

STATE OF NEW MEXICO  
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT  
OIL CONSERVATION DIVISION

CASE 10,693

EXAMINER HEARING

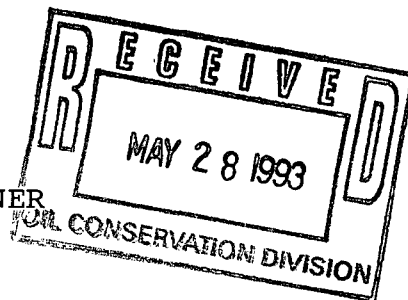
IN THE MATTER OF:

Application of Pronghorn SWD System for salt water  
disposal, Lea County New Mexico

TRANSCRIPT OF PROCEEDINGS

(Volume II)

BEFORE: MICHAEL E. STOGNER, EXAMINER



**ORIGINAL**

STATE LAND OFFICE BUILDING

SANTA FE, NEW MEXICO

May 7, 1993

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1 WHEREUPON, the following proceedings were had  
2 at 9:02 a.m.:

3 EXAMINER STOGNER: This hearing will come to  
4 order for case 10,693.

5 I believe yesterday before we took our eight-  
6 hour recess, Ms. Kery, you had just finished up with  
7 direct of Mr. Morrison.

8 Do you have any other questions at this time  
9 before I turn it over to --

10 MS. KERY: No, I don't, Mr. Stogner.

11 EXAMINER STOGNER: Okay. In that case, Ms.  
12 Aubrey, your witness.

13 MS. AUBREY: Thank you.

14 TOM MORRISON,  
15 the witness herein, having been previously duly sworn  
16 upon his oath, was examined and testified as follows:

17 CROSS-EXAMINATION

18 BY MS. AUBREY:

19 Q. Mr. Morrison, do you have Mr. Martinez's  
20 letter which is marked as one of your exhibits?

21 A. I have his April 7th, 1993, letter, which is  
22 Exhibit B.

23 Q. Okay. Why couldn't you duplicate or verify  
24 the model results produced by Mike Wallace?

25 A. As I indicated yesterday, in our memorandum

1 to the State Engineer we indicated in one of our  
2 findings -- I believe it was Finding 4 -- that the  
3 Applicant indicates that the impacts of injection will  
4 be "'practically undetectable'. However, due to the  
5 exaggerated scale of the figures..." which Mr. Wallace  
6 provided showing the changes in water quality, we could  
7 not detect small impacts in water-quality change.  
8 Those figures only show relatively large impacts.

9 Some of the figures we were looking at  
10 yesterday have contour intervals of 2000 milligrams per  
11 liter or more.

12 We were concerned about impacts to the Pecos  
13 River. Those exhibits do not indicate, especially, how  
14 the water quality changes in a manner that we can use  
15 to determine what the impacts will be at the stream or  
16 in the freshwater zones.

17 That was the first reason why we couldn't  
18 verify the results. We couldn't understand the way  
19 that the results were presented. The scales were  
20 greatly exaggerated.

21 The second reason why we couldn't verify the  
22 results were the numerous uncertainties in the  
23 investigation.

24 Q. And so you couldn't understand the way the  
25 results were presented, and your testimony is that

1     there were too many uncertainties in whose  
2     investigation?

3             A.     In the modeling study by Mr. Wallace.

4             Q.     You were provided with modeling software; is  
5     that correct?

6             A.     That's correct.

7             Q.     And you were provided with the input data?

8             A.     That's correct.

9             Q.     Did you run the model?

10            A.     No, we did not.

11            Q.     Why didn't you run the model, Mr. Morrison?

12            A.     We were concerned about whether or not the  
13     model would be able to be run upon our computer.  We --

14            Q.     And you talked to Mr. Wallace about that --

15            A.     I'm not finished.  Could I finish my --

16            Q.     Certainly.

17            A.     We were also concerned about the time  
18     involved.  We were initially requested that the hearing  
19     was going to be set, I believe, for April 8th, and they  
20     wanted a response from us.

21                    We were concerned about having to learn a  
22     totally new, different code, having to go through the  
23     manual, which is quite large and very extensive.

24                    We were quite concerned about the amount of  
25     time we were spending on this project.  We felt that we

1     could address the concerns of the OCD without having to  
2     run the model, that even by running the model, as I  
3     indicated yesterday, there are numerous uncertainties,  
4     and just running the model won't clarify those  
5     uncertainties.

6           Q.     Running the model would have allowed you to  
7     resolve your questions about what you call the  
8     exaggerated scale, though, wouldn't it?

9           A.     Yes, it would.

10          Q.     Mr. Wallace offered to help you run the  
11     model, didn't he?

12          A.     Yes, he did.

13          Q.     And Mr. Wallace talked to you about whether  
14     the model would run on your computer, didn't he?

15          A.     To some extent, yes.

16          Q.     And Mr. Wallace offered to be available to  
17     you by telephone if you had any problems, didn't he?

18          A.     Yes.

19          Q.     So you don't know what you would have found  
20     if you had run the model that Mr. Wallace ran?

21          A.     In Exhibit 8, Figure 10 -- I made reference  
22     to this yesterday -- Mr. Wallace presents some figures  
23     showing the head changes. And in Figure D10(b) for  
24     scenario one, it shows water level changes in the  
25     immediate vicinity of the river.

1           Because we have a water level change in the  
2           vicinity of the Pecos, we know we're going to have an  
3           impact upon the system. What that impact is, I do not  
4           know.

5           Q.    Let me try my question again, Mr. Morrison:  
6           You don't know what you would have found if you had run  
7           the model with the inputs that were given to you by Mr.  
8           Wallace?

9           A.    I do not know what the -- I do know from his  
10          results that we would be impacting the river. I don't  
11          need to run the model to give me that answer.

12          Q.    You don't need to run --

13          A.    He's already given me information in Exhibit  
14          8, Figure D10 and also in Figure D11, that for both his  
15          scenarios, he's got water level changes in the vicinity  
16          of the river.

17                When we have a water level change in -- next  
18          to the stream, that's going to affect the stream.

19          Q.    You've agreed, haven't you, that the  
20          injection will not propagate to the area of the Pecos  
21          River? You've agreed with that, haven't you?

22          A.    No.

23          Q.    Let me have you look at your report. I think  
24          it's your Exhibit A.

25          A.    I'm sorry, could you ask me the question,



1 please, again? I'm not sure I quite understood it.

2 Q. Isn't it true that you've agreed that the  
3 injected brine is not going to propagate to the area of  
4 the Pecos River?

5 A. I'm not sure if that's a complete  
6 understanding.

7 Because of the uncertainties, we are not  
8 completely certain that the brine would not propagate.

9 We believe probably that the head increases  
10 at the well site will be not great enough such that we  
11 would reverse the gradient.

12 We had some concerns in our study about the  
13 density corrections, whether or not the heads that the  
14 model gives us have been properly adjusted for density.  
15 When we have dense water, that's going to affect the  
16 energy potential of the water. And that's what head  
17 is, it's energy. If it's denser water, it's going to  
18 have a higher energy potential than if it's fresh  
19 water.

20 There were questions in the study whether or  
21 not the model did this properly.

22 In our -- I believe it's specific comment 12,  
23 page 18 of Exhibit A, we address the uncertainties of  
24 this head rise. We point out that the -- At present,  
25 based upon Mr. Wallace's report, using Figure D4 of his

1 study, that there is approximately 400 feet head  
2 difference between the Pecos River and the well site.

3 Based upon some very rough calculations, Dr.  
4 Barroll indicates that possibly we could have several  
5 hundred feet of head change.

6 And those are very rough calculations, I  
7 must --

8 Q. And is that work you did, Mr. Morrison?

9 A. That's work Dr. Barroll did.

10 Q. Dr. Barroll did.

11 A. And -- But all I'm saying is that there's  
12 uncertainty -- You really can't tell whether or not the  
13 brines are going to propagate into the stream until  
14 you've made a realistic estimate of what the head  
15 change will be at the injection well.

16 We feel that probably that head change will  
17 not be more than 400 feet, and so it will not travel to  
18 the stream. That's my best guess.

19 Q. So you don't think it will?

20 A. No.

21 Q. The short answer is, you don't think it will?

22 A. But there is uncertainty.

23 Q. There's always uncertainty, isn't there, Mr.  
24 Morrison?

25 A. Yes, but in this respect I think there's a --

1 We have an area of uncertainty that I'm not sure if the  
2 Applicant has carried the burden in resolving that  
3 uncertainty.

4 Q. Mr. Morrison, in your testimony I think it  
5 will move a little faster, if you need to refer to work  
6 done by Dr. Barroll or Andy Core, if you would just  
7 simply say that instead of purporting to testify to  
8 their findings, since they've not been qualified as  
9 experts. We can then go back and have them qualified  
10 or have them testify as to their own results. Okay?

11 And you agree, don't you, that the natural  
12 brine source adjacent to the Pecos probably poses the  
13 main threat to fresh groundwater in the Capitan, as  
14 opposed to the brine from any injection; isn't that  
15 right?

16 A. I believe that the brine sources in the  
17 vicinity of the Pecos are an area of concern.

18 Another area of concern is any --

19 Q. I think you answered my question.

20 I want to refer to page 16 of your memo,  
21 Exhibit A.

22 A. Yes.

23 Q. The first full paragraph says, "We also agree  
24 that the natural brine source located adjacent to the  
25 Pecos River probably poses the main threat to the fresh

1 ground water in the Capitan from which the City of  
2 Carlsbad derives its supply."

3 You did say that, right?

4 A. Yes.

5 Q. Now, you were given the software and the  
6 input data when?

7 A. I don't have that date for you. It was  
8 approximately several months ago.

9 Q. It was some time --

10 A. Several months or so ago.

11 Q. -- prior to March; is that right?

12 A. Yes.

13 Q. And you knew prior to April 7th when you --  
14 or when Mr. Martinez wrote this letter, that the  
15 hearing had been continued until May; isn't that  
16 correct?

17 A. We were advised that there is a possibility  
18 that the matter would be continued. It was shortly  
19 before the hearing scheduled in early April.

20 Q. And in the month between April 8th and the  
21 beginning of the hearing yesterday, you didn't run the  
22 model?

23 A. No.

24 Q. Do you agree that the San Andres is  
25 hydrologically connected to the Reef?

1 A. Yes.

2 Q. And you're aware that the -- there is --  
3 presently is injection of brine into the San Andres  
4 formation?

5 A. That was indicated yesterday.

6 Q. Were you not aware of that before?

7 A. That's my only -- No.

8 Q. What is the position of the State Engineer,  
9 then, on the question of degradation of the Reef by  
10 injection into the San Andres?

11 A. I don't know.

12 Q. Who will make that decision, Mr. Morrison?

13 A. Mr. Eluid Martinez.

14 Q. Were you not aware of the exempt aquifer  
15 documents that Mr. Catanach brought out as exhibits  
16 yesterday?

17 A. I was made aware of those yesterday.

18 Q. So prior to yesterday the State Engineer  
19 didn't know that for years produced brine has been  
20 being injected into the San Andres formation?

