BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
December 4, 1974

COMMISSION HEARING

IN THE MATTER OF:

The hearing called by the Oil Conservation Commission on its own motion to permit all interested parties to appear and show cause why the continued injection of water for secondary recovery or disposal purposes into any formation from the surface of the ground down to and including the Drinkard formation should be permitted in Lea County, New Mexico.

CASE NO. 5377

BEFORE: A. L. Porter, Jr., Commissioner
Ralph Trujillo, Commissioner

For the New Mexico Oil Conservation Commission:
Thomas Derryberry, Esq.
Legal Counsel for the Commission
State Land Office Building
Santa Fe, New Mexico

and

William F. Carr, Esq.
Legal Counsel for the Commission
State Land Office Building
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For Anadarko Production Company:
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APPEARANCES continued

For Skelly	Chester E. Blodget, Esq. Tulsa, Oklahoma
For Texas Pacific Oil Company	John F. Russell, Esq. Roswell, New Mexico
For Petro-Lewis Corp.	Don Stevens, Esq. Santa Fe, New Mexico
For Agua	James T. Jennings, Esq. JENNINGS, CHRISTY & COPPEL Roswell, New Mexico

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E X H I B I T S

MR. PORTER: The hearing will come to order. Let the record show that we have reconvened at Room 336 of the State Capital Building for the purpose of hearing Case No. 5377.

MR. DERRYBERRY: In the matter of the hearing called by the Oil Conservation Commission on its own motion to permit all interested parties to appear and show cause why the continued injection of water for secondary recovery or disposal purposes into any formation from the surface of the ground down to and including the Drinkard Formation should be permitted in the following described area in Lea County, New Mexico: Township 22 South, Range 37 East, NMPM, Sections 13 through 36: all; Township 23 South, Range 37 East, NMPM, Sections 1 through 12: all.

MR. PORTER: Before we get into testimony, the Commission would like to call for appearances.

MR. KELLAHIN: Jason Kellahin, of Kellahin and Fox, Santa Fe, appearing for Anadarko Production Company, in association with Mr. Irley Bennette, a member of the Texas Bar. I also wish to enter in appearance for Skelly Oil Company in association with Mr. Chester Blodget, who is a member of the Texas and Oklahoma Bars. Mr. Blodget will present the case for Skelly.

MR. PORTER: Thank you.

MR. RUSSELL: John F. Russell, of Roswell, appearing on behalf of Texas Pacific Oil Company.

MR. STEVENS: Don Stevens, Santa Fe, New Mexico, appearing on behalf of Petro-Lewis Corporation.

MR. CARR: William F. Carr, appearing for the Commission.

MR. JENNINGS: James T. Jennings, of Jennings, Christy, and Coppel, Roswell, appearing on behalf of Agua.

MR. PORTER: Anyone else?

MR. KALTEYER: C. F. Kalteyer, Gulf Oil Corporation. I have a statement.

MR. FRANTZ: Lavele Frantz, of the Phillips Petroleum Corporation. I probably will have a statement also.

MR. STUMHOFFER: C. W. Stumhoffer, of the Armor Oil Corporation, and I probably will have a statement.

MR. LYON: Victor T. Lyon, Continental Oil Company. We may wish to enter a statement.

MR. PORTER: Anyone else?

Mr. Carr, would you like to go forward with your testimony?

MR. CARR: I have a witness to be sworn at this

time.

MR. PORTER: Have him stand, please.

JOE T. RAMEY

called as a witness on behalf of the New Mexico Oil Conservation Commission, first being duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. CARR:

Q Would you state your name for the record?

A Joe T. Ramey.

Q By whom are you employed and for how long have you been employed?

A I am employed by the New Mexico Oil Conservation Commission as a District Supervisor at Hobbs, New Mexico, and I have held that position for something over 15 years.

Q Mr. Ramey, as a District Supervisor, have you been called upon to testify before the Commission in District Court matters appearing as a petroleum engineer?

A Yes, sir, I have.

Q Are you familiar with the subject matter of Case 5377?

A Yes, this is a hearing to permit all interested to show cause why continued injection for secondary recovery disposal should be permitted in Township 22 South, Range 37 East, and Township 23 South.

MR. CARR: At this time, may it please the Commission, I tender Mr. Ramey as a qualified petroleum engineer.

MR. PORTER: The Commission considers Mr. Ramey qualified to testify in this case.

BY MR. CARR:

Q Mr. Ramey, will you give the Commission a brief history of the situation in the problem which has caused the Commission to call this hearing, and feel free to refer to Exhibit No. 1 so you can show the location of the various trouble spots.

A I think first that the problem here is that the injection of water for secondary recovery or disposal purposes in this area has resulted in migration of water from the disposal and injection intervals into shallow water intervals into the fresh water sands and has resulted in contamination of fresh water in the area.

This problem was first brought to the attention when Mr. Sims, who lives near Eunice, New Mexico, reported

contamination of fresh water to a well of his that is used for watering stock. This well is located in Eunice of Section 22 of 22 South, Range 37 East, and it is indicated on Exhibit No. 1 as a dry hole. This was an oil well drilled by Intercoast and J. C. Clower some years back, and I don't know the status of the plugging or anything as our records are incomplete on the well. It was converted by Mr. Sims to a water well, and Mr. Sims reported that this well had turned salty, and it was almost overnight after Armor treated the well that he had drilled in the same forty acres approximately 300 feet in the water well.

We took a sample of the water from the well and we found chlorides in excess of 80 thousand parts per million, where near 200 had been the figure for water, fresh water, in the area; so there is no doubt the well was contaminated in some way from somewhere. Immediately we checked Armor's well in the same forty, and we found a full stream of salt, 2 inch saturated salt water, coming from the bradenhead to the surface, and we requested Armor to immediately enter the well and run a temperature survey to determine where the water was coming from. The temperature survey indicated water entering the well about 2600 feet near the base of the salt section in this area going up the well bore outside of

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the 4½" pipe to around 400 feet where it was then going out into the Formation at 400 feet. The water was then coming into the surface, so, as we stated, the water at that time was well over 500 barrels a day, and the water flowed to the surface of the ground and the pressure in the well built up to 400 pounds immediately and they opened up a full 2" string saturated salt water. We requested Armor to go in and repair this well because we couldn't permit the water, this saturated salt water, to be going out into the fresh water sand at 400 feet, and we evidently had reached the shallow water which is in the neighborhood of 100-plus feet in the area in at least this No. 1 well, the Sims well.

Armor, after some $80,000 and several cementing jobs, did manage to shut off the flow of water from 2600 feet protected upwards, and so we projected fresh water, but they were never able to squeeze off the water flow at 2600 feet. It was moving water and it is tremendously hard for cement to set up in this area in moving water.

Due to the proximity of this well to Skelly's Penrose "A" Unit, we requested that Skelly conduct tracer and temperature surveys on all of their injection wells in the unit, which they did. We found several wells where water was channeling, and we wanted it to go into the injection

interval, and at least three wells where water was channeling above the injection interval. Just how high to turn it on on the pressure surveys, we did find three wells which Skelly promptly repaired. During all of this time, we were checking to see the extent of these water floods and the more we checked, the more we would find that Skelly, who was drilling wells in the Unit, encountered water flows in the well unit "L" of Section 3, 23 37. The well in "M" of the same Section, the well in "H" of the same Section, of course, we found water flows in the Armor flow well, and the water flowed into the Armor well in Section 2 in Unit "M" of Section 2, and as we checked further on this, we found more water flows in and around the area of Anadarko's water flooded Langlie-Mattix Penrose Sand Unit where it first came to our attention where Skelly reported to us that they had been encountering some unusual pressure in their LPG Storage Wells which they operated in conjunction with the gasoline plant which was located in Section 27, which is approximately in the middle of Anadarko's water flood. They normally carried 600 pounds pressure on the well, so they unloaded the LPG that they stored in the well and shut the well in, and there was a pressure build-up of about 1700 pounds. Since these wells are completed in the

salt section, they are actually washed cavities in the salt section, and since the top of the salt is around 1200 feet, they were afraid that with 1700 pounds surface pressure, the hydrostatic head of the water at or near the rupture of the overburden pressure, we were afraid that they might have some salt sections in the area. They were producing the water from this well, and their production rate is fluctuating around 350 to 1400 barrels of saturated brine water a day. They were then, in turn, injecting into their salt water disposal well. This LPG well is in Unit E of Section 27, so at this time they requested Anadarko to run tracer and temperature surveys, and they commenced work on the first of August and are still working on obtaining the surveys. They seem to be going extremely slow. They have been having well trouble in some instances, and they have cleaned out the well and back-flowed it and then there are equipment problems also.

Further, investigation has indicated water flows in this well in Unit I of 26 of 20 to 37, these wells were wells in which they encountered water flows in drilling or at some later date the wells in this area, the waterflows encountered during the drilling of the wells in this area have been encountered after completion of the wells. Some

of the wells have produced. Sometimes the operators needed pressure on the bradenhead between the surface string and the production string.

MR. NUTTER: By saying the wells in the area, the water encountered during drilling, do you mean the southernmost area in the Section?

MR. RAMEY: In Section 22 and 23.

MR. NUTTER: Which is the water you encountered during the drilling operations?

THE WITNESS: Yes, sir.

MR. NUTTER: Do you mean subsequent to the well being drilled?

MR. RAMEY: Yes, sir, that is right.

A (Continuing) There are three wells in 24 and a total of six wells in Section 23. Now, we have in October of this year, the Commission staff and Skelly and Anadarko had a meeting in Hobbs in which we went over some of these problems. At that time we suggested that Skelly re-enter two 22 dry holes in this Unit, being wells in Section 3 and one in Unit E, and the other in Unit J of Section 23, 37, and probably plug the wells. We felt that those dry holes would not contain any injected water into the interval, and we requested Anadarko to enter a well that was drilled by

Elder and Willingham in Unit B of Section 34, Township 22, Range 37 East, for the purpose of properly plugging this well. Skelly had agreed to do this work. Anadarko has re-entered their well and they are in the process of cementing or getting close to cementing the well, or properly plugging it at this time.

Also, at that meeting I advised both Skelly and Anadarko that I would write to the operators of the deeper wells in the area where the wells were inadequately cemented, to contain the water in either of the San Andres or the Queen Formation. To clarify, we have three disposal wells in the area that are disposing water into the San Andres, and the Agua well in Unit H of 35, 2237, and the Skelly well in Unit L of 2722, 37, and the Armor well in Unit M of 22, 2337, these are disposal wells for the production of water and the injection interval for the four floods in question, which are the Skelly Penrose "B", which is the southwesternmost flood, and Skelly Penrose "A", the southeasternmost flood, and Anadarko's Langlie-Mattix Penrose Sand Unit, which is the northern flood, and the Petro-Lewis flood, which is to the northwest. These injection intervals in these floods, these are primarily the Queen Formation, and probably portion of Seven Rivers, which is the vertical

limit of the Langlie-Mattix Pool.

So, anyway, I wrote several operators in the area stating that their deeper wells did not have adequate cementing to cover these injection and disposal intervals, and it would be necessary for them to go in and locate the top of the cement, perforate and bring cement back either to tie it into the next string of casing or into the salt section, whichever was deepest.

Now, I think that Continental has gone down to work on the well. Skelly has indicated that they would be the only operator that has indicated that they would not do this work. Amerada, I had written them about the wells in Section 22, and they wrote me back and said that at the time the wells were cemented that they had been approved by the Commission and they felt that they were adequate, and that they had no problem of waterflows, and so they didn't feel it was necessary for them to do the work. Also, John Hendrix, on one of these wells, we just had to pick the best well and he didn't want to do the work, but if so ordered to do so, he would demand a hearing before he did the work, and he would only do the work after he was heard by the Commission. Texas Pacific in the Northeast Quarter

of 23, the map fortunately shows Amerada, that this quarter section does belong to Texas Pacific Oil Company, and it is indicated that they would plug some of their wells in the area and repair others, but then they started to work on their well No. 4, and they found water flow outside of the surface pipe in this well. They attempted to plug the well, and to date have been unsuccessful in shutting off this water flow outside the surface pipe, and if the water is busted through out the surface pipe, it is going through and probably into fresh water in the area, so basically that is the problem. I think that covers it.

Q Do you have any further testimony that you would like to make in regard to Exhibit No. 1?

A I do have some completion cross sections which are Exhibit Nos. 2 and 3, labeled here A' and B, and B' which I will go into now. These are, as I say, completions showing a cross section which I will illustrate with various types of completions and plugging plans that we have in this area. On this I have placed some possible water flows that could be going in this area to account for the contamination we have had. Starting over on the left, two injection wells in the waterflood. This water is in-

jected into the Queen Formation, and in the meantime, you sand and dress the top approximately 200 feet here at below the Grayburg, so you have a San Andres approximately through there, and your water is contained as it flows to the right. It is contained in the Queen, and then when it reaches the well such as this, the Amerada Hess-Wood 9, it can, because of the inadequate cement, migrate up to approximately 2700 feet over the base of the next string of casing. Then, again, it will progress until it hits another well bore such as this Atlantic-Boyd 4, and you have casings similar near the top of the salt, so now we have it to the top of the salt section, and then it progresses until it is at a well which was plugged some years back. This well has a 10-sack plug and a 2600-ton-sack plug and 1200 feet with casings stuck off, so it really moves to prevent the water migrating clear to the surface in the casing, but we will bring it on through here and we come over to this Texas Pacific-Boyd 4, and it has a casing set at 564 feet. If there is enough pressure, or any pressure as we experienced on some of these other wells, from there it is very easy to bring it to the surface, or it could progress over to this well where the casing happens in the well at 2160, and so a 15-sack plug was placed above the collapse, and a

pipe unscrewed at 344 feet, and a 17-sack plug put there and a well such as this would certainly hold much pressure. You can trace the water from the disposal interval which is here in the injection interval, and you just pretty well can trace it through the well up to the surface of the ground, or within 200 or 300 feet of the ground, with any pressure at all going to break through. I want to stress that I am not saying this has happened. It possibly could be happening. I kind of feel that probably it is happening in some manner along this way.

Exhibit 3, which is B, B' which is more or less north-south -- I don't know -- it goes into quite a bit of detail on this, but in this case on the left side of the Exhibit you have an injection well here at the disposal well.

Q Would you give the name of those wells?

A Yes. The injection well is the Anadarko Langlie-Mattix Penrose Sand Unit in Tract 37 No. 1, and the disposal well is the disposal well of Skelly's that is operated in conjunction with their gasline plant in Section 2237, but water injection into the Queen Formation can go to this dry hole, which is drilled down to some 6000 feet with a 20-sack plug in the bottom, and a 20-sack plug at

2022 feet, and from there the water hits this well bore and goes anywhere in the San Andres Disposal. The water in the well bore goes anywhere, and this could be siphoning prior to conducting, or coming on the LPG well into the disposal or into the dry hole back to the storage well. It is very remote.

