SW-SW-SW 22-20N-9W	7-17-36	550	8-1/4 @ 65		
127	#6 Santa Fe or SFP #106	SW-SW 22-20N-9W (160N/S 165E/W)	11-18-68	349	4-1/2 @ 338W/25 2 @ 335		
128	#9 Santa Fe	SW-SW-SW 22-20N-9W (165N/S 165E/W)	7-20-62	343	5-1/2 @ 308W/10 2 @ 330		P & A 4-7-67
129	#12 Santa Fe	SW-SW-SW 22-20N-9W (495N/S 165E/W)	3-15-63	360	4 @ 326W/10		P & A 4-7-67

TABULAR SUMMARY OF WELLS LOCATED WITHIN A HALF MILE RADIUS EXHIBIT "D"

Identification Number	Well Name	Location	Completion Date	Total Depth	Casing String & Setting Depth & Sacks of Cement	Cement Tops	Status
130	#14 Scanlon	SW-SW-SW 22-20N-9W (165N/S 495E/W)	7-29-63	342	2-7/8 @ 342W/10		P & A 9-24-66
131	#18 Scanlon	NW-SW-SW 22-20N-9W (825N/S 165E/W)	7-28-63	360	2-7/8 @ 360W/10		P & A 9-23-66
132	#1-SFP Mesa	SE-NE-NW 22-20N-9W (895FSL 2505FEL)	5-19-75	532	4-1/2 @ 810W/25		P & A 9-15-75
133	#2 Santa Fe Pacific or SFP #104	NW-SE-SW 22-20N-9W (990FSL 1980FWL)	4- 3-75	485	4-1/2 @ 495W/25 2-3/8 @ 463		
134	#4 Santa Fe Pacific or SFP #116	NW-SE-SW 22-20N-9W (990FSL 1650FWL)	4-25-75	480			T & A
135	SFP #6	SE-NW-SW 22-20N-9W (1650S 990W)		260			P & A 4-7-67
136	SFP #117	SW-SE-SW 22-20N-9W (330S 1650W)	9-30-75	458	4-1/2 @ 448W/12		T & A
137	#5 Santa Fe Pacific RR	NW-NW-NW 27-20N-9W (160FNL 170FWL)	12- 3-68	352	2-3/8 @ 352W/8		9-28-73
138	#7 Santa Fe Pacific RR	NW-NW-NW 27-20N-9W (495FNL 495FWL)	10- 1-69	370	2-3/8 @ 375W/8		P & A 9-28-73
139	#9 Santa Fe Pacific RR	NW-SE-NW 27-20N-9W (1815FNL 1650FWL)	12- 1-68	520			P & A 6-10-71
140	#1 OH Well	NE-NE-NW 27-20N-9W (165S/N 2145E/W)	11-20-67	523	2-3/8 @ 505W/15		P & A 11-7-74
141	#2 OH Well	NE-NW 27-20N-9W (495S/N 2145E/W)	11-20-67	520	2-3/8 @ 500W/15		P & A 11-7-74
142	#3 OH Well	NE-NW 27-20N-9W (495S/N 2475E/W)	11-20-67	520	2-3/8 @ 500W/15		P & A 11-7-74
143	SFP #12	SW-SE-NW 27-20N-9W (2310N 1650W)		620			P & A 12-19-72

TABULAR SUMMARY OF WELLS LOCATED WITHIN A HALF MILE RADIUS EXHIBIT "D"

Identification Number	Well Name	Location	Completion Date	Total Depth	Casing String & Setting Depth & Sacks of Cement	Cement Tops	Status
144	#11 Santa Fe Pacific RR	NW-NW-NW 27-20N-9W (165S/N 165E/W)	8-17-62	343	5-1/2 @ 350W/10		P & A 1966
145	#13 Santa Fe Pacific RR	NW-NW 27-20N-9W (165S/N 495E/W)	9-10-62	375	5-1/2 @ 317W/10		P & A 4-7-67
146	#54 Jaco State	NW-NW 27-20N-9W (660FNL 660FWL)	4-18-72	3,910	7 @ 90W/10		P & A 8-15-72
147	#8 Santa Fe RR	NE-NW 27-20N-9W (330S/N 1650E/W)	11- 1-68	520	None		P & A 6-10-71
148	#17 Santa Fe Pacific	SW-SW 27-20N-9W (495N/S 165E/W)	3-15-63	340	4-1/2 @ 326W/10		P & A 9-28-73
149	#6 State	NW-NE-NE 28-20N-9W (330FNL 990FEL)	12-22-77	565 PB:503	3-1/2 @ 503W/30		
150	#2 State B	SE-NW-NE 28-20N-9W (990FNL 1650FEL)	5-15-76	520	4-1/2 @ 496W/25		
151	#2 State of New Mexico	NE-NE-NE 28-20N-9W (165S/N 165W/E)	9-22-62	350	5-1/2 @ 324W/10		P & A 4-7-67
152	#3 State	SW-NW-NE 28-20N-9W (990FNL 2310FEL)	12-25-76	773 PB:450	4-1/2 @ 320W/10 2-3/8 @ 300		
153	#4 State	NE-SW-NE 28-20N-9W (1650FNL 1650FEL)	5-19-76	598	None		P & A 5-19-76
154	#5 State	NE-NE-NE 28-20N-9W (660FNL 660FEL)	3-21-76	563	None		P & A 12-1-77
155	#2 Santa Fe	NW-SE-NE 28-20N-9W	10-22-36	340			
156	#3 Santa Fe	NE-SW-NE	8- 9-44	354			
157	#1 State	SW-NE-NE 28-20N-9W (970FNL 970FEL)	4-10-76	520	4-1/2 @ 490W/20 2-3/8 @ 495		
158	#1 State	NW-NW-NW 28-20N-9W (495S/N 495E/W)	10-19-62	1,208	4-1/2 @ 330W/3		P & A 1966

TABULAR SUMMARY OF WELLS LOCATED WITHIN A HALF MILE RADIUS EXHIBIT "D" Page 5

Identification Number	Well Name	Location	Completion Date	Total Depth	Casing String & Setting Depth & Sacks of Cement	Cement Tops	Status
159	#1 Ray	NE-NE-NW 28-20N-9W (330S/N 2310E/W)	11-24-59	900 PB:533	5-1/2 @ 542W/80		P & A 4-7-67
160	#6 Ray	NE-NW 28-20N-9W (303S/N 2240E/W)	10-12-68	505			P & A 10-12-66
161	#1 Santa Fe	NW-SE-NW 28-20N-9W	7-19-37	453			
162	#11 OH Well	NE-NE-NE 28-20N-9W (495FNL 495FEL)	10- 6-68	355	None		P & A 10-26-74
163	#12 OH Well	NE-NE-NE 28-20N-9W (165FNL 495FEL)	7-20-73	370 PB:363	4-1/2 @ 370W/25 2 @ 363		P & A 10-26-74
164	#13 OH Well	NE-NE-NE 28-20N-9W (330FNL 330FEL)	8-10-73	360 PB:357	4-1/2 @ 360W/25 2 @ 357		P & A 10-26-74
165	#39 OH Well	NE-NE-NW 28-20N-9W (350FNL 2310FWL)	1-15-72	556 PB:538	4-1/2 @ 500W/35		P & A 10-26-74
166	#6 OH Well	SE-NE-NW 28-20N-9W (825FNL 2145FWL)	10-13-67	545	None Reported		P & A 4-3-72
167	#7 OH Well	NW-NE-NW 28-20N-9W (495FNL 1815FWL)	10-21-67	540	None Reported		P & A 4-3-72
168	#9 OH Well	NE-NE-NE 28-20N-9W (165FNL 165FEL)	10- 3-68	358	None		
169	#10 OH Well	NE-NE-NE 28-20N-9W (495FNL 165FEL)	10- 5-68	365	4-1/2 @ 330W/20		10-26-74
170	#5 OH Well	NW-NW-NE 28-20N-9W (330N 2310W)	10- 7-67	525	2-3/8 @ 505W/50		P & A 10-26-74
171	#8 OH Well	N-NE-NW 28-20N-9W (330N 1980W)	3- 2-68	515	2-3/8 @ 492W/50		
172	Jaco State #104	NE-SW-NE 28-20N-9W (1815/N 1485/E)		491			10-30-74
173	New Mexico #1	NW-NW-NE 28-20N-9W (165/N 2475/E)	9-15-64	550			P & A 1966

TABULAR SUMMARY OF WELLS LOCATED WITHIN A HALF MILE RADIUS EXHIBIT "D" Page 6

Identification Number	Well Name	Location	Completion Date	Total Depth	Casing String & Setting Depth	& Sacks of Cement	Cement Tops	Status
	#2 Santa Fe	SE-SW 22-20N-9W (990FSL 1980FWL)	4- 3-75	485	4-1/2 @ 459W/25			

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing String & Setting Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
Seward #1	NW-SE-NE 19-20N-9W (1580/N 805/E)			Fill hole with mud bottom to pipe, 20 ft. cement plug on top of mud.	
SFP #20	SE-SE-NW 20-20N-9W (2310/N 2310/W)	4907		4907-4807 30 sacks neat cement 3560-3460 30 sacks neat cement 2820-2720 30 sacks neat cement 1630-1530 30 sacks neat cement 50-0 15 sacks neat cement	
Santa Fe Pacific #2	SE-SW-SE 20-20N-9W (1713/E 317/S)				
Santa Fe Pacific #3	SE-SW-SE 20-20N-9W (1713/E 65/S)				
Santa Fe Pacific #4	SE-SW-SE 20-20N-9W (320/S 1920/E)				
Santa Fe Pacific #9	SE-SW-SE 20-20N-9W (110/S 1910/E)				
Santa Fe Pacific #15	SW-SE-SE 20-20N-9W (378/S 978/E)	528		528-275 25 sacks 65-Surface 20 sacks	8-67
Santa Fe Pacific RR #18	NE-NW-NE 20-20N-9W (100/N 1380/E)				
Santa Fe Pacific WS #1	C-SE-SE 20-20N-9W (660/S 660/E)				
Santa Fe Pacific #22	SW-SW-SE 20-20N-9W (80/S 2280/E)			Hole filled with 15 sacks	2-5-74
Santa Fe Pacific #23	SW-SW-SE 20-20N-9W (490/S 2300/E)				

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing & Setting String Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
Santa Fe Pacific #24	SW-SE-SE 20-20N-9W (450/S 1145/E)				
Santa Fe Pacific #25	SW-SW-SE 20-20N-9W (2575/E 80/S)			Hole filled with 15 sacks	2-5-74
Santa Fe Pacific #28	SE-SW-SE 20-20N-9W (330/S 1550/E)				
Santa Fe Pacific RR #36	SW-SW-SE 20-20N-9W (265/S 2150/E)	424	Casing - 4 1/2"	424 35 sacks	
Santa Fe Pacific #38	SE-SE-SE 20-20N-9W (275/S 510/E)	459	Casing - 4 1/2"	459 25 sacks	T & A
Santa Fe Pacific #47	SE-SW-SE 20-20N-9W (580/S 1400/E)	420	Casing - 4 1/2"	420 20 sacks	
Santa Fe Pacific I-1	NW-SW-SE 20-20N-9W (980/S 2025/E)	468		468-118 5 sacks Surface 2 sacks	8-3-79
Santa Fe Pacific I-10	NW-SE-SE 20-20N-9W (900/S 1280/E)	420	Casing - 2"	420 8 sacks	
Santa Fe Pacific I-11	SE-NW-SE 20-20N-9W (1330/S 1490/E)	450		450-200 5 sacks Surface 2 sacks	8-3-79
Santa Fe Pacific I-12	NW-SE-SE 20-20N-9W (1085/S 860/E)	436	Casing - 2"	436 8 sacks	
Santa Fe Pacific I-15	SW-SW-SE 20-20N-9W (560/S 2470/E)	505		505-255 5 sacks Surface 2 sacks	8-3-79
Santa Fe Pacific I-16	NW-SW-SE 20-20N-9W (945/S 2590/E)	500		500-250 5 sacks Surface 2 sacks	8-3-79

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing & Setting String Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
Santa Fe Pacific 1-17	SW-SW-SE 20-20N-9W (442/S 2430/W)	525		525-275 5 sacks Surface 2 sacks	8-3-79
SFP #10	SW-SE-NE 21-20N-9W (2310/N 990/E)	316	Casing - 5 1/2"	316-226 10 sacks bottom Surface 3 sacks	4-7-67
SFP #2	SW-NW-SW 21-20N-9W (1650/S 330/W)	405		405-245 10 sacks bottom Surface 3 sacks	4-7-67
SFP #1	SE-SE-SW 21-20N-9W (2310/W 330/S)	565		565-500 15 sacks Drilling mud Surface 5 sacks	5-17-71
SFP #2	SE-SE-SW 21-20N-9W (2145/W 165/S)	563		563-100 15 sacks Drilling mud Surface 5 sacks	
SFP #3	SW-SE-SW 21-20N-9W (1815/W 165/S)	539		539-400 15 sacks Drilling mud Surface 5 sacks	5-22-71
SFP #4	SW-SE-SW 21-20N-9W (1485/W 165/S)				Location Abandoned
SFP #18	SW-SE-SW 21-20N-9W (1365/E 175/S)	1500		1500-1450 50' cement plug 325-275 50' cement plug Surface 5 sacks	10-22-75
SFP #101	SE-SE-SE 21-20N-9W (565/S 565/E)	340	Casing - 5 1/2"		
SFP #103	SE-SE-SE 21-20N-9W (165/S 165/E)	340	Casing - 5 1/2"		
SFP #104	SE-SE-SE 21-20N-9W (165/S 565/E)	340	Casing - 5 1/2"		

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing String & Setting Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
SFP #110	NE-NE-NE 21-20N-9W (360/E 360/N)				
SF RR #1	SW-SE-SE 21-20N-9W (330/S 990/E)	450		450-370 12 sacks Surface 3 sacks	4-7-67
SFP #3	SE-SE-SE 21-20N-9W (330/S 330/E)	320	Casing - 4"	320-210 10 sacks Surface 3 sacks	4-17-67
SFP #4	E-SE-SE 21-20N-9W (330/E 660/S)	330	Casing - 4"	330-215 10 sacks Surface 3 sacks	4-7-67
SFP #5	NE-SE-SE 21-20N-9W (330/E 990/S)	350	Casing - 5 1/2"	350-265 10 sacks Surface 3 sacks	4-7-67
SFP #7	S-SE-SE 21-20N-9W (660/E 165/S)	235	Casing - 5 1/2"	235-220 10 sacks Surface 3 sacks	4-7-67
SFP #8	S-SE-SE 21-20N-9W (660/E 495/S)	350	Casing - 5 1/2"	350-210 10 sacks Surface 3 sacks	4-7-67
SFP #113	SE-SE-SE 21-20N-9W (365/E 165/S)	350		350-300 10 sacks	
SFP #102	SE-SE-SE 21-20N-9W (565/S 165/E)	310	Casing - 5 1/2"	310 25 sacks	
SFP #6	SE-NW-SW 22-20N-9W (990/W 1650/S)	260		260-170 10 sacks Surface 3 sacks	4-7-67
SFP #9	-SW-SW 22-20N-9W (165/W 165/S)	340	Casing - 5 1/2"	340-260 10 sacks Surface 3 sacks	4-7-67
SFP #12	SW-SW-SW 22-20N-9W (165/W 495/S)	360	Casing - 4"	340-245 10 sacks Surface 3 sacks	4-7-67

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing String & Setting Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
Scanlon #14	SW-SW-SW 22-20N-9W (495/W 165/S)	342	Casing - 2 7/8"	342-30 10 sacks Surface 3 sacks	
Scanlon #18	NW-SW-SW 22-20N-9W (165/W 825/S)	360	Casing - 2 7/8"	360-30 10 sacks Surface 3 sacks	9-23-66
Santa Fe Pacific #116	NW-SE-SW 22-20N-9W (990/S 1650/W)	480			T & A
Santa Fe Pacific #117	SW-SE-SW 22-20N-9W (330/S 1650/W)	448	Casing - 4 1/2"	448 12 sacks	T & A
#1-SFP Mesa	SE-NE-NW 22-20N-9W (2505/E 895/S)	532	Casing - 4 1/2"	Bottom 5 sacks	9-15-75
SFP #5	NW-NW-NW 27-20N-9W (160/N 170/W)	352	Casing - 2 3/8"	352-252 8 sacks	9-28-73
SFP #7	NW-NW-NW 27-20N-9W (495/N 495/W)	375	Casing - 2 3/8"	375-275 8 sacks	9-28-73
SFP #11	NW-NW-NW 27-20N-9W (495/N 165/W)	340	Casing - 2 3/8"	340-240 12 sacks	9-28-73
SFP #8	NW-NE-NW 27-20N-9W (1650/W 330/N)	520		520-450 35 sacks 380-330 25 sacks 20-Surface 10 sacks	8-3-71
SFP RR #11	NW-NW-NW 27-20N-9W (165/N 165/W)	350	Casing - 5 1/2"	350-235 10 sacks Surface 3 sacks	1966
SFP RR #13	NW-NW-NW 27-20N-9W (459/W 165/N)	375	Casing - 5 1/2"	310-230 10 sacks Surface 3 sacks	4-7-67
SFP #12	SW-SE-NW 27-20N-9W (2310/N 1650/W)	620		620-485 15 sacks	12-19-72

