NEW MEXICO OIL CONSERVATION COMMISSION

COMMISSION HEARING

SANTA FE, NEW MEXICO

Hearing Date JANUARY 16, 1992 Time: 9:00 A.M.

NAME	REPRESENTING	LOCATION
Charles Vergueer	Conkin Oil Co	San Juan Basin
Buddy Shaw	Amoco Production Co.	Farmington
William F. Carr	Campbell, Carr, Taggi Gherdan	Santa Fe
John J. Pfeil	NM Environment Dept	Santa Fe
Carol Revelt	Northwest Pipeline	Salt Lake City
Patricia Gaylord	EnviroTech Inc.	Denver
Joe Chesser	BLM	Santa Fe
Gary Stephens	BLM	Santa Fe
Patrick Flynn	Applied Environmental	Denver
Allan Kuhn	AK GeoConsult	Albuquerque
Larry Schlotterback	Texaco E&P	Farmington
Kevin McCord	KM Production Co	Farmington
A.B. Geren, Jr.	D.J. Simmons Co.	Farmington
Robert L. Bayless		Farmington
J. Gregory Merrion	Merrion Oil & Gas Corp	Farmington
Alvin Baca	IPAA NM	Santa Fe
Tom Dugan	Dugan Production	Farmington
Perry Pearce	Montgomery & Andrews	Santa Fe
Neel L. Duncan	BCO, Inc	Santa Fe
Ernest L. Padilla	Padilla & Snyder	Santa Fe

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NAME	REPRESENTING	LOCATION
Ruth Andrews	NMOGA	Santa Fe
Tommy Roberts	Tansey Law Firm	Farmington
Ned Kendrick	Montgomery & Andrews	Santa Fe
Douglas McIlhaney	Southwest Research and Information Center	Santa Fe
JOHN PHENIX	CONOCO	OKLAHOMA CITY → SF → SAN JUAN BASIN
David Gray	Indep. Geol.	Midland TX
Ron Morgan	Marathon Oil Company	WINDOW ROCK AZ
ARLENE LUTHER	NAVAJO NATION	El Paso Tx
Nancy Prince	El Paso Nat. Gas	El Paso TX
Kathleen T Bowden	El Paso Natural Gas Co	Albuquerque, SF
David Mills	NM. Environmental Consultants	Los Alamos, NM
R L Stamets	OCD	Amarillo, Tx
Margaret Anne Rogers	MARA, Inc. (consultant)	Farmington NM
W.L.O Mackey	Mesa-Tex Co	
Ned Holmes	Holmes Services	
Brian Wood	Permits West, Inc	Santa Fe
Randall Hicks	HTGC	ALBQ
PAUL THOMPSON	WILLIAMS PRODUCTION	FARMINGTON
George SEITTS	GIANT INDUSTRIES	SCOTTSDALE, AZ
Darrell Tafoya	Bureau of Indian Affairs Jicarilla Agency	Dulce, NM

NAME	REPRESENTING	LOCATION
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Paula McAfee	GCNM	San Juan, Permian
Carl Kolbe	BHP Petroleum	Houston, TX.
Luke Otero	Basin Disposal	Aztec NM
Chad Schaffer	WTEC	Farmington NM
Hector Villalobos	BLM	Albuquerque NM
John Roe	Dugan Prod Corp	Farmington
Daniel Lynch	KN Energy Inc	Denver. Co.
Chris Shuey	Southwest Research & Information Center	Albq. NM
MORRIS YOUNG	ENVIROTECH INC.	FARMINGTON N.M.
David Boyer	Kim Brown	College Station TX
ILYSE GOLD	BLM	FARMINGTON, NM
Denny Foust	OCD	~~Farmington~~ Aztec, NM
DERIN WARREN	MERIDIAN	FARMINGTON
John Eaton	Burlington Resources	Santa Fe

NEW MEXICO OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

CASE NOs. 10345 and **10346** (Consolidated)

The Application of BHP Petroleum (Americas) Inc. For Compulsory Pooling, San Juan County, New Mexico.

CASE NO. 10436

The Application by the Oil Conservation Division for the Expansion of the San Juan Basin "Vulnerable Area" which was Established by OCC Order R-7940 in 1985; San Juan, Animas and La Plata Rivers in San Juan, Rio Arriba, McKinley and Sandoval Counties, New Mexico.

BEFORE:

COMMISSION CHAIRMAN WILLIAM LEMAY

COMMISSIONER JAMI BAILEY

COMMISSIONER BILL WEISS

STAFF SPECIALIST FLORENE DAVIDSON

Morgan Hall

State Land Office Building

January 16, 1992

9:00 a.m.

ORIGINAL

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MR. A. V. GEREN
Farmington, New Mexico

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CHAIRMAN LEMAY: If you would kindly come in and take your seats.

This is the Oil Conservation Commission. My name is Bill LeMay. I'm Chairman. On my right is Commissioner Jami Bailey, representing the Commissioner of Public Lands. On my left Commissioner Bill Weiss. And of course you know Florene Davidson, and Carla, our court reporter.

The first two cases I'll call, Case No. 10345, the Application of BHP Petroleum for Compulsory Pooling, San Juan Basin, and the accompanying case, Case No. 10346, again the Application of BHP Petroleum (Americas) for Compulsory Pooling, San Juan Basin.

It is my understanding that there has been a request for a continuance of this case. That request was granted. Is there anyone that objects to the continuation of these two cases until the February 27th Commission hearing?

If not, both Cases 10345 and 10346 will be continued to the Commission hearing on February 27th.

I'll now call Case 10436, the Application by the Oil Conservation Division for

expansion of the San Juan Basin "Vulnerable Area" Which was Established by OCC Order R-7940 in 1985.

I would first like to call for appearances in this case.

MR. STOVALL: Robert G. Stovall on behalf of the Division.

CHAIRMAN LEMAY: Thank you, Mr. Stovall.

MR. PADILLA: Ernest L. Padilla on behalf of BCO, Inc.

CHAIRMAN LEMAY: Thank you, Mr. Padilla.

MR. ROBERTS: I'm Tommy Roberts, attorney in Farmington, on behalf of Southern Union Exploration Company.

CHAIRMAN LEMAY: Thank you, Mr. Roberts.

MR. MEIKLEJOHN: Douglas Meiklejohn on behalf of Southwest Research and Information Center. M-E-I-K-L-E-J-O-H-N.

CHAIRMAN LEMAY: One more time Mr. Meiklejohn, please.

MR. MEIKLEJOHN: M-E-I-K-L-E-J-O-H-N.

CHAIRMAN LEMAY: Thank you.

Representing Southwest Research?

MR. MEIKLEJOHN: That's correct.

CHAIRMAN LEMAY: Thank you.

MR. VERQUER: I'm Charles Verquer representing Caulkins Oil Company.

CHAIRMAN LEMAY: Would you spell that, please, for the court reporter.

MR. VERQUER: C-A-U-L-K-I-N-S.

CHAIRMAN LEMAY: Thank you.

MR. VERQUER: And my name is spelled with a V-E-R-Q-U-E-R.

CHAIRMAN LEMAY: That's the way you pronounce Baker?

MR. VERQUER: That's the way you pronounce Smith, yes, sir.

CHAIRMAN LEMAY: Thank you. Yes, sir.

MR. CHESSLER: Mr. Joe Chessler representing the Bureau of Land Management.

MR. CARR: May it please the Commission, my name is William F. Carr with the Law Firm Campbell, Carr, Berge & Sheridan of Santa Fe. We would like to enter our appearance for Benson-Montin-Greer Drilling Corporation, the Four Corners Gas Producers Association, the National Stripper Well Association, Dugan

Production Corporation, Marrion Oil & Gas and Robert L. Bayless.

CHAIRMAN LEMAY: Yes, sir.

MR. KENDRICK: May it please the Commission, my name is Ned Kendrick with Montgomery & Andrews Law Firm, representing New Mexico Oil & Gas Association and Amoco Production Company.

CHAIRMAN LEMAY: Thank you, Mr. Kendrick.

MR. McCORD: Mr. Chairman, I'm Kevin McCord representing K. M. Production Company in Farmington. I have no testimony but I would like the opportunity to question witnesses.