On the right,side, this is some more of the same. These are two Skelly wells that we felt were inadequately plugged to contain water into the injection-well interval. These are both wells which are offset by injection wells, so the water is injected into this Penrose "A" Unit No. 26, and it can go to the Ellen Sims No. 6 and hit the well bore, and go up to the depth of 2790, and from 2790 with 2000-plus pounds of injection pressure, it could easily break this up into your 2600. This is the Armor Sitgo State where we found the water bringing in at 2600, and going out at 400 up to the surface also.

Going this way to the other dry hole, which is Sims No. 2, the water can go up to 2790 where the injection plug is set, and come over offsetting the injection well which has a 7-inch line at about 3400 feet, cemented with 200 sacks. Out of this well it goes over to the well where we have a 7-inch line set at 3450 sacks, which is probably not enough to bring the cement back to, say, the level where it

shows the water entering, so you have actually water entering and going down into the injection well and hitting the dry hole and going into the injection well. It goes up to 1100 feet through the injection string of casing which is set there by charging all zones in this interval.

I think these things could be happening. I am not saying it is this way. I feel that it is something which is similar to what is illustrated on these two cross sections, that is what is happening in this area. This water is escaping out of the disposal and injection intervals, and is getting into the shallower zones.

Q You indicated four water floods involved in the area. Would you refer to each and indicate on what date the injection was started, the cumulative water injected to date, the injection pressure, and the daily average amount of water injected?

A Okay. We have Skelly Penrose A Unit, which is the southeastern unit on Exhibit A. The first water injected was in June of 1958. The cumulative water injected through July is 21,750,000 barrels. The daily injection is about 9300 barrels a day. The maximum pressure is 2000 psi at the surface. Skelly Penrose B Unit, the first injection was in July of 1965. They injected slightly over 20

million barrels of water. They were injecting 6400 barrels a day, and the injection pressure, the maximum was 2100, and then in Anadarko Penrose Unit, the first injection was February of 1958. They injected very close to 43 million barrels. Their daily average injection is 2100 in Section 21, and 100-barrel maximum pressure was 2300 pounds. Petro-Lewis in State "M" flood, the first injection was in November of 1963. They had injected around 16 million barrels, with a daily average of around 5000-barrels, and with a maximum pressure of 1915.

Q Would you give the same data on the well involved on the Agua No. 35 salt water disposal well?

A The first disposal was in February of 1969 and they have disposed of some 27,750,000 barrels at the daily rate of 5000 barrels a day, and at a maximum pressure of 1700 pounds. Skelly's salt water disposal well, the first injection was November of 1966. They have disposed of nearly 4 million barrels at 1500 barrels daily, with an indicated pressure to 1855 pounds. The Armor-Gulf State No. 1, was first started in May of '74 and the first injection was by Armor. However, this well had been used for a short period by trucker's for disposal prior to this for this essential purpose in May of '74. The first injection, they

first injected 45,431 barrels, and their daily average of water injected was 4000 at 1200 pounds.

Q Mr. Ramey, are you prepared to make a recommendation to the Commission as to how they are to deal with these problems?

A Unless the operators here today can assure this Commission that this continued injection of water into the area will not result in further contamination of fresh water, I would have no choice but to recommend that all injection cease in the area.

Q Do you have anything further to add to your testimony?

A No, sir, I have nothing else.

Q Were Exhibits No. 1, 2, and 3 prepared by you and under your direction or supervision?

A Yes, sir, they were.

Q At this time I would offer the Oil Conservation Commission's Exhibit 1, 2, and 3.

MR. PORTER: Without objection, those Exhibits will be admitted.

MR. CARR: We will make Mr. Ramey available for cross examination.

CROSS EXAMINATION

BY MR. NUTTER:

Q Could you give us the amount of water which is involved in the current injection?

A I didn't bring that, Mr. Nutter, but as you know, I can probably get the Statute on it, which is in front of you.

Q I was just wondering; I have got them.

A I am aware that this shut-down of the injection well into the disposal area would be quite drastic in so far as oil production is concerned.

Q I was just wondering how the injection compares with the rate of production; do you have a general idea?

A I don't remember that, Mr. Nutter.

CROSS EXAMINATION

BY MR. STEVENS:

Q I would like to point out that I am representing Petro-Lewis, and the flood is in the extreme western portion of the area that we are concerned with here, and our contention is we have to get to different areas to work with here, and in that connection I would like to use your figure of maximum

pressure of these various floods, such as in the Anadarko, for example, which is to the east of the Petro-Lewis which you stated had 1500 pounds pressure. At the time it was 1915 pounds maximum pressure, and since Petro-Lewis lies west of Anadarko, and the problem area is in the Anadarko area to the east, is it possible that in your opinion that Petro-Lewis could contribute to the problems you experienced in the east since Anadarko's pressure is higher?

A Well, I will say, Mr. Stevens, that we have found no indication of any water escaping from the injection interval into the Petro-Lewis or the Skelly Penrose "B".

Now, there were three contributing -- I don't know -- water flows in strange manners: If it gets into this zone that is at the base of the salt, it would seem to spread out; it seems to dig itself a pipeline.

Would it be possible for, say, 1900 pounds of pressure in the Petro-Lewis area to contribute 2300 pounds to the Anadarko area farther east to your problem area?

A Well, of course, these maximum pressures, I am sure Anadarko's area where they have injection under 1900

so this is the maximum. Just to find the maximum pressure on a given well, so to say that Anadarko area has 2300 pounds of pressure, that is the highest of 1900, and we can't say that you might have a well here that has 2300 pounds or you might have here a well that has 1500 pounds. You have to have a well that has 1900, so you could, in general, if there was much water moving from here to here, there is no indication that this contributed to the problem in here.

Q In your opinion is it the primary -- not the total -- problem, but the primary problem caused by additional deep wells with possibly uncemented casing or casing that has been washed around by the injection water?

A I think it is probable that some your wells in this area, the new completions, but the majority of the old Drinkard wells which were drilled in the 50's --

Q (Interrupting) I am not suggesting that there is no possible problem on the west side. With the lack of deep wells on the west side, it may be a factor in the possibility of pollution.

A Yes, sir, I am sure it would be, I feel a lot more confident there is no deep production over here, and that the water is staying in the injection intervals.

MR. STEVENS: Thank you, Mr. Ramey.

MR. PORTER: Does anyone else have any questions of Mr. Ramey?

CROSS EXAMINATION

BY MR. KELLAHIN:

Q Mr. Ramey, in the answer to Mr. Stevens, do you feel that the distance of improperly cemented deep wells is a major factor in the contamination?

A Yes, sir, I sure do, Mr. Kellahin, I very definitely do.

Q Your recommendation is that injection, unless we come up with something else, injection should immediately be curtailed or discontinued, and that would mean production would also be discontinued in the area, would it not?

A I am afraid it would. It is a little hard to dispose of water.

Q Do large volumes of water have to be disposed of?

A Yes, sir.

Q In that connection, just by shutting down the reservoir, that would be effective, and you would still leave the pressure up and have no relief, isn't that correct?

A I think that when you shut it in, Mr. Kellahin,

I mean, my theory -- as you know, I am not a hydrologist -- is that the water in the higher zones would seek a level, and that would continue to move out until they have attained zero pressure.

Q Would it be a better approach to attempt to reduce the pressures?

A Well, this could be done if you continually were injecting into a leak. You can inject one spot and take it out, and what essentially Skelly is doing there is relieving the pressure, and probably where the water has been broken through the base of the salt into the cavity reducing pressure, and something is feeding down the line, and the flow doesn't seem to be diminishing much.

MR. KELLAHIN: Thank you, sir.

BY MR. PORTER:

Q You referred to the volume of water being removed on a daily basis.

A From there to the LPG, I meant the storage well.

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

CROSS EXAMINATION

BY MR. STUMHOFFER:

Q I am C. W. Stumhoffer of the Armor Oil Corporation, and I just wanted to question you about something where you made a statement in your testimony that before the days of disposal of the Armor's well, I believe, you said 400 --

A (Interrupting) 200, I am sorry.

Q It should have been 400, it is about 200, right?

A The last figure I had was 4.

Q Well, to go to the vacuum, when we were not disposing, I just thought I would like to mention that.

A Pressure is 1200 while you are disposing, and when you're not disposing, it goes to zero.

Q Yes.

A That is interesting.

CROSS EXAMINATION

BY MR. STAMETS:

Q Mr. Ramey, is there any indication that there were water flows in the formation before these various projects of disposal production were started?

A Somebody brought up yesterday that we had a little discussion with some operators yesterday afternoon that Texaco had encountered tremendous water flow when drilling a

well down Section 16 of 2337. However, I checked the well files, and I vaguely remember something to the effect that back before I went to work for the Commission, I checked the well files in our office here, and I could find nothing in any of the Texaco wells that indicated this. I do remember something along this line; perhaps somebody else has some definite information on it.

Q Apparently, when drilling the old Drinkard wells, they didn't have a big problem.

A No, not to my knowledge, and I should point out that up here the Texas Pacific, in that area they encountered error in the salt section, and had at least two wells blew out. This Number 4 well, where the water was breaking through this well, it blew out several times when we were drilling. We managed each time to blow the red bed, and it would cave in, and they were planning to get 564 feet of casing into the hole, and they cemented 1000 sacks of cement, and when I checked the top of the cement, they only had 100-foot fill up on it, so we have got a tremendous cavity of some kind back in there, and this has been indicated in this other well. This well of Sinclair's, Sinclair drilled it to the cross section, and it also encountered air in the salt section. They set 958 feet, and this was 2900 feet and

it was perforated with 1000 sacks of cement, and then they came up and perforated at 950 feet and squeezed 2570 sacks of cement into that perforation, and before they could complete the casing, it collapsed at 2160, so there is something in that area. But it was an error in this case, and there have been occasions where the water has been encountered in a salt section in this particular area, and the only one is this rumored Texaco well.

Q It appears that these various water flows must be diminished and halted, and adequate repairs on a number of them should be made.

A I would think so. There is, from what I have seen, Texas Pacific is trying to squeeze off this No. 4 Boyd, and from Armor attempting to squeeze off this Sitgo State and pump cement in, and it just flows down the river.

Q Some of these injection pressures, the maximum pressures of 2300 pounds, what depth are they injecting into?

A You are looking at the interval 34 to 3700.

Q Would you make the bottom pressure something like 5000 pounds? I may be a little high on that.

A It is probably another 1400 pounds, so you are looking at about 3700 pounds less 46. Whatever that would be, it is not excessive at that depth. It looks pretty

excessive to me.

Q It is not as much above what you would expect as you get indication from this Skelly well of 1700 pounds, but 1200 feet.

A Right, yes. It is 3700 pounds at 3700 feet, and it is probably safer at 1700 pounds than at 1200 feet.

Q Do you think you might accomplish any pressure relief in these reservoirs by producing them and reinjecting only the produced water -- say -- selectively in the project?

A That would be a possibility.

Q Perhaps if you stayed away from the east side of the area, however, that may be a factor in staying away from the dry holes, away from the edges where there may be some deeper wells, until these wells are repaired, if they are repaired.

MR. KELLAHIN: Thank you.

MR. PORTER: Are there any other questions of Mr. Ramey?

The witness may be excused.

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MR. KELLAHIN: Thank you.

MR. PORTER: Are there any other questions of Mr. Ramey?

The witness may be excused.

(Witness sworn.)

DANIEL S. NUTTER

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

DIRECT EXAMINATION

BY MR. CARR:

Q Would you state your name for the record, please?

A Dan Nutter.

Q By whom are you employed and how long have you been employed in this position?

A New Mexico Oil Conservation Commission, Chief Engineer, approximately 17 years.

Q Mr. Nutter, as Chief Engineer of the Commission have you been called upon to testify as an expert petroleum engineer before the Commission and in the District Court?

A Yes, sir, I have.

Q Are you familiar with the subject matter of Case 5377?

A Yes, I am.

MR. CARR: I tender Mr. Nutter as an expert petroleum engineer.

MR. PORTER: Mr. Nutter's qualifications are

acceptable.

BY MR. CARR:

Q Mr. Nutter, would you explain the data you have on the rate of injection in the various water-flood projects and disposal wells and indicate how this data relates to the rate of production from the pools involved?

A Yes, I will. First we have previous testimony that says there are three water-disposal projects in the area; presumably there is no production from those water-disposal projects, so everything that goes in is in the reservoir or in a reservoir. The four water-flood projects that are operating in the area, though, which is under consideration, I have August production and injection figures here which I would like to testify to. The Anadarko Langlie-Mattix Penrose Sand Unit in the month of August, 1974, produced 55,937 barrels of oil, 264,172 barrels of water, and 22,341 mcf of gas. This gives us a total fluid produced, or liquids produced, of 310,109 barrels of oil and water and the 22,341 mcf of gas. Against this was injected 601,965 barrels of water. Now, I don't have a conversion figure at hand and I have not converted this gas produced into barrels of reservoir space, however, 22,341 mcf of gas is not

going to occupy a great deal of reservoir space when we consider that injection pressures being as high as they are, we know that the reservoir pressure is rather high, because the Anadarko Project, as Mr. Ramey testified, is injecting at a maximum pressure of 2300. This plus the hydrostatic head is going to give you a fairly high reservoir pressure in there and the 22,341 mcf of gas converted to barrels at that pressure is almost negligible. So, we have an injection-production ratio of 1.9 to 1 in this particular flood. In other words, almost twice as much is going in as is coming out.

The Petro-Lewis flood, in the month of August, produced 14,631 barrels of oil, 115,351 barrels of water, for a total liquid production of 129,982 barrels. This was accompanied by 27,260 mcf of gas. The liquid ratio again, without converting the gas into barrels, would be -- there was injected 152,838 barrels of water, so the liquid injection-production ratio is 1.2 to 1, which is just a little more than 1 to 1, of course.

The Skelly Penrose "A" Unit, in the month of August, produced 41,567 barrels of oil, 115,854 barrels of water for a total liquid production of 157,421 barrels.

This was accompanied by 8631 mcf of gas, a negligible amount. Injection totaled 272,780 barrels of water. The ratio of injected fluids to produced liquids is 1.7 to 1 in this project.

The Penrose "B" Unit operated by Skelly in the month of August had 7174 barrels of oil produced, 96,398 barrels of water produced for a total liquid production of 103,572. This was accompanied by 2607 mcf of gas. There were 167,829 barrels of water injected in the project. The injection ratio of liquids to liquids is 1.6 barrels of liquid injected to 1 barrel of liquid produced.

Now, it appears that each of these floods, with the possible exception of the Petro-Lewis, is far exceeding the amount of withdrawals if we consider the amount of injection taking place. After fill-up is achieved on a water-flood there is no real necessity for exceeding the rate of production by the injection rate. Of course, prior to fill-up you do have to because you have a void in the reservoir that must be filled. But, if you exceed it, without increasing the reservoir pressure, the liquids have to go somewhere. This may be the problem that we've got here.

MR. CARR: I have no further questions of this Witness.

MR. PORTER: Does anyone have any questions of Mr. Nutter? The Witness may be excused.

Mr. Kellahin, do you have some testimony that your client --

MR. KELLAHIN: (Interrupting) Mr. Porter, we have two witnesses that I would like sworn.