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing & Setting String Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
SFP RR #9	NW-SE-NW 27-20N-9W (1815/N 1650/W)	520		520-250 30 sacks 50-0 5 sacks	6-10-71
#1 State	SW-NE-NE 28-20N-9W (970/N 970/E)	520	Casing - 4 1/2"	520-490 20 sacks	
#6 State	NW-NE-NE 28-20N-9W (330/N 990/E)	565	Casing - 3 1/2"	565-503 35 sacks	T & A
#3 State	SW-NW-NE 28-20N-9W (990/N 2310/E)	773	Casing - 4 1/2"	320-10 sacks	
#2 State	SE-NW-NE 28-20N-9W (990/N 1650/E)	496	Casing - 4 1/2"	496 25 sacks	
OH WELL #10	NE-NE-NE 28-20N-9W (495/N 165/E)	365	Casing - 4 1/2"	330-230 100' cement plug Filled hole with mud Surface 2 sacks	10-26-74
OH WELL #11	NE-NE-NE 28-20N-9W (495/N 495/E)	365		355-255 100' cement plug Filled hole with mud Surface 2 sacks	10-26-74
OH WELL #12	NE-NE-NE 28-20N-9W (165/N 495/E)	370	Casing - 4 1/2"	373-273 100' cement plug Filled hole with mud Surface 2 sacks	10-26-74
OH WELL #13	NE-NE-NE 28-20N-9W (330/N 330/E)	360	Casing - 4 1/2"	360-260 100' cement plug Filled hole with mud Surface 2 sacks	10-26-74
OH WELL #9	NE-NE-NE 28-20N-9W (165/N 165/E)	358		350-250 100' cement plug Filled hole with mud Surface 2 sacks	11-7-74

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing & Setting String Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
#5 State	NE-NE-NE 28-20N-9W (660/N 660/E)	563		Surface 5 sacks Dry hole marker	12-1-77
New Mexico State #2	NE-NE-NE 28-20N-9W (165/N 165/E)	350	Casing - 5 1/2'	350-0 10 sacks	4-7-67
N.M. State K-1883 #1	NW-NW-NE 28-20N-9W (165/N 2475/E)	480		480-360 20 sacks	4-7-67
OH WELL #4	NW-NW-NE 28-20N-9W (165/N 2475/E)				Location Abandoned
OH WELL #5	NW-NW-NE 28-20N-9W (330/N 2475/W)	525	Casing - 2 3/8"	500 5 sacks 250 5 sacks Surface 2 sacks	10-26-74
OH WELL #6	SE-NE-NW 28-20N-9W (825/N 2145/W)	545		545-485 15 sacks Filled hole with mud Surface 5 sacks	4-3-72
OH WELL #7	NW-NE-NW 28-20N-9W (495/N 1815/W)	540		540-480 15 sacks Filled hole with mud Surface 5 sacks	4-3-72
OH WELL #8	N-NE-NW 28-20N-9W (330/N 1980/W)	515	Casing - 2 3/8"	500 5 sacks 250 5 sacks Surface 2 sacks	
OH WELL #39	NE-NE-NW 28-20N-9W (350/N 2310/W)	556	Casing - 4 1/2"	510-410 100' cement plug Filled hole with mud Surface 2 sacks	10-26-74
Scanlon Ray #6	NE-NE-NW 28-20N-9W (330/N 2310/W)	505		505-250 20 sacks Surface plug & marker	10-12-66

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing & Setting String & Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
Ray #1	NE-NE-NW 28-20N-9W (2310/W 330/N)	545	Casing - 5 1/2"	545-410 15 sacks Surface plug & marker	4-7-67
Jaco State #1	C-NW-NW 28-20N-9W (660/N 660/W)	3700		3700-3600 18 sacks 2650-2550 18 sacks 500-400 18 sacks Surface 5 sacks	4-17-72
#1 State	NW-NW-NW 28-20N-9W (495/N 495/W)	1208	Casing - 4 1/2"	1208-550 heavy mud 550-200 40 sacks Surface 7 sacks	
#4 State	NE-SW-NE 28-20N-9W (1650/N 1650/E)	525		525-475 10 sacks 325-275 10 sacks Surface 3 sacks	5-19-76
Jaco State #104	NE-SW-NE 28-20N-9W (1815/N 1485/E)	491		491-391 100' cement plug Filled hole with mud Surface 2 sacks	10-30-74
Jaco State #203	SW-SW-SW 28-20N-9W (360/W 360/S)				Location Abandoned
#1 Blackeye	NE-SW-SW 29-20N-9W (990/S 990/W)				
Santa Fe Pacific #1	NE-NW-NE 29-20N-9W (330/N 1620/E)				
S.F. Pacific #20	NE-NW-NE 29-20N-9W (330/N 1800/E)	470	Casing - 2"	470 15 sacks	
S.F. Pacific #33	NW-NW-NE 29-20N-9W (600/N 2450/E)	500	Casing - 2"	500 30 sacks	

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing String & Setting Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
S.F. Pacific #34	NW-NW-NE 29-20N-9W (95/N 2600/E)	453	Casing - 4 1/2"	453 45 sacks	
S.F. Pacific #35	NW-NW-NE 29-20N-9W (160/N 2135/E)	428	Casing - 5"	428 25 sacks	
S.F. Pacific #42	NE-NW-NE 29-20N-9W (105/N 1610/E)	438	Casing - 4 1/2"	438 40 sacks	
S.F. Pacific #43	NE-NW-NE 29-20N-9W (420/N 1940/E)	480	Casing - 4 1/2"	480 45 sacks	2-15-80
S.F. Pacific I-5	NE-NW-NE 29-20N-9W (615/N 1920/E)	463	Casing - 2"	463 8 sacks	
S.F. Pacific I-7	NW-NE-NE 29-20N-9W (225/N 1265/E)	443	Casing - 2"	443 4 sacks	
S.F. Pacific I-8	NW-NE-NE 29-20N-9W (5/N 1130/E)	450	Casing - 2 3/8"	450 4 sacks	
S.F. Pacific I-13	NE-NE-NW 29-20N-9W (452/N 2740/E)	460	Casing - 2"	460 10 sacks	
S.f. Pacific I-20	NW-SW-NE 29-20N-9W (1344/N 2555/W)	509	Casing - 2"	509 10 sacks	
S.F. Pacific I-21	SW-NW-NE 29-20N-9W (834/N 2113/W)	497	Casing - 2"	497 10 sacks	
S.F. Pacific I-22	SW-NW-NE 29-20N-9W (1115/N 2325/W)	567	Casing - 2"	567 10 sacks	
Santa Fe Monback	SE-NW-SE 29-20N-9W (1650/S 1650/E)	400		400-250 150' cement plug 50-0 50' cement plug	9-28-73

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing & Setting String Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
#2 Blackeye	SW-NE-SW 29-20N 9W (1650/S 1650/W)	3880		3880-3780 3690-3590 2895-2695 1680-1580 720-620	9-24-72
Santa Fe #3	NW-NW-NE 29-20N-9W (330/N 2310/E)				
SFP Jackson #2	SE-SW-SW 29-20N-9W (330/S 990/W)	1130		1130-1080 150' cement plug Surface 5 sacks	11-3-75
SFP Jackson #3	NW-SW-SW 29-20N-9W (990/S 330/W)	3800		3800-3700 cement plug 2850-2750 cement plug 1600-1500 cement plug Surface 5 sacks Dry hole marker 5 sacks	8-31-77
Jackson #1	SE-SW-SW 29-20N-9W (330/S 990/W)	1136		1136-1036 100' cement plug 590-540 50' cement plug Surface 10' cement plug	10-16-72
Santa Fe Pacific Railroad	SW-SE-SE 29-20N-9W (330/S 990/E)			Surface 5 sacks	5-15-76
Santa Fe RR #7	NW-NW-NE 29-20N-9W (100/N 2475/E)				
Santa Fe Pacific #19	NE-NW-NE 29-20N-9W (100/N 1800/E)			Filled hole with 15 sacks from total depth to surface	2-4-74
Santa Fe Pacific #21	NW-NW-NE 29-20N-9W (310/N 2290/E)			Spotted 5 sacks plug Marker set with 2 sacks	6-10-79
Santa Fe Pacific #27	SW-NW-NE 29-20N-9W (730/N 2505/E)			Filled hole with cement	2-74

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing & Setting String Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
Santa Fe Pacific #30	NE-NW-NE 29-20N-9W (410/N 1930/E)	973		973 5 sacks 500 3 sacks Surface marker 2 sacks	6-9-79
Santa Fe Pacific #32	NW-NW-NE 29-20N-9W (45/N 2060/E)			Bottom 5 sacks Dry hole marker 2 sacks	6-10-79
Santa Fe Pacific #31	SE-NE-NW 29-20N-9W (775/N 2380/W)				1967
Santa Fe Pacific #37	NW-NW-NE 29-20N-9W (350/N 2590/E)	450		450-400 50 sacks Filled hole with mud Marker set with 2 sacks	10-1-74
Santa Fe Pacific D-1	NE-NW-NE 29-20N-9W (330/N 1630/E)	967	Casing - 2"	967 25 sacks	5-31-79
Santa Fe Pacific I-6	NW-NE-NE 29-20N-9W (395/N 1265/E)	499		499-149 7 sacks Surface 2 sacks	8-3-79
Santa Fe Pacific I-18	NE-NE-NW 29-20N-9W (90/N 2410/W)	600		600-499 10 sacks 100-0 2 sacks	1967
Government #1	NW-SW-SE 30-20N-9W (1624/N 2355/E)				11-50
#1 Federal 8-30	C-SE-NE 30-20N-9W (1980/N 660/E)	3700		3700-3400 300' cement plug 2300-2150 150' cement plug 1700-1550 150' cement plug Surface 10' cement plug	4-15-72
Federal #1	SW-NE-SE 30-20N-9W (1900/S 840/E)	579		579 15 sacks 100-Surface 25 sacks	5-6-63
Federal #A-1	NE-SE-NE 30-20N-9W (1930/N 660/E)	1060	Casing - 4 1/2"	1060 95 sacks	

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing & Setting String Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
Federal #30-2	SE-NW-SE 30-20N-9W (1900/S 1830/E)	530		530-230 30 sacks 75-Surface 7 sacks	4-14-64
Federal #30-3	NE-SW-SE 30-20N-9W (910/S 1830/E)	577		577-2[illegible] 30 sacks 75-Surface 7 sacks	4-14-64
Federal #30-4	NW-SE-SE 30-20N-9W (910/S 840/E)	577		577-275 30 sacks Surface 7 sacks	3-12-64
Santa Fe #1	C-NE-NE 31-20N-9W (660/N 660/E)	3699		3699-3532 40 sacks 3019 100' cement plug 1000 100' cement plug 105-0 cement plug	4-5-74
Santa Fe Pacific Blackjack #1	N-NW-NE 31-20N-9W (330/N 1980/E)	3550		3550-3450 100' cement plug 2800-2600 200' cement plug 1500-1400 100' cement plug Surface 5 sacks	4-23-75
Red Mountain #1	C-NW-NW 31-20N-9W (660/N 660/W)	3440		3440-3340 32 sacks 2620-2470 48 sacks 1350-1250 32 sacks 650-600 16 sacks Surface 5 sacks	5-26-71
Red Mountain #1	Section 31			10 sacks	9-41
State #A-1	NW-NE-NE 32-20N-9W (400/N 990/E)	850		850-0 5 sacks	8-30-73
Jaco Slaughter #A-22	NW-NW-NE 32-20N-9W (340/N 2300/E)	550		550-435 25 sacks 150-35 25 sacks	9-20-74
N.M. State #6	NE-NW-NE 32-20N-9W (220/N 1485/E)	600		600-0 20 sacks	8-30-73

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing & Setting String Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
N.M. State #8	SE-NW-NE 32-20N-9W (1155/N 1485/E)	45			
Jaco Slaughter #1	NE-NW-NW 32-20N-9W (340/N 960/W)	1200		1200-30 90 sacks	2-28-73
Jacc #54	NW-NW-NW 32-20N-9W (330/N 630/W)				8-8-73
Jaco Slaughter #55	NE-NW-NW 32-20N-9W (340/N 810/W)	3790		3790-3740 15 sacks 3590-3540 15 sacks 2800-2700 28 sacks 1575-1475 28 sacks 1070-1020 15 sacks Surface 15 sacks	
Jaco #57	SE-NW-NW 32-20N-9W (990/N 990/W)	200		200-35 25 sacks	3-19-75
Jaco #59	S-NW-NW 32-20N-9W (990/N 660/W)	1060		1060-965 10 sacks 450-355 10 sacks	7-25-74
Jaco #51	NW-NW-NW 32-20N-9W (330/N 330/W)	1060		1060-960 20 sacks	4-4-75
Jaco #83	NW-SE-NW 32-20N-9W (1650/N 1650/W)	510		510-368 12 sacks	5-28-73
Jaco #83-Y	NW-SE-NW 32-20N-9W (1660/N 1650/W)	1050		1050-965 15 sacks 460-375 15 sacks	4-17-74
Jaco #178	N-NW-SW 32-20N-9W (660/W 2310/S)	200		200-106 20 sacks	3-5-75

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing String & Setting Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
Jaco #115	NW-SE-NE 32-20N-9W (1650/N 836/E)	750		750-610 30 sacks 500-406 20 sacks	4-12-75
Jaco #55-Y	NE-NW-NW 32-20N-9W (390/N 960/W)	1040	Casing - 5 1/2"	1040 75 sacks	
Jaco #58-Y	SE-NW-NW 32-20N-9W (726/N 863/W)	1038	Casing - 4 1/2"	1038 80 sacks	
Santa Fe Pacific #33-1	NW-NW-NW 33-20N-9W (330/N 330/W)	1050		1050-1000 Surface 5 sacks	6-30-76
Santa Fe #35-1	NE-NE-NW 35-20N-9W (500/N 2000/W)	4935		4935-4785 60 sacks 3819-3669 60 sacks 1830-1680 75 sacks 267-117 75 sacks 30-0 15 sacks	7-29-78

TABULAR SUMMARY OF OWNERSHIP WITHIN A TWO MILE RADIUS EXHIBIT "F"

Lease	Company	Address
20N-9W: NW of SE 1/4 of Sec. 16 S 1/2 of Sec. 27 S 1/2 of Sec. 29 All of Sec. 31 All of Sec. 33 All of Sec. 34 19N-9W: All of Sec. 4 All of Sec. 5	Tenneco Oil Co.	Penthouse 720 South Colorado Blvd. Denver, Colorado 80222
20N-9W: All of Sec. 14 All of Sec. 15 S 1/2 of Sec. 17 S 1/2 + NW 1/4 of Sec. 18 All of Sec. 19 N 1/2 of Sec. 20 N 1/2 + SW 1/4 of Sec. 21 N 1/2 + SE 1/4 of Sec. 22 All of Sec. 23 All of Sec. 26 NE 1/4 of Sec. 27 All of Sec. 35	Santa Fe Energy Co.	Box 12058 American National Bank Building Amarillo, Texas 79101
20N-9W: N 1/2 of Sec. 17 SE 1/4 of SW 1/4	David W. Miller	
19N-9W: All of Sec. 3	Lilly M. Yates	