CHAIRMAN LEMAY: Thank you.

MS. REVELT: Carol Revelt with Northwest Pipeline and Williams Services.

CHAIRMAN LEMAY: Carol who? I'm sorry.

MS. REVELT: Revelt. That's R-E-V-E-L-T, and also Paul Thompson from Williams Production Company.

CHAIRMAN LEMAY: Is Paul Thompson your witness or just another attorney representing Northwest Pipeline?

MS. REVELT: No, he'll be here. He's

late.

CHAIRMAN LEMAY: Okay. Additional appearances?

MR. GEREN: I'm A. V. Geren representing D. J. Simmons Company in Farmington, G-E-R-E-N. I have no testimony. I'm just a witness.

CHAIRMAN LEMAY: Thank you, sir. Any additional appearances?

There are some Motions for Continuance, but before we begin that process, I would like Commissioner Bailey to say a few words about the limited involvement she's had with this case so that those of you can hear that and understand whether there's a problem with that or not.

COMMISSIONER BAILEY: Today I'm representing the Commissioner of Public Lands, but as many of you know, I worked with the OCD prior to coming to the State Land Office. I was involved with the Environmental Bureau, but I came on after R-7940 had come into effect.

I enforced that order as an employee, but I did not participate in any meetings or any hearings that have directly led to this hearing today. At one time I did attend two meetings to

work on the mapping involved for the expanded area, but that was as far as my involvement has been and my participation for the events that have led up to this hearing.

CHAIRMAN LEMAY: Are there any comments or any problems with Commissioner Bailey hearing the case? Okay. Thank you.

I'll now entertain some motions for the continuance.

MR. CARR: May it please the Commission, Benson-Montin-Greer Drilling Corporation has filed a motion with the Commission requesting that this case be continued for two months. The reason for this request, we believe the time is necessary if Benson-Montin-Greer is to properly prepare for this case.

I think it should be noted initially that Benson-Montin-Greer was aware that there was a San Juan Basin Long Term Produced Water Study Committee working on this problem. We were not a member of that committee and we did not participate in the committee proceedings.

I think Benson-Montin-Greer can safely say that it has an established record of being a

company that stays abreast of regulatory changes and makes a conscientious effort to comply with the rules of the Division. In our experience, we have found that we need not be a member of every industry committee or actively involved because we have come to expect rules to be developed, circulated, and a time for operators to evaluate the impact of these proposals on their operations prior to a final hearing.

In this particular case, we are aware that rules were promulgated back in September of last year but the final rules were only available on January 7th, a week ago. We did not receive them until the 9th, Mr. Greer was out, and he actually became aware of this problem on the 13th, Monday of this week.

The memo from the Division directed operators to Reprographic Center in Farmington if they wanted to get actual topographic maps so they could determine the exact boundaries of this proposed expansion of the vulnerable area, and determine how that related to their individual properties.

Reprographics was contacted on January 13th by Mr. Greer. There were 113 topographic

maps available prior to that time, but on that date 200 additional maps were delivered to Reprographics. Wells are not spotted on these plats, section lines are hard to determine, and it is simply difficult for an operator in this time frame to try and determine what wells he operates and may have an ownership interest in that are going to be effected and to determine whether or not the issues raised by these proposed rule changes are things that he must, as a prudent operator, come in and respond to.

That is the reason we're requesting a continuance. We're simply asking for what we believe is a proper continuance in the case so that the notice given will, in fact, be reasonable and will give us an opportunity to fully evaluate the changes and prepare.

Now, we have no objection to the Division going forward or anyone going forward and presenting their case today; in fact, I think that would be appropriate. That would give everyone an opportunity to fully understand what is being proposed. We will ask that the case then be continued to the March Commission hearing, and at that time we would like to be

afforded the opportunity to present testimony, if we desire to. And I cannot tell you today that, once we evaluate this, we will be in a position where we will need to.

We would also request at that time that witnesses that testify today be available to respond to questions. Now, after that process you will enter an order and we may not like it, but at least at that point in time we believe that no one could say that the Commission proceeding had not been fair, had not given us a chance to fully evaluate this matter and present our arguments to you.

For that reason, we are requesting a continuance.

CHAIRMAN LEMAY: Thank you, Mr. Carr. I've had other motions for a continuance, one by BCO. Mr. Padilla, would you care to address BCO's application or motion.

MR. PADILLA: May it please the Commission, we have stated our reasons for asking for a continuance in our written motion before the Commission. Our motion also goes a step further and asks that, in the alternative, that we be given a period of six months to study and

evaluate the proposal by the Oil Conservation Division today. I feel that a six-month period, either by way of continuance or by way of allowing us time to further study the area in which BCO operates for water contamination, in order to reasonably address whether the safeguards that are being advanced by the Oil Conservation Division are correct.

We feel that there is no immediate danger at this time, no present and immediate danger that requires that rules and regulations be implemented by way of this hearing. We feel that our notice, as stated in the motion, that is that BCO received notice sometime after January 7th and received it from Tom Dugan, not from the Commission as to its involvement in this rule-making hearing, that's essentially the way BCO found out about this hearing. It did not find out from calling Reprographics in Farmington or anyone else.

BCO generally receives copies of all dockets mailed by the Commission. To the extent that it may have received a docket in late December and did not notice this thing, it still does not address the issue of sufficient time to

study and even ask for an exception to the blanket proposal advanced by the Commission at this time.

So basically that addresses our decision and we feel that we need to have six months within which to properly evaluate the Division's proposal.

We have no objection to the Division proceeding today and I concur with Mr. Carr's proposal that the Commission proceed today so that we can find out what exactly the Division is advancing.

So we would request, by way of continuance or by way of allowing us a further study period, six months with which to evaluate the Commission's proposal. We feel that that's reasonable.

CHAIRMAN LEMAY: Thank you, Mr. Padilla. Does anyone else wish to speak to the continuance? Mr. Roberts.

MR. ROBERTS: Mr. Chairman, Commissioners, I represent Southern Union Exploration Company. I would like to orally submit this Motion for Continuance and will not go into a lot of detail. I think we can simply

say that our reasons for that request are very similar to those that have been represented here by BCO and BMG.

I would like to say, however, that Southern Union Exploration Company received notice of the OCD's recommendations on January 8th, just a little over a week ago, and it had not participated in the Long Term Produced Water Study Committee activities and did not know of those activities and consequently has just not had any reasonable opportunity to review the technical data and scientific data upon which the OCD's recommendations are based, and feels that it is a reasonable request to have that opportunity so that it can prepare for this hearing.

So, I think the primary difference in this request for continuance would be that Southern Union Exploration Company believes that 90 days would be an adequate period of time in which to conduct that underlying examination of the scientific and technical data and to prepare for hearing. Thank you.

CHAIRMAN LEMAY: Thank you, Mr. Roberts. Additional motions? Mr. Stovall, did

you want to address that?

MR. STOVALL: Mr. Chairman, before I do, I believe Ms. Little, as President of Independent Petroleum Association, although she's not an attorney, I think she has a comment or a request in this.

MS. LITTLE: Yes, I do. May I do that from here, please?

CHAIRMAN LEMAY: Yes.

MS. LITTLE: As president of the IPA, I would like to support our members' request for continuance for 90 days.

MR. STOVALL: Do you have a written request?

MS. LITTLE: I have a written request.

MR. STOVALL: For the record, it's Sylvia Little, President of the Independent Petroleum Association.

MS. LITTLE: Thank you.

CHAIRMAN LEMAY: Thank you.

MR. STOVALL: Mr. Chairman, I've become aware of the independent producers in the Northwest's concerns about this action in the last few days. The message you've heard is the one I've heard, that they heard about this

proposed rule-making sometime around the 8th of January.

For the record, I do want to state that the case was advertised in the Northwest newspapers the 20 days in advance, so there was some publication. In addition, throughout the process of the produced water study there has been industry involvement and efforts to keep them informed through the various producer associations.

Quite frankly, the Division, while we feel that we've made every reasonable effort to get the industry involvement, I think it is important that these producers who are certainly going to be seriously affected by this, have an opportunity to evaluate what the impact on them is going to be.