MR. PORTER: Do we have anyone else that desires to present testimony in this Case? If we do, let's have all the witnesses stand and be sworn at this time.

(Witnesses sworn.)

FARRIS NELSON

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Would you state your name, please?

A Farris Nelson.

Q Mr. Nelson, by whom are you employed, and in what position?

A I am employed by Anadarko Production Company as Area Engineer in the Eunice Area.

Q Where are you located?

A I live in Hobbs.

Q Have you ever testified before the Oil Conservation Commission?

A No, I have not.

Q For the benefit of the Commission would you briefly outline your education and experience as an engineer?

A Yes. I have a BS in Petroleum Engineering from the University of Oklahoma; I worked --

Q (Interrupting) When was that?

A 1954. I worked for three years with Gulf Oil Corporation and the last 17 years with Ambassador Oil and its subsequent owner, Anadarko Production Company.

Q Have you been working during all this period as an engineer?

A Yes.

Q Working with Ambassador, did you have anything to do with the institution of what is now known as the Anadarko Penrose Sand Unit Waterflood Project?

A Yes, I have worked on that project for the last 13 years.

Q And you are familiar with the wells in the

project and the injection that has been made in it?

A Yes.

Q [illegible]

A Yes, I am.

MR. KELLAHIN: Are the Witness' qualifications acceptable?

MR. PORTER: Yes, they are.

BY MR. KELLAHIN:

Q Mr. Nelson, referring to what is marked as Anadarko's Exhibit No. 1.

(Whereupon, Anadarko's Exhibit No. 1 is marked for identification.)

Q (Continuing) Would you identify that Exhibit and discuss the information that is shown on it?

A Yes. This Exhibit shows the Anadarko Langlie-Mattix Penrose Sand Unit and further it shows other leases in the area outside of the Langlie-Mattix Unit which is operated by Anadarko.

Q Are those the areas colored in yellow?

A Yes.

Q What is the significance of the red outline?

A The red outline is the area being considered

in this hearing.

Q That is under the Commissions advertisement on this particular hearing?

A Yes, that is correct.

Q Now, you heard the testimony this morning that Anadarko was asked to make a survey of all their injection wells. Has this been done?

A The job hasn't been completed. We received directions from the Oil Commission in July of this year to commence in injection profiles to include temperature surveys and radioactive tracers on all injection wells operated by Anadarko. I might state that there are 49 injection wells in the Langlie-Mattix Unit, there are two injection wells outside of the Unit on leases operated by Anadarko. To date we have completed 31 of the surveys; we have, as Mr. Ramey pointed out, it has been progressing rather slowly and I will try to point out some of the reasons for that. We have completed 31 of the surveys with no indication of problems. Let me digress just a minute and say that the purpose of these surveys was to try to show that there was or there was not fluid movement out of zone, out of the Queen's section, around the casing shoe vertically into

the other zones. We have completed 31 of the surveys with all in good order. We have six of the wells that are ready to survey as soon as the surveying company can get to those. We have four wells that we'll have to pull the tubing on to move tubing obstructions. There are nine wells that we have fill-up in the open hole section and this must be cleaned out.

Now, part of the delay in completing this work has been in the cases where work had to be performed either to remove tubing obstructions or to clean out the wells. When you start to go into a well to pull the tubing, it generally takes one to two weeks to bleed the pressure down sufficiently that a pulling unit can move in and pull the tubing. Then, equipment has been a problem too. Pulling units just haven't been available. We've had anywhere from one to three units working on this project and we would have had more except they just were not available. Then I would like to mention on one of the wells, the only well on which we found a problem, was the Langlie-Mattix 4-3, which is located in Section 22, Unit F. This survey did indicate a leak around the casing shoe. That leak has been repaired and it has been resurveyed and the second survey was

satisfactory. This is the only well in all of the 31 wells that has shown any problem, any indication, that they could be contributing to the problem. Now, we did find a casing leak in 13-B-2 and 35-2.

Q Would you locate those wells, please?

A All right. 13-B-2 is located in Section 27, Township 22, Range 37, in Unit B. 35-2 is located in Unit H in Section 33, same township and range. The casing leak in 13-B-2 was at a depth of 2480 feet. This leak was coming back into the casing, was a result of the problem, not contributing to the problem. It has been squeezed and repaired. We currently are working on the 35-2.

The only other well that indicated any problem on the survey was Well No. 7-3 located in Section 21, Unit B, same township and range. This well indicated a water flow between the surface casing and production casing from a depth of about 1350. This has been cemented off and the water flow has been stopped.

Q Was this water flow occasioned by the 7-3 well or is it a result of water coming into that formation from elsewhere?

A No, the survey on 7-3 indicated there was no

problem with the casing shoe on that well. The water that was being injected was going into the correct formation; as far as the survey was concerned it was staying in that formation.

Q What do you think was the cause of the water flow?

A The water flow had to be coming from the zone that was pressured out by some other source.

Q Now, did you find any temperature anomalies in connection with your survey?

A Yes. We found several wells that indicated temperature anomalies. These ranged from about 2900 feet up generally to about 2300 feet.

Q What is the significance of the temperature anomaly?

A The temperature anomaly indicated that there was a fluid movement outside of the wellbore that changed the temperature gradient different from what it normally should have been.

Q That has no significance in connection with the cementing job on that particular well, does it?

A That is correct. The fluid could be placed into that particular zone at some other point; it definitely

was not from the wells where the anomaly occurred.

Q You made reference to an area of about 2600 feet and I believe Mr. Ramey gave some testimony about the water entering this level at 2600 feet. In your opinion is that a continuous zone across the area involved here?

A Just from these temperature anomaly that we have noted here it doesn't seem like it is a blanket zone. It occurs in toward the bottom of the zone, say at 2900 feet in some wells and others up as high as 2300 feet.

Q Now, you heard Mr. Ramey's testimony that in his opinion a major source of the problem is improper cementing jobs on these deep wells in the area. Do you agree with that testimony?

A Yes, I definitely do.

Q Do you recommend to the Commission that some action be taken to assure that these wells are properly cemented?

A Yes. I think this is the only way we can cure the problem.

Q Now, would shutting in the flood in any way solve the problem; shutting in all injection?

A No. Shutting in all injection will not solve

the problem. It may stop the recharging of the zone, but the potential is still there; if there is any injection ever into any of these zones from the San Andres up, the potential for flooding problems is still there unless deep wells are correctly cemented.

Q But just shutting in the injection wells, would that in any way reduce the pressures in the formation, within a reasonable time?

A In a short time, no. There needs to be some fluid withdrawals in order to reduce that fluid, that pressure.

Q Now, you heard Mr. Nutter's testimony in regard to the injection ratios in connection with this area, and there was some mention made of just injecting produced waters. What would be the effect of following that recommendation?

A The effect of just reinjecting the produced water would be finally a reduced pressure in all of these zones from the Queen up through the top-most zone to the salt, but at the same time there is going to be a drastic drop in oil production.

Q In your opinion would that productivity of the water flood ever be recovered?

A From experience , zones in floods where there has been an interruption of injection or production, the production rate of oil never returns to the trend that had already been established. That is, it doesn't return to the decline curve at the same rate as you shut it in at. It usually returns to the decline curve where it would be extrapolated to in time.

Q That would result in a loss of oil that would otherwise be recovered?

A Yes, that's right.

Q In you opinion, if you just reinjected produced water, would the decline in pressure be rapid?

A Fairly rapid; your production rate is going to fall very sharply without additional water.

Q Have you had any experience in the reduction in your production rate as a result of shutting in injection wells?

A Yes, we have. Since we started this work in August, as Mr. Ramey testified, our injection rate is averaging about 21,500 barrels in August. Our rates are now down to about 17,500 barrels per day and that reduction is due to the work that we're having to do in order to run the surveys. During this same period of

time our oil production has dropped approximately 125 to 150 barrels per day.

Q Do you attribute that to closing in the injection wells for testing?

A Yes, I think it is a reflection of reduced injection rates.

Q And you would expect a comparable reduction in production if you merely reinject produced water, is that correct?

A Yes, that's correct.

MR. TRUJILLO: Excuse me, what was that reduction drop that you just mentioned?

MR. NELSON: The production drop on the oil?

MR. TRUJILLO: Yes.

MR. NELSON: Approximately 125 to 150 barrels per day of oil.

MR. TRUJILLO: Okay. Thank you.

BY MR. KELLAHIN:

Q Now, you heard the testimony in regard to your injection pressures and it was stated your maximum pressure was 2300 pounds. Do you have any comment on that?

A Yes. I feel like maybe there was a typographical

error in preparing the C-115 because our water-injection plant pressure is only 2200 pounds.

Q So you couldn't achieve a 2300-pound pressure?

A No. We couldn't achieve a 2300-pound pressure.

Q What is your injection pressure at the present time, do you know?

A The pressure ranges in October from 1100 pounds to 2150 with -- I'll start to give an average pressure of 1525 but that's really not very meaningful.

Q It varies from one well to another, is that correct?

A Yes, it does.

Q Would you be adverse to putting your major injection over on the west side as opposed to the east side as a temporary measure?

A No. This would seem to be a reasonable approach since most of the deeper wells and the plugged wells are along the east of the Langlie-Mattix Unit.

Q You did re-enter this Willingham Well, the T. O. May Well No. 1, did you not?

A Yes, we have. Rather, we are in the process of re-entering that, and I might give the Commission a little bit more information than what Mr. Ramey has: This

morning we were at 4210 cleaning out this well. We went in and we encountered the top of 8-5/8 casing where the well records says it should be at 1904. In order to hold the red bed back, we had to set 260 feet of 10-3/4 casing and then finally a string of 7 inch was tied into the 8-5/8 at 1904. There is a reported plug of 20 sacks at 2000 feet but we didn't find it; it wasn't there. As I said, this morning we were at 4210, which puts us down in the San Andres Formation. We expected to get a tremendous waterflow. I really believe that plug was there because I expected to get an immediate waterflow when we penetrated that plug, but the plug wasn't there. We were actually loosing fluid; the fluid is actually going down the hole and evidentally into the San Andres Formation.

Q You didn't encounter any waterflow at any level in that well, is that correct?

A We had a waterflow that lasted for something less than an hour and then it has been on a vacuum ever since that time. We have been having to supply make-up water in order to keep that and clean it out.

Q You said you didn't find the plug. Anadarko didn't drill that well, did they?

A No, they did not.

Q And they didn't plug it originally did they?

A No, they did not.

Q You have taken on the job of plugging it at the Commission's request?

A That is correct.

Q Now, there has been some indication that the reduction in reservoir pressure is required here. Do you agree with that?

A Yes. I think that probably we are going to have to reduce pressure in order to allow the deeper wells to be properly cemented.

Q Would that be just an area problem around the well where the cement job is being attempted?

A I think this could be accomplished by just closing in or reducing the rate immediately surrounding the well to be worked on.

Q But as a measure to show the wells have been cemented, do you have any recommendations as to injection rates or any other action that could be taken to reduce reservoir pressures? What would you propose?

A If I understand your question correctly, your question is: How would we go about reducing the --

Q (Interrupting) What would Anadarko recommend as to future injection rates?

A We would like to recommend that future injection rates be limited to reservoir voidage. This way we are just putting back what we are taking out of the reservoir and this would be dissipating the reservoir pressure at basically the same rate as if we closed the reservoir in.

Q In other words, it would have the same effect as Mr. Ramey's recommendation?

A Yes, this is true, but it would have the advantage that it would continue to allow us to produce some of the oil during that period of time.

Q Would that result in a reduction over a period of time in the reservoir pressures?

A Yes, it will, because as Mr. Nutter pointed out, our injection rate had been varying from 1.8 to 1.9 barrels per barrel of withdrawal. When we start limiting our injection just to the reservoir voidage we're going to be from month to month increasing the amount of injection, therefore the pressure will decline.

Q Over a period of time the volume of fluid injection will be reduced, is that right?

A That's right.

Q Below the initial rate of replacement, is that right?

A That's right.

Q Do you have anything else, Mr. Nelson?

A No, I don't believe so.

Q Was Exhibit No. 1 prepared by you or under your supervision and direction?

A It was prepared under my direction.

MR. KELLAHIN: I would like to offer Exhibit No. 1.

MR. PORTER: With no objection Exhibit No. 1 will be admitted.

(Whereupon, Anadarko's Exhibit No. 1 was admitted into evidence.)

CROSS EXAMINATION

BY MR. PORTER:

Q Mr. Nelson, are you suggesting that what you are recommending here, as far as reducing the pressure, would offer a better permanent solution to this thing than complete shut-in?

A I think that it would, Mr. Porter, because complete shut-in is going to mean that production has to

cease during the time that all injection is stopped. We will achieve reduced bottomhole pressures and at the same time -- we will achieve reduced bottomhole pressures by our proposals and this will allow the deeper operators to complete their recementing jobs. At the same time we will be able to produce some of the oil we would otherwise not be able to produce.

Q Do you feel that they can come nearer completing their repair jobs on the deeper wells under your recommendations than could a complete shut-in?

A I don't think that it would be a better situation from their point of view, no, but I just don't believe that we have to go to that extreme in order to achieve the cement job. I might point out that Armor has had some very bad experience with this trying to cement in the waterflow, but we have also had one case where we had casing failure on our Metex Supply A No. 1 which is located in Unit B of Section 35, 22, 37, that required a casing repair, a cement squeeze, and we had some trouble but it was achieved.

Q I see.

A So, I don't feel that we have to reduce this reservoir pressure just to -- the original reservoir

pressure--in order for them to adequately cement the deeper wells.

Q But you feel that any reduction in pressure here will interfere with ultimate production of oil?

A Well, when you say any that becomes -- could be very small, but if we reduce the rate down to just reinjected produced fluids, then it will result in lower ultimate recovery.

Q Some loss of oil?

A Right.

Q Thank you.

MR. PORTER: Does anybody have any questions of Mr. Nelson? Mr. Nutter?

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Nelson, do you have any idea what your average injection pressure would have to be in order to reinject produced fluids?

A No. I might add that we are already reducing -- we already several days ago started reducing -- the injection pressures and injection rates on these wells as we complete the injection profiles. We have many wells that are not going to take a significant amount

of water ~ 1700 pounds wellhead pressure. This will vary from well to well.

MR. NUTTER: Thank you.

MR. PORTER: Mr. Stamets.

CROSS EXAMINATION

BY MR. STAMETS:

Q Mr. Nelson, is there anything else that Anadarko could do to reduce the pressure in these other pressure zones, I'm not talking about the reservoir zones but these stray sands up and down the hole in the salt sections which are pressured up now?

A Well, short of relief wells I don't know of anything that Anadarko could do to reduce the pressure.

Q Is a relief well a reasonable possibility?

A I don't really believe that it is a necessary step at this time. I believe that the pressure and the fluid flow will decrease fairly rapidly and that within a short period of time the cement job can be completed.

Q Short period of time; how short is a short period of time?

A 60, 90 days.

Q You testified that you had experienced a decline in oil production of 125, 150 barrels per day; what

periods of time are you talking about there?

A That is from the first of August through October.

Q Had this flood stabilized on production before this time or was it declining?