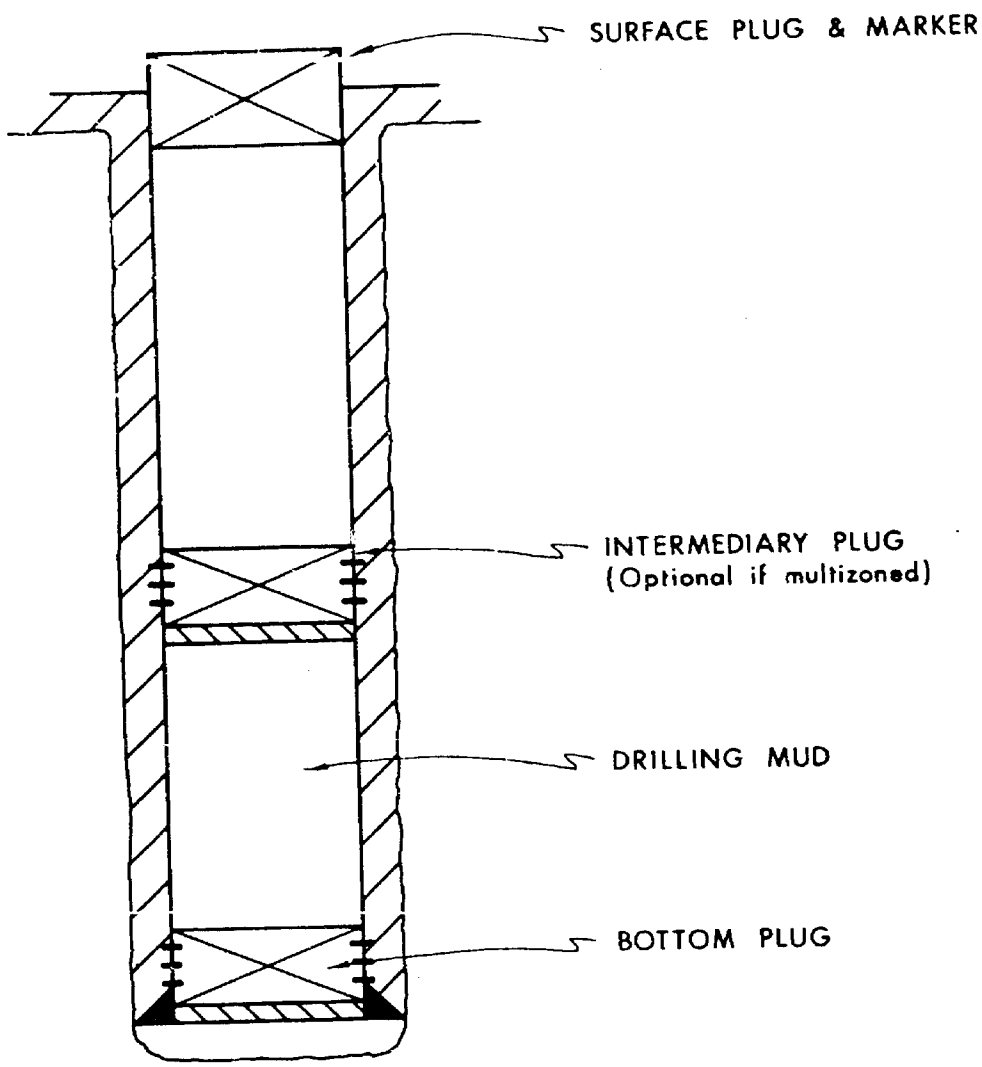
TABULAR SUMMARY OF OWNERSHIP WITHIN A TWO MILE RADIUS EXHIBIT "F"

Lease	Company	Address
	Wiser Oil Co.	Box 192 Sistersville, West Virginia 26175
S 1/2 of NW 1/4 of Sec. 30 NW 1/4 of NW 1/4 of Sec. 30		
	Marjack, Inc.	
N 1/2 of SE 1/4 SE 1/4 of SE 1/4 of Sec. 30		
	Billy Robinson	
SW 1/4 of NW 1/4 of Sec. 30 NW 1/4 of SW 1/4 SW 1/4 of SW 1/4		
	Lancaster Corp.	
NE 1/4 of SW 1/4 of Sec. 30 SW 1/4 of SE 1/4 of Sec. 30		
	Louis M. Wyman	
S 1/2 of NE 1/4 of Sec. 16 SE 1/4 of NW 1/4 SW 1/4 of SW 1/4 E 1/2 of SE 1/4		
	George H. Fredericks	
NW 1/4 of SE 1/4 of Sec. 16		
	Dome Petroleum	Suite 1400 1600 Broadway Denver, Colorado 80202
NE 1/4 of NE 1/4 of Sec. 16 W 1/2 of NW 1/4 of Sec. 16 N 1/2 of SW 1/4 of Sec. 16 SE 1/4 of SW 1/4 of Sec. 16 SW 1/4 of SE 1/4 of Sec. 16		

TABULAR SUMMARY OF OWNERSHIP WITHIN A TWO MILE RADIUS — EXHIBIT "F" —

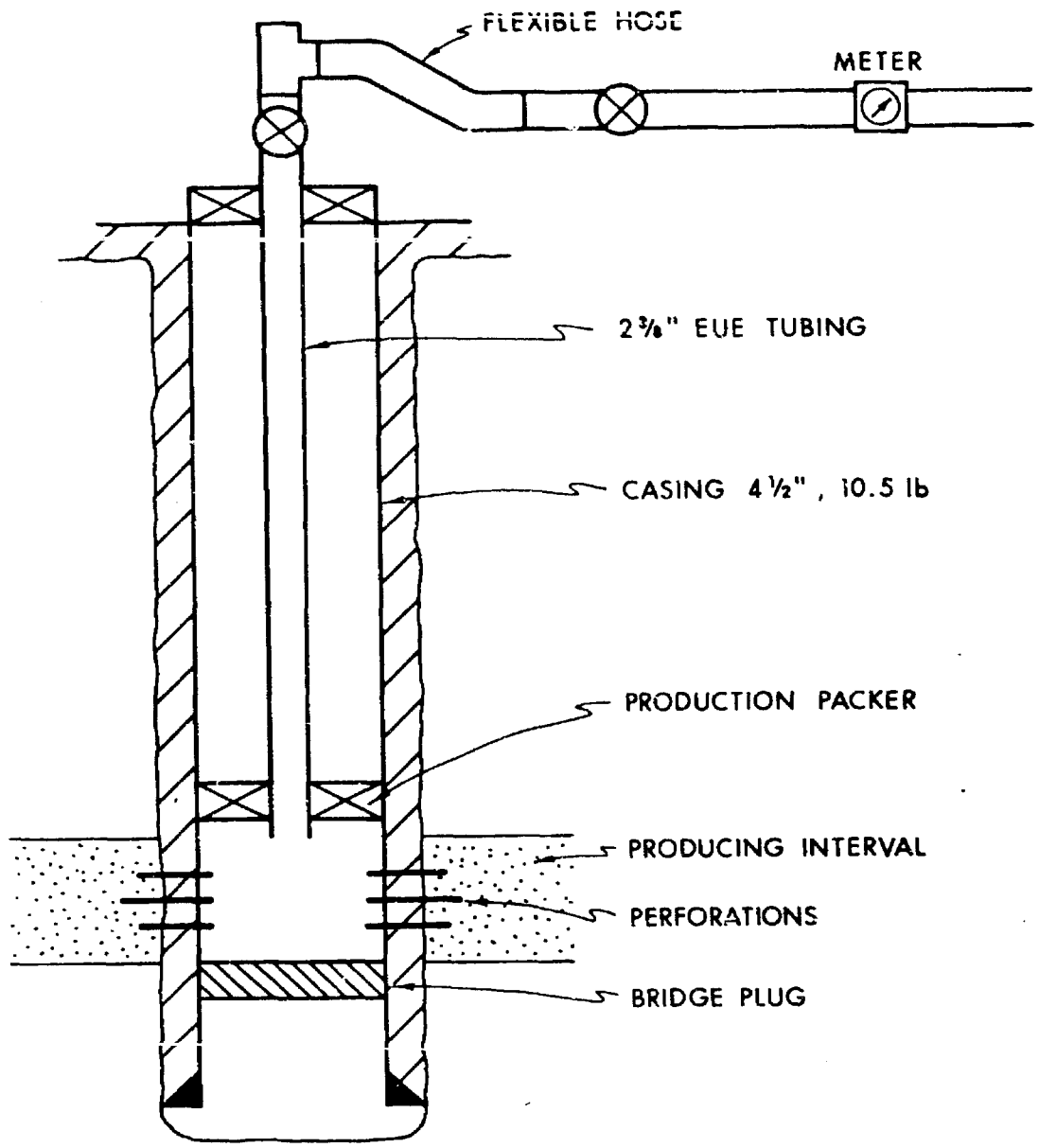
Lease	Company	Address
	BCO Dev.	
NW 1/4 of NE 1/4 of Sec. 16 NE 1/4 of NW 1/4 of Sec. 16 SW 1/4 of NE 1/4 of Sec. 32		
	Louis M. Wyman	
SE 1/4 of NE 1/4 of Sec. 32 NW 1/4 of NW 1/4 of Sec. 32 NE 1/4 of SW 1/4 of Sec. 32 SW 1/4 of SW 1/4 of Sec. 32 SE 1/4		
	Lou & Paula Wyman	
N 1/2 of NE 1/4 of Sec. 32 SE 1/4 of NW 1/4 NW 1/4 of SW 1/4	-	
	Claude C. Kennedy	
SW 1/4 of NW 1/4 of Sec. 32		
	Open Land	
SE 1/4 of SW 1/4		
19N-9W:	Gulf Oil	Box 2100 Houston, Texas 77001
All of Sec. 2		

EXHIBIT G



TYPICAL SCHEMATIC OF A PLUGGED WELL
IN THE CHACO WASH AREA

EXHIBIT H



TYPICAL SCHEMATIC OF AN INJECTION WELL

SUMMARY OF RED MOUNTAIN WATERFLOOD - EXHIBIT "J"

RED MOUNTAIN WATERFLOOD

The Red Mountain Waterflood oil field was discovered in June, 1934, and is located in Sections 20 and 29, T20N and R9W, in Northern McKinley County, New Mexico. It is about 1 mile east of the Chaco Wash field.

Primary production from the field was marginal until it was partially waterflooded in 1961.

The waterflood at 450 feet covered 50 to 70 acres of the Red Mountain pay. This single channel has become the most successful waterflood on a per acre basis in Northern New Mexico, yielding over 236,000 bbls. of oil compared to 26,000 bbls. for the primary recovery by December, 1977. Oil per acre recovery ranged from 3,371 to 4,720 bbls.

RED MOUNTAIN MESAVERDE

(Oil)

T. 20 N., R. 9 W., NMPM

McKinley County, New Mexico

By: Bruce A. Black
Colorado Plateau Geological Services

GEOLOGY

Regional Setting: South flank of the San Juan Basin

Surface Formations: Cretaceous, Menefee Formation

Exploration Method Leading to Discovery: Surface mapping

Type of Trap: Structural-stratigraphic

Producing Formation: Cretaceous, Menefee Formation

Gross Thickness and Lithology of Reservoir Rocks: 15 feet, fluvial channel sandstone

Geometry of Reservoir Rock: Lenticular channel sandstone which pinches out both east and west

Other Significant Shows: None

Oldest Stratigraphic Horizon Penetrated: Cretaceous, Menefee Formation (975 feet)

DISCOVERY WELL

Name: Stacy, Weber, et al. No. 1 SFP

Location: NE NE sec. 29, T. 20 N., R. 9 W.

Elevation (KB): 6,480 feet

Date of Completion: June, 1934

Total Depth: 495 feet

Production Casing: 478 feet of 4½"

Perforations: Completed open hole

Stimulation: None

Initial Potential: Pump 5 BOD

Bottom Hole Pressure: 195 psi

DRILLING AND COMPLETION PRACTICES

Wells are normally drilled with natural water-base mud through the pay zone. 4½" casing is set on top of the pay and cemented to surface. Rods, tubing and pump are installed. Wells are pumped with small pump jacks. From spud to completion, operation takes three days.

RESERVOIR DATA

Productive Area:
Proved (as determined geologically): 40 acres
Unproved: 20 acres
Approved Spacing: 5 acres
No. of Producing Wells: 4 (14 injectors)
No. of Abandoned Wells: 25
No. of Dry Holes: 10

Average Net Pay: 15 feet

Porosity: 28 percent

Permeability: 400 millidarcies

Water Saturation: 50 percent

Initial Field Pressure: 195 psi

Type of Drive: Low pressure water drive

Gas Characteristics and Analysis: Small amounts of methane, ethane, propane, butane, and pentane with butane and pentane dominant; gas is too small to measure

Oil Characteristics and Analysis: Oil is light brown, low sulfur, low paraffin 42° API gravity

Associated Water Characteristics and Analysis: Fresh water

Original Gas, Oil, and Water Contact Datums: Oil water contact approximately +6,025 feet

Estimated Primary Recovery: 173 BO per acre (15 percent estimated primary recovery factor). Prior to water flood, the field had produced 25,290 BO

Type of Secondary Recovery: Under water-flood the field produced an additional 225,000 BO from 40 acres (as of January, 1978)

Estimated Ultimate Recovery: Assuming no additional deeper pays, the ultimate is established at 300,000 bbls of oil

Present Daily Average Production: 4 BOD (January, 1978)

Market Outlets: Oil trucked to Farmington by Plateau Corporation. No gas production.

FIELD COMMENTARY

The Red Mountain oil field is located in sections 20 and 29, T. 20 N., R. 9 W., in northern McKinley County, New Mexico. The field is 55 miles north of Grants, 50 air miles west of Cuba, 57 air miles south-southeast of Farmington and 93 air miles northwest of Albuquerque. The Red Mountain structure is situated in a broad strike valley in shale members of the Mesaverde Group some two miles south of the escarpment known as Chacra Mesa, which is capped by the uppermost member of the Mesaverde Group, the Cliff House Sandstone. Topographic relief in this portion of the San Juan Basin is generally slight, interrupted by occasional buttes capped by erosion-resistant sandstone beds. In a regional sense, the Red Mountain field is on the Chaco Slope on the south flank of the San Juan Basin between the Zuni Uplift to the south and the deeper parts of the San Juan Basin to the north. Regional dip is to the northeast at an average of about 100 feet per mile.

The Red Mountain pay zone is a fluvial channel sandstone and is the only pay horizon in the field. It ranges from 5 to 25 feet in thickness with an average of 15 feet of net pay. Porosities average 28 percent in this channel sandstone. The channel sandstone and the Red Mountain anticline combine to form a combination stratigraphic-structural trap with a low pressure water drive.

Oil was originally discovered in the Menefee Formation at Red Mountain by the Stacey, Weber et al., No. 1 Santa Fe well in sec. 29, T. 20 N., R. 9 W., in June of 1934. The discovery well, completed near the crest of a small but obvious surface anticline, produced at a rate of 5 BOD from a depth of 478 to 495 feet. In the next three years, 25 additional wells were drilled on the structure. Seven of these wells were completed as producers. Sporadic shallow primary development con-

tinued through the next two decades. Available state records indicate a cumulative production in excess of 22,000 barrels during this period of time.

However, since the field was discovered prior to the establishment of the Oil Conservation Commission, production and technical data now available are incomplete and unreliable. The productive area of the field, now covered by a lease from the Santa Fe Pacific Railroad Company, on the south half of section 20 and the north half of section 29, has changed hands intermittently since the field discovery. In 1937, this lease was assigned to Ben and Celia Sapir. In November of 1957, operation of this lease was assumed by Chaco Oil Company, a joint venture of Ben Sapir and Henry S. Birdseye. In November 1958, Chaco Oil Company assumed operations of the field. At this time, the field had four producers and was making approximately 300 barrels of oil per month. Chaco Oil Company drilled and logged an additional 10 shallow stratigraphic test holes to delineate the field boundaries and the structural configuration.

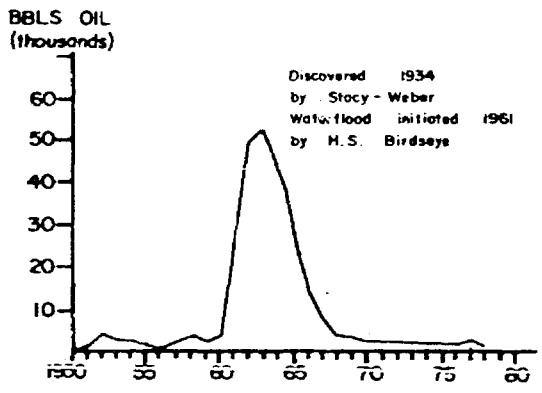
In July 1958, Chaco Oil Company drilled a Morrison test in the southeast quarter of section 20. This well bottomed at a total depth of 3,936 feet. The well was plugged and abandoned after encountering gas-cut salt water in the Dakota Sandstone. While this test did not find oil in the Dakota, oil and gas shows were logged in the samples and seen on the gas detector in the basal Menefee Formation, Point Lookout Sandstone, "Hospah" sandstone, "Gallup" sandstone, and Dakota Sandstone. Selected intervals in the "Hospah," "Gallup" and Dakota were drill-stem tested with negative hydrocarbon results. The well was plugged back to 900 feet and eventually completed as a water supply well in July of 1960 in preparation for flooding the north half of the Red Mountain field.

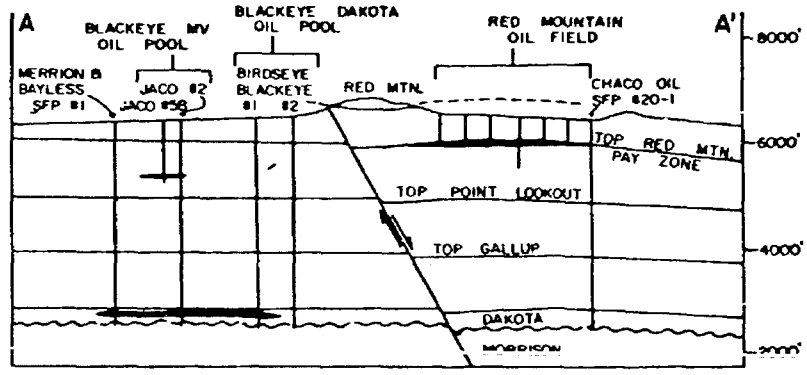
Chaco Oil Company began its first regular water injection into the Red Mountain field in January 1961. Between December of 1960 and March 1961, production was doubled to 1,080 barrels per month and by August of 1963, the field was making 5,440 barrels of oil per month. The water flood oil production peaked at 5,552 barrels per month in August 1963 and production gradually declined to its economic limit by September, 1969. Between 1960 and January 1971, the Red Mountain water flood had produced more than 241,156 barrels of 43° API gravity oil from approximately 55 acres of the field at an average depth of 450 feet, using a maximum of 15 injection and 10 producing wells. This is an average of approximately 293 barrels of oil recovered per net acre foot of reservoir flooded, or a cumulative oil recovery of 4,385 barrels per acre. Ninety percent of this oil was recovered in the six-year period from 1961 through 1966. This recovery is the highest flood recovery per acre in the San Juan Basin and is more than twice the per acre recovery of Gulf Oil's West Bisti Unit flood which is the next highest.