At the very least, I would expect that the Commission would want to keep the record open for some time after this hearing. I would object to any continuance of this hearing. I think there are a lot of people in this room who need to hear what has been presented and, in fact, those people who have requested continuances, I think it is to their benefit to hear what is

going to be presented by the Division. This is an excellent opportunity for them to get the formal information that they apparently have not gotten up to this point, and then they can respond to the specific things which they have concerns about.

For example, we're going to discuss the concept of some sort of variance where there's a demonstration that there is no water to be protected. That might be something they would want to address in a future study. One of the large discussions that has taken place, and a lot of producers have been involved in, is the timetable for implementation of the proposed rules if they're adopted. I suspect that's something that the independents who have requested the continuance are going to want to look at.

Hopefully, by going through the hearing process today, they will then have the opportunity to focus those efforts on the things that are going to be most useful and helpful to them, rather than having to take a shot gun approach, if you will, reinventing the wheel, and try to find out everything that's gone on over

the past five years in a 30 to 90 to six-month, 180-day period.

One other comment with respect to the map situation. There are only going to be 165 maps presented, so I think that Reprographics has given Mr. Greer or Mr. Carr a wrong number.

The other thing that we will have and we will present for their information, one of our exhibits will be a listing of the number of wells, and we've had our data processing section print out, and they were only able to do so last night, the number of wells each operator has in the proposed vulnerable area.

We also have, it's not printed out here because it's several hundred or so pages long, but it is available, a printing of each of those wells for each operator. I think we'll clearly going to want to make that available for each operator to look at the wells and start focusing on those specifics again. In fact, we were here until late last night because we narrowed that list down to actual wellbores so we didn't have hopeful completions in there to confuse the thing.

The Division's position on the request

for continuance is, we would like to present the case today and then, after the case has been presented and after they have an opportunity to hear the preliminary information, to leave it to the Commission to decide how best to allow them to evaluate and have some meaningful input into the process. Because certainly in a rule-making process, that is essential. The Division has done its part to try and get their involvement, but I certainly don't want to stand on some sort of formality to prevent their involvement at this point.

CHAIRMAN LEMAY: Thank you, Mr. Stovall. Anyone else have anything to say on the continuance? Yes, sir.

MR. MEIKLEJOHN: Mr. Chairman, I'm Douglas Meiklejohn. I'm an attorney for the Southwest Research and Information Center. My client was involved in the study committee and we, therefore, did have notice of this matter. I believe, as Mr. Stovall has indicated, that the Division did make efforts to involve the industry in this situation.

We have two requests with regard to any possible continuance. The first is that the data

that has been gathered by the Division indicates that the problem that is to be addressed by the amendments to the rule involves serious threats to water resources in the affected part of the state. We therefore request that if a continuance is granted, that it not be for six months, but that it be for one or at the most two months, simply because we are dealing with a serious problem and we need to get on with the business of protecting the ground water that is at risk here.

The second point is, if the Commission determines that people who are regulated by the rule can wait until one month or two months from now to present their evidence, that other interest groups, such as Southwest Research and Information Center, also be given that opportunity. That is, that the Division present its case today but parties such as Southwest Research and Information Center would not have to present their case today, unless the Commission's ruling is that everyone will present their case today.

CHAIRMAN LEMAY: Thank you, Mr. Meiklejohn. I think at this point--anything

additional on the continuance? Yes, sir.

MR. VERQUER: I think my comments probably are on the postponement.

MR. STOVALL: Sir, would you identify yourself for the court reporter, please.

MR. VERQUER: I'm Charles Verquer, the Superintendent for Caulkins Oil Company. We, at this time, would like to request that this be continued for more studies. Number one, for the input on the State of New Mexico and the defining of the areas that are involved.

By interpretation, the way they're defined now, it could be so radical as to be 50 feet above ground level. Now, when you take the tributaries of the tributaries of the tributaries and go 50 feet from the center of the water course, you're 50 feet above ground level.

Now, that's radical--okay?--but we have inspectors in the country that do get radical, and it needs to be defined very closely, I do believe. Then when and if this order is written, we should have language in the order that defines which pits are involved.

CHAIRMAN LEMAY: I don't really want to interrupt you, Mr. Verquer, but we're really not,

at this point, looking at what's going to be presented, just the concept of the continuance.

MR. VERQUER: Oh, okay. All right. On the continuance, as operator of 25 sections, mostly in 26 North 6 West, we operate some 200 wells, and we would like to have the opportunity to put in a little input of our views on something that could cost us $2 million. Thank you.

CHAIRMAN LEMAY: Thank you, sir. Additional comments? We'll take a five-minute recess and we'll have a decision in five minutes.

Before you leave, I think there's four alternatives: (1) Everyone present a case today and deny the continuance; (2) everyone present their case today and leave the record open for a period of 30 to 60 days, at which time the Commission would consider the evidence and render an order; (3) grant the continuance and we just all go home now; or (4) which is what has been presented initially, which would be to put on the case today, as many as wanted to testify, make that information available to everyone, and come back within a period of 30 days to, I guess, six

months, to hear additional testimony. I think those are the options I see before us.

Mr. Carr.

MR. CARR: May it please the Commission, there is only one other thing I would like to mention before you consider this, and that is that I intend to call a witness for Dugan Production Company. He will also present testimony for the National Stripper Wells Association. I will have a separate witness for Dugan Production.

If the ruling is that we are going to go forward and wrap it up today, of course I will present those individuals. You'll notice that the first notice we had was the January 3rd Farmington paper. I will tell you that if the case is going to be reopened for testimony later on, we might not go forward with ours today because admittedly it's been put together in a hurried fashion.

CHAIRMAN LEMAY: Thank you, Mr. Carr.

MR. STOVALL: Mr. Chairman, my comment would be, and Mr. Meiklejohn raised it, is that if a continuance is granted, assume testimony is taken today, I think anybody should have the

opportunity to present testimony today, but I would certainly want that anybody would have the opportunity to present additional testimony at the continued hearing, not just those parties who don't present testimony today.

CHAIRMAN LEMAY: I have one question, only if we did extend it to take additional testimony. Have the exhibits prepared by the OCD, have they been available for what period of time?

MR. STOVALL: Some of the exhibits, for example the producer listing just was produced last night. The last of the maps were just available within the last approximately week, I would say 50 maps. A lot of the other stuff has been available and presented in roughly similar forms to the Study Committee and the group involvement in previous meetings.

CHAIRMAN LEMAY: Is the Study Committee officially disbanded once the recommendation is forth, or is it an ongoing Committee?

MR. STOVALL: That's your decision, Mr. Chairman, Mr. Director.

CHAIRMAN LEMAY: Commissioner Weiss raised that point, and I wasn't sure.

We'll take a five-minute recess and come back with a decision.

[A recess was taken.]

CHAIRMAN LEMAY: We shall reconvene the Commission hearing. It is the Commission's unanimous decision to accept testimony today from the Division and anyone else who wants to present testimony. The case will be continued until the Commission hearing on March 12th, at which time additional presentations can be made.

We do request two things: Those people presenting their case on March 12th will make their exhibits available to everyone two weeks prior to their presentation, because they'll have two months basically to work with the OCD exhibits, and we will get a prehearing statement filed by those presenting testimony so we'll be able to plan our agenda for the 12th. The interest in this case may spread over into the 13th, is the reason for that.

So, is there any misunderstanding with that? Mr. Carr.

MR. CARR: Mr. Chairman, would it be appropriate to send exhibits to all parties who have appeared in the case today? or would that be

the way to determine that?

CHAIRMAN LEMAY: I think it would be. Or, if they are large exhibits, make them available. As I understand it the Division has made the maps available for reproduction at a reproduction agency in Farmington. If that type of exhibit is too large, I think that can be done, too, just so long as they are available.

MR. STOVALL: Mr. Chairman, I would make a recommendation along that line to assist in doing that, that after the conclusion of today's hearing, say within 10 days, any party who wishes to be on the appearance list be required to submit a written entry of appearance with address and contact person, one per company, and at the end of 10 days that official list will be the list to which distribution is made. So there's sort of a finite definition of it and we have an official list, if you will.