21 MS. KERY: Objection, this witness can't  
22 answer about what the State Engineer knows or doesn't  
23 know.

24 Q. (By Ms. Aubrey) I'll change the question.

25 The head of Hydrology at the State Engineer's

1 Office didn't know?

2 A. The first time -- I've been in this section  
3 for over 14 years. The first time that our office was  
4 requested to assist the OCD with respect to an  
5 injection problem was last year with the Anadarko  
6 application.

7 Our Roswell district office may have been  
8 performing some services to the OCD with respect to  
9 other proposals.

10 Up until last year, we were not involved in  
11 any -- at least my staff and myself, we have never been  
12 involved in any application to inject until the  
13 Anadarko application.

14 Q. And in the intervening year between the  
15 Anadarko application and this case, did you make any  
16 investigation of what injection was already going on in  
17 the San Andres?

18 A. No.

19 Q. The State Engineer's Office and the Oil  
20 Commissioner have worked closely over the years on the  
21 question of underground injection; isn't that true?

22 A. We have advised the OCD on areas which are  
23 designated as freshwater zones.

24 Q. And you are aware of the OCD's designation of  
25 certain aquifers as exempt; is that correct?

1           A.    I was aware that they may have some aquifers  
2           which are exempt, yes.

3           Q.    Did you have -- Did the State Engineer's  
4           Office, or you as head of Hydrology, have any concerns  
5           that there might be a degradation of an existing  
6           aquifer by virtue of that injection into those exempt  
7           aquifers?

8           A.    I must assume that on every application that  
9           comes before the OCD and the State Engineer's Office  
10          that we look at it on its own merits and that we act  
11          accordingly. I must assume that, you know, we take  
12          actions on the information before us and that the  
13          applicant has the burden of proof.

14          Q.    Well, in connection with the Anadarko  
15          application, was any information withheld from you  
16          about the proximity of the San Andres formation or the  
17          injection into the San Andres formation in connection  
18          with the Anadarko well?

19          A.    I don't know.

20          Q.    Have you talked with anyone from your Roswell  
21          office about the implications of injection into the San  
22          Andres formation which is in hydrologic connection with  
23          the Capitan Reef?

24          A.    I've been in contact with Mr. Ken Fresquez of  
25          our Roswell District Office only with respect to this

1 Application, with -- which proposed the injection into  
2 the Capitan Reef.

3 I've had no discussions with anyone in our  
4 office about injection into the San Andres.

5 Q. Do you recall discussing injection into the  
6 San Andres with Mr. Scott and Mr. Wallace on March 31st  
7 in your office?

8 A. No, I do not.

9 Q. Well, Mr. Morrison, is injection into the San  
10 Andres degrading the Capitan reservoir?

11 A. I haven't made that determination.

12 Q. Have you seen any effects?

13 A. I don't know. I haven't investigated that.  
14 I've investigated this Application, which was injecting  
15 into the Capitan Reef.

16 Q. I believe you testified yesterday that the  
17 entire Reef is in hydrologic connection; is that right?

18 A. I testified that we have information that the  
19 Reef in New Mexico is in continuous hydrologic  
20 connection with itself.

21 Q. So that the injection into the San Andres  
22 formation is then, under your view, affecting the water  
23 supply at Carlsbad; is that correct?

24 A. There might be some potential impact. But as  
25 we indicated yesterday, it's a matter of measure, of --



1 everything is in connection, but it's a matter of  
2 degree.

3 Q. So it's a question of the degree of effect,  
4 then, that you're concerned about; is that correct?  
5 Not the fact of hydrologic connection?

6 A. Hydrologic connection is a factor.

7 Q. Well, which is --

8 A. But also -- You could also say that  
9 everything in the world is in hydrologic connection, so  
10 you shouldn't permit anything. You have to use some  
11 practical sense.

12 Q. So we start with the fact that there is, in  
13 your view, a continuous hydrological connection. Does  
14 that in and of itself lead you to the position that the  
15 injection should not be permitted?

16 A. The fact that we have a significant  
17 hydrologic connection, that we're injecting into an  
18 aquifer that's also used by a municipality and which is  
19 connected to one of our major streams in our state, are  
20 major considerations.

21 Q. If you were to -- Let's assume for the moment  
22 that there is a continuous significant hydrological  
23 connection, but that in fact there was no effect on the  
24 water supply. Would that then cause the State  
25 Engineer's Office to take the position that there

1       should be no injection?

2           A.    No.

3           Q.    So it really is -- I just want to try to  
4       understand what your more important point is here. It  
5       really is the effect that you're looking at, then, not  
6       the fact?

7           A.    No, it's the connection.

8           Q.    It's not the effect?

9           A.    Our primary concern is that we have an  
10      aquifer that's in intimate hydrologic connection with  
11      freshwater zones.

12          Q.    Uh-huh.

13          A.    We also have vast uncertainty, so it's  
14      difficult to quantify what the effect is.

15                So to ensure that the existing water  
16      resources are protected, we've taken a conservative  
17      approach which indicates that no injection should be  
18      allowed into the Capitan.

19          Q.    Even if there's no effect?

20          A.    That determination has not been made.

21          Q.    How would you go about filtering out the  
22      effect of the San Andres injection on the Capitan, in  
23      order to determine whether or not there would be an  
24      effect?

25          A.    You'd have the same problem. You'd have to

1 look at all available data and see whether or not --  
2 what kind of calculations you'd have. If you have  
3 significant uncertainty, your ability to make  
4 reasonable predictions would be greatly limited.

5 Q. Well, Mr. Morrison, I'm sure there are people  
6 in the room who can say this better than I, but I think  
7 injection has been going on in the San Andres for about  
8 40 years, since the late Forties or early Fifties.  
9 Maybe Mr. Stogner knows better, but...

10 Are you aware that it's been that kind of a  
11 time period that we're talking about?

12 A. I'm not familiar with injection into the San  
13 Andres. I know that injection has been occurring in  
14 the area in various different formations -- injections  
15 and withdrawals -- and that all the activity has  
16 impacted the water levels in the Capitan.

17 Q. Are you aware that there are San Andres  
18 injection wells in the area which are closer to  
19 freshwater sources than Pronghorn's proposed one?

20 A. No, I'm not aware of that.

21 Q. Now, in analyzing this Application -- Well,  
22 let me go back and ask another question.

23 Mr. Martinez in his letter has said that  
24 degradation of any portion of the Aquifer could  
25 eventually degrade the entire Aquifer.

1           If we assume that some degradation must have  
2 occurred from the injection of produced brine into the  
3 San Andres, is it your professional opinion that the  
4 Aquifer is presently degraded?

5           A.    Since they're in hydrologic communication  
6 between the San Andres and Capitan, yes, degradation  
7 would have some impact upon the Capitan.

8           Q.    So it's already occurred; is that your  
9 testimony?

10          A.    I'm saying the potential exists.

11          Q.    But are you --

12          A.    I have not made a determination that that has  
13 occurred. I'm just saying the potential exists.

14          Q.    Are you assuming from a hydrological point of  
15 view that it has occurred? Can you make that  
16 assumption?

17          A.    I have not made that determination.

18          Q.    So based on what you know, you can't make  
19 that determination -- is that correct? -- today, that  
20 there has been degradation as a result of the injection  
21 of brine in the San Andres?

22          A.    I don't know.

23          Q.    Well, Mr. Morrison, will you agree with me  
24 that you can't conclude, then, that there will  
25 automatically be degradation as a result of injection

1 of brine?

2 A. I'm sorry, I don't understand your question.

3 Q. If you're not willing to conclude that  
4 because of injection which we all know has been going  
5 on for 40 or 50 years, that there is degradation of the  
6 aquifer, will you agree with me that you can not  
7 presume degradation simply from the fact of the  
8 injection?

9 A. In the Capitan Reef we have an intimate  
10 connection with the freshwater zones, and we also have  
11 available evidence that indicates that wells in the  
12 Capitan can influence the heads throughout that system.  
13 That was a fairly important reason for the declaration  
14 of the Basin.

15 We have not looked at the interaction of  
16 other systems and how they connect with the Capitan and  
17 how they may affect the freshwater zones.

18 Q. When was the basin declared?

19 A. It was declared in 1965.

20 Q. And can you come to whichever one of your  
21 exhibits you think shows it best and show me the extent  
22 of the basin?

23 A. I can show you approximately the boundary.  
24 The Carlsbad Underground Water Basin extends to the  
25 east of the Pecos River a short distance.

1           The Capitan Basin boundary is east of the  
2 Pecos River and extends eastward towards the state line  
3 and the Lea County Underground Water Basin.

4           Q.    So is there an area in here, in the middle,  
5 where we're not in either one of those?

6           A.    No, it's -- That entire area has been  
7 declared as an underground water basin.

8           Q.    So they're contiguous?

9           A.    Yes.

10          Q.    This is the Carlsbad Basin?

11          A.    Yeah, the Carlsbad Basin would be directly --  
12 The east boundary would be immediately east of the  
13 river, and that would extend westward towards the  
14 Guadalupe Mountains.

15          Q.    And this one is called what?

16          A.    The Capitan Underground Water Basin would  
17 extend east of the Carlsbad Underground Water Basin.

18          Q.    And it goes to the state line?

19          A.    It goes to the state line, and butts up  
20 against Lea County Underground Water Basin, which  
21 covers most of Lea County.

22          Q.    What's down here?

23                EXAMINER STOGNER:  What are you pointing to,  
24 Ms. Aubrey?

25          Q.    (By Ms. Aubrey)  I'm sorry, Mr. Stogner.

1                   What to the south?

2           A.    The Capitan Underground Water Basin extends  
3   from the Lea County Underground Water Basin, down to  
4   the corner of the Texas/New Mexico state line where the  
5   east/west boundary line starts.

6           We also have the Jal Underground Water Basin,  
7   which is in that area.

8           We also have another --

9           Q.    Can you show that -- Is that shown on here?

10          A.    It's not shown on this map.

11          Q.    Can you point on the wall where it would be?

12          A.    Probably this map here would be --

13               EXAMINER STOGNER:  Now, what exhibit are you  
14   referring to?

15               THE WITNESS:  We're looking at Figure Number  
16   5 of State's Exhibit A.

17               Jal is located in the southeastern corner of  
18   New Mexico, and we do have a small underground water  
19   basin in this area.

20               We also have an area which has been -- I'm  
21   not sure what the status of it is right now, but it was  
22   proposed as a new underground water basin in this area  
23   at the southern state line between New Mexico and  
24   Texas, and that would be between Jal and the Carlsbad  
25   Basin.