A It had been fairly stable, between 1800 and 1900 barrels per day, for the last several months.

Q How about 1973? Was this flood producing more oil at the beginning of the year than the end?

A Yes, it was.

Q So 1973 had experienced a decline?

A That's right.

Q Is it possible that this decline you experienced here is just a natural decline in the productivity of the flood rather than altogether due to the decline in injection?

A Well, the decline charts indicate that it is a faster decline now than it was earlier.

Q The Wellingham re-entry, you say that you had a little waterflow early. At what depth did you have the waterflow?

A I'm sorry, but I can't answer that. I don't know.

Q Do you know if it was in the Queen Formation?

A No, I'm sorry, I didn't ask that question so I don't have the answer. Of course, it would be hard to say anyway because we have found no competent plugs anywhere in that formation so everything from 2800 feet down is communicated together, which would include most of the Seven Rivers, Queen, and all deeper formations.

Q You limited your injection to reservoir voidage; do you have any idea what that figure would be currently, what your injection volume would be?

A That would be in the range from 10 to 11 thousand barrels of injection per day.

Q It would be roughly 1 to 1; for every barrel of fluid produced you put in another barrel of fluid?

A Roughly that, a little more than that.

Q If you were to reinject only the produced water that would reduce that ratio to a little less than 1 to 1?

A Yes, and it would be a real fast decline; it's my opinion.

Q Referring back to Mr. Nutter's figures for August, it would appear as though one-sixth of the voidage would be oil so you would be able to put back

five-sixths of the voidage.

A Where you just reinjected produced water, is that what you're saying?

Q Right.

A This should be correct.

MR. STAMETS: That's all.

MR. PORTER: Does anyone else have a question of the Witness? Mr. Trujillo?

CROSS EXAMINATION

BY MR. TRUJILLO:

Q Mr. Nelson, how many of these deep wells are you required to cement? Do you have any idea how many that would be?

A Well, that's kind of a loaded question.

Q What I'm really trying to find out is how long, Mr. Nelson, how long you would take to do the recementing that is required, that is the cementing that's required on these deep wells? I'm trying to get an idea how long you would have to operate under these reduced pressures.

A Reduced rate?

Q Right.

A It's at least probably going to take in excess of 3 months, and part of that is going to be because of

equipment trouble. Equipment just will not be available for that much additional work in the area. There's going to be several of these wells that are either within the unit area or one location removed from injection; approximately 15 to 20 wells are going to have to be re-cemented in that area. Now if you expand the area out there's going to be more than that, but I think all of us would agree that the immediate concern is the wells closest to the injection.

MR. TRUJILLO: Thank you.

MR. PORTER: Mr. Ramey, did you have any questions?

MR. RAMEY: Yes.

CROSS EXAMINATION

BY MR. RAMEY:

Q Mr. Nelson, you know it has been common practice when an operator finds a flow of water down there in between casing strings that he just puts a squeeze on it. Is this going to offer any problem, to go in and try to shut off water lower down in these wells where the top has been filled with cement?

A Well, to begin with I don't agree with that way of squeezing a well for solving the waterflow and to my knowledge, none of our problems have been handled

that way, but to answer your question, it will make the problem more difficult. That would probably involve perforating, squeezing, resurveying and seeing if your cement is where it belongs. If you did not have that cement cap you could just circulate -- hopefully you could circulate -- cement to the surface and you would be in good shape.

Q What about dry holes that have to offset these units by one or two locations?

A I think that a check should be made of the record to see what the record says comparing the plugging operation. A little bit of experience may have to be applied to that to decide whether that hole has to be re-entered or if it may have adequately been plugged.

MR. NUTTER: Is that the experience you get from the Willingham?

MR. NELSON: Yes. I'd say if we had another Willingham well in the area we would probably take a look at it.

MR. PORTER: Any further questions of Mr. Nelson?

REDIRECT EXAMINATION

BY MR. KELLAHIN:

Q Mr. Nelson, in the question asked by Mr. Porter

he asked if our proposal would reduce pressures enough and waterflow enough to permit the cementing of these wells. Would you recommend that off-set injection wells perhaps be shut in while cementing was being done?

A Yes, sir. The question was: Would it be advisable to reduce injection or shut in the injection off-setting deep wells that needed to be recemented. In some cases there are deep wells that are inadequately cemented on the same 40-acre location as an injection well. In this case I think that it is imperative that that injection well be shut in. It might even be necessary that additional wells off-setting that one location be shut in.

Q Now, in connection with reducing injection pressures and volumes, should that be done on any injection well prior to completion of the objectivity profile survey?

A We feel that it should not be.

Q For what reason?

A We would like to continue to perform all of these profiles at the pressure and rate that they have been operating under for the last several months or years, and then after that profile has been completed,

at that time reduce the rate.

Q Is that what you have done on the wells on which you have run the profiles?

A Yes, this is what we have done already.

MR. KELLAHIN: That's all I have.

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

RECROSS EXAMINATION

BY MR. RAMEY:

Q Mr. Nelson, go back say to the plug well, and say for example that Intercoast and J. C. Clower Well that Mr. Sims converted to a water well or something, where the Commission file shows three strings of pipe from the well and then it just shows it plugged and abandoned and we have no information as to how the well was plugged. What would be your suggestion? We don't know whether it was plugged adequately or plugged at all, whether pipe was pulled, and I think our records show 10-3/4 pipe at the surface, the well now has like 9-1/2 at the surface. Nothing seems to add up on the well.

A Personally, I think that well, the only way that you can ever satisfy yourself that it is plugged properly is to at least re-enter it and determine that there are

plugs somewhere because you don't have records to indicate that there are any plugs; you don't have any records at all on the plugging operations. But, if it is just ignored then we could be facing a situation just like we are on this T. O. May well, making no plugs there.

MR. RAMEY: Perhaps Mr. Sims could enlighten us on this well. Do you have any information on that, Mr. Sims?

MR. SIMS: It was supposed to have been plugged back above the salt and the people that shot the casing in two before the salt and I don't know what depth now, even at the time; it has been years since it was drilled and they gave it to us that way, and they were supposed to come back to second water, which was somewhere around 4 or 5 hundred feet, and that was where we were supposed to get the water from. It doesn't produce water from shallow water, the 60-to-70-foot water, but that's as far as I know about it. Clower, he did all the work himself, and gave it to us as a water well. But as far as if it was plugged, I don't know.

MR. PORTER: If no one has any further questions of Mr. Nelson, he may be excused.

MR. KELLAHIN: I call Mr. Kernaghan.

(Witness previously sworn.)

DAN KERNAGHAN

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Would you state your name, please?

A My name is Dan Kernaghan.

Q By whom are you employed and in what position, Mr. Kernaghan?

A By Anadarko Production Company as Division Evaluation Engineer.

Q How long have you worked for Anadarko?

A 3 years.

Q In connection with your work at Anadarko does the Langlie-Mattix Sand Unit come under your jurisdiction?

A Yes, it does.

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

A Yes, I have.

MR. KELLAHIN: Are the Witness' qualifications acceptable?

MR. PORTER: Yes, sir, they are.

BY MR. KELLAHIN:

Q Mr. Kernaghan, have you made any study of the reserves on the Anadarko project?

A Yes, I have.

Q What have you arrived at on that?

A Well, the reserves, based on continued operations from Anadarko-operated leases within the area of this hearing, are approximately 1,900,000 barrels as of 1/1/75.

Q Now you heard some questions in regard to reducing injection rates to produced water. Would that have any adverse effect on the ultimate recovery in this flood?

A Yes, sir, it would.

Q If so, what would the effect be, in your opinion?

A The effect would be substantial. I don't have any exact figures on it at this time. It would be very difficult to determine the exact extent of it at this time but I feel that the loss would be substantial.

Q Now, if all injection were stopped, what would be the effect upon this reservoir?

A If all injection were stopped and we could still

produce the wells, supposing that a reasonable source, a reasonable method of disposing of the water could be found, we stand to lose about a million and a half barrels.

Q And if you can't find a place to dispose of the water where --

A (Interrupting) We stand to lose the whole million nine.

Q You can't produce this without some disposal system, is that correct?

A That's correct.

Q And at least at present you can put the produced water back in?

A That's correct.

Q Now, do you have any recommendations to relate to the Commission as to what should be done in connection with this problem of waterflows and various zones in this area?

A Yes, I do. I would like to make the following recommendations: That we be allowed to continue current injection profiles and require similar surveys on all injection and disposal wells within the area under consideration; that the Commission require individual operators to conduct surveys of the bradenhead pressure

of all wells within this area and to collect fluid samples from these wells, from those wells in which the bradenhead flow is detected. Some of them will have pressure and still not be capable of flow, and that the Commission should require that Rule 107 for the Rules and Regulations of the New Mexico Oil Conservation Commission be complied with immediately within the area under consideration -- this rule applies to the cementing of wells and the protection of all zones below the salt; that the water-flood projects within this area be required to reduce injections to no more than reservoir voidage for a period of 90 days, and that the Commission should appoint an industry committee, chaired by Mr. Ramey, to study all available information, including the results of the above steps, and to report their progress to the Commission within 90 days.

Several of the questions aimed at Mr. Nelson would hopefully be answered by such a committee; the extent of the plugging necessary, the extent of the cementing. That's all.

MR. KELLAHIN: That's all I have of this Witness.

MR. PORTER: Anybody have any questions of the Witness? He may be excused.

MR. KELLAHIN: That completes our presentation, Mr. Porter, thank you.

MR. PORTER: Who would like to go on next?

MR. BLODGET: I will.

MR. PORTER: Fine.

(Witness previously sworn.)

O.V. STUCKEY

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

DIRECT EXAMINATION

BY MR. BLODGET:

Q Please state your name, your occupation, and by whom are you employed?

A O.V. Stuckey, I'm employed by Skelly Oil Company as a Technical Specialist 1 Engineer, in Midland Texas.

Q Are you familiar with the area and matters pertaining to the cause that is now before the Commission?

A Yes, I am.

Q Have you testified before this Commission prior to this time and your qualifications been accepted?

A Yes.

MR. BLODGET: We move the qualifications of --

MR. PORTER: (Interrupting) The Commission considers the Witness qualified.

BY MR. BLODGET:

Q Mr. Stuckey, I hand you an instrument which has been marked as Exhibit No. A, Skelly Oil Company. Would you identify that instrument and discuss briefly what it shows?

A This plat is a portion of a current land map prepared by Midland Map Company showing updated data on well locations and lease ownership. The 36-section area covered by this hearing is outlined in red. Skelly operated leases within this area are marked in yellow. From this exhibit it can be seen that injection operations in the area in question consists of waterflooding in the Skelly Penrose "A" and "B" Units, and disposal operations by Skelly's manufacturing department in Section 27, Township 22 South, Range 37 East. We will discuss each of these operations in more detail as we proceed. The other Skelly operated leases which are indicated on this plat have no injection or disposal facilities of their own, but are served by the Agua operated Blinebry Drinkard Salt Water Disposal System. The only exception to this statement is the Elien Sims "A" Lease which is

served for disposal purposes by the Skelly Penrose "A" Unit. Skelly-operated wells which have developed casing leaks in the 1500-2500 foot intervals, or have developed waterflows outside the casing, or have encountered waterflows during drilling operations, are circled in red on this plat.

Q Mr. Stuckey, for purposes of the record, how long have you been with Skelly and how long have you been familiar with this particular area; worked in this area of New Mexico?

A I have been with Skelly approximately six-and-a-half years, and I have worked in this area during that entire period.

Q Were you involved in the two Skelly Units when they were formed in this area?

A I have worked on each of these units during the entire period when they were placed under fluid in this State.

Q Now, I call your attention to Skelly Penrose "B" Unit. Would you give us a little history of that particular unit?

A The Skelly Penrose "B" Unit containing 63 wells became effective July 1, 1965. Injection was started

in August, 1966, into eight wells, and was expanded and lease line agreements were developed with offsetting operators. This Unit was originally placed under flood on inverted nine-spot patterns, with 5-spot modifications along the lease line, and this pattern was generally effective by July 1, 1967. Additional wells were converted to injection in September and October of 1970 to provide a complete 5-spot pattern for the unit area; except for a localized gas cap area in the southwestern portion, which was not deemed feasible to flood operations. Wells No. 59 and 61 on the south edge of the unit were converted to injection in January of 1974 for cooperative flooding with offset wells to the south. This unit now contains 26 active injection wells and 29 active producing wells.

Cumulative injection into the Skelly Penrose "B" Unit to November the 1st, 1974, was 20,309,307 barrels of water. The average injection rate during October, 1974, was 6,334 barrels at an average pressure of 1630 psi. A maximum injection on any well within this unit during this month is noted at 2100 pounds.

From the start of injection to date, injection in this unit has been monitored by temperature logs and/or selected injection profiles at irregular intervals

due to different time periods of injection for the various injection wells under service in this unit. There have been no indications from any of this data that any injections from this unit have gone outside the unitized interval. All surveys and temperature logs indicate that this water was confined to the unit interval. We have performed some remedial operations on approximately 16 wells in this unit for control of water within the unitized interval. This work was done primarily to attempt to achieve better sweep efficiency. We have only two instances where problems have been encountered with casing in this unit. On Well No. 32 in March, 1972, leaks in the casing were located in the interval 226 to 426 feet. These were squeezed off during the course of other operations on the well. This well was drilled and completed in October, 1957, and this type failure is not considered unusual or unexpected for a well of this age. Well No. 53 has now developed a waterflow between the casing string and the surface casing. Repairs to this well will be made as soon as a rig becomes available to perform this work. This water problem with this well is not believed due to injection from the Penrose "B" Unit. It is considered highly probable that the source of the waterflow

in this well is the same as the previous waterflow which had been encountered in the Skelly Penrose "A" Unit Well No. 47, which is located in the Skelly Penrose "A" Unit adjacent to this area.

Cumulative oil production from the Skelly Penrose "B" Unit area since unitization was 1,083,831 barrels of oil as of November the 1st, 1974. Response from flood operations on this unit have been relatively satisfactory. Daily production rate increased from 116 barrels of oil per day in mid-1966 to a peak of 500 barrels of oil per day by the beginning of 1969. Production rate remained relatively stable for the next two years at this rate, and then started to decrease at the beginning of 1971 down to approximately 220 barrels of oil per day by mid-1974. Recent stimulation operations on 5 wells in this unit have increased production to approximately 280 barrels of oil per day at the present time. Estimated remaining recoverable oil is 312,000 barrels for this unit under present conditions and injection pattern.

Q Could you tell us anything about future plans or recommendations that you would propose in this particular unit?

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A We would propose to continue monitoring operations of bradenhead pressures and periodic surveys of injection wells, as dictated by performance data, to insure that confinement of injected fluids is maintained in this unit area.

We recommend that injection in this unit be continued. Present produced water rate is 3371 barrels of water per day in October of 1974. Production of 280 barrels of oil per day will have to be shut-in for lack of disposal facilities if injection is interrupted or terminated, since produced water is presently being recycled. Hauling of this volume of water would not be economically feasible.