MR. CARR: Will the Division witnesses also be present at the March 12th hearing?

CHAIRMAN LEMAY: Yes, I would request that the Division witnesses be present at that meeting.

MR. PADILLA: I would like to clarify

that point. So far as cross-examination is concerned, we're not prepared to do any type of extensive cross-examination today. May we defer our cross-examinations of the Division's witnesses to March 12th?

CHAIRMAN LEMAY: The witnesses will be available for recall. Mr. Stovall, do you have anything to address on that?

MR. STOVALL: Yes, I do, Mr. Chairman. I certainly wouldn't preclude additional examination, but I think given the nature of a rule-making, this is not an adversarial type of proceeding and the Division is not--hopefully not fighting with everybody, although we may be asking for something that is not popular.

I would ask that the cross-examination be limited to clarification and understanding of what has been presented, and in fact if there are any concerns, that the OCD witnesses not be used to present an alternative case but rather if there are specific things, that they be presented by the proper technical witness at that time.

So, recognizing that the cross-examination in any case should be limited to what has been presented and the basis for it

and not to build an opponent's case in the nature of a rule-making. I don't have any objection to their being available for some limited recall.

CHAIRMAN LEMAY: I think when a witness presents evidence today, that for clarification purposes that it's best to cross-examine today, because that bring out those issues that they'll probably wish to understand. However, they will be available but the actual cross-examination, as part of the process today, I think should take place when they present their information today.

MR. PADILLA: Well, Mr. Chairman, to the extent I can ask some clarifying questions today, it goes with the understanding that there are certainly a lot of questions that I'm not prepared to ask today and we may have some clarifying questions. As long as the witnesses are available on the 12th, I think that answers it.

CHAIRMAN LEMAY: They will be available, but I don't want to make a major cross-examination of these people occur on the 12th. I want to reserve that for you all to present your cases. They'll be present, however. If there are some problems that you

have at that time, you can raise those issues and recall them.

MR. ROBERTS: I would like to join in the concern that Mr. Padilla has expressed. Today we're just not in any position to cross-examine on the scientific data or basis or the technological basis for the recommendation. And I assume that's some of the information that will be put on today. I've just not had the opportunity to consult with anyone who could analyze the underlying report for this recommendation. Again, I just want to express that concern.

I understand Mr. Stovall's concern about the nature of the cross-examination, but again we do want that opportunity to readdress the expert witnesses that may be brought on today and to obtain some clarification of technical or professional testimony.

CHAIRMAN LEMAY: Thank you, Mr. Roberts. The purpose will be to collect information and get a fair hearing of all sides and all elements. I suggested that most of the cross-examination be done today because that's when the witness is here presenting his

information. You'll have an opportunity to present your case, you will have technical witnesses maybe for rebuttal or whatever, although this should not be an adversarial hearing, as Mr. Stovall indicated, and should be one of trying to really understand the situation.

So, with that framework, is that understandable? Mr. Stovall?

MR. STOVALL: Mr. Chairman, I would make a suggestion that perhaps at the next hearing, and for the moment we should think about the idea that at the next hearing the Division witnesses will be there but the other parties present their cases first at that hearing. And then I may wish to call those Division witnesses to express some opinions with respect to the information that's presented at that hearing.

For example, if they do another study, I may question their expert with respect to that but also put the Division witness back on to say, okay, in response to that, I would say this. And that may be the framework for that. I think if there are disagreements with the underlying study around here, there needs to be some direct,

formal presentation that will help the Commission, rather than just trying to--

CHAIRMAN LEMAY: Oh, I think so, but I think their point is well taken. They've not had a chance to study the technical data and that by studying the technical data, that will raise questions that may not be obvious today. And they will have that opportunity.

It has been the policy of the Commission, though, to present generally a case with your own witnesses rather than trying to structure a case based strictly on cross-examination.

MR. STOVALL: The other question I would have, Mr. Chairman, I think we need to clarify and do it on the record in the public setting, a lot of what has gone on here before has been in a public, if you will, undocumented, unrecorded, informal meetings, in the sense that there has been give-and-take and participation between the Division employees, who have developed the recommendations, and the participants from industry and environmental groups and whatever, in that process.

The question I would ask and have a

little bit of concern about is, communications between the Division staff and members of industry groups. On the one hand I see some benefit to the industry folks being able to ask my witnesses some questions with respect to the study and to continue an exchange of information. On the other hand, I don't want to prejudice the process in any way. Again, because it's not adversarial, because it is a rule-making and not an adjudication, I'm not quite so concerned about the nature of those kinds of proceedings.

I would like a response from, perhaps, Mr. Carr or Mr. Padilla, Mr. Roberts or others, do you have any feeling or sense on that at the moment as far as those off-the-record communications between the Division staff and experts?

CHAIRMAN LEMAY: Mr. Carr?

MR. CARR: May it please the Commission, I have, in just general experience, found that a lot of misunderstanding and miscommunication can be revolved when technical people do have the opportunity to talk to agency personnel. That's always complicated when you

get lawyers involved and a hearing going, but my basic feeling is that that would be appropriate.

The people I'm working with, I don't think have any hidden agenda or are trying to set anyone up, but if there are some questions that could be revolved informally, it might avoid unnecessary time in a hearing.

CHAIRMAN LEMAY: Thank you. It's always been our policy to work together to try and resolve issues, not necessarily to create a legal format where there are opponents and advocates for various positions, although that does happen when you have certain types of cases.

This type of case is one where we've tried to put some scientific documentation together, or the Division has, and make some recommendations. And I feel the staff should be available for all kinds of clarifying questions. In fact, the more that industry can work with the staff and the environmental groups concerning the proposed rules and regulations, I think the better off we'll be on the 12th of March to resolve these issues.

I see no advantage in making it out of

bounds to call the staff up on anything that comes up.

MR. STOVALL: And again, should we decide that it would be beneficial to schedule a public meeting, that list of appearances that would be filed in this case would be the notification list for anything, should there be a group meeting. As we've done all along, we want this involvement, as you state.

CHAIRMAN LEMAY: What I want to do, after today's meeting, I would like to call a group of those appearances together and we can outline, since there are so many of them, organize the proceedings on the 12th a little bit better and see if we might go on the 13th also. There will be a pretrial conference with the lawyers. We've had this in other cases and we'll have it here.

Is that understandable with everyone concerned here? Thank you, Mr. Stovall.

I have only one other bit of information. Those of you here, hope you had a big breakfast. I have to be available at one o'clock for a legislative budget hearing, so we plan to break for lunch at 10 minutes to 1:00 and

reconvene at 2:30. I hope that's not inconvenient for any of you, but this is something I was told I had to do, and I would like to hear all the testimony, so we'll take an expanded lunch today. Unless the Division is quick with their case and we can quit before then. I have no idea.

At this point, is there anyone that wants to present their case today along with the Division? I won't go through this list of appearances, but if you want to present your case today--and you'll still have the opportunity to present additional evidence on the 12th--but will you stand and identify yourself if you do?

MR. CARR: We previously indicated we had witnesses and we'll reserve that testimony until March 12th.

CHAIRMAN LEMAY: Thank you, Mr. Carr. Well, I'm not hearing anything else.

MS. LINDA THOMAS: I would like to read a letter into the record. I'm with the Bureau of Reclamation in Durango.

CHAIRMAN LEMAY: Fine. Would it be possible to maybe take all statements and maybe read that letter on the 12th, or today?

MR. STOVALL: I don't think it would be inappropriate, Mr. Chairman, to go ahead and accept comments, if people wish to make them today and get them in, in case they're unable to come on the 12th.

CHAIRMAN LEMAY: All right. Well, is there any objection to that? Okay. Well, we'll certainly accept your Bureau of Reclamation letter today if you wish, whenever you wish to submit it. And, of course, the record will be open during this two-month period.

Okay. We shall proceed then, Mr. Stovall.

MR. STOVALL: Mr. Chairman, I hate to do this, but I've been zealously guarding the exhibits here for the moment to make sure that all the participants had a copy. I have them all arranged, with the exception of Exhibit 5, which are the maps, starting with Exhibit 1 at that end, down to the last Exhibit 13 at this end.