1 Q. (By Ms. Aubrey) What basin is the WIPP site  
2 in?

3 A. It's in the Capitan Underground Water Basin.

4 Q. Is there any area in here of the reef that is  
5 not in a declared basin?

6 A. After the new basin is formally declared,  
7 it's gone to hearing, I'm not sure --

8 MS. KERY: It is formally declared.

9 THE WITNESS: Okay, the whole area now has  
10 been declared as an underground water basin.

11 Q. (By Ms. Aubrey) In one basin or the other,  
12 right?

13 A. Yes.

14 Q. It's not one basin?

15 A. No.

16 Q. Okay. And the WIPP site is in the Carlsbad  
17 Basin?

18 A. I believe the WIPP site is in the Capitan  
19 Basin.

20 Q. Capitan Basin.

21 A. Yeah.

22 Q. Okay, thank you.

23 Now, Mr. Morrison, Mr. -- I'm referring still  
24 to Mr. Martinez's letter. In that letter -- I'm sorry,  
25 I don't have an exhibit number on mine. What --



1 MS. KERY: It's Exhibit B.

2 Q. (By Ms. Aubrey) Exhibit B. Mr. Martinez  
3 states that the State Engineer's duty and the  
4 Legislature's grant of authority to the OCD is to  
5 regulate produced water in a manner that affords  
6 reasonable protection against contamination of fresh  
7 water. Do you agree with that?

8 A. Which paragraph are you referring to?

9 Q. It's the second full paragraph on page 2 of  
10 Mr. Martinez's letter.

11 A. Are you talking about the first full  
12 sentence?

13 Q. No, the sentence is -- sentence begins, "This  
14 is the same policy which underlies both the Federal  
15 Underground Injection Control Program's mandate that a  
16 determination be made that such injection not pose a  
17 danger of contaminating underground sources of drinking  
18 water and our legislature's grant of authority to the  
19 OCD to regulate produced water in a manner that affords  
20 reasonable protection against contamination of fresh  
21 water supplies..."

22 A. I'm not familiar with the Federal Underground  
23 Injection Control program.

24 Q. Are you familiar with the New Mexico  
25 Legislature's grant of authority to the New Mexico Oil

1 Commission, which is contained in the statute referred  
2 to by Mr. Martinez?

3 A. I'm familiar with the statute referred to in  
4 Mr. Martinez's letter.

5 Q. And do you agree that the requirement is that  
6 produced water be disposed of in a manner that affords  
7 reasonable protection against contamination of fresh  
8 water?

9 A. Yes.

10 Q. In analyzing the Application of Pronghorn SWD  
11 System and the study produced by Mr. Wallace, what  
12 analytical work did you or your staff do?

13 A. We did some analytical calculations using the  
14 Theis equation. Basically the way that Mr. Wallace is  
15 modeling the system with respect to changes in head is  
16 very simplistic. It's very conservative, and the  
17 Aquifer is a continuous thickness of 1000 feet.

18 Q. I hate to interrupt you, Mr. Morrison, but  
19 we'll be here all day unless you can answer my  
20 question. My question was, what did you do in terms of  
21 analytical work?

22 MS. KERY: And I believe he's answering that  
23 question.

24 THE WITNESS: I'm trying to tell you, and I'm  
25 saying that due to the simplicity of the model,

1 analytical calculations were very good to serve as a  
2 check on the Applicant's work.

3 Q. (By Ms. Aubrey) What were those analytical  
4 computations?

5 A. We calculated using the Theis equation what  
6 the head increases would be due to the injection  
7 activities.

8 Q. Anything else?

9 A. This is with respect to analytical  
10 calculations?

11 Q. That's correct.

12 A. That's all.

13 Q. Did you run your MODFLOW model?

14 A. Yes.

15 Q. And do you have the results of that for us  
16 today?

17 A. Yes, I do.

18 Q. Have you previously provided those to Mr.  
19 Wallace?

20 A. I ran those this morning, about 6:00 a.m.

21 MS. KERY: This is the first I've learned of  
22 it too, Counsel, so...

23 MS. AUBREY: We all get surprised, don't we?

24 Q. (By Ms. Aubrey) Do you have copies of that  
25 model run for --

1           A.    No, I didn't, because I wasn't anticipating  
2           -- Other than just explaining what I did.

3                   Deborah Hathaway computed -- performed a  
4           modeling exercise in which she developed a calibrated  
5           numerical model.

6                   The bottom line is that the proposed  
7           injection, based upon these model calculations, will  
8           cause an effect on the stream of 97 acre-feet per year,  
9           which is about 16 percent of the annual pumping of 588  
10          acre-feet per year.

11          Q.    Let me stop you there, because I don't  
12          understand what you just said, Mr. Morrison.

13          A.    Okay.

14          Q.    Are you talking -- By "the stream" you mean  
15          the Pecos?

16          A.    The Pecos, I'm sorry.

17          Q.    So this is an analysis of the effect on the  
18          Pecos?

19          A.    That's correct.

20          Q.    Okay. And it's based on Hathaway's study; is  
21          that correct?

22          A.    Yes.

23          Q.    Do you have Hathaway's study for us today?

24          A.    Yes, I do.

25          Q.    Is this the first time you've run the MODFLOW

1 model on this problem?

2 A. I've run numerous MODFLOW models.

3 Q. On this issue, in connection with this case?

4 A. No, it's not.

5 Q. When did you run the MODFLOW model before  
6 this?

7 A. I ran a -- just a very rough calculation last  
8 week to see if the model would run without any  
9 problems.

10 Q. Did you run the MODFLOW model before writing  
11 your criticism of Mr. Wallace's report?

12 A. No, we only located the input last week.

13 Q. Which input?

14 A. The input to Hathaway's model. It was a week  
15 or two ago when we located it.

16 Q. Okay. The Hathaway report is referred to in  
17 your memorandum, which I assume is dated April 7th,  
18 1993; is that right?

19 A. That's correct.

20 Q. And so you had the Hathaway report at that  
21 time, didn't you?

22 A. We had the Hathaway report.

23 Q. And prior to that report being authored, Mr.  
24 Wallace had asked the State Engineer's Office to  
25 provide him with any and all information that it had

1 about the Capitan Reef; is that correct?

2 A. No, that's not my understanding.

3 At our meeting, Mr. Wallace was concerned  
4 about water quality impacts. He asked if we had any  
5 calculations to show what the water quality impacts  
6 were, and I said, no, we didn't.

7 I know we've made several analyses in the  
8 region to -- in the evaluation of water-right  
9 applications and that probably we had some flow  
10 analyses with respect to those applications. I'm not  
11 familiar with any of those specific analyses. But I  
12 know that it was my understanding that we had not had  
13 any solute transport calculations.

14 Q. So you took his request to be an extremely  
15 narrow one; is that correct?

16 A. I took his request with respect to his main  
17 area of interest, which was, what will the water-  
18 quality impacts be due to the injection of brine?

19 Q. And what is the subject of the Hathaway  
20 report?

21 A. The Hathaway model is a groundwater flow  
22 model. The model predicts groundwater lowering and  
23 stream depletions on the Pecos River.

24 If I may finish my answer to a previous  
25 question, you asked what the results of the model were.

1 I gave you the impacts to the Pecos River.  
2 What that number tells you, the 16 percent of total  
3 pumping impact onto the stream, is that the injected  
4 well is in connection with the stream and it does have  
5 an impact on the stream, and it does impact water  
6 levels from the well site to the Pecos River.

7 The drawdown at the well site was computed as  
8 18 feet at the end of 40 years. The stream depletion  
9 estimates -- or stream accretion estimates, are also  
10 for a period of at the end of 40 years of pumping.

11 The Application is for the injection for a  
12 50-year time period.

13 Q. Now, the Hathaway report deals with  
14 groundwater flow; is that correct?

15 A. That's correct.

16 Q. And at the time that Mr. Wallace made his  
17 request for information to you, you were aware that one  
18 of the sections of his report, which was to be used as  
19 an exhibit here, was in fact an analysis of groundwater  
20 flow?

21 A. I would assume that he would have to do a  
22 thorough analysis of groundwater flow, yes.

23 Q. So it would be reasonable to assume that if  
24 the State Engineer as a public agency had a document in  
25 which work had already been done in that area, it would

1       only be fair to give that to him, don't you think?

2           A.    At the time we were meeting I was not clear  
3       that this was public information.  Mr. Wallace asked me  
4       for information on whether or not we had computed  
5       solute changes, and I told him no, we had no  
6       information with respect to that.

7           Q.    And when did you discover that in fact this  
8       document on which you have relied, and your memo, which  
9       is more than a month -- which is a month old now -- was  
10      public information so that it could be shared with a  
11      private party who was going to have to respond to this  
12      sort of an analysis by the State Engineer's Office?

13          A.    It was shortly before our April 7th  
14      memorandum was issued.

15                It was not -- We did not rely upon the  
16      Hathaway study.  We were addressing -- We were  
17      requested by the OCD to point out problems with the  
18      report, and Mr. Wallace made the statement that he was  
19      not -- there were no other investigations that  
20      evaluated the impacts of wells in the Capitan on the  
21      Pecos Valley, and we pointed out that there were Mr.  
22      Akin's study, and there was also the Hathaway study  
23      which computed the impacts of wells in the Capitan on  
24      the Pecos Valley.

25          Q.    But you didn't see any necessity to give that



1 report to Mr. Wallace or to me until today?

2 A. That's right.

3 Q. The Hathaway study, as I understand it, is a  
4 numerical model of the Capitan; is that correct?

5 A. That's correct.

6 Q. And it models groundwater flow; is that  
7 correct?

8 A. That's correct.

9 Q. Who is Hathaway?

10 A. Deborah Hathaway was a staff hydrologist who  
11 was employed with our agency for -- oh, a number of  
12 years in the early 1980s. She was involved in the  
13 litigation with Texas. She performed numerous  
14 evaluations. She has a -- holds a master's degree in  
15 hydrology and performed numerous modeling studies for  
16 us.

17 Q. And where is she now?

18 A. It's my understanding she's with S.S.  
19 Papadopolis and Associates, located in Virginia.

20 Q. Now, this numerical model, is it created from  
21 software like your MODFLOW or like the SUTRA software?

22 A. Yes.

23 Q. Computer-generated?

24 A. Yes, it's a US Geological Survey code. It's  
25 the US2D code by Prescott, Larson and Pinder.

1 Q. And that's a model that the State Engineer's  
2 Office uses regularly; is that correct?

3 A. We use several models, and as Mr. Wallace  
4 pointed out, we use MODFLOW quite a bit, but we also  
5 use the --

6 Q. So this model is available in your office to  
7 be run; is that correct?

8 A. Yes.

9 Q. Where did you get her input data?

10 A. I had to go through files that were stored  
11 away in her files. Ms. Hathaway left several computer  
12 diskettes, and it required that I go through diskettes  
13 from employees that left the agency and find her  
14 diskettes and go through those to find the input.

15 Q. Where did she get her input data?

16 A. Ms. Hathaway did an evaluation of the  
17 available literature, which I made note of yesterday.  
18 She used the work of Hiss to come up with her aquifer  
19 coefficients. She started out by understanding the  
20 geology, characterizing the hydrology of the area,  
21 characterizing the system, like we've been saying, as  
22 being a tube with highly transmissive material,  
23 relative to the surrounding material.