Q Now, you mentioned Skelly Penrose "A" Unit. Would you give us a little short history and status of that particular unit?

A Skelly Penrose "A" Unit became effective May the 1st, 1967. Injection was started in September and October of 1967 into 24 injection wells. Two additional wells were converted to injection in this unit since that date. Injection facilities were expanded in August, 1974, by installation of a fourth pump at the injection plant.

A pilot waterflood was in operation on Skelly's H.O. Sims Lease within this unit area prior to unitization. Cumulative injection into these two wells was 2,639,018 barrels prior to effective date of the unit. Cumulative injection since unitization into the unit area was 19,410,572 barrels as of November the 1st, 1974. The daily average injection rate during October, 1974, was 9361 barrels at 1900 psi. The maximum pressure is approximately 2000 pounds within this unit. The total cumulative injection into the unit area to date is 22,049,590 barrels as of November the 1st, 1974. This includes injection prior to unitization.

This unit consisted of 60 wells on the effective date in 1967. Out of these 60 wells, 11 wells were drilled and completed after 1942. The remaining wells were drilled and completed in the time interval from 1936 through 1942. We recognized the fact that these wells had a potential for considerable problems with casing in all intervals, and particularly within the upper 900 feet where the exterior is subjected to corrosion from the Santa Rosa and upper water zones. We have diligently persued casing checks on each of these individual wells at any time we had occasion to perform operations on these wells. In

the interim period from the effective date of the unit until now, we have located and performed remedial operations on leaks within the upper 1200 foot interval in 11 wells. We recognize that this will be a continuing problem and will continue diligent monitoring and checking of these wells in order to detect and remedy casing leaks in this upper 1200-foot interval as they become evident. We are also investigating and designing a cathodic protection system to combat corrosion in this upper portion. In addition, we have located and repaired or are in the process of repairing leaks or waterflows behind the pipe in the intervals from 1500 to 2500 in four wells in this unit area. These 4 leaks or waterflows have occurred within the past 18 months. From the start of injection to date, we have run selected injection profiles, temperature logs at irregular intervals. Following a series of injection profiles and temperature surveys in late 1971 and early 1972 it was decided to initiate a program of installing stub liners in some of the open hole wells which had been converted to injection in order to provide a better, more efficient means for control of injected water. Eighteen liners were installed in injection wells in this unit in 1972 and 1973. Injection

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profiles run immediately following these liner installations indicated all injection water in these wells was being confined to the unitized interval. This record of casing leak repairs, repairs to waterflows behind the casing and liner installations within this unit is considered as solid evidence that we have diligently attempted to confine water to the unitized interval in this waterflood project. Cumulative oil production from the unit area since unitization was 2,259,569 barrels on November the 1st, 1974. The average daily producing rate during October, 1974, was 1588 barrels of oil. Recompletion of Well No. 62 as an infill well in May of 1973, and drilling and completion of 4 infill producers in 1974, has increased production rate from the unit area. These infill producers are now being evaluated. Additional infill drilling for 1975 may be recommended if results from this evaluation are as favorable as they now look, and if industry conditions and price structure are also favorable. Recent stimulation operations on 7 wells in this unit have also contributed to increasing and maintaining a maximum production rate. Three additional stimulation jobs are projected for this unit for the immediate future and additional work of this nature is under study. This unit

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has potential for increased production rate if all other conditions are favorable and injection is allowed to continue. Estimated remaining recoverable oil is 1,715,000 barrels for this unit under present conditions and injection pattern.

The first evidence of waterflow in the Skelly Penrose "A" Unit Area was in May of 1973, when waterflow was encountered outside the casing of unit Well No. 29 and then this was repaired. Then, waterflow was encountered in July of 1971, in drilling operations on the Ellen Sims "A" No. 1 Well, which was located immediately northeast of this unit area. This well encountered waterflow at approximately 2500 feet.

MR. PORTER: I believe your date there was July of 1973, instead of 1971.

MR. STUCKEY: Yes.

A (Continuing) Then, in September of 1973, unit Well No. 9 developed a leak at 2569 feet. However, when the Ellen Sims "A" No. 2 Well, which is a north offset to the No. 1, was drilled in February of 1974, no waterflow was encountered in drilling operations on this well. Then, in March of 1974, a waterflow developed outside the casing in unit Well No. 47, and this was followed

during the next month, April, 1974, by waterflows in unit Well No. 63, which was being drilled as an infill well and had waterflows at 2200 feet and 2500 feet. Well No. 64 was drilled in August of 1974, and encountered a waterflow at 2500 feet. Drilling operations on infill wells, which was unit Wells 65 and 66 in October of 1974, encountered no waterflows at all. And since that date we have encountered waterflows in this unit in Wells No. 3 and No. 28. These wells presently have waterflows outside the casing and will be repaired as soon as equipment can be located to perform this work. When we were requested by the Hobbs office and the New Mexico Oil Conservation Commission to perform necessary surveys in February, 1974, in order to determine whether there was any injection water leaving the unitized interval, we designed a survey program for these wells which we considered as the best possible method to determine any failure to confine water to the unitized interval. This program was undertaken and completed in March of 1974, covering 28 wells within the unit area. This included all of the wells which were active injectors in this unit at that time. Since that date we have completed 1 well in the south edge of the unit, which is Well No. 59. Analysis of the data from the injection

profiles, temperature decay, and 24-hour temperature surveys on these wells indicated 3 wells which were not confining injection to the unit interval. These wells have since been repaired. In addition, there were 7 wells which indicated channels within the unitized interval, but had no discernable channel above the unit interval. We plan to work on these wells in the immediate future as this work can be coordinated with a reservoir study in this area of the unit. It is our intention to confine all injections to the unit interval, and also to the desired flooding interval within that unitized interval, where feasible.

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Now, with the unit area, still in Penrose "A" there are two wells which have been plugged and abondoned, which the Hobbs office and the New Mexico Oil Conservation Commission has requested be re-entered and re-plugged to provide sufficient cement across the Penrose Sand interval and intervals above which could be charged from strayed water so that any movement within these wells would be eliminated. We are preparing to embark upon this work as soon as possible. These wells are the R. D. Sims et al. "D" No. 2, and the Ellen Sims No. 6. The Sims "D" No. 2 well is located in the southeast quarter of the

northwest quarter of Section 3, and the Ellen Sims No. 6 is located in the northwest quarter of the southeast quarter of Section 3. These are all located in Township 23 South, Range 37 East.

Q Would you give us a short resume of future plans and recommendations for this particular unit?

A We plan to monitor bradenhead pressures, re-plug the 2 plugged and abandoned wells in the area, develop cathodic protection installation for the wells in this unit for protection of casing strings in the upper intervals, and periodically survey injection wells to verify that injection is confined to desired intervals. We also plan to perform all remedial work as requested by the Commission or as indicated by requirements for prudent operations.

We recommend that injection in this unit be continued. Present production rates, water production rates, is 3485 barrels of water per day, and that was the October, 1974, figure. Production of 1588 barrels of oil per day will have to be shut-in for lack of disposal facilities if injection is interrupted or terminated, since produced water is being recycled in this unit. Production from the Ellen Sims "A" Lease could be maintained by hauling the 22 barrels of water per day

to an area outside the unit in question.

Q Do you plan any studies or anything like that?

A We also plan to participate in any study or investigation into waterflows or contamination problems in this area in question. We would cooperate to the fullest in the area of the Skelly Penrose "A" Unit in any investigation to determine the scope and ramifications of this problem.

MR. BLODGET: Mr. Chairman, would you care that we go ahead with this or would you want a recess?

MR. PORTER: Maybe we better recess until about 1:30.

(Whereupon, the noon recess was held.)

MR. PORTER: The hearing will come to order, please. Mr. Blodget, you may proceed with your examination of the Witness.

MR. BLODGET: Thank you.

BY MR. BLODGET:

Q Mr. Stuckey, does Skelly have any deep wells in the area in question, and if so would you give a short resume of their status?

A In addition to the secondary recovery flood units,

Skelly operates wells on primary production status in the area as indicated on Exhibit A. These wells are shown on this plat and we will not list their location and lease. Of these wells, 4 have experienced problems with casing leaks in the Penrose Sand or San Andres intervals. These are the Baker "A" No. 5, the Baker "A" No. 6, the Baker "C" No. 1 and the J.V. Baker No. 10. These leaks have occurred within the past 2-year period. Baker "A" Well No. 5 produced for a short period with a paker set to exclude extraneous water and has now been shut-in. The Baker "A" No. 6 has been recompleted higher in the Penrose Sand interval after repairing casing below this point. The Baker "C" No. 1 experienced parted casing which was repaired in late 1973. The J.V. Baker No. 10 presently has a casing leak and repairs will be performed on this well in the near future.

We were directed by the Hobbs office of the New Mexico Oil Conservation Commission on October 24th, 1974, to re-enter 7 wells which were in this deeper category and run cement bond longs, then perforate, and bring cement back either into the next casing shoe or provide sufficient cement to tie back into the base of the salt. These wells were the Baker "A" No. 1, the Baker "A" No. 4,

"A" 5, "A" 6, the J.V. Baker No. 9, the J.V. Baker No. 10 and the J.V. Baker No. 11. We concurred with the idea that it was the responsibility of the operator of the deeper wells in the area to take remedial action which would insure the placement of cement across the producing interval for shallower zones within the area of these floods. We have developed satisfactory procedures for the work on these wells with the Hobbs office of the OCC and will proceed to do this work as soon as rigs can be made available to carry on with this work. This remedial work will not only insure that these wells do not become a pipeline to transmit stray water within the area, but will also have the benefit of protecting these wells from collapsed casing due to external corrosion on the casing and pressure on the outside of the casing.

Q Do you have any other recommendations in this connection?

A Our future plans and recommendations would be to perform needed remedial work on all wells in this category in this area to prevent transmission of stray water via these wellbores. We will also participate in and cooperate fully with studies of water migration problems in the area in question.

We recommend a check of bradenhead pressures of all wells in the problem area, and any extension of this area which is determined desirable from data obtained, a search of records on P&A wells to determine if these present any problems, and a search of records to insure that all wells which penetrated the Queen Sand or deeper zones have adequate cement behind the casing to prevent migration of water.

Q Now, there has been some testimony heretofore concerning Skelly's Eunice Salt Water Disposal Well. Would you give us a short summary of the history of that well?

A The Eunice Salt Water Disposal Well No. 1, operated by the Manufacturing Department of Skelly Oil Company, is located 2580 feet from the south line and 1200 feet from the west line of Section 27, Township 22 South, Range 37 East, Lea County, New Mexico. This well was completed 11/12/61 by open hole completion 4010 feet to 4550 feet in the San Andres zone with 10-3/4 inch casing set at 300 feet and cemented to the surface, and 7 inch casing set at 4010 feet with 1750 sacks of cement and cemented back to the surface. This well is equipped with 3-1/2 inch OD tubing to 3914 feet. While the records

available to me at the present time are very incomplete, regarding injection history on this well, they indicate the average injection rate over the last 9-month period was 1974 barrels of water at 1945 pounds, that injection into this well in September, 1974, was 46,617 barrels at an average pressure of 1950 pounds, and that cumulative injection into this well to 10/1/74 was 3,875,861 barrels. Continued disposal of this water into this well is considered vital by Skelly's Manufacturing Department to continue operation of this plant for hydrocarbon extraction from casing head gas in the area.

Q What are the future plans and recommendations for this particular well?

A We plan to run injection profile and/or temperature decay surveys to determine storage interval or intervals and to check for possible casing leaks or channel behind casing and perform any remedial work indicated.

We recommend that disposal into the San Andres Zone be permitted to continue. Elimination of problems with deficient cement placement in deeper wells in the area should permit confinement of any water disposal into this zone by this well. Water handled by this disposal

well, under normal conditions, is surplus from cooling tower and boiler operations in this casinghead gas plant. This water is laden with chromates and other treating chemicals, oxygen saturated, and unsuitable for use as flood waters in any waterflood project without extensive and expensive water treatment and filtration.

Q In summary, what are your general recommendations to the Commission concerning this problem?

A In summary, we consider the Skelly Penrose "B" Unit to be free from water migration problems. The Skelly Penrose "A" Unit has experienced some waterflow problems and has contributed in some measure to this problem. We have taken measures, are presently taking measures, and will continue to pursue the problem to minimize water migration within the area in question. We are initiating action on remedial work on the deeper Skelly-operated wells to eliminate this potential source of transmission. We consider these actions as at least a step in the right direction and as solid evidence of our good faith efforts to alleviate and minimize this problem of water migration. We therefore request continuation of injection in the area to permit continued production and flood operations in the area. This would provide time

to permit a comprehensive study of this problem.

No one operator or individual company has access individually to sufficient data to determine the scope of this problem or to assess the various ramifications, and to formulate action needed by the various interests to alleviate this problem. This will require cooperative study and action by all concerned. We therefore suggest formulation of a special study group, implementation of a comprehensive study of the problem, formulation of a comprehensive coordinated plan of attack to minimize and alleviate this water migration problem.

Q Mr. Stuckey, you were present and heard the testimony of Mr. Kellahin of Anadarko Company?

A I did.

Q Mr. Kernaghan, correction.

A Yes, I did.

Q Did you hear him suggest as a possible plan to coordinate this program to try to find the problem and remedy same recommend these five, in substance, these five objectives: First, that the continued current injection profiles survey, including injection and disposal wells; two, continue bradenhead survey of all wells in the area and fluid samples if any in the bradenhead;

three, requiring all operators to comply with Rule 107 or reduce injection to match reservoir voidage; five, recommend that the Oil Conservation Commission appoint a committee, with Mr. Ramey as chairman, to make a study of the problem within the area and to report back their recommendations within 90 days. Do you concur with those recommendations?

A I concur generally with those recommendations. I noted he had stated that he felt like old injection wells in the area should be surveyed. We have some wells which have not had a recent survey but have had surveys possibly in '72 or '73 with no indication of any change in the status of this well; therefore I think that the recommendation to survey all wells should be tempered to some extent.

Q What about the size of the committee; do you have any ideas on that?

A I think it should be a small workable committee of around 6 or 7 or something on that order.

MR. BLODGET: I have no further questions.

MR. PORTER: Does anyone else have any questions of this Witness? Mr. Nutter.

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Stuckey, you had some general recommendations with regard to your Penrose Skelly "A" Unit and your "B" Unit there, that you would continue to inject water in there. Do you have any recommendation on that Skelly disposal well that's associated with the gasoline plant?

A I think we need to continue injection there.

Q Well, if we have this open pipeline through some well or wells, is it going to alleviate the situation if we continue to inject into the San Andres?

A Injection into the San Andres does not present a problem if we confine that water to the San Andres.

Q If it's confined to the San Andres. Is there any way of knowing that the water is being confined to the San Andres, however?

A I feel like some of the actions that we have discussed in this hearing today would go a long way toward insuring that it is confined to the San Andres.

Q But, in other words, your solution to the problem is to correct the ill but not to curtail the injection, whether it be from secondary recovery or disposal?

A I think that --

Q (Interrupting) Close the pipelines, in other words.