I would ask, first off, each of the attorneys and parties who have entered an appearance to come by and pick up one exhibit for each party. I don't want one exhibit for each person in the room, but one exhibit for each

company or association or representative. I think if you start this way and move down the line, we could do that fairly quickly and efficiently.

CHAIRMAN LEMAY: At this time we'll swear in the witnesses that will give testimony today.

MR. STOVALL: I have two witnesses to be sworn. I would suggest that anybody who might give testimony today go ahead and stand to be sworn.

[The witnesses were duly sworn.]

CHAIRMAN LEMAY: Mr. Stovall.

MR. STOVALL: A couple of matters, Mr. Chairman, if I might, before I actually call my witnesses. I'll try to get through both witnesses before we take the one o'clock recess. That should, hopefully, give the parties a chance to look at what has been presented and come back and perhaps use the period afterwards to ask some questions.

The second thing, I've indicated that one of the exhibits which you have is a listing, by operator, of the number of wells which we have determined to be within the vulnerable area.

These are actually wellbores and not dual completions or anything else.

Right now we've printed out a list of each well, identifying each well by operator. The staff upstairs is preparing that list. What we're going to do is break it out and have one copy available for each operator of its own wells. In other words, don't grab everybody else's. We're only making it for each operator.

When you leave here today, hopefully each operator will be able to go home and say, "I know which wells are involved," and you can start focusing again on the stuff that's important and not get lost in some other things.

CHAIRMAN LEMAY: Yes.

MS. REVELT: I'm not sure how these proceedings work, but I was under the impression that even though you may be on this list, because the expanded vulnerable area varied within the little boxes, that this may not be an actual listing, that there may be fewer because they fall outside the contours on the map?

MR. STOVALL: That will come out in the testimony. The list that's coming out is the list within those unit letters, and when we get

into the testimony I'll explain the concept of your question. Essentially you'll have a good list to work with, for the most part and that is, as I say, for information for the operators so they're aware of that.

I would first call Mr. Roger Anderson.

ROGER ANDERSON

Having been first duly sworn upon his oath, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. STOVALL:

Q. Would you please state your name and city of residence.

A. I'm Roger Anderson. I'm from Santa Fe, New Mexico.

Q. How are you employed, Mr. Anderson?

A. I'm employed as an Environmental Engineering Specialist for the Environmental Bureau of the Oil Conservation Division.

Q. How long have you been so employed?

A. Approximately six years.

[Discussion off the record.]

CHAIRMAN LEMAY: Talk loudly so it projects back there.

THE WITNESS: Okay.

Q. How long have you been so employed, Mr. Anderson?

A. Since February of 1986 with the Oil Conservation Division.

Q. In which bureau of the Oil Conservation Division do you work?

A. The Environmental Bureau.

Q. What have your responsibilities generally been over that period of time?

A. In the past they have been permitting disposal sites, gas plant refineries and inspections of these sites, and most recently as Acting Bureau Chief of the Environmental Bureau.

Q. Is it true that within that capacity you've done just about everything the bureau does, is that correct? Just an overlap of--

A. That's correct.

Q. Have you testified previously before the Division or the Commission and had your qualifications accepted as a matter of record?

A. Yes, I have.

Q. Are you familiar with the application in this case?

A. Yes, I am.

MR. STOVALL: I would offer Mr.

Anderson as an expert in the area of engineering in the Environmental Bureau.

CHAIRMAN LEMAY: His qualifications are acceptable.

Q. Mr. Anderson, the Division is prepared to offer another witness to present the actual proposal and the technical supporting evidence that goes with the proposal. Would you please summarize for the Commission and those present what the impetus is for this application for rule-making on the part of the Division?

A. In June of 1984, the Oil Conservation Division conducted a hearing into proposals for protection of ground water. At that time the Division required--the Examiner or the Division Director required the Division to create two study committees to study the impacts of oil field discharges to ground water. There was a Short Term Study Committee and a Long Term Produced Water Study Committee.

The Short Term Study Committee presented evidence before the Commission which resulted in Order R-7940 which created the original vulnerable area.

The Long Term Study Committee was

charged with investigating those issues which the Short Term Study Committee did not have time or failed to look at.

Q. Now, Mr. Anderson, I would ask you to take a look at what has been marked Division Exhibit 3--to show you how efficient we are, we're moving right on to Exhibit 3 in this case. Would you identify that for the Commission and those present?

A. Division Exhibit 3 is the Order of the Commission in Case No. 8224, which is Order No. R-7940 which created the original vulnerable area.

Q. In addition to actually creating the area and defining the geographic limits there, it imposed some rules and obligations on operators with respect to that vulnerable area, is that not correct?

A. That's correct.

MR. STOVALL: If we may break for just a moment to plug in the mike.

[Discussion off the record.]

Q. I'll back up again and regroup once again. Did I understand you correctly that Order R-7940 was the result of the efforts of the Short

Term Produced Water Study Committee study?

A. That's correct.

Q. You also indicated that there was a Long Term Produced Water Study Committee created by the Commission. Can you identify, or do you have an exhibit which identifies the members of that Long Term Study Committee?

A. Division's Exhibit 1 identifies the current members of the Long Term Produced Water Study Committee, and that is as of January 13, 1992.

Q. This list is, in fact, the current makeup of that committee, and members have been added to this over a period of time, is that correct?

A. That's correct.

Q. What is the statutory authority and responsibility for the Commission as far as taking the proposed action?

A. The statutory authority is under the Oil and Gas Act, Section 70-2-12, and it requires the Division to protect fresh water. There's an Act amendment in 1989 that also requires the Division to protect public health and the environment.

Q. Is the action which is being proposed here in an effort to fulfill that obligation on the part of the Division?

A. Yes, it is.

Q. Mr. Olson will testify about the details of the proposal, but isn't it true that this proposal, as it's being presented, is going to impose some cost burdens upon the industry?

A. Yes, it will.

Q. Have you any idea or do you have any experience or history to have any concept of how those potential costs of what the Division may require here compare with the costs of cleaning up an actual contamination?

A. We have had one cost estimate submitted by a company, that it may take $1,000 or a little more than $1,000 per well to comply with the new regulations. We have no way of determining whether that's accurate or not.

However, we do have cases--or one specific case where contamination from an unlined pit contaminated a community water supply and estimated cost was somewhere around $200- to $250,000 just to clean up that one case. Consequently, if if does only cost $1,000 to

comply with the regulations, the cost of clean-up of one site that we require clean-up of, could comply with 200 wells. The cost of clean-up is enormous.

Q. We recognize it's not the purpose of this hearing to condemn or criticize industry practices in the past, is it?

A. That's correct. The industry practices in the past were fully within the laws and regulations of the Oil Conservation Division. What has happened in the past is not being attacked in this hearing. We are trying to prevent future contamination that has been known to have occurred from past practices.

Q. Mr. Olson will present some testimony that shows that the current accepted and legal practices do pose a hazard of contamination of fresh water supplies?

A. That's correct.

Q. When did the Long Term Study Committee start its efforts and has it been an ongoing process?

A. Yes, it has, ever since the original R-7940 Order came out. The first meeting of the Long Term Produced Water Study Committee was in

September of 1985, and we've had approximately 10 documented meetings, 10 documented official meetings since then, the most recent being in October of 1991.

We've had numerous correspondence between the OCD and the Long Term Produced Water Study Committee in addition to that.

Q. And that is shown on Exhibit 2, is that correct?

A. That's correct.

Q. And what mechanism has the Division used in an effort to ensure industry involvement?

A. Through this Long Term Produced Water Study Committee. Plus we have mailing lists through the independent trade organizations, notification to all the trade organizations, that the meetings were occurring. They've all been on the mailing list.

Q. In fact, has there not been some active industry input into the efforts of the Division in this matter?

A. Yes, there has. Exhibit 4 is sign-up sheets for all the documented meetings that we've had. The majority of these, the people that were at the meetings, were industry personnel.