24 She also performed a transient model  
25 calibration for a period of years, and she adjusted her

1        aquifer parameters to calibrate the model.

2            Q.    Did she use any field data that she gathered  
3        in obtaining this model?

4            A.    She did not go out and gather any data.    She  
5        used existing data available in available publications.

6            Q.    So is there any way that we can tie the data  
7        that she used from Hiss to her results?

8            A.    She uses the data from Hiss and her  
9        calibration together to come up with her final --

10          Q.    So do you feel that this modeling exercise of  
11        Ms. Hathaway is helpful to you in your analysis of this  
12        problem?

13          A.    I have not evaluated -- As Mr. Wallace said,  
14        we develop models for particular reasons, for  
15        particular issues that we want to address.

16                Ms. Hathaway developed this model for a  
17        particular job.    That's not to say that we're going to  
18        be using this model for every application that comes  
19        into this area.

20          Q.    Are you using it for this one?

21          A.    I mainly used it as an illustrative point of,  
22        what if we use this model and the well was injecting?  
23        I'm not saying that these are our best estimates of  
24        what the impact is.

25                The statement was made by Mr. Scott that he

1 felt that there was no direct connection between the  
2 injection well site and the stream, and I'm only saying  
3 that there is another hydrologist who did a model, and  
4 that model gives us a different answer.

5 Mr. Akin is a different hydrologist, and he  
6 also has a different answer. He came up with the  
7 answer that, yes, wells in the Capitan do affect the  
8 Pecos Valley.

9 Q. But Ms. Hathaway's model was not designed to  
10 address the question of the effect of an injection well  
11 in the location where the injection well is, was it?

12 A. It was developed to address the impacts of  
13 all wells in the Capitan on the Pecos River for her  
14 study, and that was -- that were wells in New Mexico  
15 and Texas.

16 Q. So do you think -- Is it your testimony, Mr.  
17 Morrison, that a model developed for another purpose,  
18 using different input data, is somehow relevant to this  
19 hearing and should be relied upon by the State Engineer  
20 and the OCD in determining whether or not to grant this  
21 Application?

22 A. No, we're not relying upon this model; we're  
23 just saying that here is another tool that we can look  
24 at. A model is only a tool, and this tool was  
25 developed, and if you apply it in this specific place,

1     what are the results?

2             I'm only providing those numbers to you to  
3     show you that here we have another model that was  
4     developed, and it's calibrated, and these are the  
5     numbers that that model gives you.

6             Q.    And have you reviewed her calculations and  
7     her input data to make sure that they're both accurate  
8     and correct?

9             A.    I have not reviewed those in detail.  I've  
10    made a visual inspection that basically her model, if  
11    you visualize those aquifer parameters, it provides you  
12    with a picture like you see here in Figure 3 on the  
13    wall, that you have a tube of highly transmissive  
14    material.

15            You have a submarine canyon between the well  
16    site and the stream, you have the Pecos River, which is  
17    fully penetrated, like in Mr. Wallace's model, that it  
18    has lower transmissive material surrounding it on both  
19    sides.

20            So that model conceptually comes close to  
21    what we've been talking about in this proceeding.

22            Q.    So models can be helpful to making these  
23    determinations; is that your testimony?

24            A.    Models are tools, and they can be useful for  
25    certain situations.

1 Q. In fact, I believe your testimony yesterday  
2 was that you are involved in a modeling effort in the  
3 Capitan right now; is that correct?

4 A. No, that's not correct. We are -- What I  
5 said was, we are involved in a model of the Carlsbad  
6 Basin, and part of that modeling area is -- overlaps  
7 into our area of interest here, where the Reef crosses  
8 the Pecos River.

9 So the area of interest for this Application  
10 overlaps into an area which Dr. Barroll has been  
11 investigating for the Carlsbad Underground Water model.

12 Q. And why are you running -- or creating that  
13 model?

14 A. That model is being prepared for several  
15 different reasons. The primary reason is for the  
16 administration of water rights and the determination of  
17 impacts of wells onto the stream system for  
18 administration of the stream.

19 Q. So you're going to use that model to make  
20 some decisions here about the effects of additional  
21 wells on the stream system?

22 A. That's a possible use. When we develop a  
23 model, we just don't routinely use it for every problem  
24 that comes into our office. We need to assess whether  
25 or not the model is reasonable for this application.

1 New information may come about such that will make us  
2 want to change our modeling.

3 So even though we have a model, it's more to  
4 make sure, is that model the best tool that we should  
5 be using? The applicant may go out and do an aquifer  
6 test, collect site-specific data, which may wish us to  
7 alter that model.

8 Q. Let me have you look at a couple of figures  
9 from Mr. Wallace's report. Do you have that in front  
10 of you? I've got another copy if you don't.

11 A. Yes, I do.

12 Q. I'd like you to look at Mr. Wallace's Figure  
13 D10.

14 A. Okay.

15 Q. Now, you gave me some testimony yesterday  
16 about this exhibit; is that correct?

17 A. That's correct.

18 Q. Is this the exhibit that you referred to  
19 yesterday as showing the head rising as high as Lake  
20 Avalon? Is that the one you were referring to  
21 yesterday?

22 A. This exhibit, I made reference to it to show  
23 that the model shows head rises from the injection site  
24 to the left-hand portion of this figure, which  
25 represents the Pecos and Lake Avalon area.

1 Q. Let me have you look at Figure (a) in Figure  
2 D10. It's the one in the upper left-hand corner. This  
3 is a depiction of head distribution at 23.35 years. Do  
4 you see that --

5 A. Yes, I do.

6 Q. -- in that particular quadrant?

7 A. Yes.

8 A. And after 23.35 years, where is the head from  
9 the injection well?

10 A. At the injection well?

11 Q. Yes.

12 A. Using Figure D10(a), the head at the  
13 injection well is slightly less than 30 feet.

14 Q. Okay. And at 50 years?

15 A. At 50 years it's approximately the same.

16 Q. And at 66 years, what does that show?

17 A. At 66 years it shows a water level decline of  
18 several feet.

19 Q. Now, if I recall your testimony from  
20 yesterday correctly, you used this figure in your  
21 discussion of the -- your claim that there will be a  
22 reversal of the gradient around the Pecos River. Do I  
23 recall your testimony correctly?

24 A. No, you don't. I didn't claim that that  
25 reversal would occur. I indicated that this



1 information -- and using Mr. Hiss's map showing the  
2 head distribution, the level of the water surface --  
3 using those two pieces of information together  
4 indicates that there is a possibility that the gradient  
5 may be reversed.

6 Q. How high on Figure D10(a) would the head at  
7 the injection well have to be for there to be a  
8 reversal?

9 A. As I said yesterday, if you look at Hiss's  
10 1980 map, the head is basically flat near the stream,  
11 so any rise whatsoever in the aquifer may be  
12 significant to induce flow westward towards the river.

13 Q. Is it your testimony that it doesn't matter  
14 what the head in the injection well is?

15 A. No, the head in the injection well is  
16 relevant because that head affects the surrounding head  
17 all the way to the stream.

18 Q. Okay. How high would the head in the  
19 injection well have to be for there -- for it to effect  
20 a reversal at the stream?

21 A. In this situation, in this example, the head  
22 here at the injection well has changed 30 feet, and  
23 that induces change in head near the river, and so what  
24 I'm saying is, there's -- Because of density changes in  
25 water in the area, there is uncertainty on what the

1 actual head distribution is.

2 Based upon Mr. Hiss's map showing the  
3 surface, indicates that it's a fairly level surface, so  
4 that any head rise will -- may be possible in inducing  
5 some water level -- some water migration towards the  
6 stream and the freshwater zones.

7 Q. Isn't it true that the injection well would  
8 have to be higher than the initial head shown on  
9 diagram D10(a), which is at about 28 feet?

10 A. No.

11 Q. No?

12 A. His model results indicate that you're going  
13 to have head rises due to the injection activity of  
14 about a half a foot per mile away from the stream.

15 Q. Let me have you look at D11 now.

16 (Off the record)

17 Q. (By Ms. Aubrey) Let me have you look at D11,  
18 which is the next figure.

19 A. Yes, I'm looking at it.

20 Q. That's scenario two. What do you understand  
21 scenario two to be?

22 A. Scenario two is a scenario in which the heads  
23 are level, the gradient is not slumping from the Pecos  
24 to the east end of the model. But the gradient --  
25 There's no gradient; it's a level surface. You have

1 two constant-head boundaries at either end of the basin  
2 -- of the model.

3 Q. What effect would it have on this diagram,  
4 D11, if you lowered the hydraulic conductivity in the  
5 model?

6 A. If you lowered the hydraulic conductivity of  
7 the model, you would lower the transmissivity. If you  
8 lower the transmissivity, the drawdowns at -- or the  
9 head rises at the injection well would be much greater.  
10 The effects further away would be less than what's  
11 predicted if you used a higher hydraulic conductivity  
12 at the areas distant from the injection well.

13 Q. Let me have you go back to D10 now. What is  
14 this -- What is the head at the river shown in this  
15 diagram?

16 A. These diagrams do not show head in the river.  
17 They show changes -- Let me correct myself. I must  
18 assume, since Mr. Wallace used a constant head  
19 boundary, that the head shown at the far left-hand end  
20 of the figures represents the head of that constant  
21 head boundary representing the Pecos River. That would  
22 be approximately 33.8 feet, according to his diagrams.

23 Q. Do you have any problem with that?

24 A. No.

25 Q. And what does this diagram show the head of

1 the injection well at?

2 A. At what location?

3 Q. Well, maybe you can help me read it. What do  
4 you understand this area in here to be?

5 EXAMINER STOGNER: I'm sorry, where are you  
6 pointing?

7 Q. (By Ms. Aubrey) I'm sorry, I'm pointing at  
8 the center of Figure (a) of D10.

9 A. The spike in the middle of Figure 10 is the  
10 head rise at the injection well.

11 Q. And is that the little spike in the dashed  
12 line that you're referring to?

13 A. The diagram shows several things, and it's  
14 kind of difficult to identify those in the figure. The  
15 steep spike in the middle of the diagram that goes up  
16 to 30 feet is the head change. The heavier dashed line  
17 is the elevation, I would assume some datum relating  
18 the stream in the eastern end of the model.

19 What these diagrams tell you is that the  
20 injection will cause a head change, and that head  
21 change will propagate from the injection well where it  
22 will be the largest, and it will propagate out towards  
23 either end of the model.

24 At the constant head boundary representing  
25 the river it will be zero head change. By definition,

1 that head is constant; it does not change.

2 But as you go from the constant head towards  
3 the injection well, the heads increase -- the head  
4 changes increase as you get towards the injection site.