A I think as a long-term solution to it that would be the solution. That would be the way I think we should proceed with the problems generally, overall.

Q Pending the time when the pipelines are closed, isn't it reasonable to assume that the situation continues to be aggravated by continued further injection into the Queen and/or San Andres Formations?

A Yes, it would be reasonable to presume that.

Q Now, your recommendation on the last page of your statement was simply that you be permitted to continue to inject into these two units that you're operating. Now, you said you generally concurred with Mr. Nelson's recommendations of reducing injection rates, or in his general recommendation, one of which was to reduce injection rates to the voidage of the water flood. Would you recommend that for the water flood?

A The water floods, yes.

Q And what rate of voidage do we go by for the disposal wells then?

A That I'm not sure of.

MR. NUTTER: Thank you.

MR. PORTER: Mr. Ramey.

CROSS EXAMINATION

BY MR. RAMEY:

Q Let me pursue this line of questioning a little more. How much water is being brought into the area from outside the source to make up water, Mr. Stuckey? Do you know? Is most of the water purchased from Skelly, from their gathering water system west of Jal or something?

A Yes, it is.

Q How much water is brought in to make up water in this area of the three floods, the Anadarko and the two Skelly floods?

A I can give you a general figure; I didn't bring any specific information on that with me.

Q Just roughly.

A All 4 of these floods are purchasing make-up water from Skelly system, approximately 22 thousand barrels.

Q Why wouldn't it be practical to take injection away from the San Andres and put it into the Queen? That way we would be reducing not only from your well

but from the Agua Well -- and maybe from the Armor Well, taking these produced waters that are in the area and using those for make-up waters in the flood. That would reduce your total volume injected into these. Just off the top of my head, it seems like 7000 barrels a day being injected into the San Andres from the 30 wells in the area, you take this 7000 and put into the Queen and you would certainly be reducing by 7000 barrels a day the potential hazard in the area that now exists, would you not?

A That's right.

Q Even if it did take extensive treatment, aeration and such, of the water that you have in your salt water disposal well in the plat, this could be done; the water could be treated. It may be more extensive, but it could be treated, is that not correct?

A I would say that it could be. I have not done any work on this particular well to specify on that.

Q In looking there at the leaks or waterflows you have had on your Penrose "A" Unit, I wonder if these couldn't be tied into dry holes, possibly improperly plugged wells that you have. The clump that you have in the middle are reasonably close to the two dry holes

are they not, Mr. Stuckey?

A Yes.

Q I notice on the plat there the Sims Well No. 16 located in Unit M of 34, 23, 37; or 22, 37 I guess. Have you checked out that well to see that it is properly plugged over the injection disposal intervals? The reasons I point this out, this is reasonably close to two other wells that you have a leak in. See, you have five wells in the area where you have two dry holes and you have two wells in an area where you have one dry hole. There are still two wells to the south on the south end of the unit that there is no dry hole for, but have you checked into the No. 16 Well?

A I have not checked into it recently.

Q I just wondered if anyone had looked at that to see if it should be possibly re-entered and ultimately plugged or whether it was when it was --

A (Interrupting) We have that listed as part of the work that we plan on looking at.

Q Okay.

MR. RAMEY: That's all I have.

MR. PORTER: Mr. Stamets?

CROSS EXAMINATION

BY MR. STAMETS:

Q Mr. Stuckey, do you agree with the other witnesses who have testified here that there will need to be a reduction in pressures on these zones that have the waterflow in order to adequately seal them off?

A Yes.

Q If you inject as much water, as much fluid into the water flood as you are withdrawing, how will this reduce the pressure?

A Well, the efficiency of the water flood we know is definitely not 100 percent. There are some zones within the unitized interval which have been indicated by our injection profiles to be taking water which we do not consider as a portion of the actual floodable section of the unitized interval, and you just do not have 100-percent sweep efficiency on that.

Q Were you including in these zones you're talking about the clean and salt section and red beds?

A No. I was including the sections that are in the Queens and top portions of the Skelly Penrose Units.

Q Areas we're concerned about here today?

A Yes.

Q What would be the effect on Skelly's flood if you reduced the injected volume to the produced volume of water?

A Quantitatively it is extremely difficult to say. I feel like it would cause a sharp reduction in production rate.

Q It would speed the reduction in pressure in the reservoir, though?

A Yes.

MR. STAMETS: That's all.

MR. PORTER: Does anyone else have a question of the Witness?

MR. RAMEY: Let me ask one more question, Mr. Porter.

FURTHER CROSS EXAMINATION

BY MR. RAMEY:

Q Mr. Stuckey, maybe you can answer this. Would you consider the Intercoast Oil and Jason Clower Well which directly offsets your Penrose "A" Unit, the old dry hole, would you consider that part of the problem of your flood? That's the well that's located in Unit E of Section 2, 23, 37.

MR. NUTTER: Is that the one that's the Sims

Water Well now?

MR. RAMEY: Yes.

A Well, I did not consider this a direct result of this flood operation there. It is possible that by some stray channel led our water to be affected. Somebody's water is. Exactly whose, I'm not sure, and by what means I'm not sure because I do not have enough information.

Q Would you feel that that well should be entered and re-entered and properly plugged if it isn't?

A Yes, I definitely feel it should be.

MR. RAMEY: Thank you, that's all.

MR. PORTER: Does anyone else have a question? Mr. Stuckey may be excused.

MR. BLODGET: We have no other witnesses, Mr. Porter.

MR. PORTER: Who would like to proceed next, Mr. Kalteyer?

MR. KALTEYER: If I might make a short statement.

MR. PORTER: Would you come up to the front of the table, please sir. Mr. Kalteyer has indicated that he has a plane connection to make and he would like to make a statement before he leaves.

MR. KALTEYER: I'm Charles F. Kalteyer, District

Proration Engineer, Gulf Oil Corporation in Midland.

Gulf Oil Corporation operates no salt water injection wells or salt water disposal wells in the area concerned in this hearing. Gulf does operate six pilot water flood injection wells in the south Penrose-Skelly Unit more than a mile north of the area concerned. Injection of produced water into these wells is under vacuum at rates below 20 barrels per day per well.

Gulf has interests in two of the active water flood projects in the area concerned, namely the approximate 6 percent interest in Anadarko's Langlie-Mattix Penrose Sand Unit and approximately 3 percent in Skelly's Penrose "B" Unit. In addition, Gulf has some 71 wells connected to Aqua's Blinebry Drinkard salt water disposal system which disposes into their well located in Unit A, Section 35, Township 22 South, Range 37 East, within the area of interest of the hearing. The daily production of these 71 wells operated by Gulf, which produce from some 8 different pools, amounts to approximately 1075 barrels of oil per day, 2400 barrels of water per day, and 12,315 mcf of gas per day. Gulf has received a letter dated October 24th from the Oil Conservation Commission's District Supervisor, Mr. Ramey, advising

that their records indicate that our R.E. Cole No. 5, located in Unit I of Section 16, Township 22 South, Range 37 East, which is situated north of the Anadarko Langlie-Mattix Penrose Sand Unit, and which well produces from the Blinebry, does not have sufficient cement to cover the Penrose injection interval from around 3400 to 3700 feet. Gulf is currently formulating plans to enter this well to correct this condition as directed.

Gulf is ready to comply with any directives which the Commission may issue as a result of this hearing to remedy this situation. Gulf does request that we be allowed to continue to produce our wells in the area of concern as long as we are able to dispose of the salt water in a manner satisfactory to the Oil Conservation Commission.

Gulf would recommend that an industry committee composed of representatives of operators in the area of concern and shared by Mr. Ramey, District 1 Supervisor, be formed to carefully investigate the matter to pinpoint the source of the problem and to make recommendations for remedial action within 90 days.

That concludes the statement for Gulf.

MR. PORTER: Thank you. Who would like to come

forward with their testimony at this time? Mr. Stevens.

(Witness previously sworn.)

JOHN B. SOMERS

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

DIRECT EXAMINATION

BY MR. STEVENS:

Q Would you state your name, your residence, and your occupation and by whom employed?

A My name is John Somers, I live in Boulder, Colorado, and I am employed by Petro-Lewis Corporation as a Division Production Manager.

Q Have you previously testified before this Commission and had your qualifications accepted by the Commission?

A Yes, I have.

MR. STEVENS: Are the Witness' qualifications accepted?

MR. PORTER: Yes, they are.

BY MR. STEVENS:

Q Would you briefly state the position of Petro-Lewis concerning this hearing; I don't believe you need to go into what is proposed.

A Basically it is Petro-Lewis' position that the proposal by the Commission to shut-in injection is unnecessary, however, we do feel that in order to correct and remedy the problems which are occurring in the area, which has been outlined, it may be necessary to curtail injection to a level which we feel should be equivalent to the produced water volume within the -- well, from the properties within this area.

Q Referring to what has been marked as Exhibit 1 would you describe it for the Commission and use it in reference for your justification for the position of Petro-Lewis.

A Exhibit No. 1 is a map from Midland Map Company showing a portion of the area outlined by the Commission as the problem area where water migration is occurring. It is shown in red. Also shown on this map is the State M water flood which is operated by Petro-Lewis, and it is that area which is outlined in dashed red line in yellow. We operate 61 wells in that area, 37 producers and 24 injection wells.

Q Would you briefly describe the production that you are now receiving from that water flood and the amount of water injected?

A We're injecting 5000 barrels of water a day; we're producing 460 barrels of oil per day and approximately 3770 barrels of water a day.

Q Could you give the Commission the reserves applicable to that water flood?

A The remaining reserves associated with our water flood are 1,300,000 barrels from 6/30/74, which is our last date of reserve estimates.

Q Do you have a value placed upon that?

A Yes. Basically the oil and gas reserves that we have in this area were evaluated at $30,000,000.

Q Could you, referring to your map, to the previous testimony, and perhaps the Commission's Exhibit, differentiate the area of your water flood from the problem areas previously discussed?

A Well, actually our water flood lies on the extreme west edge of the problem area which has been outlined by Mr. Ramey. Specifically, right along the Sections 19, 20, 29, and 30. This is basically an area which is characterized by shallow production alone, only production from the Queer interval and shallower zones without any of the deeper wells which characterize the eastern edge or basic problem area which is shown with

the red wells on Mr. Ramey's Exhibit.

Q Have you had any problems with waterflow or leaking of any injection wells or producing wells?

A No, we don't. We have had one problem; we just purchased this property less than a year ago and we took over operation the first of 1974. At that time we made a field inspection survey and one well, which is State M 20, had water leaking at the surface. It's a well which was drilled to the Drinkard and plugged and was used as a water supply well originally by Humble for this water flood. It has two stings of casing in it and what was occurring was that injection water that was going down the 2-7/8 casing was communicating with San Andres or lower perforations in the Penrose Skelly in the San Andres in the 4-1/2 casing which was going to the deeper zone. The water was going out of the Penrose Skelly and into the San Andres and then a small amount was coming to the surface. When we detected this problem in January we prepared an AFP and subsequently squeezed both the tubing -- I say tubing -- the 2-7/8 inch casing which was used for injection into the Penrose Skelly and the 4-1/2 inch casing which was used for , originally, for water supply into the San Andres, and we subsequently,

as a result of this squeeze work, shut off all the water production and migration which was occurring.

MR. NUTTER: Could you give us the location of that well, please?

MR. SOMERS: Yes. It would be in F of Section 29, 22, 37.

MR. NUTTER: That's the old Drinkard discovery by Humble, is that correct?

MR. SOMERS: That's correct.

BY MR. STEVENS:

Q To your knowledge, are there any other deep wells in the area of your leases or nearby?

A No, there are not.

Q Have you made any efforts to determine if there had been waterflows or leaking casing in your area?

A Yes, we did. When we received the notice from the Commission about 15 days ago, our Field Foreman was instructed to actually conduct a complete bradenhead casing survey on all injection wells in our flood, and that was done, and there were no waterflows indicated on that survey. We also checked for packer leakage and also for the possibility of casing leaks which might contribute also to the problem. We did detect two

problems; we have tubing leaks in two wells and we had packer leakage in two wells. We presently have a unit on the property which is correcting those particular problems. We had no casing leaks and no flows indicated.

Q No evidence you found where you can show any migration of water out of the Penrose Skelly Formation other than that one deep well?

A None whatsoever, because we had an opportunity, since there were wells drilled within the past year which are shown on Exhibit No. 1, to actually evaluate whether there are any shallow-charged sands, whether migration has occurred into these sands, and whether we have any such problem. These wells are unit wells, or actually State M Well 53, 54, and 55 which were drilled in November and December of last year. None of these wells experienced any problem as to waterflow in any shallow interval at all.

Q According to the Commission's Exhibit No. 2, Mr. Ramey had marked "possible waterflows" emanating from one of your injection wells. What is your opinion of that possibility which he outlined?

A We feel that it is highly unlikely because of our low average injection pressure that the water would

migrate from our flood area, cross another flood 3 miles, and surface in a well over on the eastern edge of this problem area.

Q In running your surveys, did you notice any temperature anomalies in your area?

A We haven't run any temperature surveys. We have, however, checked the surveys which we received from the previous operators, Wood, McShane & Toms, and also the surveys which had been run by Humble prior to Wood & McShane's acquisition of the property, and 18 of our 24 wells had surveys run on them. There were no indications on these old surveys of any migration. However, there are no recent surveys any more recent than January, 1973.

Q What would be the effect in this area if the Commission adopted your proposal to limit the injection of water to solely that water produced?

A We would go from a ratio of injected water to reservoir liquid voidage of 1.6 to 1 to .8 to 1. In other words we would cut that ratio in half.

Q Is that over the field, the area over --

A (Interrupting) That's over the whole area and specifically for the floods that we are talking about. So if we just returned the produced water to the formation,

allowing these properties to be continued to produce and not sacrifice production to remedy this problem, then we would cut in half the ratio of injected water to voidage. This would also very rapidly bring the reservoir pressure back down in line.

Q Would this, in your opinion, tend to more readily make it possible to perform the remedial work on the deeper wells that are considered to be a problem?

A Yes, it should. It should also minimize the amount of migration which is occurring and the possibility of pollution which may occur because of that migration, because as you start reducing that pressure you are going to have less tendency to go into the shallow intervals.

Q Do you have any additional proposals in line with those by the Commission or other operators other than the reduction of injected water to produced water?

A Well, really, quite frankly since we are on the western edge of this there is no deep production. We have had no problems as far as flows. We feel that this area specifically of the State M lease and quite possibly the western two tiers of sessions could be excluded from this problem area because as Mr. Ramey's map shows, and as the other operators have testified, the problem is

localized primarily in the areas where there has been inadequate cementing and there are deep producing wells which just do not have cement across the Penrose Skelly zone.

Q Taking various proposals, a complete shut-in that was proposed by the Commission, what would you recommend if the Commission should consider that procedure?

A Well, the consequence of this would be you would leave the Penrose Skelly reservoir over-pressured which would continue to cross-feed into these shallower zones and continue to charge these shallow sands because there would be no voidage or no actual other way of relieving the pressure and as long as this is occurring now it would continue to occur. It might be easy to repair the wells which need remedial work in order to cement the deep wells, but it's doubtful that it would stop or prevent any additional damage to fresh-water sands or the charging of the shallow sands.