In December 1971, a partnership was formed to buy out the assets of the Chaco Oil Company. On June 20, 1972, and prior to beginning any additional water flood operations on the undeveloped and unflooded portions of the Red Mountain field, the general partner and operator were tragically killed in a small plane accident in southwestern New Mexico. The subsequent settlement of the general partners estate and resulting problems necessitated the termination of the partnership. Monback Associates acquired a 75 percent interest in the Red Mountain field in August 1973 and Colorado Plateau Geological Services, Inc. acquired the remaining 25 percent in 1975. A possible micellar flood is now being planned for the field in late 1979.

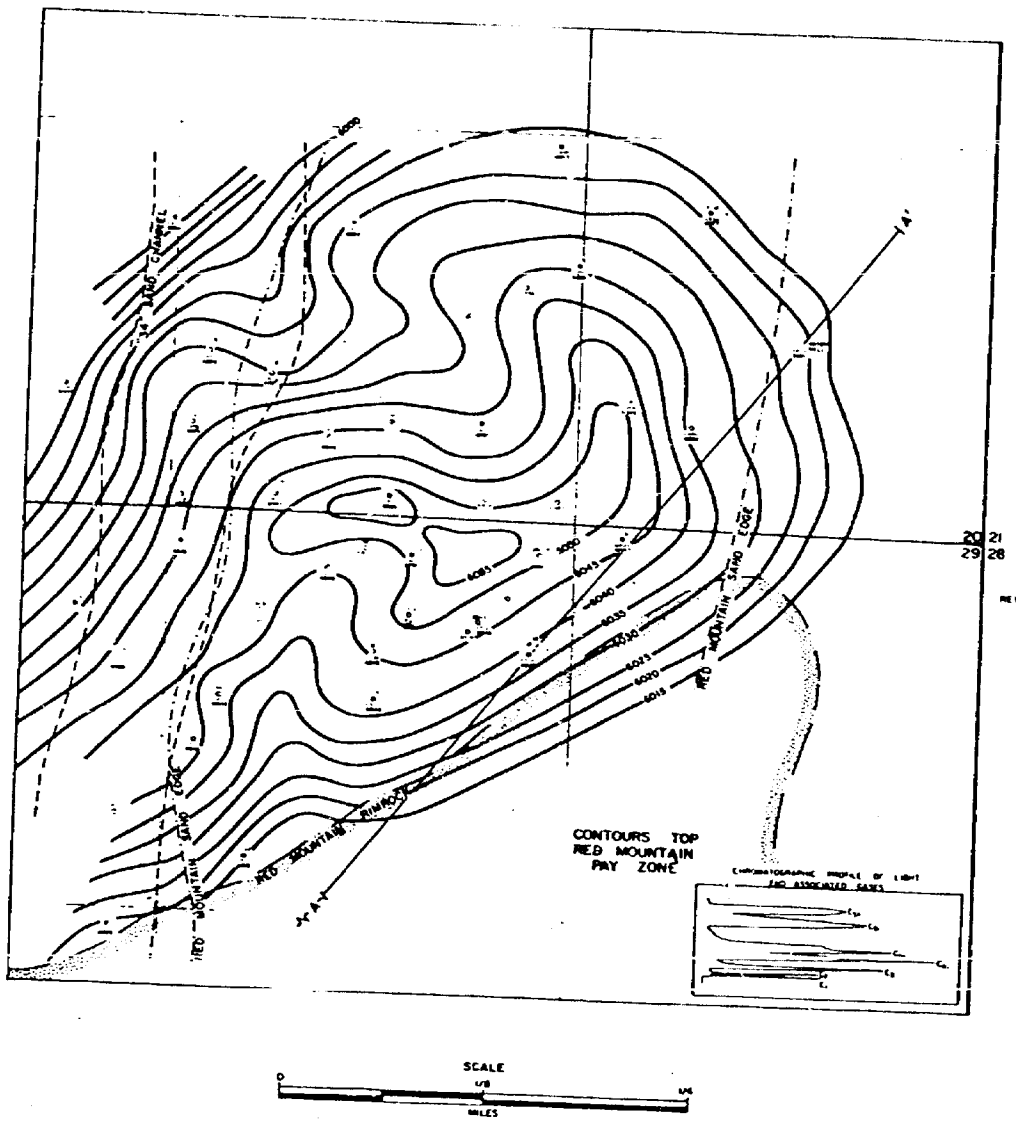
REFERENCES

Files of H. S. Birdseye (deceased).
New Mexico Oil Conservation Commission records.
Personal and operator's files.





Oil and Gas Fields of the Four Corners Area}


RED MOUNTAIN
OIL FIELD
STRUCTURE MAP
TOP RED MOUNTAIN
PAY ZONES
CHANNEL EDGES
SUPERIMPOSED
McKinley County, New Mexico
CONTOURS TOP
RED MOUNTAIN
PAY ZONE
RED MOUNTAIN SAND CORE
RED MOUNTAIN RIM NO 1
RED MOUNTAIN CHANNEL
A
A'
SCALE
MILES
SP
RES
TOP RED MOUNTAIN OIL PAY
NOTE REVERSE SP
CHACO OIL CO SFP D-1
330' FNL 1830' FEL
SEC 29 - 20 N - 9 W
D F 6498'
T D 1965'

NEW MEXICO OIL CONSERVATION COMMISSION

CASE NO. 7039

APPLICATION OF RED MOUNTAIN ASSOCIATES

FOR A FIVE SPOT WATERFLOOD PROJECT

AND SOME UNORTHODOX WELL LOCATIONS

IN THE CHACO WASH POOL

TOWNSHIP 20 NORTH

RANGE 9 WEST

McKINLEY COUNTY

NEW MEXICO

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Located Within a Two Mile Radius

D - Tabular Summary of Wells Located
Within a Half Mile Radius

E - Tabular Summary of Plugged Wells
Within a Half Mile Radius

F - Tabular Summary of Ownership
Within a Two Mile Radius

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Plugged Well

H - Schematic Diagram of Typical
Injection Well

I - Well Logs of Typical Well

J - Summary of Red Mountain Waterflood

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HISTORY

The Chaco Wash Mesa Verde oil pool is located in Sections 21, 22, 27 and 28 of T20N and R9W, McKinley County, New Mexico.

The Chaco Wash oil pool was discovered in the late 1930's and the early attempts to develop the pool were unsuccessful due primarily to the lack of reservoir energy. Production was very minor and very sporadic until 1967.

Between 1968 and 1971, the field produced approximately 4,000 barrels of oil from an average of four wells with most of the production in the first two years. In 1973, a single inverted five spot pilot waterflood was initiated. This small pilot flood increased the production by sixteen fold until it was discontinued in January, 1975. From that time to July, 1979, the lease has been produced on primary and averaged less than a barrel per day.

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GEOLOGIC SUMMARY

The shallow oil pay at Chaco Wash is a lenticular sandstone of the Menefee formation, Mesa Verde Group of Cretaceous age occurring at depths of approximately 340 feet.

The Menefee formation is a series of sandstones, shales and coal beds deposited in a nearshore lagunal or swamp environment. In the Chaco Wash area it extends to a depth of about 1,600 feet. The Chaco Wash pay is a fluvial channel from 9 to 19 feet in thickness draped over a structural nose.

The trapping is both stratigraphic and structural, to the east and west by the channel edges, and north and south by the structural closure provided by the fold. The Chaco Wash is on the Chaco slope on the south flank of the San Juan basin, with a 400 foot+ northeast trending normal fault downthrown to the west. No oil water contact has been found yet.

In light of the experience acquired through the waterflood of the Red Mountain field located in Sections 20 and 29, T20N and R9W, and the pilot waterflood done on the Chaco Wash oil pool, it is expected that increased recovery will result through repressuring and flushing the producing zone.

RESERVOIR CHARACTERISTICS AND PRODUCTION PERFORMANCE

The core analysis of the Chaco Wash pay shows an average porosity of 27%, permeabilities to dry air of the order of 300 millidarcies. The initial oil saturation is estimated at 50% because the core was considerably flushed during the coring.

The oil is a light brown, low sulphur, low paraffin 45° API with no associated C_1 or C_2, and only very small amounts of C_3 through C_5 have been seen on the chromatograph. Consequently, the quantity of gas produced with the oil has been reported to be too small to be measurable. Moreover, the initial field pressure was reported to have been 140 psi. There is no evidence for a water drive and little or no energy stored in the reservoir.

The typical performance of a well producing from the Chaco Wash sand is characterized by a very rapid decline from 25 BOPD to 1 BOPD.

Production to date:

Primary: 0
Average net pay: 12 feet
Average porosity: 25%
Total acreage: 20 acres (estimated)
Oil saturation: 45% (estimated)
Oil formation volume factor: 1.05 (estimated)
O.O.I.P.: 200,000 bbls.
Remaining oil reserves: 200,000 bbls.

WATERFLOOD

The objective of the waterflood is two fold:

Repressuring the Reservoir

This would prevent gas blockage at the producing well and provide the energy necessary to the oil flow, hence the need for an early water injection program.

Flushing the Remaining Oil

As in any waterflood, the injected water will displace some of the residual oil, thus increasing recovery.

Feasibility

The initiation of a single inverted pilot waterflood in 1973 demonstrated the floodability of the Chaco Wash Sand in this area by increasing the production sixteen fold.

Proposed Waterflood

The relative homogeneity of the reservoir, the low dip of the structure and the location of several wells completed into the pay zone led to the following waterflood design:

Injection pattern - Five spot
Pattern size - 5 acres
Injection pressure - 150 psi
Injection rate - 25 BWPD/well

will stay within .2 psi/ft

340
.2
68.0

Estimated Waterflood Recovery

An estimation of the waterflood recovery was obtained using the Dykstra-Parsons method because the reservoir characteristics were compatible with the assumptions of the method and due to the availability of core analysis data.

	M		
WOR	1.0	1.3	2.0
1	.25	.225	.188
5	.352	.317	.273
25	.436	.407	.378
100	.467	.460	.441

M = 1.3
WOR = 25

R = .407
Ea = .72

Nwp = RxN = 58,000 bbls.

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PROPOSED INJECTION WELLS

To obtain the waterflood pattern, several wells will have to be drilled in unorthodox locations. The following list is a tabular summary of the proposed injection and production wells.

WELL NAME	LOCATION	STATUS	COMPLETION TYPE
State #1	990/FNL 990/FEL	D & A	Producing
State #2	990/FNL 1650/FEL	D & A	Producing
State #3	990/FNL 1980/FEL	D & A	
State #4	1650/FNL 1650/FEL	D & A	
State #5	660/FNL 660/FEL	D & A	Injector
State #6	330/FNL 990/FEL	D & A	Injector
State #7	660/FNL 990/FEL	Waiting on completion	Producing
State #8	660/FNL 1315/FEL	To be drilled	Injector
State #9	330/FNL 1650/FEL	Waiting on completion	Injector
State #10	5/FNL 1315/FEL	To be drilled	Producing
State #11	330/FNL 660/FEL	Waiting on completion	Producing
State #12	990/FNL 660/FEL	To be drilled	Producing
State #13	1315/FNL 990/FEL	To be drilled	Producing
State #14	1315/FNL 660/FEL	To be drilled	Injector
State #15	1315/FNL 330/FEL	To be drilled	Producing
State #16	990/FNL 330/FEL	To be drilled	Injector
State #17	660/FNL 330/FEL	To be drilled	Producing
State #18	330/FNL 330/FEL	To be drilled	Injector
State #19	330/FNL 1315/FEL	To be drilled	Producing
State #20	990/FNL 1315/FEL	To be drilled	Producing

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SOURCE OF INJECTION WATER

The Red Mountain Waterflood source water will be used as source water for injection into the Chaco Wash Sand. This source water is produced from the Chaco #20-1, Section 20-20N-9W, well completed in the Hopash-Gallup water sand. It is estimated that these water sands hold 372,000 barrels of water per acre. Furthermore, two tests produced artesian water at the rate of 2,160 BWPD on only 50 feet of the 196 feet of water sand present.

Chemical analyses were made before initiating the Red Mountain Waterflood and indicate a good compatibility with the connate water.

SURFACE EQUIPMENT

The surface equipment should allow monitoring of the injection wells, the production wells and the proper handling of produced water for re-injection.

Injection Facilities

Monitoring of the injection rate and pressure on each well.
Injection of a corrosion inhibitor.
Filtering, if necessary.
Injection lines of plastic to be buried at about 2-3 feet.
Tubing in the injection well, either plastic or plastic lined.
Storage tank to be added, if necessary.

Production Facilities

Monitoring of the production rates on each well.
Production lines in plastic from each well to well test system.
Free water knockout.
Heater treater.
Storage tanks for the produced water and injection pump.
Storage tanks for the oil production.

TABULAR SUMMARY OF WELLS LOCATED WITHIN A TWO MILE RADIUS EXHIBIT "C"

Identification Number	Well Name	Location	Completion Date	Producing Formation	Status
1	#1 Roseta	SW-SW 16-20N-9W (1025N/S 330E/W)	7-20-68	Menefee	D & A
2	#1 Santa Fe	SE-SE-NE 19-20N-9W	1-15-37	Menefee	D & A
3	#1 Red Mountain	NE-SW-SE 20-20N-9W	6- 4-44	Menefee	
4	#1 Santa Fe	NE-SW-SE 20-20N-9W	4-18-36	Menefee	
5	#20-1 Red Mountain	C-SE-SE 20-20N-9W (660N/S 660E/W)	7-31-58	Water well for Waterflood	
6	#2 Santa Fe	SW-SE 20-20N-9W	6-11-44	Menefee	
7	#2 Santa Fe	SW-SE-SE 20-20N-9W (83/N 1650/W)	8-26-36	Menefee	
8	#4 Santa Fe	SE-SW-SE 20-20N-9W (320/S 1920/E)	11- 8-36	Menefee	
9	#3 Santa Fe	SE-SW-SE 20-20N-9W (65/S 1713/E)	9-10-36	Menefee	
10	#5 Santa Fe	SW-SE 20-20N-9W	7-19-37	Menefee	
11	#7 Santa Fe	SW-SW-SE 20-20N-9W	8-15-38	Menefee	
12	#47 Santa Fe Pacific	SE-SW-SE 20-20N-9W (580/FNL 1400/FEL)	5-30-79	Menefee	
13	#1 Santa Fe Pacific 20	SE-SW-NW 20-20N-9W (2310/FNL 2310/FWL)	3-31-73	Menefee	P & A

TABULAR SUMMARY OF WELLS LOCATED WITHIN A TWO MILE RADIUS EXHIBIT "C"

Identification Number	Well Name	Location	Completion Date	Producing Formation	Status
14	#22 Santa Fe Pacific RR	SW-SW-SE 20-20N-9W (80N/S 2280W/E)	8-25-61	Menefee	P & A in 2-5-74
15	#36 Santa Fe RR	SW-SW-SE 20-20N-9W (265/FSL 2150/FEL)	5-12-74	Water Injection	
16	#38 Santa Fe RR	SW-SE 20-20N-9W (275/FSL 2510/FEL)	10-19-74	Menefee	
17	#23 Santa Fe Pacific RR	SW-SW-SE 20-20N-9W (490/S 2300/E)	9-14-61	Water Injection	
18	I-16 Santa Fe Pacific RR	NW-SW-SE 20-20N-9W (945N/S 2590W/E)	5- 2-62	Menefee	P & A 8-3-79
19	I-17 Santa Fe Pacific RR	SW-SW-SE 20-20N-9W (442N/S 2430E/W)	7-31-62	Water Injection	P & A 8-3-79
20	#D-2 Santa Fe Pacific RR	SW-SE 20-20N-9W (330N/S 1550W/E)	6- 1-63	Menefee	
21	#20-9 Santa Fe Railway	SW-SE 20-20N-9W (110N/S 1910W/E)	7-15-59	Menefee	
22	#23 SFP	SW-SW-SE 20-20N-9W (490/S 2300/E)	9-14-61	Menefee	
23	#24 SFP	SW-SE-SE 20-20N-9W (450/S 1145/E)	6- 9-60	Menefee	
24	#28 SFP	SE-SW-SE 20-20N-9W (1550/E 330/S)	4-30-62	Menefee	