5 Q. Mr. Morrison, what's your understanding of  
6 what the right-hand axis of that Figure (a) is?

7 A. Freshwater head.

8 Q. And what --

9 A. That would be an elevation above mean sea  
10 level, if I remember Mr. Wallace's report correctly.

11 Q. And what's your understanding of what the  
12 left-hand axis is?

13 A. Freshwater head change.

14 (Off the record)

15 Q. (By Ms. Aubrey) I want to go briefly through  
16 some of your main points that you made yesterday, Mr.  
17 Morrison.

18 Point Number 6, which is on page 4 of your  
19 memo, suggests that -- or says that the -- Mr.  
20 Wallace's memo suggests that the hydraulic gradient may  
21 be reversed; is that correct?

22 A. Finding 6 states, "The consultants' study  
23 results suggest the possibility that the hydraulic  
24 gradient may be reversed in the vicinity of the Pecos  
25 River which may eventually degrade the fresh water

1 sources..." of the aquifer and the stream.

2 Q. Where in the study is that suggestion made?

3 I want to be sure I'm not confusing you. I  
4 understood this to read that you said Mr. Wallace said  
5 that; is that what you're saying?

6 A. What I'm saying is -- This goes back to what  
7 we were talking about yesterday with respect to Exhibit  
8 8, Figure D10 and Figure 11, and comparing those  
9 computed head changes from the injection well with Mr.  
10 Hiss's map.

11 If you use those two pieces of information,  
12 that suggests that you could have a reversible  
13 gradient, such that saline water could flow towards the  
14 stream.

15 Q. Is there anyplace in Mr. Wallace's report,  
16 that you are aware of, that there is a suggestion that  
17 there may be a reversal of the hydraulic gradient?

18 A. The other area of uncertainty that we talked  
19 about earlier was the head correction because of  
20 density, and that could have some relevancy on what  
21 kind of head changes -- what kind of reversal of flow  
22 you would have.

23 As an example --

24 Q. Well, what I'm trying to get to is where you  
25 think Mr. Wallace said that.

1           A.    Mr. Wallace -- If I go back to Figure 6, what  
2 I'm saying is that the consultants' study results -- by  
3 that I'm talking about Figure D10 and Figure D11, his  
4 computed head changes -- he's calculating that you are  
5 going to have head changes, head rises in the vicinity  
6 of the river. That information and the information by  
7 Hiss suggests that you could reverse the gradient.

8                    Could I -- I need to say one more thing.  
9 Could you give me one second? I might be able to help  
10 you out.

11           Q.    Sure.

12           A.    In specific comment 9, page 16, this  
13 discussion is provided in which we indicate,  
14 "Information provided in the study..." and that's  
15 Figure D10 and D11 "...suggests that the closed  
16 injection could cause a reversal of groundwater flow in  
17 the Capitan adjacent to the Pecos to degrade fresh  
18 water zones."

19                   And that goes through an explanation of my  
20 discussion yesterday on the possible reversal of  
21 gradient.

22           Q.    And is there any other information in the  
23 study, other than Figures D10 and D11, which causes you  
24 to state that?

25           A.    Our understanding of the system would

1 indicate that you would expect to have an impact in the  
2 region, because the aquifer is continuous when you  
3 inject or discharge, that is going to have a response  
4 throughout the system.

5 And because we feel that available  
6 information suggests that we have a good communication  
7 with the system, any pumping activity is going to  
8 propagate along the system.

9 So based upon that information, we would  
10 expect the stream to be impacted from injection or  
11 discharging the wells.

12 Q. Let me see if I can make my question clear to  
13 you, Mr. Morrison.

14 What I'm trying to find out from you is which  
15 information in Mr. Wallace's study is behind these  
16 statements that you've made, and you've made two, one  
17 on page 16 which says, "Information provided in the  
18 study suggests...", and you've made one on page 4 which  
19 says, "The consultants' study results suggest..." And  
20 I'm just trying to find out what Mr. Wallace said that  
21 you think suggests this reversal, what Mr. Wallace  
22 said.

23 A. There are two primary things.

24 Q. Okay.

25 A. Number one is Figure D10 and D11 --



1 Q. Okay.

2 A. -- which shows a head change next to the  
3 river.

4 Q. Okay.

5 A. The second thing is his discussion of his  
6 conceptual model, that you have an aquifer with a  
7 fairly high transmissivity, which is continuous.

8 By -- Just from that discussion, one would  
9 expect the possibility of wells to induce changes next  
10 to the stream.

11 Q. Now, you've spoken many times through your  
12 testimony about the Hiss reports. Have you made any  
13 independent analysis or verification of the information  
14 contained in the Hiss report or in Mr. Hiss's maps?

15 A. We've looked for information which might not  
16 have been contained in Hiss's studies. We looked for  
17 sources of other aquifer tests which were not included.  
18 We reviewed all sources available and considered all  
19 that information together in formulating our comments,  
20 which are represented in Exhibit A.

21 Q. Have you gone back to check whether or not  
22 Mr. Hiss's -- For instance, his chloride ion  
23 concentration numbers, which are on your Figure 3, have  
24 you made any independent investigation of whether or  
25 not those numbers are accurate?

1 A. No.

2 Q. Are you aware of any wells which were  
3 identified by Mr. Hiss in his report but which were  
4 omitted from Figure 3?

5 A. I believe Mr. Wallace makes reference to some  
6 wells which were omitted from Hiss's study.

7 Q. From the map, right?

8 A. I'm not sure. I know Mr. Wallace made the  
9 statement that some information was omitted from Hiss's  
10 study.

11 Q. Are you aware that Mr. Hiss omitted from his  
12 map at least two wells in the, quote, freshwater  
13 portion to the east of the injection zone?

14 A. No.

15 Q. Are you aware that those are high-chloride-  
16 ion-concentration wells, high-TDS wells?

17 A. I wouldn't be surprised. When you look at  
18 the data, you see a wide variety of water quality.

19 You could have two wells sitting right next  
20 to each other that have totally different water  
21 qualities, because the system is so complex.

22 What this information tells us is, you've got  
23 freshwater wells in those locations; you may have other  
24 wells in the Capitan which have different water  
25 qualities that are not designated as being fresh.

1           Our main concern is if you have wells which  
2           have fresh water, then that's an indicator that some  
3           fresh water does exist there.

4           Q.    Now, you've referred to the wells from the  
5           Richey study also.  Have you gone back and  
6           independently verified Richey's results?

7           A.    Again, we've looked for all the available  
8           sources of information, and we have not gone through  
9           and examined every piece of information to see if that  
10          information is correct.

11          Those reports were prepared by the US  
12          Geological Survey, and they have their own internal  
13          review system to assure that the information is  
14          correct.

15          Q.    Would you be surprised to find that there are  
16          errors?

17          A.    No.

18          Q.    Now, the Akin memo that you referred to was  
19          what triggered the Hiss study; is that correct?  The  
20          Hiss study was made in response to concerns expressed  
21          by Mr. Akin in his 1967 memo?

22          A.    I don't recall Mr. Akin providing any  
23          discussion to the State -- to the Chief of the Water  
24          Rights Division, to which this memo was addressed,  
25          informing him that we should enter into a cooperative

1 investigation with the Survey to study the area.

2 I'm not sure if the Akin memo started Hiss's  
3 investigation or not. I would say it's probably a  
4 strong possibility.

5 Q. And the Akin memo, in fact, was an attempt by  
6 Mr. Akin to identify a problem; is that correct?

7 A. The purpose of -- You're talking about the  
8 April 10th, 1967, memo?

9 Q. Right.

10 A. The subject of the memo was to discuss water  
11 quality and try to provide the Office some information  
12 on the definition of fresh water.

13 Q. And is -- The trigger for this memo was the  
14 withdrawal of water from the Capitan, particularly in  
15 Texas, for use as supply for oil wells; is that  
16 correct?

17 A. I believe that's correct.

18 Q. Do you have any present quantification of the  
19 amount of water that's been withdrawn from the Capitan  
20 in the eastern area of the Aquifer?

21 A. I believe the most recent estimate was  
22 prepared in the Water Resource Investigation Report,  
23 84-4077, by Richey and others of the US Geological  
24 survey.

25 In that report he gives withdrawal estimates

1 from the Capitan in Texas for 1960. He indicates that  
2 13,000 acre-feet per year was pumped from the Capitan  
3 in Texas in 1960 for industrial and irrigation  
4 purposes.

5 Q. Are you aware of any more recent estimate of  
6 those withdrawals?

7 A. I'm not aware of more recent information for  
8 withdrawal information in Texas.

9 Q. Now, yesterday in your testimony you said in  
10 your opinion there were no barriers to flow in the  
11 Aquifer; is that correct?

12 A. That's correct.

13 Q. And another time I believe you said that  
14 there were partial restrictions to flow in the aquifer;  
15 is that correct?

16 A. That's correct.

17 Q. Are there partial restrictions to flow in  
18 these submarine canyons that Mr. Wallace spoke of?

19 A. That's correct.

20 Q. So you do agree the canyons are there; is  
21 that right?

22 A. Yes.

23 Q. And do you agree that they have some effect?

24 A. Yes.

25 Q. But you don't agree that they're a barrier?

1           A.    I do not believe that they are a complete  
2           barrier such that flow does not propagate through them.  
3           I believe that flow does continue through the Aquifer,  
4           but the submarine canyon restricts the flow.

5                    It's like having a tube with a narrow  
6           passage, and that's what the submarine canyons are  
7           doing.

8           Q.    Have you seen the addendum to Mr. Wallace's  
9           study, which is marked as Exhibit 9 to this hearing?

10          A.    I don't have a copy, but I've seen it.

11          Q.    Here, I've got several copies right here.  
12          Would you like another copy?

13                   I'd like you to look at the front page of  
14          that addendum. That is a representation of a  
15          simulation, both with and without injection; is that  
16          correct?

17          A.    Figure 1 is including injection, and Figure 2  
18          is without injection formulas.

19          Q.    And they both -- Both of these figures assume  
20          no gradient; is that correct?

21          A.    That's what they're labeled.

22          Q.    Do you have any reason to question that that  
23          assumption was made in creating this graphic?

24          A.    No.

25          Q.    And the simulation was made over a period of

1 1058 years; is that right?

2 A. That's what the document indicates.

3 Q. Do you have any reason to doubt that?

4 A. I have no information at all about this  
5 calculation, other than what is shown here on this  
6 page.

7 Q. It's true, Mr. Morrison, that you were  
8 provided the input file for this calculation, right?

9 A. I'm not sure if we were -- We were provided  
10 the input for scenario one and scenario two. The input  
11 could be revised to conduct this scenario, probably.

12 Q. There is no effect shown, is there, of the  
13 injection over a thousand years, even assuming no  
14 gradient?

15 A. As I said before, one of our problems in Mr.  
16 Wallace's study is in figures like this which are  
17 presented to us. The graphics, with all due respect,  
18 are not really that easy to look at.

19 With respect to the Pecos, we're interested  
20 in whether or not any degradation is to occur. In  
21 performing diagrams like this, those impacts may not be  
22 very distinguishable.