Q. Now, with respect to the specific recommendations that Mr. Olson is going to make, can you testify as to whether or not the input received at these meetings has caused an evolution of the presentation and the development of the proposal as it is being made today?

A. Yes, it has. We take the recommendations and suggestions of the industry very seriously and have changed positions--well, not positions, but we've changed criterion requirements a number of times.

Q. Now, is it true that as the proposal is framed--and again, Mr. Olson will go into more detail--but as the proposal is being made, it is not conduct which is being proposed to be directed but rather a result of a goal achievement, is that correct?

A. That's correct.

Q. And that goal is to prevent contamination of fresh water?

A. That's correct.

Q. In your opinion, is the proposal being made by the Division today, will that result in the prevention of contamination of fresh water and protect ground water and public health and

the environment?

A. We feel it will, yes.

MR. STOVALL: I have no further questions for Mr. Anderson. I would move the admission of Exhibits 1 through 4.

CHAIRMAN LEMAY: Without objection, Exhibits 1 through 4 will be admitted into evidence.

Is there anyone that wishes to ask Mr. Anderson some questions on cross-examination? Commissioners? Commissioner Weiss.

MR. ROBERTS: Mr. Chairman, will the witness be available after the break? I understood Mr. Stovall to say that's when he would be available for questions.

CHAIRMAN LEMAY: I think you can ask him now or after exhibits are presented. Was it your statement to make him available after 2:30?

MR. STOVALL: I might suggest, and I don't know what Mr. Robert's concerns are, but I might suggest that it may be helpful for those present to hear Mr. Olson's testimony. Some of the questions he may have may, in fact, be answered by Mr. Olson. I don't object to them--

MR. ROBERTS: That would be acceptable

to me.

CHAIRMAN LEMAY: He'll be available for recall, then.

MR. ROBERTS: I think the testimony by the next witness may answer some questions. If he's available later on, that's acceptable to me.

CHAIRMAN LEMAY: He'll be available all the time, from now until whenever we get through with this.

Commissioner Weiss, did you have some questions?

COMMISSIONER WEISS: Yes.

CROSS-EXAMINATION

BY COMMISSIONER WEISS:

Q. What has been the effect of hot water quality of Rule 7940?

A. There was a study which Mr. Olson will testify about, as to what the exemptions, what contamination there was created by exemptions. We did not have hot water quality data before the inception of R-7940. We do not know if it made an impact or not.

Q. You mentioned one problem with some contamination.

A. That's correct.

Q. Was it successfully cleaned up?
A. Yes, it was.
Q. Who paid for it?
A. The oil company.
COMMISSIONER WEISS: That's all I have. Thank you.
CHAIRMAN LEMAY: Commissioner Bailey.

CROSS-EXAMINATION

BY COMMISSIONER BAILEY:

Q. I would like for you to clarify something. My name appears on the current list of members of the Long Term Produced Water Study Committee. To your knowledge, have I participated in any of these Long Term Produced Water Study Committee meetings since December of 87, over four years ago?
A. No, you have not.
Q. All right. I just wanted clarification for the record.
A. It should have been taken off when you left the Division.
COMMISSIONER BAILEY: That's all.
CHAIRMAN LEMAY: Any additional questions of the witness? He may be excused, subject to recall later.

Mr. Stovall, you may present your next witness.

MR. STOVALL: I would like to call my next victim, Mr. Bill Olson, please.

WILLIAM C. OLSON

Having been first duly sworn upon his oath, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. STOVALL:

Q. Mr. Olson, would you please state your name and city of residence for the record.

A. My name is William C. Olson. I live in Santa Fe, New Mexico.

Q. How are you employed?

A. I'm employed by the New Mexico Oil Conservation Division.

Q. In what capacity are you so employed?

A. I'm employed as a hydrogeologist with the Division.

Q. In which bureau?

A. The Environmental Bureau.

Q. How long have you been with the Division in that capacity?

A. I've been with the Division in this capacity for the last two years. I had also

worked for approximately a year and a half in 1986 and 1987 for the Division.

Q. What was your experience in the intervening period? Were you still involved in this similar type of work?

A. In the two-year intervening period I was working as a hydrogeologist for the New Mexico Environmental Improvement Division.

Q. What is your educational background?

A. I have a bachelor of science in geology and a master's of science in hydrology, both from the New Mexico Institute of Mining and Technology in Socorro, New Mexico.

Q. Have you participated in the efforts, since your employment with the Oil Conservation Division, in either period, in the San Juan Basin Produced Water Study Committee efforts?

A. I've been involved with the San Juan Basin Produced Water Study Committee through both my employment with the Oil Conservation Division and the Environmental Improvement Division.

Q. In effect, in the process of getting your master's degree, did you do any work that would have any connection with this study?

A. Yes. My master's work was based upon

the San Juan Basin Study that was carried out for exempt pits in the vulnerable area.

Q. And the presentation or thesis which you did in connection with that master's work is, in fact, an exhibit in this case today, is it not?

A. Yes, it is.

MR. STOVALL: Mr. Chairman, I offer Mr. Olson as a qualified hydrogeologist.

CHAIRMAN LEMAY: His qualifications are acceptable.

Q. Mr. Anderson, touch briefly on what the Long Term Study Committee did. We're not going to focus on the Short Term Committee now. All of our discussions will be with respect to the Long Term Committee.

Will you please describe for the Commission and those present what the Commission was charged with and what it accomplished?

A. The Commission was charged with two tasks involved with participating in the San Juan Basin Long Term Produced Water Study Committee, which was charged with evaluating areas outside the vulnerable area as defined in Order R-7940 for additional ground water protection measures.

In addition, the Division was also tasked with performing a study to determine if the exemptions allowed in Order R-7940 were posing any potential threat to ground water.

Q. Just generally summarize, what did the Committee accomplish in that effort?

A. The Committee had set out the criteria for defining the expanded areas and reviewed results of the study of exempt pits.

Q. As a result of those efforts, is that what has resulted in the recommendations which the Division is presenting today?

A. Yes, it has.

Q. Mr. Anderson has testified that there has been some active industry involvement in the Long Term Study Committee. Would you agree with that testimony?

A. Yes, I would.

Q. And, in fact, the list which was distributed I believe as Exhibit 4, the attendance sheets, were these people actively involved? Did they participate and make recommendations?

A. Most of the people that have attended the meetings have actively participated in the

evolving process of the recommendations.

Q. From a point in time, say, two or three years ago, to what has happened today, has that combined effort modified or changed or caused an evolution of the recommendations to where they are today?

A. They have been modified even up as recently as the January 7th memorandum of the Division which incorporated comments on the previous recommendations of September 25, 1991.

Q. It's important to say it's an evolution that the approach, as Mr. Anderson testified, has been to prevent contamination, and the evolution has been in how best to accomplish that result?

A. That's correct.

Q. In addition to industry, have there been other interest groups involved in the study?

A. There have been local environmental groups in the Farmington area that have been noticed of the meetings and provided the opportunity to attend, as well as the Southwest Research and Information Center, and some private citizens.

Q. Would you just summarize--and we'll go into more detail--but tell the Commission and

those present what the Division is requesting in this case.

A. The Division is requesting in this case an expansion of the current vulnerable area into major drainages within the San Juan Basin, and elimination of discharges to unlined pits in these areas.

Q. We talk about reference to a vulnerable area. There currently exists a vulnerable area, is that correct?

A. That's correct.

Q. How is that area currently defined?

A. That area is currently defined as 100 vertical feet from the San Juan, Animas and La Plata Rivers. There are additionally some special areas which were determined to have shallow, fresh water, springs and wells which were listed on an individual basis.

Q. And within that vulnerable area there are rules regarding the discharged or produced water and fluids onto the surface, is that correct?

A. Yes. There was a prohibition order for discharge to unlined pits. In the order there was also an exemption allowed for discharge of

five barrels per day of produced water to an unlined pit if the pit was a minimum of 10 feet above water table and had a total dissolved solids of discharged water of less than 10,000 milligrams per litre.

Q. We're talking about Order R-7940, Exhibit 3 in this case, is that correct?

A. Yes.

Q. With respect to this application, then, what is the proposed definition of vulnerable area?

A. The OCD is recommending that the vulnerable area be expanded to include 50 vertical feet from major drainages in the San Juan Basin.