Identification Number	Well Name	Location	Completion Date	Producing Formation	Status
25	SFP I-12	NW-SE-SE 20-20N-9W (1085/S 860/E)	3-26-61	Menefee	
26	SFP I-11	SE-NW-SE 20-20N-9W (1330/S 1490/E)	7-15-60	Menefee	P & A 8-3-79
27	SFP #4	SE-SW-SE 20-20N-9W (338/S 1865/E)		Menefee	
28	SFP #6	SW-SE 20-20N-9W	4- 5-38	Menefee	
29	SFP I-1	NW-SW-SE 20-20N-9W (980/S 2025/E)	11- 8-61	Menefee	P & A 8-3-79
30	SFP #1-9	SW-SE-SE 20-20N-9W (450/S 1145/E)	6- 9-60	Menefee	
31	State #1	NE-SW 20-20N-9W	1-15-37	Menefee	
32	SFP #25	SW-SW-SE 20-20N-9W (2575/E 80/S)	4-17-62	Menefee	P & A 2-5-74
33	#1 Blackeye	NE-SW-SW 29-20N-9W (990/FSL 990/FWL)	3-30-72	Menefee	
34	#2 Blackeye	SW-NE-SW 29-20N-9W (1650/FSL 1650/FWL)	9-24-72	Dakota "D"	P & A 9-24-72
35	#1 FEE	NE-NW-NE 29-20N-9W	7-10-36	Menefee	
36	#4 FEE	NE-NW-NE 29-20N-9W	8-30-36	Menefee	
37	#1 Jackson	SE-NW 29-20N-9W (330/FSL 1650/FWL)	10-16-72	Menefee	P & A 10-16-72

TABULAR SUMMARY OF WELLS LOCATED WITHIN A TWO MILE RADIUS EXHIBIT "C"

Identification Number	Well Name	Location	Completion Date	Producing Formation	Status
38	#2 Jackson	SE-SW-SW 29-20N-9W (330/FSL 990/FWL)	4- 1-76	Menefee	P & A 11-3-75
39	#6 Red Mountain	NE-NW-NE 29-20N-9W (450/S 1530/W)	5-25-55	Menefee	
40	#7 Red Mountain	NW-NW-NE 29-20N-9W (100/S 2475/W)	5-25-55	Menefee	
41	#1 RR Land	NE-NE-NW 29-20N-9W (250/S 2390/E)	7-17-36	Menefee	Loc. moved to #2 RR Land
42	#2 RR Land	NE-NE-NW 29-20N-9W (990/S 330/W)	1-15-37	Menefee	
43	#20 SFP	NE-NW-NE 29-20N-9W (300/N 1800/E)	1-10-59	Menefee	
44	#33 SFP	NW-NW-NE 29-20N-9W (600/N 2450/E)	9- 3-64	Menefee	
45	#35 SFP	NW-NW-NE 29-20N-9W (160/N 2135/E)	6-13-74	Menefee	
46	#43 SFP	NE-NW-NE 29-20N-9W (420/N 1940/E)	10-31-79	Menefee	2-15-80
47	SFP I-5	NE-NW-NE 29-20N-9W (615/N 1920/E)	3-27-62	Menefee	
48	#3 SFP Jackson	NW-SW-SW 29-20N-9W (990/S 330/W)	8-25-77	Dakota	P & A 8-31-77

TABULAR SUMMARY OF WELLS LOCATED WITHIN A TWO MILE RADIUS EXHIBIT "C"

Identification Number	Well Name	Location	Completion Date	Producing Formation	Status
49	#3 Santa Fe	NW-NW-NE 29-20N-9W (330/N 2310/W)	6-12-36	Menefee	
50	#5 Santa Fe	NE-NE-NW 29-20N-9W (2310/W 330/S)	1-25-38	Menefee	
51	#2 Santa Fe-Monback	SE-NW-SE 29-20N-9W (1650/FSL 1650/FEL)	6-13-73	Menefee	P & A 9-28-73
52	#42 Santa Fe Pacific	NE-NW-NE 29-20N-9W (105/FNL 1610/FEL)	4-19-79	Menefee	
53	#30 Santa Fe Railroad	NE-NW-NE 29-20N-9W (410S/N 1930W/E)	5-30-65	Menefee	P & A 6-9-79
54	#31 Santa Fe Railroad	SE-NE-NW 29-20N-9W (775S/N 2380E/W)	4-19-64	Menefee	P & A 1967
55	#37 Santa Fe Railroad	NW-NW-NE 29-20N-9W (350/FNL 2590/FEL)	9-27-74	Menefee	P & A 10-1-74
56	SFP #21	NW-NW-NE 29-20N-9W (310S/N 2290W/E)	6- 3-61	Menefee	P & A 6-10-79
57	I-18 Santa Fe Railroad	NE-NE-NW 29-20N-9W (90S/N 2410E/W)	7-28-62	Menefee	1967
58	#1 Santa Fe Railroad-D	NE-NW-NE 29-20N-9W (330S/N 1630W/E)	4- 1-62	Menefee	P & A 5-31-79
59	#34 Santa Fe RR	NW-NW-NE 29-20N-9W (95/FNL 2600/FSL)	4-25-74	Menefee	
60	#29-18 Santa Fe RR	NW-NE 29-20N-9W (1005/N 1380W/E)	1- 3-59	Menefee	P & A 8-8-79

TABULAR SUMMARY OF WELLS LOCATED WITHIN A TWO MILE RADIUS EXHIBIT "C"

Identification Number	Well Name	Location	Completion Date	Producing Formation	Status
61	SFP I-7	NW-NE-NE 29-20N-9W (225/N 1265/E)	6-19-60	Menefee	
62	SFP I-8	NW-NE-NE 29-20N-9W (5/N 1130/E)	6- 3-60	Menefee	
63	SFP I-13	NE-NE-NW 29-20N-9W (452/N 2740/E)	10- 6-61	Menefee	
64	SFP I-20	NW-SW-NE 29-20N-9W (1344/N 2555/W)	6-23-62	Menefee	
65	SFP I-21	SW-NW-NE 29-20N-9W (834/N 2113/W)	6-21-62	Menefee	
66	SFP I-22	SW-NW-NE 29-20N-9W (1115/N 2325/W)	7-31-62	Menefee	
67	#2 RR Land	NE-NE-NW 29-20N-9W	1-15-37	Menefee	
68	Red Mountain #2	29-20N-9W		Menefee	
69	SFP #35	NW-NE-NE 29-20N-9W (160/N 2135/E)	6-13-74	Menefee	
70	SFP I-6	NW-NE-NE 29-20N-9W (395/N 1265/E)	3-21-61	Menefee	P & A 8-3-79
71	SFP #1	NE-NW-NE 29-20N-9W (330/N 1620/E)	4-15-62	Menefee	
72	SFP #27	SW-NW-NE 29-20N-9W (730/N 2505/E)	5-24-62	Menefee	P & A 2-74

TABULAR SUMMARY OF WELLS LOCATED WITHIN A TWO MILE RADIUS EXHIBIT "C"

Identification Number	Well Name	Location	Completion Date	Producing Formation	Status
73	SFP #32	NW-NW-NE 29-20N-9W (45/N 2060/E)	9-28-64	Menefee	P & A 6-10-79
74	SFPRR #1	SW-SE-SE 29-20N-9W (330/N 990/E)	10-13-71	Menefee	
75	#29-19 Santa Fe RR	NE-NW-NE 29-20N-9W (100S/N 1800W/E)	1- 9-59	Menefee	P & A 2-3-76
76	#1 Federal	SW-NE-SE 29-20N-9W (1900N/S 40W/E)	4- 9-63	Menefee	P & A 6-6-63
77	#1-A Federal	NE-SE-NE 30-20N-9W (1930/FNL 660/FEL)	5- 8-72	Menefee	
78	#1 Federal 8-30	C-SE-NE 30-20N-9W (1980/FNL 660/FEL)	4-14-72	Menefee	P & A 4-15-72
79	#2 Santa Fe	SE-NE-NE 30-20N-9W		Menefee	
80	#1 Santa Fe	C-NE-NE 31-20N-9W (660/FNL 660/FEL)	4- 5-74	Dakota	P & A 4-5-74
81	#1 Santa Fe	NE-NE-NE 31-20N-9W (330/S 330/W)	1- 9-37	Menefee	
82	#1 Santa Fe Pacific Blackjack	N-NW-NE 31-20N-9W (330/FNL 1980/FEL)	4-23-75	Menefee	P & A 4-23-75
83	#51 Jaco	NW-NW-NW 32-20N-9W (330/FNL 330/FWL)	5-19-73	Menefee	P & A 4-4-75
84	#54 Jaco	NW-NW-NW 32-20N-9W (330/FNL 630/FWL)	7-27-73	Menefee	P & A 8-8-73

TABULAR SUMMARY OF WELLS LOCATED WITHIN A TWO MILE RADIUS EXHIBIT "C"

Identification Number	Well Name	Location	Completion Date	Producing Formation	Status
85	#58 Y Jaco	SE-NW-NW 32-20N-9W (726/FNL 863/FWL)	9-19-73	Menefee	
86	#59 Jaco	S-NW-NW 32-20N-9W (990/FNL 660/FWL)	7-23-74	Menefee	P & A 7-25-74
87	#83 Y Jaco	NW-SE-NW 32-20N-9W (1660/FNL 1650/FWL)	3-25-74	Menefee	P & A 4-17-74
88	#83 Jaco	NW-SE-NW 32-20N-9W (1650/FNL 1650/FWL)	5-28-73	Menefee	P & A 5-28-73
89	#115 Jaco	NW-SE-NE 32-20N-9W (1650/FNL 836/FEL)	10-22-73	Menefee	P & A 4-12-75
90	#178 Jaco	N-NW-SW 32-20N-9W (2310/FSL 660/FWL)	12- 7-75	Menefee	P & A 3-5-75
91	#55 Jaco-Slaughter	NE-NW-NW 32-20N-9W (340/FNL 810/FWL)	5-30-72	Dakota	P & A 5-30-72
92	#57 Jaco-Slaughter	SE-NW-NW 32-20N-9W (990/FNL 990/FWL)	7-28-72	Menefee	P & A 3-19-75
93	#55 Y Jaco	NE-NW-NW 32-20N-9W (390/FNL 960/FWL)	6-18-72	Menefee	
94	Jaco Slaughter #A-22	NW-NW-NE 32-20N-9W (340/FNL 2300/FEL)	7- 2-72	Menefee	P & A 9-20-74
95	Jaco Slaughter #1	NE-NW-NW 32-20N-9W (340/FNL 960/FWL)	5- 6-72	Menefee	P & A 2-28-73
96	#6 State	NE-NW-NE 32-20N-9W (220/FNL 1485/FEL)	6- 1-69	Menefee	P & A 8-30-73

TABULAR SUMMARY OF WELLS LOCATED WITHIN A TWO MILE RADIUS EXHIBIT "C"

Identification Number	Well Name	Location	Completion Date	Producing Formation	Status
97	State #A-1	NW-NE-NE 32-20N-8W (440/FNL 990/FEL)	9- 5-69	Menefee	P & A 8-30-73
98	State #4	NW-NW-NE 32-20N9W (330/N 2310/E)		Menefee	
99	State #6Y	NE-NE-NE 32-20N-9W (225/N 1485/E)		Menefee	
100	Santa Fe Pacific #33-1	NW-NW-NW 33-20N-9W (330/FNL 330/FWL)	6-29-76	Menefee	P & A 6-30-76
101	#1 FEE	NW-NW-SE 35-20N-9W	10- 1-36	Menefee	
102	Santa Fe #35-1	NE-NE-NW 35-20N-9W (500/FNL 2000/FWL)	7-28-78	Menefee	P & A 7-29-78

TABULAR SUMMARY OF WELLS LOCATED WITHIN A HALF MILE RADIUS EXHIBIT "D"

Identification Number	Well Name	Location	Completion Date	Total Depth	Casing String & Setting Depth	Sacks of Cement	Cement Tops	Status
103	#3 Santa Fe	SW-SE-SE 21-20N-9W	6-25-44	354	8 @ 315 12 @ 60			
104	#1 Santa Fe	SW-SW-SW 21-20N-9W	11- 7-35	540	2 @ 315 5-1/2 @ 900	5		
105	#4 Santa Fe	E-SE-SE 21-20N-9W (660N/S 330W/E)	11- 6-61	330	4 @ 320W/10			P & A 4-7-67
106	#8 Santa Fe	SE-SE 21-20N-9W (495N/S 660W/E)	1-11-62	325	6-5/8 @ 32W/10 4 @ 315W/10			P & A 1966
107	#1 Santa Fe	SE-SE 21-20N-9W (165FSL 965FEL)	4- 3-75	502 PB:316	4-1/2 @ 306W/25 2-3/8 @ 307			
108	#18 Santa Fe Pacific	SW-SE-SW 21-20N-9W (175FSL 1365FEL)	10-19-75	1,583	Not Reported			P & A 10-22-75
109	#3 Santa Fe Pacific RR	SW-SE-SW 21-20N-9W (165FSL 1815FWL)	10- 1-69	539	None			P & A 5-22-71
110	#4 Santa Fe RR or SFP #104	SE-SE-SE 21-20N-9W (165FSL 565FEL)	10- 1-68	340	5-1/2 @ 308W/25 2-3/8 @ 330			
111	#5 Santa Fe RR	NE-SE-SE 21-20N-9W (990N/S 330W/E)	10-31-61	360	5-1/2 @ 360W/10			P & A 4-7-67
112	#1 Santa Fe RR	SE-SE-SW 21-20N-9W (330FSL 2310FWL)	10- 9-69	565	None			P & A 5-17-71
113	#2 Santa Fe RR or SFP #102	SE-SE-SE 21-20N-9W (565FSL 165FEL)	10- 1-69	340	5-1/2 @ 310W/25			
114	#2 Santa Fe RR	SE-SW 21-20N-9W (165FNL 2145FWL)	6- 5-69	563	None			P & A 4-3-72
115	#3 Santa Fe RR or SFP #103	SE-SE-SE 21-20N-9W (165N/S 165W/E)	11- 8-68	340	5-1/2 @ 323W/15 2 @ 330			

TABULAR SUMMARY OF WELLS LOCATED WITHIN A HALF MILE RADIUS EXHIBIT "D"

Identification Number	Well Name	Location	Completion Date	Total Depth	Casing String & Setting Depth & Sacks of Cement	Cement Tops	Status
116	#10 Santa Fe RR	SW-SE-NE 21-20N-9W (2310S/N 990W/E)	8-16-62	350	5-1/2 @ 310W/10		P & A 4-7-67
117	#1-1 Santa Fe RR	SE-SE 21-20N-9W (360FSL 360FEL)	7-19-68	340	5-1/2 @ 316W/25 2 @ 322		
118	#17 Scannion	SE-SE 21-20N-9W (990N/S 660W/E)	3-31-68	350(a)			P & A 3-31-66
119	SFP #1	SE-SE-SE 21-20N-9W (565S 565E)	10-26-68	340	5-1/2 @ 326W/20 2-3/8 @ 330		
120	SFP #1	SW-SE-SE 21-20N-9W (990E 330S)	5-25-60	450			P & A 4-7-67
121	SFP #3	SE-SE-SE 21-20N-9W (330E 330S)	9- 1-61	320	5-1/2 @ 295W/10 4 @ 314W/10		P & A 4-17-67
122	SFP #7	S-SE-SE 21-20N-9W (165S 660E)	1-16-62	333	4-1/2 @ 318W/10 2 @ 312		P & A 4-7-67
123	SFP #101	SE-SE-SE 21-20N-9W (565S 565E)	10-26-68	340	5-1/2 @ 326W/20 2-3/8 @ 330		
124	SFP #113	SE-SE-SE 21-20N-9W (165S 965E)	4- 1-75	500(316)	4-1/2 @ 306W/10 2-3/8 @ 306		
125	SFPRR #2	SW-NW-SW 21-20N-9W (1650S 330W)	11- 1-60	405			P & A 4-7-67
126	#1 Santa Fe	SW-SW-SW 22-20N-9W	7-17-36	550	8-1/4 @ 65		
127	#6 Santa Fe or SFP #106	SW-SW 22-20N-9W (160N/S 165E/W)	11-18-68	349	4-1/2 @ 338W/25 2 @ 335		
128	#9 Santa Fe	SW-SW-SW 22-20N-9W (165N/S 165E/W)	7-20-62	343	5-1/2 @ 308W/10 2 @ 330		P & A 4-7-67
129	#12 Santa Fe	SW-SW-SW 22-20N-9W (495N/S 165E/W)	3-15-63	360	4 @ 326W/10		P & A 4-7-67

TABULAR SUMMARY OF WELLS LOCATED WITHIN A HALF MILE RADIUS EXHIBIT "D"