23 It's uncertain to me -- This provides you an  
24 indicator of large changes that may happen in the  
25 system. It indicates that, yes, when you put the well

1 in, this is what's going to happen. But fairly small  
2 changes are not clearly shown.

3 Q. Would you have preferred to have a numerical  
4 list, as opposed to a graphic?

5 A. That was one thing that we mentioned at our  
6 meeting, but -- As I said previously, in the  
7 preparation of our memo it wasn't really deemed  
8 necessary for us to get the memo out.

9 We acknowledged the uncertainty, and we felt  
10 that it would be too time-consuming to go through that  
11 investigation ourselves. We felt it was Mr. Wallace's  
12 duty to carry the burden.

13 Q. Did you ask Mr. Wallace for a numerical  
14 representation of this data, as opposed to a graphical  
15 representation?

16 A. I believe we did.

17 Q. And did you receive it?

18 A. No. I believe we indicated to him that  
19 providing the results in some other form would be much  
20 better for understanding the results of the model, if  
21 he could give us a table showing what the impacts to  
22 the Pecos would be over a number of years, and also do  
23 the same for the other freshwater zones.

24 Q. That would be the freshwater area to the  
25 east; is that correct?



1           A.    All fresh zones, the one to the southeast of  
2   the injection site, and also the one located west of  
3   the injection site at the Pecos River.

4           Q.    So there are really only two zones we're  
5   talking about; is that right, Mr. Morrison?

6           A.    There's two zones in the Capitan Aquifer, and  
7   then there's the Pecos River.

8           Q.    You have agreed, though, unless you've  
9   changed your mind, that the contaminants will not reach  
10  the Pecos River, right?

11          A.    I'm saying that we're uncertain about that  
12  because of the uncertainties of the model, namely the  
13  head corrections.

14          Q.    Or is it your uncertainty about the reversal  
15  of the gradient?

16          A.    There's also uncertainty there.

17          Q.    Have you revised your opinion since you wrote  
18  this memorandum?

19          A.    No.

20                MS. AUBREY:  Mr. Stogner, may I have a couple  
21  of minutes to talk to my witnesses to see if we can  
22  finish this up?

23                EXAMINER STOGNER:  Okay, we'll have a --  
24  Let's take a ten-minute recess at this time.

25                (Thereupon, a recess was taken at 10:23 a.m.)

1 (The following proceedings had at 10:40 a.m.)

2 EXAMINER STOGNER: Let's go back on the  
3 record.

4 Before we get started again, how much longer  
5 do you have, Ms. Aubrey?

6 MS. AUBREY: I have just a brief recall of  
7 Mr. Wallace.

8 EXAMINER STOGNER: And how long will you  
9 expect that to be?

10 MS. AUBREY: I would expect that to be fairly  
11 short, maybe twenty minutes.

12 EXAMINER STOGNER: When are you going to  
13 start wrapping this up? This has gone on way too much  
14 long.

15 I'm not going to go on past noon today. I  
16 don't normally do this, but this is beginning to get  
17 nit-picky, and we need to -- The State Engineer's  
18 Office has got work to do, I know I've got work to do,  
19 and I know you've got -- So let's go ahead and start  
20 wrapping this up, Ms. Aubrey.

21 Q. (By Ms. Aubrey) Mr. Morrison, can you tell  
22 me again what the impact on the Pecos River was that  
23 you found from the model that you ran this morning?

24 EXAMINER STOGNER: You know, we don't have  
25 that as an exhibit, nor do we have a copy of it, nor do

1 I have one in front of me.

2 We're going to go past that, don't refer to  
3 that, because I don't have it, I haven't admitted it as  
4 an exhibit or anything.

5 So, Ms. Aubrey, let's start cleaning this  
6 thing up.

7 MS. AUBREY: Okay, that's what I was trying  
8 to do, Mr. Stogner.

9 EXAMINER STOGNER: And for your information,  
10 do not refer to that document because it has not been  
11 submitted as an exhibit.

12 THE WITNESS: Yes, sir.

13 MS. AUBREY: May I move to strike the former  
14 testimony about it then, since I can't cross-examine  
15 him on it? I move to strike the former testimony on  
16 it, and we'll just move on to another area.

17 EXAMINER STOGNER: Your motion has been  
18 accepted. So stricken.

19 MS. AUBREY: Thank you.

20 Q. (By Ms. Aubrey) Mr. Morrison, do you -- Does  
21 the State Engineer's Office take the position that  
22 there's any effect -- or that the WIPP site is in  
23 hydrological connection with the Capitan area?

24 A. I don't know.

25 Q. Is there anyone here in the room who would

1 know that?

2 A. There is some hydrological connection.  
3 Whether or not we've quantified what that connection  
4 is, I don't think we've had --

5 Q. When you say you haven't quantified the  
6 connection, what do you mean by that?

7 A. That we have a model which we feel is  
8 realistic for the simulation of one activity onto  
9 another in the area, with respect to the WIPP site.

10 Q. And you believe there's a connection, though,  
11 a hydrologic connection?

12 A. As we said, there's a hydrologic connection  
13 to some degree for the entire earth.

14 MS. AUBREY: I have no more questions, Mr.  
15 Stogner.

16 EXAMINER STOGNER: Thank you, Ms. Aubrey.  
17 Ms. Kery?

18 MS. KERY: Just several questions, Mr.  
19 Stogner.

20 REDIRECT EXAMINATION

21 BY MS. KERY:

22 Q. Mr. Morrison, why may there be a difference  
23 in analyzing brine injected into the San Andres, as  
24 opposed to analyzing brine injected into the Capitan  
25 Reef?

1           A.    I believe because even though we do have a  
2           connection between the two, that connection may not be  
3           very extensive, that the conditions between the  
4           aquifers -- There may be a large significance in  
5           hydrologic parameters between the two, that we might  
6           have just one area where the southern freshwater zone  
7           is located, where the properties of the San Andres and  
8           Grayburg might be higher than the surrounding region,  
9           but those properties may still be much lower than the  
10          Capitan.

11                   And again, we don't have much information.

12          Q.    And did you intentionally keep the Hathaway  
13          report from Mr. Wallace?

14          A.    No, I didn't. I was mainly being very  
15          cautious because of the numerous ongoing studies we  
16          have in our agency. We've got a number of  
17          investigations ongoing now with the Pecos River, and I  
18          wanted to proceed very cautiously to ensure that we  
19          were not releasing information that may create a  
20          problem for our agency, that we were fully satisfied  
21          with that document being released.

22          Q.    And initially the OCD just requested that the  
23          State Engineer Office prepare a memorandum, correct?

24          A.    Yeah, that's correct. Mr. Van Ryan's March  
25          25th letter to us advised us that they wanted us to

1 review the study and that they may ask later for  
2 someone to attend this hearing and provide testimony.

3 Q. And when did you find out that we would need  
4 to provide a witness?

5 A. I believe it was sometime last week.

6 Q. Okay. And at that time did any -- Did you do  
7 anything definitely?

8 A. At that time, then, I started looking for the  
9 input file for the Hathaway model, and that's when I --

10 MS. AUBREY: -- not supposed to discuss that.

11 MS. KERY: I'm sorry. I have no further  
12 questions.

13 EXAMINER STOGNER: Okay. With that, if  
14 there's no other questions of this witness -- Mr.  
15 Stovall?

16 MR. STOVALL: No. I don't have any  
17 questions.

18 EXAMINER STOGNER: Okay, Mr. Morrison may be  
19 excused.

20 Do you have any further witnesses?

21 MS. KERY: No, I don't, Mr. Stogner.

22 EXAMINER STOGNER: Okay.

23 With that, Ms. Aubrey?

24 MS. AUBREY: Thank you. I recall Mike  
25 Wallace briefly.

1                    MICHAEL G. WALLACE,

2            the witness herein, having been previously duly sworn  
3            upon his oath, was examined and testified as follows:

4                    DIRECT EXAMINATION

5            BY MS. AUBREY:

6                    Q.    Mr. Wallace, would you refer to Figures D10  
7                    and D11 in Exhibit 8?

8                    A.    Yes, I have them here.

9                    Q.    Yes.    These documents have been suggested by  
10                   the State Engineer's Office to support a conclusion  
11                   that there may be a reversal of gradient of the Pecos  
12                   River.

13                   Can you explain whether or not in fact that  
14                   conclusion can be drawn by this exhibit or your report?

15                   A.    No, that conclusion cannot be drawn from  
16                   these figures or from anywhere else in my report.

17                   I believe that -- Well, I don't know how Mr.  
18                   Morrison came up with those conclusions. I think there  
19                   was quite a bit of misunderstanding regarding this  
20                   figure, and maybe I'm partially to blame, because it  
21                   was my desire to provide them as much information as I  
22                   could about the model. So what I did was, I tried to  
23                   pack information into figures.

24                   In this figure we're talking about two  
25                   different things.

1           Q.    You're referring to Figure (a); is that  
2   right?

3           A.    Figure D10 (a), (b), (c) and (d) all are  
4   identical in terms of the information they contain.

5                   Let's look at Figure D10(a).  There are two  
6   sets of curves on this figure, and there are two axis  
7   labels on either side of the figure, to the left and  
8   the right.

9                   One axis label, called "Fresh-Water Head  
10   Change", on the left of the figure, refers to the large  
11   solid line that's somewhat bell-shaped, and the very  
12   small dotted line that goes horizontally across the  
13   page.

14                  The right-hand axis, which is labeled "Fresh-  
15   Water Head", refers to the diagonal lines.  There is a  
16   heavy dotted line and a light dotted line.

17                  So they mean two different things.  They are  
18   related to each other.

19                  I'm going to talk about the diagonal lines,  
20   because I think that Mr. Morrison was confusing the  
21   other two lines with the diagonal lines.

22                  The diagonal lines are described by the axis  
23   on the right and at the very -- at the left-hand side.  
24   Both of those lines converge at a point that represents  
25   the constant head boundary condition at the left-hand



1 side of the river, and if you go across to the right  
2 and read that, it's approximately somewhat under 3200  
3 feet above sea level.

4 If you go all the way down to the bottom  
5 right-hand corner of these two diagonal lines, the  
6 freshwater head there is approximately 2600 feet. So  
7 let's see, roughly --

8 Q. Mr. Wallace, what is the 2600 feet? What  
9 does the 2600 feet represent?

10 A. That represents the boundary condition at the  
11 right-hand side of my model.

12 Q. Okay. In fact, I think it would be helpful  
13 if I go back just a little bit and refer to Figure D3  
14 before you do that, and maybe your -- D3 will clarify  
15 that. But the 2600 feet, does that refer to the -- to  
16 the river?

17 A. No, that refers to the lower right-hand side  
18 of my model boundary.

19 And the 3200 feet, approximately, refers to  
20 the river.

21 And if you look at Figure D3, you can see my  
22 model laid out and some heads shown across the model  
23 domain. I don't show the actual heads at the boundary,  
24 but you can see that near the right-hand boundary it's  
25 2650, and near the left-hand boundary it's 3150.