Q If this procedure then were considered, you would recommend the western two tiers of sections to be excluded in the provisions of such an order?

A That's correct.

Q Regarding the Anadarko proposal as to the injection of total liquid voidage of the reservoir, would you be amenable to that suggestion?

A We would be agreeable to it because it basically wouldn't affect us very much. However, it would continue the condition status quo. In other words, we're putting in every barrel that we're taken out; maintaining the reservoir pressure and continuing a problem with migration.

Q Would you agree with the 90-day study period recommended by other operators?

A Yes, we do.

Q Would you agree with the requirement that all injection wells be surveyed?

A We don't, since we haven't detected any flow in our bradenhead casing survey, feel that it is absolutely necessary that every single well be surveyed. As Anadarko found out and Skelly has shown. Anadarko, in their case, had one well out of 31 which showed any problem. We don't feel that it is necessary to survey every well as a result because we don't feel that there is a problem.

Q Would you consider a partial survey of the area to perhaps highlight the problem areas?

A Definitely. We feel that, you know, possibly a

key well survey, or survey those which the Commission designated or felt were necessary, would be both helpful to us in terms of evaluating how effective our flood is and also to identify whether there is a problem.

Q Have you anything further to add to your testimony?

A No.

Q Was Exhibit 1 prepared by you or under your direction?

A Yes, it was.

MR. STEVENS: I would like to move the introduction of Exhibit No. 1.

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

(Whereupon, Petro-Lewis' Exhibit No. 1 was admitted into evidence.)

MR. STEVENS: We have no further questions.

CROSS EXAMINATION

BY MR. PORTER:

Q How would you determine what the key wells are?

A I would say basically the wells which had all of the Penrose Skelly Zone open from the top to the bottom

because some of the wells only have the lowest-most interval open and I think it is more likely that the wells which have all zones from what we in nomenclature call the A through the D Zones oper would be more than likely to have a channel. Also, I think that the wells along the eastern boundary of our property would be more than likely the problem wells where we would see this first.

MR. PORTER: Do you have any questions, Mr. Nutter?

MR. NUTTER: Yes.

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Somers, what type of survey are you talking about there that you'd run on the key wells?

A We'd run the temperature and radioactive tracer surveys which the other operators have run.

Q Now there is no problem in running a bradenhead survey on all the wells?

A No. We've done that on all our injection wells and are presently digging out all the producing wells to run the same type of survey on all the producing wells.

Q That is what I was going to ask you next, if you

plan to do it on the --

A (Interrupting) Yes. We are in the process of doing it right now; it's just a little bit more lengthy process to get all that done.

Q What is the cost of running a temperature survey?

A Well, the cost of the combined survey we estimated at a cost of $1000 so when you are talking about requiring us to do this we are talking about a $25,000 investment just to gather this information.

Q Now, your proposal, as I understand it, would be to limit injection in the Queen water floods to the producing water but to exempt the westernmost two rows of sections?

A That's correct.

Q So you wouldn't be covered by that at all?

A Well, we would be willing to abide by that in that area as well.

Q You would do it even though you would be exempt?

A That's correct.

Q I see.

MR. PORTER: I believe his testimony went to the effect that he thought they could be eliminated. He didn't indicate he would ask for that.

MR. NUTTER: I see.

A (Continuing) We feel because we haven't been able to detect any problem and we don't have any deep wells, we have exclusively Penrose-Skelly production and injection, we don't have any cementing problems that we have knowledge of or have been able to detect, really that there is no reason to include that area of the State M lease within the problem area. However, if we were included,we feel that this course of action would be the most logical and practical course to take.

Q And I believe that you said your estimated reserves at 6/30/74 were 1,300,000 barrels?

A Yes, sir.

Q And you estimated that the oil in there was worth $30,000,000?

A We have, I might add, a couple of problems: One is that we have 25 completions tied onto the Agua system. Much as Gulf's position, we have wells which are producing outside of this area where the water is being actually disposed of in this area.

Q So you've got wells in other zones?

A Yes, wells which are Blinebry-Drinkard, Mattix, Penrose-Skelly; wells which are outside of this actual

problem area to the north where the water is actually coming into Section 35 to Agua's system and we would lose that production in those reserves as well.

Q Well, now, your reserves in the water flood?

A Ours is 1,300,000.

Q The $30,000,000 is the value of the oil in all your property?

A That's correct.

Q All the formations.

MR. PORTER: I believe he said oil and gas, didn't you?

MR. SOMERS: That's correct, of all oil and gas production.

MR. NUTTER: Thank you.

MR. PORTER: Anyone else? Mr. Stamets.

CROSS EXAMINATION

BY MR. STAMETS:

Q Mr. Somers, do you have any recommendation about the salt water disposal wells in the area?

A No, other than adequate cementing is required in the wells, deep wells, surrounding those disposal wells in order to prevent the migration of water disposed into the San Andres from getting into the shallower intervals,

which goes along with Amoco's proposal that we comply with Rule 107.

MR. PORTER: Anyone else?

CROSS EXAMINATION

BY MR. KELLAHIN:

Q Mr. Somers, how many wells do you have with parallel strings, or casing?

A One.

Q Only one?

A State M No. 1.

Q Is that type of completion very difficult to cement?

A Yes, it is. Humble actually had 675 sacks of cement used in the initial cementing. We put in an additional 400 sacks ourselves in remedying the problem that we had so we have over 1000 sacks of cement in trying to get, actually in separating these two strings of casing.

MR. KELLAHIN: Thank you.

FURTHER CROSS EXAMINATION

BY MR. PORTER:

Q Did you testify that your flood was now producing 406 barrels a day?

A 460.

Q 460 barrels a day?

A Yes, sir.

Q And you were estimating that your recoverable reserves in the flood were 1,300,000?

A Yes, sir.

Q Have you, do you think, reached the peak of your flood?

A We are actually declining and feel that we are on a declining phase. We're actually to a water-cut of better than 85 percent so we have seen already the major effect of the water flood. Most of the area has been swept to date and as a result we are looking at a very small fraction of the water flood recovery remaining.

Q I noticed your water-cut was roughly 9 to 1?

A Correct.

Q So, it still would take you a long time to recover your additional reserves?

A Yes, it would, and with reduced injection it would take even longer. What we would hope to see would be that we could reduce injection for the period necessary to get adequate cementing which would prevent any migration of Penrose Skelly injection water out of that interval or

San Andres water out of the interval and enable us to resume normal water flood operations and increase our injection again.

MR. PORTER: Any further questions?

MR. RAMEY: I would like to clarify one thing, Mr. Porter. Mr. Somers keeps referring to "Penrose Skelly." Primarily this area is Langlie-Mattix but we do have Penrose Skelly nosing into the area.

MR. PORTER: Right.

MR. SOMERS: In general, right.

MR. PORTER: Anyone else? You may be excused. Mr. Jennings.

MR. JENNINGS: Before proceeding I might state I don't recall any testimony showing that Agua has been contaminating the area in question, but we have been called upon to show cause why it has not done so, so we will proceed with that.

MR. PORTER: You mean to show cause why you haven't contaminated ?

MR. JENNINGS: Yes.

(Witness previously sworn.)

W.G. ABBOTT

called as a witness, having been first duly sworn, was

examined and testified as follows:

DIRECT EXAMINATION

BY MR. JENNINGS:

Q Would you state your name and occupation, please?

A My name is W.G. Abbott, and I'm Manager of Agua, Incorporated, in Hobbs, New Mexico.

Q Mr. Abbott, have you appeared before and testified before this Commission and Examiners on many occasions?

A Yes.

MR. PORTER: The Commission considers the Witness qualified.

BY MR. JENNINGS:

Q Mr. Abbott, would you just basically state your position and your place in this hearing?

A Yes. Agua operates a jointly owned disposal system made up of 36 different operators and about 270 wells. I would like to refer to our Exhibit 1.

Q Refer to Exhibit 1?

A Yes. The subject area of the Commission under question is outlined in red. We have one disposal well, H 35 Well, which is in the Unit, Letter H of 35, 22, 37, and into this well there is water being disposed that is

outside of the subject area of this area.

Q Why don't you outline the pipelines that you have leading into that well.

A Well, we have the pipeline out to Section 12, which is outside of the area, there is another pipeline just north of the area, and there is quite a network out here in this Arrowhead area. Now, this system is all gravity in that the water flows downhill to the disposal wells. Because the water has been increasing and did increase in this area we drilled another disposal well up here outside of the area, our SWDC-2. There is a valve on this line; the valve is located in the southwest quarter of Section 35, so all the water north of this valve is diverted into this C-2 disposal well, but from that valve on down south, this is the main line, the water goes down to the H-35 well. I point this out because we can segregate these two -- they are segregated -- these two sections.

Q Would you refer to what has been marked Exhibit 2?

A Yes. Exhibit 2 is a sketch of the -- diagramatic sketch of the disposal well. We have 9-5/8th-inch surface casing set at 1180 feet with 450 sacks of cement,

and that cement is circulated. We have 7-inch casing set at 3975 which is into the San Andres Formation, the top of the San Andres Formation is 3931, and we have a TD on the well of 5250 and we plugged back to 4918, so our injection interval is from bottom of the 7 inch at 3975 to 4918; roughly 1000 feet. Also, this well is equipped with 5-1/2 inch, 14 pound casing used as tubing, and behind this tubing, floating on the water, is an oil blanket. We use this method to protect the outside of the tubing and inside of the casing, and also it reflects the pressure on top of the surface in that casing tubing annulus.

Q Mr. Abbott, was this well drilled solely for salt water disposal purposes?

A Yes, sir, it was.

Q And was it drilled pursuant to an order of this Commission?

A Yes, it was.

Q Referring to what has been marked Exhibit 3, Mr. Abbott, would you refer to that and briefly tell us what that is?

A Yes. This is a water listed by months and accumulative water by months and the average injection

pressures on the tubing since our injection started in March of 1969. You'll note that through October we have disposed in this well 11,649,892 barrels and the average injection pressure is 1700 pounds. There is about 5500 barrels a day being injected into this well.

Q Has the injection pressure increased any in the last two years?

A No, it has leveled out at 1700 pounds.

Q Mr. Abbott, is the water that you are disposing into this well suitable for flood purposes?

A Yes, it's suitable.

Q How many wells are hooked up -- producing oil and gas wells -- are hooked up to your system?

A Well, the total is approximately 270, but the wells that are connected to this particular disposal well is 179 wells.

Q Referring to what has been marked as Exhibit 4, is this a list of the wells?

A Yes. This is a breakdown of the wells showing the various wells and the operators that are connected to this segment of the Blinebry Drinkard SWD system that flows into this particular disposal well.

Q Do you have any idea, Mr. Abbott, as to the

amount of water or the amount of oil that is being produced in these 179 wells?

A It's sort of an educated guess that there is 2500 to 3000 barrels of oil per day being produced out of these wells that are connected to this particular disposal well.

Q If the Commission's recommendation or Mr. Ramey's recommendation were to be carried out and disposal terminated, what would be the effect on these wells?

A Well, we'd probably have to shut-in most of the wells; in that we might be able to haul water out of the area, but the mechanics of hauling 5500 barrels a day with the trucks that are available it would be very difficult and of course be very expensive.

Q Since you received this notice, Mr. Abbott, have you had occasion to evaluate the alternative disposition that could be made of the water?

A Well, you could haul the water out of the area, or most of it.

Q To where?

A Well, we could haul to our SWD C-2 by doing some additional work on the C-2 well. There is another disposal area, which is called -- what is it, Joe -- Laguna Latuna, which is between Hobbs and Carlsbad, and

that would be quite a long haul.

Q Just roughly how long would it take a truck to make a round trip from the present location to the site?

A It would probably be at least 4 to 5 hours. That's loading, unloading, hauling, and they probably stop and talk too.

Q Can you calculate how many trucks it would take to haul that 3500 barrels a day?

A No, I haven't made those calculations.

Q Okay. Are there other alternatives?

A Yes. There are two other alternatives: One would be to lay a line back up here to this C-2 disposal well--now you're talking of about 6 miles of probably 6-inch line -- and then equipping this well with a coup e of centrifugal pumps to keep the water up there. That would take time.

Q How long do you assume it would take -- assuming that you have the right-of-way -- to construct the line?

A It would probably take 90 days; equipment is hard to get, and also equipment, pipe, and so on. I think we could probably do it in 90 days. The other alternative would be to sell this water for a water flood water in this area, but that's something we haven't discussed with

the operators of those water flood units.

Q Would it be less expensive to hook up to the water flood than it would be to put it into the No. 2 Well?

A Yes. It would cost approximately $125.000 to $150,000 to build that line up to that C-2 well, and to run a line to this water flood would probably be approximately 1/3rd of that.

Q Are there any other possible ways you can dispose of the water?

A I don't believe so.

Q Were Exhibits 1 through 4 prepared by you?

A Yes.

Q Do you have anything else that you wish to add?

A No, I don't believe so.

MR. JENNINGS: That's all we have Mr. Commissioner.

MR. PORTER: Do you offer your Exhibits?

MR. JENINGS: Yes, sir, we will.

MR. PORTER: If there are no objections the Exhibits will be admitted.

(Whereupon, Agua's Exhibits Nos. 1 through 4 were admitted into

evidence.)

MR. PORTER: The Witness is available for cross examination.

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Abbott, are there any old dry holes east of this area that could be converted into salt water disposal wells?

A East of this area?

Q Yes, sir, east of your well there in Section 35?

A Not that I know of, Dan. I don't think there are any wellbores available and if there were, the wells probably wouldn't have sufficient permeability and porosity to get a gravity disposal well.

Q If you move east until you're getting off the platform, is this correct?

A Yes, evidentally. I don't know if I pointed out, this SWD C-2 Well is taking water by gravity.

Q And what formation is that going into?

A It's going into the San Andres.

Q Now, I was wondering about the advisability of expanding injection facilities in that area if there is nothing to guarantee that what has happened in the

area we're concerned with won't happen there. Isn't that right close to the Town of Eunice itself?

A Yes, but I think the San Andres permeability is better developed than that area and I think the water would go by gravity for some time.

Q And there would be nothing down here east of your No. 35?

A Not that I know of. I think eventually this area will be water flooded.

Q Have you conducted any surveys on your well, Mr. Abbott, to insure that the water is not leaking out of the bottom of the San Andres Formation?

A We haven't done any surveys.

Q Now, does this show pressure on that bradenhead?

A Yes, I think when we drilled the well we had a little pressure, and I don't -- I think we have some pressure on it now.

Q Now, that's a column of oil floating on the injection?

A Oh, no, the bradenhead you were talking about.

Q Yes, well, I meant the annulus between your tubing and your casing.

A Yes. There is pressure on that.

Q Has that ever changed?

A No. If the Commission requires us to run a survey, we will run a survey.

Q Do you have a guage on the bradenhead between the production pipe and the --

A (Interrupting) Yes.

Q Has there been any change there?

A I think the pressure has been increasing over the years, but when we drilled the well there was pressure on it, originally.