Identification Number	Well Name	Location	Completion Date	Total Depth	Casing String & Setting Depth & Sacks of Cement	Cement Tops	Status
130	#14 Scanlon	SW-SW-SW 22-20N-9W (165N/S 495E/W)	7-29-63	342	2-7/8 @ 342W/10		P & A 9-24-66
131	#18 Scanlon	NW-SW-SW 22-20N-9W (825N/S 165E/W)	7-28-63	360	2-7/8 @ 360W/10		P & A 9-23-66
132	#1-SFP Mesa	SE-NE-NW 22-20N-9W (895FSL 2505FEL)	5-19-75	532	4-1/2 @ 810W/25		P & A 9-15-75
133	#2 Santa Fe Pacific or SFP #104	NW-SE-SW 22-20N-9W (990FSL 1980FWL)	4- 3-75	485	4-1/2 @ 495W/25 2-3/8 @ 463		
134	#4 Santa Fe Pacific or SFP #116	NW-SE-SW 22-20N-9W (990FSL 1650FWL)	4-25-75	480			T & A
135	SFP #6	SE-NW-SW 22-20N-9W (1650S 990W)		260			P & A 4-7-67
136	SFP #117	SW-SE-SW 22-20N-9W (330S 1650W)	9-30-75	458	4-1/2 @ 448W/12		T & A
137	#5 Santa Fe Pacific RR	NW-NW-NW 27-20N-9W (160FNL 170FWL)	12- 3-68	352	2-3/8 @ 352W/8		9-28-73
138	#7 Santa Fe Pacific RR	NW-NW-NW 27-20N-9W (495FNL 495FWL)	10- 1-69	370	2-3/8 @ 375W/8		P & A 9-28-73
139	#9 Santa Fe Pacific RR	NW-SE-NW 27-20N-9W (1815FNL 1650FWL)	12- 1-68	520			P & A 6-10-71
140	#1 OH Well	NE-NE-NW 27-20N-9W (165S/N 2145E/W)	11-20-67	523	2-3/8 @ 505W/15		P & A 11-7-74
141	#2 OH Well	NE-NW 27-20N-9W (495S/N 2145E/W)	11-20-67	520	2-3/8 @ 500W/15		P & A 11-7-74
142	#3 OH Well	NE-NW 27-20N-9W (495S/N 2475E/W)	11-20-67	520	2-3/8 @ 500W/15		P & A 11-7-74
143	SFP #12	SW-SE-NW 27-20N-9W (2310N 1650W)		620			P & A 12-19-72

TABULAR SUMMARY OF WELLS LOCATED WITHIN A HALF MILE RADIUS EXHIBIT "D"

Identification Number	Well Name	Location	Completion Date	Total Depth	Casing String & Setting Depth & Sacks of Cement	Cement Tops	Status
144	#11 Santa Fe Pacific RR	NW-NW-NW 27-20N-9W (165S/N 165E/W)	8-17-62	343	5-1/2 @ 350W/10		P & A 1966
145	#13 Santa Fe Pacific RR	NW-NW 27-20N-9W (165S/N 495E/W)	9-10-62	375	5-1/2 @ 317W/10		P & A 4-7-67
146	#54 Jaco State	NW-NW 27-20N-9W (660FNL 660FWL)	8-19-72	3,910	7 @ 90W/10		P & A 8-15-72
147	#8 Santa Fe RR	NE-NW 27-20N-9W (330S/N 1650E/W)	11- 1-68	520	None		P & A 6-10-71
148	#17 Santa Fe Pacific	SW-SW 27-20N-9W (495N/S 165E/W)	3-15-63	340	4-1/2 @ 326W/10		P & A 9-28-73
149	#6 State	NW-NE-NE 28-20N-9W (330FNL 990FEL)	12-22-77	565 PB:503	3-1/2 @ 503W/30		
150	#2 State B	SE-NW-NE 28-20N-9W (990FNL 1650FEL)	5-15-76	520	4-1/2 @ 496W/25		
151	#2 State of New Mexico	NE-NE-NE 28-20N-9W (165S/N 165W/E)	9-22-62	350	5-1/2 @ 324W/10		P & A 4-7-67
152	#3 State	SW-NW-NE 28-20N-9W (990FNL 2310FEL)	12-25-76	773 PB:450	4-1/2 @ 320W/10 2-3/8 @ 300		
153	#4 State	NE-SW-NE 28-20N-9W (1650FNL 1650FEL)	5-19-76	598	None		P & A 5-19-76
154	#5 State	NE-NE-NE 28-20N-9W (660FNL 660FEL)	3-21-76	563	None		P & A 12-1-77
155	#2 Santa Fe	NW-SE-NE 28-20N-9W	10-22-36	340			
156	#3 Santa Fe	NE-SW-NE	8- 9-44	354			
157	#1 State	SW-NE-NE 28-20N-9W (970FNL 970FEL)	4-10-76	520	4-1/2 @ 490W/20 2-3/8 @ 495		
158	#1 State	NW-NW-NW 28-20N-9W (495S/N 495E/W)	10-19-62	1,208	4-1/2 @ 330W/3		P & A 1966

TABULAR SUMMARY OF WELLS LOCATED WITHIN A HALF MILE RADIUS EXHIBIT "D"

Identification Number	Well Name	Location	Completion Date	Total Depth	Casing String & Setting Depth & Sacks of Cement	Cement Tops	Status
159	#1 Ray	NE-NE-NW 28-20N-9W (330S/N 2310E/W)	11-24-59	900 PB:533	5-1/2 @ 542W/80		P & A 4-7-67
160	#6 Ray	NE-NW 28-20N-9W (303S/N 2240E/W)	10-12-68	505			P & A 10-12-66
161	#1 Santa Fe	NW SE NW 28 20N 9W	7-19-37	453			
162	#11 OH Well	NE-NE-NE 28-20N-9W (495FNL 495FEL)	10- 6-68	355	None		P & A 10-26-74
163	#12 OH Well	NE-NE-NE 28-20N-9W (165FNL 495FEL)	7-20-73	370 PB:363	4-1/2 @ 370W/25 2 @ 363		P & A 10-26-74
164	#13 OH Well	NE-NE-NE 28-20N-9W (330FNL 330FEL)	8-10-73	360 PB:357	4-1/2 @ 360W/25 2 @ 357		P & A 10-26-74
165	#39 OH Well	NE-NE-NW 28-20N-9W (350FNL 2310FWL)	1-15-72	556 PB:538	4-1/2 @ 500W/35		P & A 10-26-74
166	#6 OH Well	SE-NE-NW 28-20N-9W (825FNL 2145FWL)	10-13-67	545	None Reported		P & A 4-3-72
167	#7 OH Well	NW-NE-NW 28-20N-9W (495FNL 1815FWL)	10-21-67	540	None Reported		P & A 4-3-72
168	#9 OH Well	NE-NE-NE 28-20N-9W (165FNL 165FEL)	10- 3-68	358	None		
169	#10 OH Well	NE-NE-NE 28-20N-9W (495FNL 165FEL)	10- 5-68	365	4-1/2 @ 330W/20		10-26-74
170	#5 OH Well	NW-NW-NE 28-20N-9W (330N 2310W)	10- 7-67	525	2-3/8 @ 505W/50		P & A 10-26-74
171	#8 OH Well	N-NE-NW 28-20N-9W (330N 1980W)	3- 2-68	515	2-3/8 @ 492W/50		
172	Jaco State #104	NE-SW-NE 28-20N-9W (1815/N 1485/E)		491			10-30-74
173	New Mexico #1	NW-NW-NE 28-20N-9W (165/N 2475/E)	9-15-64	550			P & A 1966

TABULAR SUMMARY OF WELLS LOCATED WITHIN A HALF MILE RADIUS

EXHIBIT "D"

Identification Number	Well Name	Location	Completion Date	Total Depth	Casing String & Setting Depth & Sacks of Cement	Cement Tops	Status
	#2 Santa Fe	SE-SW 22-20N-9W (990FSL 1980FWL)	4- 3-75	485	4-1/2 @ 459W/23		

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing & Setting String & Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
Seward #1	NW-SE-NE 19-20N-9W (1580/N 805/E)			Fill hole with mud bottom to pipe, 20 ft. cement plug on top of mud.	
SFP #20	SE-SE-NW 20-20N-9W (2310/N 2310/W)	4907		4907-4807 30 sacks neat cement 3560-3460 30 sacks neat cement 2820-2720 30 sacks neat cement 1630-1530 30 sacks neat cement 50-0 15 sacks neat cement	
Santa Fe Pacific #2	SE-SW-SE 20-20N-9W (1713/E 317/S)				
Santa Fe Pacific #3	SE-SW-SE 20-20N-9W (1713/E 65/S)				
Santa Fe Pacific #4	SE-SW-SE 20-20N-9W (320/S 1920/E)				
Santa Fe Pacific #9	SE-SW-SE 20-20N-9W (110/S 1910/E)				
Santa Fe Pacific #15	SW-SE-SE 20-20N-9W (378/S 978/E)	528		528-275 25 sacks 65-Surface 20 sacks	8-67
Santa Fe Pacific RR #18	NE-NW-NE 20-20N-9W (100/N 1380/E)				
Santa Fe Pacific WS #1	C-SE-SE 20-20N-9W (660/S 660/E)				
Santa Fe Pacific #22	SW-SW-SE 20-20N-9W (80/S 2280/E)			Hole filled with 15 sacks	2-5-74
Santa Fe Pacific #23	SW-SW-SE 20-20N-9W (490/S 2300/E)				

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing & Setting String Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
Santa Fe Pacific #24	SW-SE-SE 20-20N-9W (450/S 1145/E)				
Santa Fe Pacific #25	SW-SW-SE 20-20N-9W (2575/E 80/S)			Hole filled with 15 sacks	2-5-74
Santa Fe Pacific #28	SE-SW-SE 20-20N-9W (330/S 1550/E)				
Santa Fe Pacific RR #36	SW-SW-SE 20-20N-9W (265/S 2150/E)	424	Casing - 4 1/2"	424 35 sacks	
Santa Fe Pacific #38	SE-SE-SE 20-20N-9W (275/S 510/E)	459	Casing - 4 1/2"	459 25 sacks	T & A
Santa Fe Pacific #47	SE-SW-SE 20-20N-9W (580/S 1400/E)	420	Casing - 4 1/2"	420 20 sacks	
Santa Fe Pacific I-1	NW-SW-SE 20-20N-9W (980/S 2025/E)	468		468-118 5 sacks Surface 2 sacks	8-3-79
Santa Fe Pacific I-10	NW-SE-SE 20-20N-9W (900/S 1280/E)	420	Casing - 2"	420 8 sacks	
Santa Fe Pacific I-11	SE-NW-SE 20-20N-9W (1330/S 1490/E)	450		450-200 5 sacks Surface 2 sacks	8-3-79
Santa Fe Pacific I-12	NW-SE-SE 20-20N-9W (1085/S 860/E)	436	Casing - 2"	436 8 sacks	
Santa Fe Pacific I-15	SW-SW-SE 20-20N-9W (560/S 2470/E)	505		505-255 5 sacks Surface 2 sacks	8-3-79
Santa Fe Pacific I-16	NW-SW-SE 20-20N-9W (945/S 2590/E)	500		500-250 5 sacks Surface 2 sacks	8-3-79

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing & Setting String Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
Santa Fe Pacific I-17	SW-SW-SE 20-20N-9W (442/S 2430/W)	525		525-275 5 sacks Surface 2 sacks	8-3-79
SFP #10	SW-SE-NE 21-20N-9W (2310/N 990/E)	316	Casing - 5 1/2"	316-226 10 sacks bottom Surface 3 sacks	4-7-67
SFP #2	SW-NW-SW 21-20N-9W (1650/S 330/W)	405		405-245 10 sacks bottom Surface 3 sacks	4-7-67
SFP #1	SE-SE-SW 21-20N-9W (2310/W 330/S)	565		565-500 15 sacks Drilling mud Surface 5 sacks	5-17-71
SFP #2	SE-SE-SW 21-20N-9W (2145/W 165/S)	563		563-100 15 sacks Drilling mud Surface 5 sacks	
SFP #3	SW-SE-SW 21-20N-9W (1815/W 165/S)	539 ?		539-400 15 sacks Drilling mud Surface 5 sacks	5-22-71
SFP #4	SW-SE-SW 21-20N-9W (1485/W 165/S)				Location Abandoned
SFP #18	SW-SE-SW 21-20N-9W (1365/E 175/S)	1500		1500-1450 50' cement plug 325-275 50' cement plug Surface 5 sacks	10-22-75
SFP #101	SE-SE-SE 21-20N-9W (565/S 565/E)	340	Casing - 5 1/2"		
SFP #103	SE-SE-SE 21-20N-9W (165/S 165/E)	340	Casing - 5 1/2"		
SFP #104	SE-SE-SE 21-20N-9W (165/S 565/E)	340	Casing - 5 1/2"		

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing String & Setting Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
SFP #110	NE-NE-NE 21-20N-9W (360/E 360/N)				
SF RR #1	SW-SE-SE 21-20N-9W (330/S 990/E)	450		450-370 12 sacks Surface 3 sacks	4-7-67
SFP #3	SE-SE-SE 21-20N-9W (330/S 330/E)	320	Casing - 4"	320-210 10 sacks Surface 3 sacks	4-17-67
SFP #4	E-SE-SE 21-20N-9W (330/E 660/S)	330	Casing - 4"	330-215 10 sacks Surface 3 sacks	4-7-67
SFP #5	NE-SE-SE 21-20N-9W (330/E 990/S)	350	Casing - 5 1/2"	350-265 10 sacks Surface 3 sacks	4-7-67
SFP #7	S-SE-SE 21-20N-9W (660/E 165/S)	235	Casing - 5 1/2"	235-220 10 sacks Surface 3 sacks	4-7-67
SFP #8	S-SE-SE 21-20N-9W (660/E 495/S)	350	Casing - 5 1/2"	350-210 10 sacks Surface 3 sacks	4-7-67
SFP #113	SE-SE-SE 21-20N-9W (365/E 165/S)	350		350-300 10 sacks	
SFP #102	SE-SE-SE 21-20N-9W (565/S 165/E)	310	Casing - 5 1/2"	310 25 sacks	
SFP #6	SE-NW-SW 22-20N-9W (990/W 1650/S)	260		260-170 10 sacks Surface 3 sacks	4-7-67
SFP #9	SW-SW-SW 22-20N-9W (165/W 165/S)	340	Casing - 5 1/2"	340-260 10 sacks Surface 3 sacks	4-7-67
SFP #12	SW-SW-SW 22-20N-9W (165/W 495/S)	360	Casing - 4"	340-245 10 sacks Surface 3 sacks	4-7-67

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing String & Setting Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
Scanlon #14	SW-SW-SW 22-20N-9W (495/W 165/S)	342	Casing - 2 7/8"	342-30 10 sacks Surface 3 sacks	
Scanlon #18	NW-SW-SW 22-20N-9W (165/W 825/S)	360	Casing - 2 7/8"	360-30 10 sacks Surface 3 sacks	9-23-66
Santa Fe Pacific #116	NW-SE-SW 22-20N-9W (990/S 1650/W)	480			T & A
Santa Fe Pacific #117	SW-SE-SW 22-20N-9W (330/S 1650/W)	448	Casing - 4 1/2"	448 12 sacks	T & A
#1-SFP Mesa	SE-NE-NW 22-20N-9W (2505/E 895/S)	532	Casing - 4 1/2"	Bottom 5 sacks	9-15-75
SFP #5	NW-NW-NW 27-20N-9W (160/N 170/W)	352	Casing - 2 3/8"	352-252 8 sacks	9-28-73
SFP #7	NW-NW-NW 27-20N-9W (495/N 495/W)	375	Casing - 2 3/8"	375-275 8 sacks	9-28-73
SFP #11	NW-NW-NW 27-20N-9W (495/N 165/W)	340	Casing - 2 3/8"	340-240 12 sacks	9-28-73
SFP #8	NW-NE-NW 27-20N-9W (1650/W 330/N)	520		520-450 35 sacks 380-330 25 sacks 20-Surface 10 sacks	8-3-71
SFP RR #11	NW-NW-NW 27-20N-9W (165/N 165/W)	350	Casing - 5 1/2"	350-235 10 sacks Surface 3 sacks	1966
SFP RR #13	NW-NW-NW 27-20N-9W (459/W 165/N)	375	Casing - 5 1/2"	310-230 10 sacks Surface 3 sacks	4-7-67
SFP #12	SW-SE-NW 27-20N-9W (2310/N 1650/W)	620		620-485 15 sacks	12-19-72

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing & Setting String Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
SFP RR #9	NW-SE-NW 27-20N-9W (1815/N 1650/W)	520		520-250 30 sacks 50-0 5 sacks	6-10-71
#1 State	SW-NE-NE 28-20N-9W (970/N 970/E)	520	Casing - 4 1/2"	520-490 20 sacks	
#6 State	NW-NE-NE 28-20N-9W (330/N 990/E)	565	Casing - 3 1/2"	565-503 35 sacks	T & A
#3 State	SW-NW-NE 28-20N-9W (990/N 2310/E)	773	Casing - 4 1/2"	320-10 sacks	
#2 State	SE-NW-NE 28-20N-9W (990/N 1650/E)	496	Casing - 4 1/2"	496 25 sacks	
OH WELL #10	NE-NE-NE 28-20N-9W (495/N 165/E)	365	Casing - 4 1/2"	330-230 100' cement plug Filled hole with mud Surface 2 sacks	10-26-74
OH WELL #11	NE-NE-NE 28-20N-9W (495/N 495/E)	365		355-255 100' cement plug Filled hole with mud Surface 2 sacks	10-26-74
OH WELL #12	NE-NE-NE 28-20N-9W (165/N 495/E)	370	Casing - 4 1/2"	373-273 100' cement plug Filled hole with mud Surface 2 sacks	10-26-74
OH WELL #13	NE-NE-NE 28-20N-9W (330/N 330/E)	360	Casing - 4 1/2"	360-260 100' cement plug Filled hole with mud Surface 2 sacks	10-26-74
OH WELL #9	NE-NE-NE 28-20N-9W (165/N 165/E)	358		350-250 100' cement plug Filled hole with mud Surface 2 sacks	11-7-74