1           So basically these correspond to the heads on  
2 this figure. This was an initial head. In fact the  
3 initial head shown on Figure D3 is also recreated in a  
4 one-dimensional sense in Figure D10(a) on that diagonal  
5 lightly dotted line.

6           Now, the heavy dotted line is called "Head",  
7 and that shows the head after 23.35 years of injection  
8 along that A-A' cross-section.

9           Now, water doesn't move in response to head;  
10 it moves in response to head gradients. And to keep  
11 this discussion as simple as possible, if you're  
12 wondering where water is moving between point A and B,  
13 all other things being equal, which they are in my  
14 model, then the head at point B has to be higher than  
15 at point A, or reverse. If you want water to move from  
16 point A to B, the head has to be higher at point A than  
17 at point B.

18           Now, I would direct your attention to the  
19 spike, the tiny spike on the heavy dotted line that  
20 corresponds to the location of the injection point, and  
21 the head at that injection point is under 2900 feet  
22 above sea level, and the head at the river is nearly  
23 3200 feet above sea level.

24           So in summary, there's no head gradient from  
25 the injection point to the river because the head at

1 the river is several hundred feet above the head at the  
2 injection point.

3 Now, what had occurred to me is, my thinking  
4 is that Mr. Morrison was confusing head changes with  
5 head, and all I did on that other figure was plot out  
6 the changes at every single point.

7 Now, it's true the greatest head change,  
8 which is all I was trying to show with this figure, is  
9 at the point of injection. And the smallest head  
10 change is -- The farther away you go from the point of  
11 injection, the less the head change.

12 But the initial head is so much higher at the  
13 river that it doesn't get close to changing the  
14 gradient.

15 Now, this is true in the next figure, Figure  
16 D10(b). Once again, you've got that tiny little blip  
17 in the head, compared to the -- several hundred feet of  
18 head at the river.

19 So there's really no question about it:  
20 There's no gradient directing flow back towards the  
21 Pecos.

22 Q. How high would the head at the injection well  
23 have to be in order to induce a reversal of the  
24 gradient of the river?

25 A. Well, it would not only -- It would have to

1 be much higher than the head at the river. It wouldn't  
2 even have to just be higher than the head at the river;  
3 it would have to be quite a bit higher because of  
4 certain aspects of the hydraulics.

5 And in fact, that was another conservative  
6 assumption of my model. By creating a prescribed flux  
7 boundary condition, I didn't know what the head was  
8 going to be at this point when I ran my model. And I  
9 plotted out the spike. The spike was about 30 feet in  
10 the immediate vicinity of the well.

11 But this head change should not be mistaken  
12 for -- Let me put it this way; this is the way I see  
13 it: Mr. Morrison has said that head at the injection  
14 point was about 30 feet -- he didn't say head change,  
15 he said head -- and that head at the river was zero  
16 feet. That's not what the model says.

17 The model says that head at the injection  
18 point is about 2900 feet and head at the river is  
19 nearly 3200 feet.

20 So I apologize if my graphs are misleading,  
21 but this is a common way to depict hydrologic data. I  
22 haven't dealt with the --

23 Q. So in your opinion, do your Figures D10 or  
24 D11 support a claim that your study shows that there  
25 could be a reversal in gradient at the river?

1           A.   Well, D10 doesn't. D11 doesn't either.

2                   But D11 is a very conservative model. D11  
3 does show that there is -- In D11 I'm not reversing  
4 gradients, I'm taking flat gradients and creating  
5 gradients in any direction. And that's true in D11,  
6 you have water moving in every direction around the  
7 well.

8                   But I don't think we should get hung up on  
9 this. This is such an incredibly conservative model,  
10 D11, that I don't think you can compare that to  
11 reality. I think D10 is the figure we should be  
12 talking about.

13                   Nonetheless, let's talk about D11 just a  
14 little bit.

15                   D11 shows water moving in both directions  
16 towards the freshwater zone on the east, towards the  
17 freshwater zone on the left. And I think there may be  
18 about ten times -- when the State Engineer says I was  
19 not conservative with flow to the east. But D11, which  
20 is incredibly conservative, shows that there is a  
21 gradient in both directions. That's not the point,  
22 because -- I'll put it another way.

23                   There is no possible way I could have made a  
24 model -- If I wanted to favor my client and do a model  
25 that wasn't conservative at all and completely favored

1 my client, I could not simulate injection under these  
2 conditions without a gradient going in every direction.

3 The things that make brine move within the  
4 aquifer is not just the gradient; it's how long is that  
5 gradient there? What is the hydraulic conductivity?  
6 Where are the contaminants moving? Everywhere in  
7 response to that gradient for a period of time.

8 That's exactly why I went to such lengths to  
9 show this. I never intended to hide that there wasn't  
10 a gradient here. Later on, I show where the  
11 contaminants moved in response to that gradient for a  
12 thousand years. There was no attempt to deny the fact  
13 that this very conservative model doesn't have a  
14 gradient.

15 In the oil industry, when someone pumps oil  
16 out of a reservoir, they have an impact for miles,  
17 perhaps. Maybe not. It really depends on the aquifer,  
18 the reservoir, what you're looking at and for how long  
19 you're pumping. And that's why I went to the trouble  
20 to do this model.

21 To top off, Figure D15 shows the velocity  
22 vectors from my model as a result of all of those  
23 factors, including the gradient, and I make no pains to  
24 hide the fact that there are arrows directed towards  
25 the Pecos and toward the freshwater zone.

1 But as you see, those arrows -- As I  
2 mentioned before, the long arrows mean a high  
3 magnitude, the short arrows mean a low magnitude. They  
4 actually almost disappear to the left of this focused  
5 area. This was my way -- In fact, when the injection  
6 is turned off the arrows disappear completely because  
7 there's no flow again.

8 So it's not just the fact that there's a  
9 gradient; it's how big that gradient is and how long  
10 that gradient is acting, and you need a model to show  
11 that.

12 MS. AUBREY: That's all I have, Mr. Stogner.

13 EXAMINER STOGNER: Ms. Kery, Mr. Stovall, do  
14 you have any --

15 MR. STOVALL: Yeah, I just have --

16 MS. AUBREY: I object. We've got one witness  
17 who's --

18 MS. KERY: Right, I'm not --

19 MR. STOVALL: I am the only one. I'm the one  
20 that cross-examined Mr. Wallace, and I am the only one  
21 that's going to --

22 EXAMINER STOGNER: Mr. Stovall? I apologize.

23 CROSS-EXAMINATION

24 BY MR. STOVALL:

25 Q. Mr. Wallace, would it be fair to say that you

1 and Mr. Morrison don't completely agree on the  
2 interpretation of the information?

3 A. Yes, that's true.

4 Q. And would it be fair to say that you don't  
5 agree on the ability of this model, as it's been  
6 applied, to predict the impact upon the fresh water,  
7 and that the influence of other variables --

8 A. With Mr. Morrison?

9 Q. Yes. -- that you and he don't agree on that?

10 A. Yes.

11 MR. STOVALL: I have no other questions.

12 EXAMINER STOGNER: Okay, Ms. Aubrey, do you  
13 have any other redirect?

14 MS. AUBREY: No.

15 EXAMINER STOGNER: Okay.

16 EXAMINATION

17 BY EXAMINER STOGNER:

18 Q. When I'm looking at D10 and D15 simultaneous-  
19 ly, or -- Can I do that?

20 A. No, because D10 refers to -- The  
21 corresponding vector plot for D10 is Figure D9.

22 Q. Okay. So I need to look at D11 and D15; is  
23 that correct?

24 A. Right.

25 Q. Okay. So I can make it clear in my mind,



1 after injection is shut off, you show all arrows or  
2 velocity vectors are gone or disappear; is that  
3 correct?

4 A. Right.

5 Q. Okay. Now, when I go down there for the  
6 51.35 years --

7 A. Oh, in that case I would have to say that  
8 probably at that point in time the velocity vectors  
9 were so small that the model program -- I don't know,  
10 didn't -- they didn't factor in.

11 I can't explain exactly how a vector plotting  
12 package works, but you scale in it, and in this case  
13 the gradients are probably so low that you don't see  
14 anything.

15 In fact, now that I look at it, it's not  
16 inconsistent with the other points in time. If you  
17 look at freshwater head changes like at 23.35 years, it  
18 seems like anywhere where the head change is less than  
19 10, an arrow doesn't show up.

20 Q. Okay, so in actuality, things are equalizing  
21 out, the rest of the water flow. But of course, once  
22 you get down to 66 -- in your model, 66.29 years --  
23 that's your equalizing time?

24 A. Well, even there, I think you can see a  
25 slight displacement.

1 Q. Okay.

2 A. Yeah, for all practical purposes it's pretty  
3 much damped out.

4 Q. If it's not there, it's almost there,  
5 according to your model?

6 A. Yes.

7 Q. Okay, I just wanted to clarify that.

8 A. And if that's important to you, I just wanted  
9 to reiterate how conservative this model, this second  
10 scenario model is. It was intended to make a point  
11 that -- If I was doing this in any other regime where  
12 they permit these things, I wouldn't have gone nearly  
13 this much overboard in making conservative assumptions.

14 EXAMINER STOGNER: Okay. So pointed.

15 Any other questions of this witness? The  
16 witness may be excused.

17 Are there any other witnesses either one of  
18 you would like to call at this time?

19 MS. KERY: (Shakes head)

20 MS. AUBREY: I have no other witnesses.

21 EXAMINER STOGNER: Okay, I believe closing  
22 statements at this time.

23 Mr. Stovall, I'll allow you to go first, and  
24 I'm assuming that you will be the one to make the  
25 closing arguments.

1 MR. STOVALL: Well, I will make the closing  
2 statements, yes. I think "argument" is probably  
3 better.

4 EXAMINER STOGNER: Okay, and then, Ms.  
5 Aubrey, I'll let you close.

6 MR. STOVALL: Actually, just very briefly, I  
7 think the concerns that the Division has at this point  
8 are just as they were at the time we received the  
9 Application and as they have been previously in  
10 discussions about the use of the Capitan Reef.

11 There appears to be a -- There has been  
12 historically developed and appears to be and was  
13 testified to in this hearing, clear evidence that the  
14 Capitan Reef constitutes some sort of geologic tube in  
15 which water is contained. It is not homogeneous; it is  
16 very heterogeneous. It has a variety of features  
17 within it that affect flows of water. It contains  
18 fresh water, it contains saline water.

19 It is obviously desirable for purposes of  
20 injection because it has the capacity to accept lots of  
21 water, and from oilfield economics that's important.

22 And the Division -- One of the Division's  
23 responsibilities is the conservation of resources, and  
24 considering the economics of some of the, if you will,  
25 the other factors of doing business, such as the

1 disposal of water, are certainly an issue.