Q You never have opened it up to see what was in there?

A No.

MR. NUTTER: I believe that's all, thank you.

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

CROSS EXAMINATION

BY MR. STAMETS:

Q Mr. Abbott, I believe your Exhibit 3 shows that you are injecting a pressure 300 pounds or so less than some of the water floods in the area, maybe as much as 600 pounds less?

A Yes.

MR. NUTTER: You have a little more hyperstatic head on yours than they do on theirs though, don't you?

MR. ABBOTT: Yes. Also, we have large tubing; we have 5-1/2-inch tubing on it so we don't have friction.

BY MR. STAMETS:

Q For your water to flow into these other zones it would be first competing with the higher pressures in the water floods?

A I would think so. Of course, on their injection pressures I think that those pressures at the wellhead, and I don't know, you know, if you get away from the injection well whether that pressure runs 2000 or 1400. That's something I have no knowledge of.

MR. STAMETS: That's all.

MR. PORTER: Anyone else? Mr. Kellahin.

CROSS EXAMINATION

BY MR. KELLAHIN:

Q Mr. Abbott, on your No. 2 Well up there to the north, there are a number of producing wells in that area too, are there not?

A Yes.

Q Have you made any investigation as to the cement jobs or depths of those wells?

A No. There have been two or three disposal wells in that area for 20 years and there are other disposal wells in that area.

Q I'm talking about producing wells too. There are a number of producing wells, aren't there?

A Right.

Q So if you do have a problem down in the south you could possibly have the same problem up in the north end if you start putting more water in there?

A The only thing that would be different, Jason, the water would go by gravity and we wouldn't have to pump it in.

Q But there is a possibility that there could be a problem there?

A Right.

MR. KELLAHIN: Thank you.

MR. PORTER: I assume that your preference, Mr. Abbott, would be to supply the water for the water flood?

MR. ABBOTT: Yes. That would be the most logical.

MR. KELLAHIN: That is an astute observation.

MR. PORTER: Thank you. If there are no further questions, this Witness may be excused.

MR. JENNINGS: Thank you, sir.

MR. PORTER: Mr. Snider, did you have any testimony that you wanted to put on? Mr. Russell? Is there anyone else who had testimony they wanted to put on?

At this time the Commission will listen to any statements that anybody has. Mr. Lyon, you might want to start.

MR. LYON: All right. I am V.T. Lyon with Continental Oil Company.

From the evidence produced here today I believe it is apparent that we do have some problem in this area and Continental Oil Company feels that the industry should work together with the Commission and adopt a logical method of eliminating the problem. Continental Oil Company stands ready to do its share of this work and to do whatever is necessary to carry our share of the burden.

MR. PORTER: Mr. Lyon, do you have wells in some of units?

MR. LYON: We have a small interest in Anadarko's Unit; an infinitesimal interest in Skelly's B Unit and we have 19 wells, I believe it is, going into the Agua disposal system.

MR. PORTER: Thank you.

MR. STUMHOFFER: I'm C.W. Stumhoffer, Armor Oil Company. Armor operates 9 producing wells, 1 Blinebry and 8 Penrose Sand wells on the east side of the Penrose "A" and Skelly and Anadarko's Langlie-Mattix Penrose Sand Unit. Production from these 9 wells is about 115 barrels a day and about 200 barrels of water a day. This water is being disposed in our Mill State No. 1 salt water disposal in the southwest southwest of Section 2, 23 South, 37 East. The well takes this water at about a thousand pounds wellhead pressure while the pump is running and goes on vacuum when the pump is shut down. We feel like this well is not causing any of the problems this area is experiencing so we would request that this well not be included in this consideration.

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I would like to add, we do concur generally with the data and recommendations that have been made today. I think that would be a large step to help the problem.

MR. PORTER: Yes, sir.

MR. FRANTZ: I'm Lavele Frantz with Phillips Petroleum Company, and I'm Associate Production Engineer. Phillips' wells in the subject area are marginal producers. Those wells which produce water are connected to Agua's

operated Blinebry-Drinkard salt water disposal system and the water goes into their south well H-35. If trucking of this produced water was required we would have to evaluate the economics of continued operation of these marginal wells and we do support the 90-day study period which others have suggested here today.

Thank you.

MR. PORTER: Mr. Russell.

MR. RUSSELL: I'm John F. Russell from Roswell and I would like to make a statement on behalf of Texas Pacific Oil Company, Inc. TP supports Anadarko's recommendations of (1) reducing but not eliminating injection, (2) continuing the profile program, (3) monitoring bradenhead pressures, and (4) the formation of a committee to be headed by Mr. Ramey and TP would like to have a representative on that committee.

MR. PORTER: Somebody else campaigning? Joe, Mr. Snider.

MR. SNIDER: I'm A. E. Snider, Amerada Hess Corporation. I agree with Lyon's testimony here today; certainly looks like we have problems. As to how it got started or when, well, certainly we're not in compliance with some of the older deeper wells with the current

Rule 107 and 108 as far as cementing practices are concerned. We are somewhat in the position of Mr. Sims, Sr., here. We have 15 old wells in the area that pays breathing a little bit of life into and we go along our merry way and try to make a little money out of it just like he was trying to produce his water well and things went bad. So, we do want to work with the Commission and the industry in doing whatever is necessary to get this thing straightened out. We would like to work with the committee if there is one formed and do anything that we can to help out.

MR. PORTER: Mr. Kellahin.

MR. KELLAHIN: If the Commission please, I think we are all in agreement that we have a problem and I think for the most part we are also in agreement that one of the major concerns is the condition of these old deep wells. We do feel, and have recommended, that this be probably the first order of business and some kind of investigation on the situation on these wells and whatever corrective measures that may be required. Now, this may call for another hearing and possibly would. Perhaps that could wait until the proposed study committee could come with its recommendations and at that

time the Commission take whatever action may be necessary. In many instances I am sure the corrective measures will be taken without a hearing but perhaps the hearing would be required if the Commission is going to make a requirement of new cement jobs on these old wells. Now, we are confronted here with the question of what can we do right now, and Mr. Ramey has recommended to just shut off all water injection. I think our testimony shows that if this was done it would also shut off all production simply because we have no place to go with the water. To arrive at this stage then we have accomplished nothing. We have left the pressure in the reservoir and go back to where we started it from except that over periods of time the pressures will dissipate.

Now, our recommendation is to replace simply fluid withdrawals and only to that extent and that would permit us to continue to produce this reservoir without damage to the water flood projects. At the same time, as our witness has testified, pressures will decline simply because we don't have 100-percent efficiency, and certainly I don't think it can be claimed that the Penrose Sand is a closed reservoir in any sense of the word, and I'm not talking about up, I'm talking about out.

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We hopefully will shut off the "up" portion of it wherever we find it. Our recommendation for the industry committee I think is the essential thing for the Commission to follow through on, and Mr. Ramey, we feel, would be the appropriate head for that. He has a present campaign for him, but I think it would be fruitless to have just an industry committee as such operating without some supervision by the Commission. I don't think they would arrive at very much. We also feel that the committee should be kept as small as possible in order to have a workable group who can investigate the problem here and come back within 90 days with definite recommendations as what other measures should be taken, other than those which we have already recommended.

We appreciate your hearing us; thank you very much.

MR. PORTER: Mr. Kellahin, what was your recommendation for the interim period as far as injection is concerned?

MR. KELLAHIN: That our injection of water would be equal to withdrawal. In other words, volumetric.

MR. PORTER: Thank you.

MR. KELLAHIN: I think our testimony reflects

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that if you reduce it simply by replacing produced water, within a period of a relatively short time you will have such a decline in the water flood project that you would never get it back again -- oh, you'd get it back, certainly, to some extent, but I believe that Mr. Nelson's testimony shows that there would be an ultimate loss of recoverable oil which would be needless.

MR. PORTER: Do you have any recommendations on a disposal well?

MR. KELLAHIN: No, sir, I do not. We didn't get into that. I think everybody here wants a disposal well in one way or another. We do feel that the injection surveys and profiles should be run on those wells as well as any other and any appropriate tests be made of the injection wells. I don't know how you're going to curtail ordering injection on the wells, about moving somewhere else, as I attempted to show, in particular to that well up north, if you're transferring from the south end to the north end, you may have the same thing or worse, if that is the cause, which we don't know. It is our engineer's opinion that if we do get these cement jobs done, this will be confined to the San Andres and we'll have no problem.

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MR. PORTER: Does anyone else have a statement? Mr. Stevens.

MR. STEVENS: Mr. Chairman, Petro-Lewis considers that its area is probably outside the call of this hearing. There is no evidence shown that any of the problem areas are in this area. However, Petro is concerned that they could be, without our knowledge, and certainly something must be done about the problem. Therefore, its recommendation that the injected water be limited to produced water while probably it would result in loss of production, it would also result in a lesser pressure, making it possible to cement these old wells. On that basis, the recommendation was made. We concur with the recommendations for a 90-day period for a study group, and we would hope that the Commission would consider this evidence and not go the full way and shut-in the injection. If such were done we would ask the Commission to consider the western tier of the two sections to be outside the scope of the order.

MR. PORTER: Anyone else have a statement? Mr. Blodget.

MR. BLODGET: I might make just a short observation. First, I think that probably we ought to wait

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until the study is made before deleting any areas. I think we need to have the study to really know whether we should delete any areas or not from the 36 sections outlined. Secondly, I don't know whether it has been emphasized -- I would like to emphasize -- I think these five recommendations that have been made first by Anadarko and Skelly and preferred by others, those matters, it is my understanding, could be put into effect right off and the 90-day period is for the committee to work and see what else needs to be done.

MR. PORTER: Does anyone else have a statement?

We're going to recess the hearing for a few moments and I would like to reconvene in a short time. The Commission might have some announcement at that time as to how we will proceed.

(Whereupon, a short recess was held.)

MR. PORTER: Gentlemen, going back on the record at this time, we would like to ask Mr. Sims if he has anything further to add to the hearing. He has a well which has become contaminated in the area and he has come quite a distance to the hearing. Mr. Sims, do you have anything additional that you would like to put

into the record?

MR. SIMS, SR.: Well, no, I would like to have something done about the well, that's the main thing. It's been going on for a year, since December of last year.

MR. FLOYD SIMS: My name is Floyd Sims. My house is located right in the middle of all of this water flood. Skelly's injection land is not a quarter of a mile from my house; the Agua well is less than a mile; and I'm right in the middle of all of these. I'm sure I know that there is not a whole lot of fresh water down where we're at, and we'd like to kind of keep what we've got. I had the water tested at my house, and the well water at my house is getting in pretty bad condition. What are we going to do when our fresh water is gone? I mean, these oil companies, they're working against all that. We can't drink their oil, and I don't want nothing to do with that.

MR. PORTER: In other words, you plan to stay there?

MR. FLOYD SIMS: Yes, sir, and what are we going

to do when they get all the oil out and they're gone? I mean, we're still there. I'd kind of like to know what's going to happen in the future; I plan on being there for several years.

MR. PORTER: Thank you.

(Whereupon, a discussion was held off the record.)

MR. PORTER: The Commission certainly realizes the seriousness of this situation, and has for some time, and this is why we have been meeting with people who are involved in the water floods and disposal projects. While we have been trying to get something started in order to alleviate the situation, we felt that time is of the essence and that some action should be taken immediately. With that in mind, we're going to enter an order which will include the following: It may not be limited to the following, but right now we would limit the injection in the four easternmost rows of sections to the withdrawal of oil, water, and gas; number 2, we would limit the two westernmost rows at this time to the injection to 150 percent of the total voidage of oil, water, and gas; number 3, we would require Skelly to continue to produce the storage well; number 4, we would limit

injection in Skelly's disposal well to the plant effluent only. That doesn't mean the water that comes out of the storage well, but the effluent from the plant itself. Number 5, we would, for the time being, allow the other disposal wells in the area to operate as they presently are. We also -- this will not be an order -- but we will call a hearing sometime in January to consider requiring temperature surveys as well as submit bond logs on all wells. Also, to show cause why any well that shows any leak or inadequate cement should not be repaired or plugged. We don't know just what date this will be in January, but we will set a date for such a hearing.

We are going to follow the suggestion of a number of people here and put Mr. Joe Ramey in charge of a committee, but we will give them 60 days to act in. We would request that the first meeting of this committee be held in the Hobbs Office at 9:00 day-after-tomorrow, Thursday. The committee will be composed of Anadarko, Skelly, Texas Pacific, Petro Lewis, Agua, Gulf, Continental, Amerada, and Don Hendricks. That's 9 besides Mr. Ramey. Are there any questions?

If not, that concludes the hearing on the Case

5377. The meeting of the Commission to consider some other matters will be recessed until 8:30 on Thursday morning in the Oil Conservation Commission Conference Room 205. That will be to consider other matters and maybe we hope to sign a formal order in this matter.

The meeting is recessed until that time.

(Whereupon, the Hearing was recessed at 3:35 p.m.)

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STATE OF NEW MEXICO)
) SS.
COUNTY OF SANTA FE)

I, RICHARD L. NYE, Court Reporter, do hereby certify that the foregoing and attached Transcript of Hearing before the New Mexico Oil Conservation Commission was reported by me, and the same is a true and correct record of the said proceedings, to the best of my knowledge, skill and ability.

RICHARD L. NYE, Court Reporter

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NEW MEXICO OIL CONSERVATION COMMISSION

COMMISSION HEARING

SANTA FE, NEW MEXICO

Hearing Date DECEMBER 3, 1974 TIME: 9 A.M.

NAME	REPRESENTING	LOCATION
Gene Gradick	Amoco	Houston
John D. Russell	T.P. Oil Co. Inc.	Roswell
Laurie Frantz	Phillips Petroleum	Odessa
[illegible]	Jennings, Christy & Copple Ogura	Roswell
Dan Kernaghan	Anadarko	Houston
B.W. Griffin	"	"
C.F. Kalteyer	Gulf Oil Corp	Midland
W.C. Young III	Texas Pacific	Midland
L A Wright	" "	"
W.G. Abbott	AGUA	Hobbs
M C Boyd	Texas Pacific	Midland
C W. Stumhoffer	Armer Oil Company	Fort Worth
V.T. Lyon	Conoco	Hobbs
W.T Thomas	Shelly	Hobbs
A.B. Cary	Skelly	Midland
O.V. Stuckey	Skelly	Midland
J. B. Somers	Petro Lewis Corp	Denver
H.S. Winston	Petro Lewis Corp	Fort Worth
Donald [illegible]	" "	Santa Fe
Austin E. Blodgett	Skelly	Tulsa

NEW MEXICO OIL CONSERVATION COMMISSION

COMMISSION HEARING

SANTA FE, NEW MEXICO

Hearing Date DECEMBER 3, 1974 TIME: 9 A.M.

NAME	REPRESENTING	LOCATION
Jason Kellahin	Kellahin & Fox	Santa Fe
C. Joseph Reed	Ed F. Reed & Assoc	Midland Tx
ARTHUR BROWN	U.S.G.S.	HOBBS
JIM GILLHAM	"	ROSWELL