Q. What does the concept of vulnerable area mean? Why have we used that term and how are we getting to that definition?

A. The vulnerable areas would be areas that are subject to potential ground water contamination from discharges to unlined pits.

Q. When you talk about a major drainage, what does that term mean? I think there's some concern that this could be right up on top of the mesa. Is there a definition of major drainage

that you could present?

A. The mapping was done with the consideration that major drainage would be the principal surface drainages that either contain shallow ground water or have a reasonable probability of containing shallow ground water.

Q. Are there any maps which show this proposed vulnerable area with the major drainages and the geographic definition of the topographic limits of it, if you will?

A. Yes. We've produced approximately 165 maps.

MR. STOVALL: Mr. Chairman, at this time, I would like to present what is presented as Exhibit No. 5, which are the maps. I am going to ask Mr. Olson to talk about those, and then I'm going to make a recommendation with respect to dealing with those maps in a way which makes them usable and accessible to parties to this case and operators and how they may be effected.

But for the record purposes, this collection of approximately 165 maps, is marked as Exhibit 5.

Q. Would you please describe these maps, Mr. Olson?

A. These maps are largely seven-and-a-half-minute U.S.G.S. quadrangle maps. There are three or four 15-minute maps that were used in the mapping.

Q. What areas do these maps include?

A. These maps include definition of both the current vulnerable area and the expanded vulnerable area.

Q. Is it the entire San Juan Basin? Is that on the map?

A. No. We have just maps for the current oil and gas producing areas of the Basin.

Q. Did I understand you correctly that what you've done is you've taken a production map of some sort, taken the topo maps that cover that production area and then, in some way, marked the area proposed to be identified as the vulnerable area on those topographical maps?

A. Yes. We basically mapped the areas for the production areas and provided, essentially, a buffer area also around those in case of expansion of production. Roughly a map or two on a buffer area outside of the production areas.

Q. If you got to a boundary where there was production, you would include that map and

then you would go to the next map in the appropriate direction or directions and continue to draw the vulnerable area on to those maps, is that correct?

A. That's correct. Uh-huh.

Q. You say that's for the purpose of addressing expansion, new development, new stepouts, if you will, in fields, to help operators identify where they are in that respect?

A. Yes.

Q. Is it the Division's request that the areas which are not on these maps, that is, outside the current producing areas, be included within the definition of vulnerable area if they meet this 50-foot criteria of a major drainage?

A. Yes, we would.

Q. Why have you not mapped those areas as well?

A. Because of the labor involved and because these currently do not have production in them.

Q. Those maps would not be of any great utility at this time in terms of operator's understanding what's effected and what's not, is

that correct?

A. That's correct.

Q. Would it be the Division's intent that if production were to move out, expand within the Basin, that additional mapping would be done to define the areas which would be considered in the vulnerable area?

A. Yes, it is.

Q. Within the mapped area, a concern was expressed in some comments early on about what is a major drainage, what's within 50 feet of the major drainage. As far as within the mapped areas, is it the Division's intent and recommendation that only those drainages which are identified on the maps be considered as major drainages at this time?

A. Yes, that they would be considered major drainages, what is currently mapped.

Q. In other words, we're not proposing some rule that says 50 feet of a drainage, and then if you find some low spot on top of the mesa, call that a drainage and require compliance with the rules that are proposed on that basis? It is a defined area, where they know what they're looking at?

A. It is a defined area. It is defined on the maps.

Q. I've set on the table in front of us some original topographic maps which have been marked. I'm going to hand you one of those maps. It is the Rattlesnake, New Mexico/Colorado topographic map.

Would you look at it and describe for the Commission and those present how it has been marked? And that's just a prototype example.

A. Essentially the maps were created by tracing in the average 50-foot contour for the expanded area, as was done for the previous vulnerable area, 100 vertical-foot average from San Juan River, as it is on this map.

Q. The stack of maps in front of us, is that the only actual copy of the map that's available at this time?

A. No. They have been sent out, and some industry representatives have produced master copies of these on Mylar, which are available for copying at Reprographics in Farmington, New Mexico.

Q. Those Mylars are available in Reprographics Center, which I believe is on

Apache Street?

A. I believe that's the location.

Q. With respect to determining whether or not the particular location is within the vulnerable area, is the the Division's intent and recommendation that these areas which have been mapped, that these official sets of maps be the controlling documents to make that determination?

A. Yes, it is.

Q. We'll talk about a little bit later the impact on operators, and we've identified wells which operators have which are in the proposed vulnerable area. Would you briefy describe the process you went through to accomplish that?

A. To identify the wells in the area?

Q. To identify the wells in the area, and how do you know, from a land description basis, whether you're in or not?

A. Essentially, after the mapping exercise was completed, we went back to the maps and determined down to the unit letter all of the areas that would fall within the current and expanded vulnerable area. Using that, we put that into a database system which we then linked with the main computer to get a listing of wells

that fall within the vulnerable area.

Q. So you actually have a database program that you can spit out by unit letter, section, township and range, the vulnerable area, broadly speaking, is that correct?

A. That's correct.

Q. Are there not some areas, some of those unit letters, court recorded subdivisions, in which the vulnerable area contour line would go through a portion of but not include all of those unit letters?

A. Yes. For inclusion purposes, when we were making this, there are some sections where a partial unit letter is in a specific unit letter and the entire unit letter was then included as part of the vulnerable area. The listing that we did, the listing of wells in those areas, would just be used as a guide for using the maps, essentially.

Q. If an operator were to take a well location identified as being within a unit letter and compare it to the map, it might determine that even though it's within that unit letter and on the OCD listing, it is, in fact, not within the vulnerable area, is that correct?

A. That's correct.

Q. Again, the map would be controlling, and that database listing of the unit letter, section, township, range is not suggested or recommended as the definition of the vulnerable area?

A. No, it's not. We recommend that the maps be the determinative factor and not a listing by unit letter.

MR. STOVALL: Mr. Chairman, at this time, because of the nature of this exhibit and the fact that it will, in all probability, be the document which is used by the Division and operators for quite some time to come in the future, I would like to recommend that the process for handling this exhibit be that at the conclusion of this hearing, that the Commission certify, and we'll prepare some sort of certification to go onto the back of each of these individual sheets, a listing of these individual sheets will be made as the certified list of maps so that an operator or any interested party can look at the list and say, I know which topo I need to look at. Then they can come to the Division and say, This is the

official copy and this is the one upon which the rule will be enforced.

I understand, from talking to some of the operators--and I think Mr. Carr mentioned the 200 maps--there appears to be a possibility that there is some confusion at the Reprographics Center in Farmington with respect to which Mylars have been and will be produced. The Division certainly wants to clear that up and make sure that that set is an accurate set of the maps which should be available.

And we would continue to make those available, in effect, by having the Mylars at the Reprographics Center. And the cost for producing those Mylars was paid for by industry. The operators in the Basin could go to Reprographics and purchase the appropriate maps. If they needed them officially certified, they could be somehow certified by the Commission as being accurate copies of the original maps; but maintain these in a safe place where they can't be harmed, lost, or otherwise damaged and where they are so properly marked.

Therefore, I'm not submitting them and asking them to go in the case file and make

copies available. They're too expensive. But if we can develop a system like that, I think that would be the best way to preserve these for future enforcement should this rule be adopted.

CHAIRMAN LEMAY: I think it's agreeable. You might want to consider having an index for all these 165 topos that would be available, so that an operator who didn't know what topo his wells fell in, could consult that index.

MR. STOVALL: I think we can make a listing of the topographic maps. The U.S.G.S. puts out a graphic representation, so you can look at your area, identify which map it is, and then go to the listing and make sure that map is within the listing.

CHAIRMAN LEMAY: For clarification purposes, if you could, along with this exhibit, give a graphic listing of section, township and range, and the topo, the seven-and-a-half-minute quad, where it fell within that section, township and range, graphically presented. That could be a good reference.

MR. STOVALL: All right. I think we can do that. I think we can use the U.S.G.S.

index maps as the basis for doing that. I think that's the most logical.