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing & Setting String Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
#5 State	NE-NE-NE 28-20N-9W (660/N 660/E)	563		Surface 5 sacks Dry hole marker	12-1-77
New Mexico State #2	NE-NE-NE 28-20N-9W (165/N 165/E)	350	Casing - 5 1/2"	350-0 10 sacks	4-7-67
N.M. State K-1883 #1	NW-NW-NE 28-20N-9W (165/N 2475/E)	480		480-360 20 sacks	4-7-67
OH WELL #4	NW-NW-NE 28-20N-9W (165/N 2475/E)				Location Abandoned
OH WELL #5	NW-NW-NE 28-20N-9W (330/N 2475/W)	525	Casing - 2 3/8"	500 5 sacks 250 5 sacks Surface 2 sacks	10-26-74
OH WELL #6	SE-NE-NW 28-20N-9W (825/N 2145/W)	545		545-485 15 sacks Filled hole with mud Surface 5 sacks	4-3-72
OH WELL #7	NW-NE-NW 28-20N-9W (495/N 1815/W)	540		540-480 15 sacks Filled hole with mud Surface 5 sacks	4-3-72
OH WELL #8	N-NE-NW 28-20N-9W (330/N 1980/W)	515	Casing - 2 3/8"	500 5 sacks 250 5 sacks Surface 2 sacks	
OH WELL #39	NE-NE-NW 28-20N-9W (350/N 2310/W)	556	Casing - 4 1/2"	510-410 100' cement plug Filled hole with mud Surface 2 sacks	10-26-74
Scanlon Ray #6	NE-NE-NW 28-20N-9W (330/N 2310/W)	505		505-250 20 sacks Surface plug & marker	10-12-66

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing & Setting String	Size & Location of Plugs & Number of Sacks	Date Abandoned
Ray #1	NE-NE-NW 28-20N-9W (2310/W 330/N)	545	Casing - 5 1/2"	545-410 15 sacks Surface plug & marker	4-7-67
Jaco State #1	C-NW-NW 28-20N-9W (660/N 660/W)	3700		3700-3600 18 sacks 2650-2550 18 sacks 500-400 18 sacks Surface 5 sacks	4-17-72
#1 State	NW-NW-NW 28-20N-9W (495/N 495/W)	1208	Casing - 4 1/2"	1208-550 heavy mud 550-200 40 sacks Surface 7 sacks	
#4 State	NE-SW-NE 28-20N-9W (1650/N 1650/E)	525		525-475 10 sacks 325-275 10 sacks Surface 3 sacks	5-19-76
Jaco State #104	NE-SW-NE 28-20N-9W (1815/N 1485/E)	491		491-391 100' cement plug Filled hole with mud Surface 2 sacks	10-30-74
Jaco State #203	SW-SW-SW 28-20N-9W (360/W 360/S)				Location Abandoned
#1 Blackeye	NE-SW-SW 29-20N-9W (990/S 990/W)				
Santa Fe Pacific #1	NE-NW-NE 29-20N-9W (330/N 1620/E)				
S.F. Pacific #20	NE-NW-NE 29-20N-9W (330/N 1800/E)	470	Casing - 2"	470 15 sacks	
S.F. Pacific #33	NW-NW-NE 29-20N-9W (600/N 2450/E)	500	Casing - 2"	500 30 sacks	

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing & Setting String Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
S.F. Pacific #34	NW-NW-NE 29-20N-9W (95/N 2600/E)	453	Casing - 4 1/2"	453 49 sacks	
S.F. Pacific #35	NW-NW-NE 29-20N-9W (160/N 2135/E)	428	Casing - 5"	428 25 sacks	
S.F. Pacific #42	NE-NW-NE 29-20N-9W (105/N 1610/E)	438	Casing - 4 1/2"	438 40 sacks	
S.F. Pacific #43	NE-NW-NE 29-20N-9W (420/N 1940/E)	480	Casing - 4 1/2"	480 45 sacks	2-15-80
S.F. Pacific I-5	NE-NW-NE 29-20N-9W (615/N 1920/E)	463	Casing - 2"	463 8 sacks	
S.F. Pacific I-7	NW-NE-NE 29-20N-9W (225/N 1265/E)	443	Casing - 2"	443 4 sacks	
S.F. Pacific I-8	NW-NE-NE 29-20N-9W (5/N 1130/E)	450	Casing - 2 3/8"	450 4 sacks	
S.F. Pacific I-13	NE-NE-NW 29-20N-9W (452/N 2740/E)	460	Casing - 2"	460 10 sacks	
S.F. Pacific I-20	NW-SW-NE 29-20N-9W (1344/N 2555/W)	509	Casing - 2"	509 10 sacks	
S.F. Pacific I-21	SW-NW-NE 29-20N-9W (834/N 2113/W)	497	Casing - 2"	497 10 sacks	
S.F. Pacific I-22	SW-NW-NE 29-20N-9W (1115/N 2325/W)	567	Casing - 2"	567 10 sacks	
Santa Fe Monback	SE-NW-SE 29-20N-9W (1650/S 1650/E)	400		400-250 150' cement plug 50-0 50' cement plug	9-28-73

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing & Setting String Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
#2 Blackeye	SW-NE-SW 29-20N-9W (1650/S 1650/W)	3880		3880-3780 3690-3590 2895-2695 1680-1580 720-620	9-24-72
Santa Fe #3	NW-NW-NE 29-20N-9W (330/N 2310/E)				
SFP Jackson #2	SE-SW-SW 29-20N-9W (330/S 990/W)	1130		1130-1080 150' cement plug Surface 5 sacks	11-3-75
SFP Jackson #3	NW-SW-SW 29-20N-9W (990/S 330/W)	3800		3800-3700 cement plug 2850-2750 cement plug 1600-1500 cement plug Surface 5 sacks Dry hole marker 5 sacks	8-31-77
Jackson #1	SE-SW-SW 29-20N-9W (330/S 990/W)	1136		1136-1036 100' cement plug 590-540 50' cement plug Surface 10' cement plug	10-16-72
Santa Fe Pacific Railroad	SW-SE-SE 29-20N-9W (330/S 990/E)			Surface 5 sacks	5-15-76
Santa Fe RR #7	NW-NW-NE 29-20N-9W (100/N 2475/E)				
Santa Fe Pacific #19	NE-NW-NE 29-20N-9W (100/N 1800/E)			Filled hole with 15 sacks from total depth to surface	2-4-74
Santa Fe Pacific #21	NW-NW-NE 29-20N-9W (310/N 2290/E)			Spotted 5 sacks plug Marker set with 2 sacks	6-10-79
Santa Fe Pacific #27	SW-NW-NE 29-20N-9W (730/N 2505/E)			Filled hole with cement	2-74

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing & Setting String & Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
Santa Fe Pacific #30	NE-NW-NE 29-20N-9W (410/N 1930/E)	973		973 5 sacks 500 3 sacks Surface marker 2 sacks	6-9-79
Santa Fe Pacific #32	NW-NW-NE 29-20N-9W (45/N 2060/E)			Bottom 5 sacks Dry hole marker 2 sacks	6-10-79
Santa Fe Pacific #31	SE-NE-NW 29-20N-9W (775/N 2380/W)				1967
Santa Fe Pacific #37	NW-NW-NE 29-20N-9W (350/N 2590/E)	450		450-400 50 sacks Filled hole with mud Marker set with 2 sacks	10-1-74
Santa Fe Pacific D-1	NE-NW-NE 29-20N-9W (330/N 1630/E)	967	Casing - 2"	967 25 sacks	5-31-79
Santa Fe Pacific I-6	NW-NE-NE 29-20N-9W (395/N 1265/E)	499		499-149 7 sacks Surface 2 sacks	8-3-79
Santa Fe Pacific I-18	NE-NE-NW 29-20N-9W (90/N 2410/W)	600		600-499 10 sacks 100-0 2 sacks	1967
Government #1	NW-SW-SE 30-20N-9W (1624/N 2355/E)				11-50
#1 Federal 8-30	C-SE-NE 30-20N-9W (1980/N 660/E)	3700		3700-3400 300' cement plug 2300-2150 150' cement plug 1700-1550 150' cement plug Surface 10' cement plug	4-15-72
Federal #1	SW-NE-SE 30-20N-9W (1900/S 840/E)	579		579 15 sacks 100-Surface 25 sacks	6-6-63
Federal #A-1	NE-SE-NE 30-20N-9W (1930/N 660/E)	1060	Casing - 4 1/2"	1060 95 sacks	

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing & Setting String & Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
Federal #30-2	SE-NW-SE 30-20N-9W (1900/S 1830/E)	530		530-230 30 sacks 75-Surface 7 sacks	4-14-64
Federal #30-3	NE-SW-SE 30-20N-9W (910/S 1830/E)	577		577-275 30 sacks 75-Surface 7 sacks	4-14-64
Federal #30-4	NW-SE-SE 30-20N-9W (910/S 840/E)	577		577-275 30 sacks Surface 7 sacks	3-12-64
Santa Fe #1	C-NE-NE 31-20N-9W (660/N 660/E)	3699		3699-3532 40 sacks 3019 100' cement plug 1000 100' cement plug 105-0 cement plug	4-5-74
Santa Fe Pacific Blackjack #1	N-NW-NE 31-20N-9W (330/N 1980/E)	3550		3550-3450 100' cement plug 2800-2600 200' cement plug 1500-1400 100' cement plug Surface 5 sacks	4-23-75
Red Mountain #1	C-NW-NW 31-20N-9W (660/N 660/W)	3440		3440-3340 32 sacks 2620-2470 48 sacks 1350-1250 32 sacks 650-600 16 sacks Surface 5 sacks	5-26-71
Red Mountain #1	Section 31			10 sacks	9-41
State #A-1	NW-NE-NE 32-20N-9W (400/N 990/E)	850		850-0 5 sacks	8-30-73
Jaco Slaughter #A-22	NW-NW-NE 32-20N-9W (340/N 2300/E)	550		550-435 25 sacks 150-35 25 sacks	9-20-74
N.M. State #6	NE-NW-NE 32-20N-9W (220/N 1485/E)	600		600-0 20 sacks	8-30-73

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing & Setting String & Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
N.M. State #8	SE-NW-NE 32-20N-9W (1155/N 1485/E)	45			
Jaco Slaughter #1	NE-NW-NW 32-20N-9W (340/N 960/W)	1200		1200-30 90 sacks	2-28-73
Jaco #54	NW-NW-NW 32-20N-9W (330/N 630/W)				8-8-73
Jaco Slaughter #55	NE-NW-NW 32-20N-9W (340/N 810/W)	3790		3790-3740 15 sacks 3590-3540 15 sacks 2800-2700 28 sacks 1575-1475 28 sacks 1070-1020 15 sacks Surface 15 sacks	
Jaco #57	SE-NW-NW 32-20N-9W (990/N 990/W)	200		200-35 25 sacks	3-19-75
Jaco #59	S-NW-NW 32-20N-9W (990/N 660/W)	1060		1060-965 10 sacks 450-355 10 sacks	7-25-74
Jaco #51	NW-NW-NW 32-20N-9W (330/N 330/W)	1060		1060-960 20 sacks	4-4-75
Jaco #83	NW-SE-NW 32-20N-9W (1650/N 1650/W)	510		510-368 12 sacks	5-28-73
Jaco #83-Y	NW-SE-NW 32-20N-9W (1660/N 1650/W)	1050		1050-965 15 sacks 460-375 15 sacks	4-17-74
Jaco #178	N-NW-SW 32-20N-9W (660/W 2310/S)	200		200-106 20 sacks	3-5-75

TABULAR SUMMARY OF PLUGGED WELLS WITHIN A HALF MILE RADIUS - EXHIBIT "E"

Well Name	Location	Total Depth	Casing String & Setting Depth	Size & Location of Plugs & Number of Sacks	Date Abandoned
Jaco #115	NW-SE-NE 32-20N-9W (1650/N 836/E)	750		750-610 30 sacks 500-406 20 sacks	4-12-75
Jaco #55-Y	NE-NW-NW 32-20N-9W (390/N 960/W)	1040	Casing - 5 1/2"	1040 75 sacks	
Jaco #58-Y	SE-NW-NW 32-20N-9W (726/N 863/W)	1038	Casing - 4 1/2"	1038 80 sacks	
Santa Fe Pacific #33-1	NW-NW-NW 33-20N-9W (330/N 330/W)	1050		1050-1000 Surface 5 sacks	6-30-76
Santa Fe #35-1	NE-NE-NW 35-20N-9W (500/N 2000/W)	4935		4935-4785 60 sacks 3819-3669 60 sacks 1830-1680 75 sacks 267-117 75 sacks 30-0 15 sacks	7-29-78

TABULAR SUMMARY OF OWNERSHIP WITHIN A TWO MILE RADIUS EXHIBIT "F"

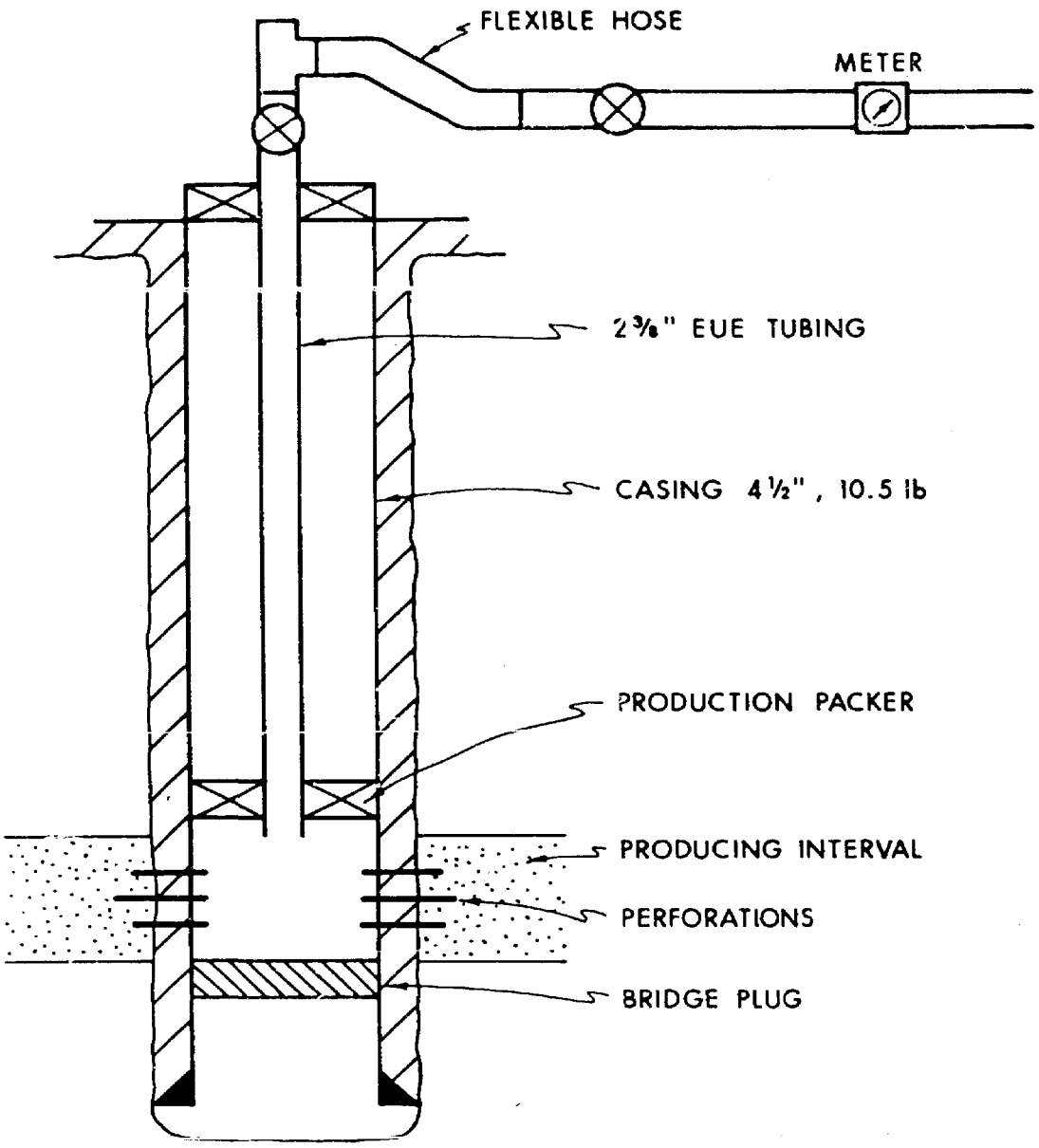
Lease	Company	Address
20N-9W: NW of SE 1/4 of Sec. 16 S 1/2 of Sec. 27 S 1/2 of Sec. 29 All of Sec. 31 All of Sec. 33 All of Sec. 34 19N-9W: All of Sec. 4 All of Sec. 5	Tenneco Oil Co.	Penthouse 720 South Colorado Blvd. Denver, Colorado 80222
20N-9W: All of Sec. 14 All of Sec. 15 S 1/2 of Sec. 17 S 1/2 + NW 1/4 of Sec. 18 All of Sec. 19 N 1/2 of Sec. 20 N 1/2 + SW 1/4 of Sec. 21 N 1/2 + SE 1/4 of Sec. 22 All of Sec. 23 All of Sec. 26 NE 1/4 of Sec. 27 All of Sec. 35	Santa Fe Energy Co.	Box 12058 American National Bank Building Amarillo, Texas 79101
20N-9W: N 1/2 of Sec. 17 SE 1/4 of SW 1/4	David W. Miller	
19N-9W: All of Sec. 3	Lilly M. Yates	