2 For a number of years, probably -- well, at  
3 least the life of the oil and gas industry in this  
4 state -- there has been a reason why the Capitan Reef  
5 has not been used for the injection of water. The  
6 basic reason is that it does contain fresh water. It's  
7 known to be the water supply for Carlsbad and is  
8 connected with the Pecos River. It is also known to  
9 have fresh water supplies to the southeast of this  
10 location, which are being -- currently being used,  
11 according to the State Engineer.

12 In terms of setting a policy, there are --  
13 and this case will be precedent-setting, and it will in  
14 fact be a position on the part of the Division. In my  
15 mind, there's a question as to whether the questions  
16 have in fact been answered. There is a hydrologic  
17 connection; what happens at one end of the tube will  
18 have some effect on the other.

19 Mr. Wallace has done some modeling work,  
20 which we don't question the validity of the model, and  
21 we're not particularly challenging his assumptions.

22 I think, from my concern, looking at it from  
23 the Division's responsibility of protecting fresh  
24 water, is that we don't know how much reliance we can  
25 put on that model, because we just simply don't have

1 enough data to compare the model to the real world.

2 One of the things I look at, and I think  
3 would need to be answered, is that there are things  
4 happening other places in the tube that will affect it.  
5 There's water being withdrawn at the southeast end,  
6 there's water being withdrawn at the north end.

7 There is some discussion about gradients and  
8 heads and fluxes and things that I don't really  
9 understand. I'm not sure we've got all the answers to  
10 those questions, and I think that's the point, is that  
11 we don't have the answers to those questions.

12 Mr. Catanach has suggested, in discussing the  
13 UIC program, in particular, that there -- and the  
14 Division's rules with respect to the implementation of  
15 that program -- there are two approaches to take in  
16 terms of allowing injection. One is on a case-by-case  
17 hearing basis, and the other is on the basis of  
18 exempting an aquifer, and the State has exempted  
19 several aquifers, including the San Andres, and others  
20 as detailed in the exhibit, within the State. And  
21 hearing -- or a process for allowing injection into  
22 those aquifers can be done administratively.

23 It's kind of my feeling at this point that if  
24 injection is going to be allowed into the Capitan at  
25 all, that it needs to be looked at as an aquifer, and

1 decisions need to be made about that as an aquifer,  
2 because of the complexity of it and the known presence  
3 of fresh water and the potential for cumulative effects  
4 and the effects of other activities taking place in the  
5 aquifer.

6 I don't think we have enough information at  
7 this point to make a decision that injection of water  
8 can be permitted. I don't think the burden of proof  
9 has been satisfied, and I think this needs further  
10 action and study at this time.

11 And therefore I believe this individual  
12 Application should be denied, and then the Division, as  
13 it has done in the past, can formulate a task force and  
14 review it and see what type of information really is  
15 needed in order to consider these types of  
16 applications.

17 EXAMINER STOGNER: Thank you, Mr. Stovall.

18 Ms. Aubrey?

19 MS. AUBREY: Thank you, Mr. Stogner.

20 The Applicant in this case has the burden of  
21 proving to you by a preponderance of the evidence that  
22 it should be granted authority to inject in this  
23 wellbore in the volumes and under the injection program  
24 that we've proposed to you.

25 As a technical matter, the Applicant has met

1 all aspects of that burden. There has been no claim by  
2 the State Engineer's Office or the Oil Conservation  
3 Division that there is anything wrong with our  
4 completion of the well, that there's anything wrong  
5 with our proposed injection pressure, or anything in  
6 the nature of a saltwater disposal application.

7 The only question that you face is the  
8 question of what is the burden and has it been met on  
9 the issue of the effect that this injection will have  
10 on freshwater sources in the Capitan.

11 Mr. Stovall says that there's no question in  
12 his mind of the validity of the model or the  
13 assumptions that Mr. Wallace made, and the model is the  
14 best evidence that's been given to you -- in fact, the  
15 only evidence that's been given to you -- of what will  
16 happen when this water is injected.

17 The State Engineer's Office had the  
18 opportunity to run the model, use the input data, and  
19 to come up with other numbers, and they declined that  
20 opportunity.

21 The Applicant has done everything possible to  
22 share information and data with the State Engineer's  
23 Office in this regard.

24 The response of the State Engineer's Office  
25 is not that your model is wrong, your model is giving

1 an incorrect result, or this is an anomaly and we can  
2 show it. The response of the State Engineer's Office  
3 is, Well, there may be some uncertainty, we're not  
4 sure.

5 They could have been sure, had they run the  
6 model, but they chose not to do it.

7 The uncertainties that are reflected in their  
8 report are uncertainties that they have created.  
9 Somehow, it has happened that the burden of showing  
10 that there will be no impact on fresh water because the  
11 contaminant never reaches fresh water has been turned  
12 into an impossible burden.

13 It seems to me that what the OCD is asking  
14 this Applicant to show is that to an absolute  
15 certainty, that we know what is going on in that  
16 aquifer. That is a burden that no applicant before  
17 this Examiner or the Commission has ever had, because  
18 this -- the Examiner, the Division and the Commission  
19 deal on a daily basis with making decisions, permitting  
20 activities, based on that which we only believe but do  
21 not know. That's the whole basis behind the science of  
22 reservoir engineering: We don't really know.

23 But the Commission looks at scientific data  
24 and draws a conclusion and permits activities based on  
25 the best scientific estimate of what's going to happen.



1 And that's what you've been given here, is the best  
2 scientific estimate of what's going to happen.

3 In the prehearing statement filed in this  
4 case, the Division has taken the position that somehow  
5 the Applicant has the burden of showing to a certainty  
6 that there will be no adverse effect on freshwater  
7 supplies.

8 Even Mr. Martinez, the State Engineer,  
9 acknowledges that the legal burden this Applicant has  
10 is to reasonably protect fresh water against  
11 contamination. There is no burden to show anything to  
12 a certainty. In fact, nothing in this area, and in the  
13 area of oil and gas, can be shown to a certainty.

14 What we have brought you today is valid  
15 scientific evidence, generated by a scientist who is  
16 well known in his field and highly experienced in  
17 modeling these kinds of questions, a scientist whose  
18 expertise is in contaminant transport modeling.

19 There has been no showing by anyone in this  
20 case that there is anything wrong with the hydrology,  
21 wrong with the geology, or wrong with his modeling  
22 ability. The only thing you've heard from the State  
23 Engineer and the Division in this case is that we can't  
24 be absolutely certain.

25 "Absolutely certain" is not your standard,

1 and it's not the standard of the State Engineer's  
2 Office.

3 I submit that Pronghorn has met its burden of  
4 showing you by a preponderance of the evidence that it  
5 will reasonably protect freshwater sources by injection  
6 in this well, in this area.

7 I know you're concerned about the precedent-  
8 setting -- the precedential value of this case, and  
9 you're right to be concerned about it, but the Division  
10 has a way of handling that. The Division can require  
11 that every applicant for saltwater disposal into the  
12 Reef come to hearing and meet the same kind of burden  
13 with the same kind of scientific evidence, based on  
14 that applicant's injection site and the movement of the  
15 contaminant plume from that injection site.

16 The Division can also, in the context of  
17 considering later applications, decide that it's  
18 necessary to tot up the number of barrels per day that  
19 it's already approved in evaluating the data brought  
20 before it on that day sometime in the future when you  
21 hear another application.

22 Surely any hydrologist, any hydrogeologist  
23 who comes before you again, if this Application is  
24 granted, as I believe it will be, will have to include  
25 the fact that Pronghorn is over here injecting 10,000

1 barrels per day in that scientific calculation of the  
2 effect of the new well. You have that ability. It  
3 does not need to be done at this time on a global  
4 basis.

5 We have met our burden of proof before you on  
6 the scientific matters, we've met the burden of proof  
7 on the, if I may call them, more ordinary saltwater  
8 disposal questions, and there's no reason that the  
9 Application should not be granted.

10 EXAMINER STOGNER: Thank you, Mr. Stovall,  
11 Ms. Aubrey.

12 I would request at this time rough drafts of  
13 a proposed order, since I don't want to use the word  
14 "sides", but since there is such a diversity here in  
15 opinion.

16 What would be a good time frame, Ms. Aubrey?

17 MS. AUBREY: I could have a draft order to  
18 you within a week.

19 EXAMINER STOGNER: Okay. Mr. Stovall, will  
20 that be sufficient?

21 MR. STOVALL: No, I don't believe so. I  
22 would like to take more time to review the information  
23 again. I mean, I think this is a question that is not  
24 a rush question. I'd like to take a month to draft the  
25 Order.

1 I'm wondering whether I want the transcript.  
2 I'd like to have a transcript before I draft up an  
3 Order.

4 EXAMINER STOGNER: I see Mr. Stovall's point.

5 A month does seem a little bit long. How  
6 about a week after the transcript gets submitted, I  
7 think will be a sufficient time -- or is provided, I  
8 should say. So it will all depend upon when a  
9 transcript is delivered to both parties.

10 MS. AUBREY: Well, since I haven't ordered  
11 one, Mr. Stogner, perhaps Mr. Stovall could let me know  
12 when he receives his.

13 EXAMINER STOGNER: Mr. Stovall, could you do  
14 that?

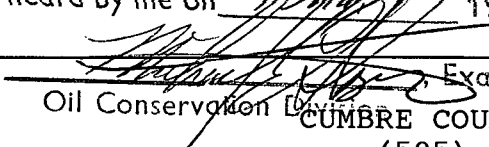
15 MR. STOVALL: I will do that.

16 EXAMINER STOGNER: With that, if there's  
17 nothing further in this case, I'll leave the record  
18 pending. Just rough draft orders with that.

19 And this case -- the hearing in this case is  
20 concluded, and this hearing is adjourned.

21 (Thereupon, these proceedings were concluded  
22 at 11:00 a.m.)

23 I do hereby certify that the foregoing is  
24 a complete record of the proceedings in  
the Examiner hearing of Case No. 10693  
25 heard by me on 7/11/93 1993.

  
Oil Conservation Division, Examiner  
CUMBRE COURT REPORTING  
(505) 984-2244

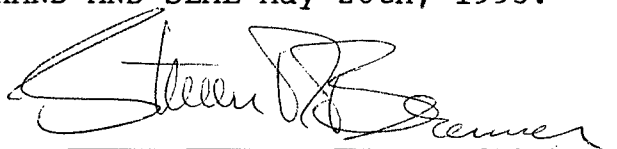
## CERTIFICATE OF REPORTER

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

I, Steven T. Brenner, Certified Court Reporter and Notary Public, HEREBY CERTIFY that the foregoing transcript of proceedings before the Oil Conservation Division was reported by me; that I transcribed my notes; and that the foregoing is a true and accurate record of the proceedings.

I FURTHER CERTIFY that I am not a relative or employee of any of the parties or attorneys involved in this matter and that I have no personal interest in the final disposition of this matter.

WITNESS MY HAND AND SEAL May 20th, 1993.



STEVEN T. BRENNER  
CCR No. 7

My commission expires: October 14, 1994