Lease	Company	Address
E 1/2 of NW 1/4 of Sec. 30 NW 1/4 of NW 1/4 of Sec. 30	Wiser Oil Co.	Box 192 Sistersville, West Virginia 26175
N 1/2 of SE 1/4 SE 1/4 of SE 1/4 of Sec. 30	Marjack, Inc.	
SW 1/4 of NW 1/4 of Sec. 30 NW 1/4 of SW 1/4 SW 1/4 of SW 1/4	Billy Robinson	
NE 1/4 of SW 1/4 of Sec. 30 SW 1/4 of SE 1/4 of Sec. 30	Lancaster Corp.	
S 1/2 of NE 1/4 of Sec. 16 SE 1/4 of NW 1/4 SW 1/4 of SW 1/4 E 1/2 of SE 1/4	Louis M. Wyman	
NW 1/4 of SE 1/4 of Sec. 16	George H. Fredericks	
NE 1/4 of NE 1/4 of Sec. 16 W 1/2 of NW 1/4 of Sec. 16 N 1/2 of SW 1/4 of Sec. 16 SE 1/4 of SW 1/4 of Sec. 16 SW 1/4 of SE 1/4 of Sec. 16	Dome Petroleum	Suite 1400 1600 Broadway Denver, Colorado 80202

TABULAR SUMMARY OF OWNERSHIP WITHIN A TWO MILE RADIUS EXHIBIT "F"

Lease	Company	Address
	IBCO Dev.	
NW 1/4 of NE 1/4 of Sec. 16 NE 1/4 of NW 1/4 of Sec. 16 SW 1/4 of NE 1/4 of Sec. 32		
	Louis M. Wyman	
SE 1/4 of NE 1/4 of Sec. 32 NW 1/4 of NW 1/4 of Sec. 32 NE 1/4 of SW 1/4 of Sec. 32 SW 1/4 of SW 1/4 of Sec. 32 SE 1/4		
	Lou & Paula Wyman	
N 1/2 of NE 1/4 of Sec. 32 SE 1/4 of NW 1/4 NW 1/4 of SW 1/4	-	
	Claude C. Kennedy	
SW 1/4 of NW 1/4 of Sec. 32		
	Open Land	
SE 1/4 of SW 1/4		
19N-9W:	Gulf Oil	Box 2100 Houston, Texas 77001
All of Sec. 2		

EXHIBIT H



TYPICAL SCHEMATIC OF AN INJECTION WELL

SUMMARY OF RED MOUNTAIN WATERFLOOD - EXHIBIT "J"

RED MOUNTAIN WATERFLOOD

The Red Mountain Waterflood oil field was discovered in June, 1934, and is located in Sections 20 and 29, T20N and R9W, in Northern McKinley County, New Mexico. It is about 1 mile east of the Chaco Wash field.

Primary production from the field was marginal until it was partially waterflooded in 1961.

The waterflood at 450 feet covered 50 to 70 acres of the Red Mountain pay. This single channel has become the most successful waterflood on a per acre basis in Northern New Mexico, yielding over 236,000 bbls. of oil compared to 26,000 bbls. for the primary recovery by December, 1977. Oil per acre recovery ranged from 3,371 to 4,720 bbls.

RED MOUNTAIN MESAVERDE

(Oil)
T. 20 N., R. 9 W., NMPM
McKinley County, New Mexico

By: Bruce A. Black
Colorado Plateau Geological Services

GEOLOGY

Regional Setting: South flank of the San Juan Basin

Surface Formations: Cretaceous, Menefee Formation

Exploration Method Leading to Discovery: Surface mapping

Type of Trap: Structural-stratigraphic

Producing Formation: Cretaceous, Menefee Formation

Gross Thickness and Lithology of Reservoir Rocks: 15 feet, fluvial channel sandstone

Geometry of Reservoir Rock: Lenticular channel sandstone which pinches out both east and west

Other Significant Shows: None

Oldest Stratigraphic Horizon Penetrated: Cretaceous, Menefee Formation (975 feet)

DISCOVERY WELL

Name: Stacy, Weber, et al. No. 1 SFP

Location: NE NE sec. 29, T. 20 N., R. 9 W.

Elevation (KB): 6,480 feet

Date of Completion: June, 1934

Total Depth: 495 feet

Production Casing: 478 feet of 4½"

Perforations: Completed open hole

Stimulation: None

Initial Potential: Pump 5 BOD

Bottom Hole Pressure: 195 psi

DRILLING AND COMPLETION PRACTICES

Wells are normally drilled with natural water-base mud through the pay zone. 4½" casing is set on top of the pay and cemented to surface. Rods, tubing and pump are installed. Wells are pumped with small pump jacks. From spud to completion, operation takes three days.

RESERVOIR DATA

Productive Area:
Proved (as determined geologically): 40 acres
Unproved: 20 acres
Approved Spacing: 5 acres
No. of Producing Wells: 4 (14 injectors)
No. of Abandoned Wells: 25
No. of Dry Holes: 10

Average Net Pay: 15 feet

Porosity: 28 percent

Permeability: 400 millidarcies

Water Saturation: 50 percent

Initial Field Pressure: 195 psi

Type of Drive: Low pressure water drive

Gas Characteristics and Analysis: Small amounts of methane, ethane, propane, butane, and pentane with butane and pentane dominant; gas is too small to measure

Oil Characteristics and Analysis: Oil is light brown, low sulfur, low paraffin 42° API gravity

Associated Water Characteristics and Analysis: Fresh water

Original Gas, Oil, and Water Contact Datums: Oil water contact approximately + 6,025 feet

Estimated Primary Recovery: 173 BO per acre (15 percent estimated primary recovery factor). Prior to water flood, the field had produced 25,290 BO

Type of Secondary Recovery: Under water-flood the field produced an additional 225,000 BO from 40 acres (as of January, 1978)

Estimated Ultimate Recovery: Assuming no additional deeper pays, the ultimate is established at 300,000 bbls of oil

Present Daily Average Production: 4 BOD (January, 1978)

Market Outlets: Oil trucked to Farmington by Plateau Corporation. No gas production.

FIELD COMMENTARY

The Red Mountain oil field is located in sections 20 and 29, T. 20 N., R. 9 W., in northern McKinley County, New Mexico. The field is 55 miles north of Grants, 50 air miles west of Cuba, 57 air miles south-southeast of Farmington and 93 air miles northwest of Albuquerque. The Red Mountain structure is situated in a broad strike valley in shale members of the Mesaverde Group some two miles south of the escarpment known as Chacra Mesa, which is capped by the uppermost member of the Mesaverde Group, the Cliff House Sandstone. Topographic relief in this portion of the San Juan Basin is generally slight, interrupted by occasional buttes capped by erosion-resistant sandstone beds. In a regional sense, the Red Mountain field is on the Chaco Slope on the south flank of the San Juan Basin between the Zuni Uplift to the south and the deeper parts of the San Juan Basin to the north. Regional dip is to the northeast at an average of about 100 feet per mile.

The Red Mountain pay zone is a fluvial channel sandstone and is the only pay horizon in the field. It ranges from 5 to 25 feet in thickness with an average of 15 feet of net pay. Porosities average 28 percent in this channel sandstone. The channel sandstone and the Red Mountain anticline combine to form a combination stratigraphic-structural trap with a low pressure water drive.

Oil was originally discovered in the Menefee Formation at Red Mountain by the Stacey, Weber et al., No. 1 Santa Fe well in sec. 29, T. 20 N., R. 9 W., in June of 1934. The discovery well, completed near the crest of a small but obvious surface anticline, produced at a rate of 5 BOD from a depth of 478 to 495 feet. In the next three years, 25 additional wells were drilled on the structure. Seven of these wells were completed as producers. Sporadic shallow primary development con-

tinued through the next two decades. Available state records indicate a cumulative production in excess of 22,000 barrels during this period of time.

However, since the field was discovered prior to the establishment of the Oil Conservation Commission, production and technical data now available are incomplete and unreliable. The productive area of the field, now covered by a lease from the Santa Fe Pacific Railroad Company, on the south half of section 20 and the north half of section 29, has changed hands intermittently since the field discovery. In 1937, this lease was assigned to Ben and Celia Sapir. In November of 1957, operation of this lease was assumed by Chaco Oil Company, a joint venture of Ben Sapir and Henry S. Birdseye. In November 1958, Chaco Oil Company assumed operations of the field. At this time, the field had four producers and was making approximately 300 barrels of oil per month. Chaco Oil Company drilled and logged an additional 10 shallow stratigraphic test holes to delineate the field boundaries and the structural configuration.

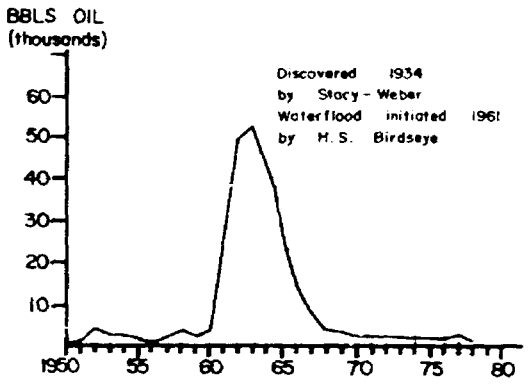
In July 1958, Chaco Oil Company drilled a Morrison test in the southeast quarter of section 20. This well bottomed at a total depth of 3,936 feet. The well was plugged and abandoned after encountering gas-cut salt water in the Dakota Sandstone. While this test did not find oil in the Dakota, oil and gas shows were logged in the samples and seen on the gas detector in the basal Menefee Formation, Point Lookout Sandstone, "Hospah" sandstone, "Gallup" sandstone, and Dakota Sandstone. Selected intervals in the "Hospah," "Gallup" and Dakota were drill-stem tested with negative hydrocarbon results. The well was plugged back to 900 feet and eventually completed as a water supply well in July of 1960 in preparation for flooding the north half of the Red Mountain field.

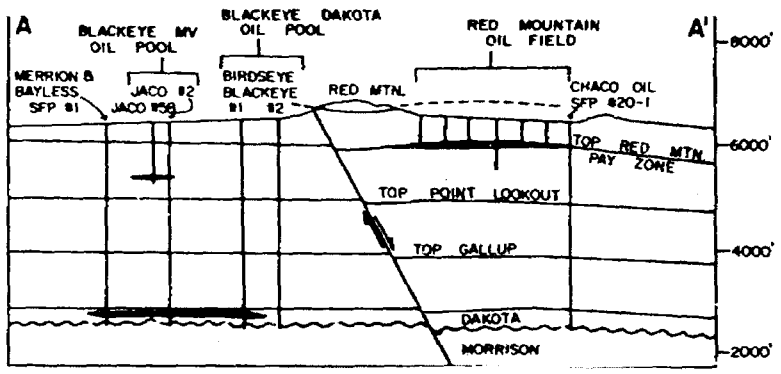
Chaco Oil Company began its first regular water injection into the Red Mountain field in January 1961. Between December of 1960 and March 1961, production was doubled to 1,080 barrels per month and by August of 1963, the field was making 5,440 barrels of oil per month. The water flood oil production peaked at 5,552 barrels per month in August 1963 and production gradually declined to its economic limit by September, 1969. Between 1960 and January 1971, the Red Mountain water flood had produced more than 241,156 barrels of 43° API gravity oil from approximately 55 acres of the field at an average depth of 450 feet, using a maximum of 15 injection and 10 producing wells. This is an average of approximately 293 barrels of oil recovered per net acre foot of reservoir flooded, or a cumulative oil recovery of 4,385 barrels per acre. Ninety percent of this oil was recovered in the six-year period from 1961 through 1966. This recovery is the highest flood recovery per acre in the San Juan Basin and is more than twice the per acre recovery of Gulf Oil's West Bisti Unit flood which is the next highest.

In December 1971, a partnership was formed to buy out the assets of the Chaco Oil Company. On June 20, 1972, and prior to beginning any additional water flood operations on the undeveloped and unflooded portions of the Red Mountain field, the general partner and operator were tragically killed in a small plane accident in southwestern New Mexico. The subsequent settlement of the general partners estate and resulting problems necessitated the termination of the partnership. Monback Associates acquired a 75 percent interest in the Red Mountain field in August 1973 and Colorado Plateau Geological Services, Inc. acquired the remaining 25 percent in 1975. A possible micellar flood is now being planned for the field in late 1979.

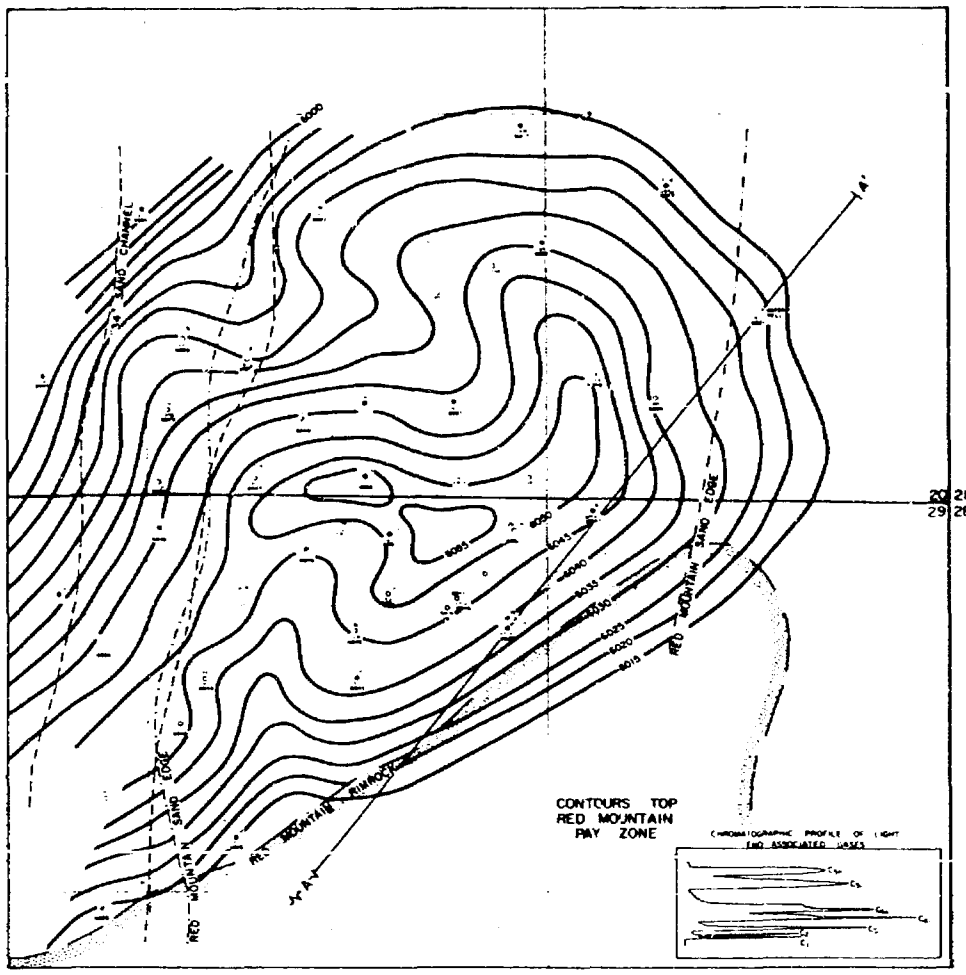
REFERENCES

Files of H. S. Birdseye (deceased).
New Mexico Oil Conservation Commission records.
Personal and operator's files.





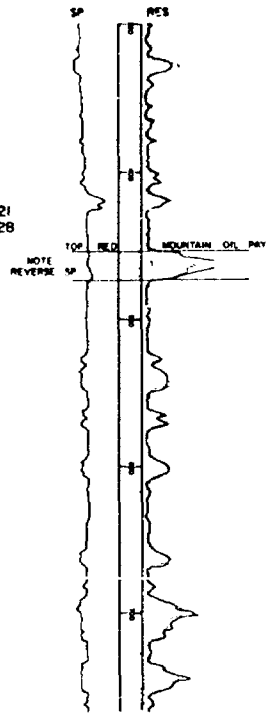
Oil and Gas Fields of the Four Corners Area]



RED MOUNTAIN OIL FIELD

STRUCTURE MAP
TOP RED MOUNTAIN
PAY ZONES
CHANNEL EDGES
SUPERIMPOSED

McKinley County, New Mexico



CHACO OIL CO. SFP D-1
339' FNL 1630' FEL
SEC 29 - 20 N - 9 W
D.F. 6498'
T.D. 965'

[Four Corners Geological Society