THE WITNESS: That could be done.

MR. STOVALL: And we can use the index maps for that.

CHAIRMAN LEMAY: That will serve as an identification map. I think that's needed with 165 separate topos.

MR. STOVALL: Correct. We would have the maps, the listing of the maps, and that identification. I think that would be appropriate to do it that way.

Q. (BY MR. STOVALL) Now, stepping away from the maps, Mr. Olson, the notice and the proposals here also talk about the establishment of a wellhead protection area. Would you tell the Commission what that means, what that term means?

A. Yes. The OCD recommends that a wellhead protection area be established around all fresh water wells and springs, and that that area be defined as a radius of 1,000 feet from each fresh water well and spring.

Q. Why does the Division include this within its recommendations?

A. Either because these wells will represent either shallow ground water at a location or a potential conduit for migration contamination due to the way a lot of water wells are completed.

The other reason why we considered this is because, during the mapping exercise, there was a considerable number of wells and springs that fall outside of the currently mapped area, and particularly for wells that were outside the area, there was basically little information available as to where these wells were completed, whether they were shallow wells or deep wells.

Q. When you're talking about wells, are you talking about water wells?

A. Water wells.

Q. When we're talking about wellhead protection area, we're referring to water well production, not oil and gas wellhead protection?

A. That's correct.

Q. So the definition of 1,000 feet would be within 1,000 feet of a water wellhead?

A. Right, or spring.

Q. Or spring. Those areas, are they mapped on these maps we talked about?

A. No, they're not.
Q. And that's because you say you can't identify them all, is that correct?
A. There are a lot of wells that have never been registered with the State Engineer and were not shown on the map.
Q. They do produce fresh water defined by the State Engineer and they are protectable, is that correct?
A. That's correct.
Q. So the well listing which we'll talk about later, the well listing also does not include wells which may be within the 1,000 feet, oil and gas wells, that is, which may be within 1,000 feet of the water well, is that correct?
A. That's correct.
Q. That's an individual determination that operators will have to make based upon their own knowledge of what's in the field?
A. On a site-by-site basis.
Q. What are the Division's recommendations with respect to discharges of produced fluids to open pits within the expanded vulnerable area and the wellhead protection area? And when I talk about vulnerable area now, we're talking about

the original, plus the proposed expansion area.

A. The OCD recommends that there be no discharges of any type allowed to any type of pit within the current and expanded vulnerable areas.

Q. Including the wellhead protection areas?

A. Including the wellhead protection areas.

Q. You mentioned earlier that the current rule, Exhibit 3, allows discharges of five barrels a day in certain conditions. Do I understand correctly that you are recommending that that exemption be eliminated?

A. Yes, we are.

Q. In other words, what you're saying is that there be no discharges into unlined pits or onto the surface within the vulnerable area wellhead protection area?

A. That's correct.

Q. What's the basis for making that recommendation? Do you have any sort of technical analysis which indicates that's necessary?

A. Yes. The basis is the study that the Division carried out in 1986 and 1987, looking at

the exempt pits as exempt from OCC Order R-7940.

Q. The results of that study, are they contained in Exhibit No. 6?

A. Yes.

Q. Would you identify Exhibit No. 6 and explain to the Commission and those present what that is?

A. Exhibit No. 6 is a report entitled Volatile Organic Contamination of Ground Water Around Unlined Produced Water Pits.

Q. That was prepared by you, is that correct?

A. This was prepared by me in partial fulfillment for my requirements for a master's of science degree in hydrology from the New Mexico Institute of Mining and Technology.

Q. Has this report been filed or published in any way by Tech?

A. It has been filed at the New Mexico institute of Mining and Technology as Open File Report H89-9.

Q. Would you just briefly summarize and tell the Commission what you found as a result of the study that was performed, and what causes the Division to make these recommendations? Why is

it significant? What does it say?

A. Maybe I should explain how the study was carried out. Essentially, we did a preliminary site evaluation to determine sites that would basically qualify, essentially, for the exemption and that we could easily access with available equipment which, for us, was a hand auger.

We evaluated over 200 sites originally, and due to problems in the Basin, of course, with gravel, cobbles, we were only able to find approximately 13 sites there that were able to be accessed--at least ground water was able to be accessed with the available equipment.

Of those 13 sites, we then went back to those sites and performed an extensive ground water investigation around the produced water pit at each location. During the process of that, we installed typically, around four monitor wells, one up-gradiant, three down-gradiant from each pit.

We then sampled ground water for volatile aeromatic purgeable organics and general water chemistry, which were submitted to the state laboratory in Albuquerque, New Mexico, for

analysis using operate EPA methods.

Based upon that, the results of that are then contained in this report. Of the 13 sites that we did review, nine had ground water contamination by dissolved phased volatile organics. Seven of those sites, of those nine, had ground water contamination in excess of New Mexico water quality standards for benzene.

Q. What were the volumes of discharges into those sites in which you found contamination?

A. Eight of the sites that were looked at, eight of the 13 sites, had discharges of less than a barrel a day as determined from operator's C-111 reports. Of those eight that had low-volume discharges, six of them had ground water contamination.

Q. What conclusions have you drawn as a result of this study which has been performed with respect to, say, the volumes of produced fluids that are necessary before contamination occurs?

A. The conclusion is that these exempt pits are resulting in ground water contamination in the current vulnerable area.

Q. In other words, even discharges of less than five barrels per day can result in contamination of ground water, is that correct?

A. Yes, even discharges of less than a barrel a day can result in ground water contamination in these areas.

Q. I think, Mr. Olson, for the purpose of this, I'm not going to ask you to go into any more detail of this study because this hearing will be continued and the parties will have an opportunity to read it, but does the study contain the backup information with respect to your methodology and preliminary results and conclusions and how you got to where you are in terms of recommendations?

A. Yes. It contains all the details of how the study was carried out and the results of the study.

Q. Is it on the basis of this study, primarily, that the Division is making a recommendation to prohibit discharges into unlined pits and onto the surface in these areas?

A. Yes, it is.

Q. Do you have anything further you wish to add with respect to the study?

A. I don't believe so.

Q. Now, Mr. Olson, I think with this study you've identified why the Division feels there is a need to make the request that it's making to the Commission today, but isn't it going to place a significant burden on operators?

A. Yes, it will.

Q. Do you have any idea of how many locations may be affected?

A. We have produced a listing, by operator, and the number of wells of each operator that fall within the vulnerable area, as defined by the unit letter listing that we pulled out of the maps.

Q. And that listing is contained in Exhibit No. 7, is that correct?

A. That's correct.

[Discussion off the record.]

Q. All right. Would you describe what Exhibit 7, that we are submitting to the Commission today, summarizes?

A. It is a listing of the number of wells for each operator that lie within the current and expanded vulnerable area.

Q. Subject to your comments earlier about

partial unit letters, it may be within a unit letter and on the list but outside the actual vulnerable area, is that correct?

A. Right. This would, essentially, be a worst case of how many wells would be within the current and expanded area.

Q. And did the Division not make an effort to determine and eliminate multiple completions and that sort of thing, where there will multiple completions in the area listed as separate wells?

A. Yes. These are actually well locations and do not represent multiple completions.

Q. What is the total number of wellbores that appear to be wellbore locations that appear to be affected by this?

A. There are 7,253, according to Exhibit 7.

Q. I believe you heard at the beginning of this presentation, as I told the parties present, that we would be able to hopefully provide an individual listing of wells for each operator, and it's from this product that that list comes also, is that correct?

A. That's correct.

Q. Now, this information tells you how

many well locations may be affected, but does it tell you how many pits may be affected?

A. No, it does not.

Q. How come?

A. There's going to be some difficulty with interpreting from this how many pits will be affected. Some of these locations fall within the current vulnerable area and would already have had tankage replaced--pits replaced by tankage. Other sites may not have much in the way of production of water or have much of a discharge to a pit or not have a pit at all, and it does also reflect gathering-line drip pits and to main-line transmission drip pits.

Q. If I understand you correctly, in some cases there may be well sites that do not have pits that are subject to the new proposal, and there may be also some facilities that do have pits that don't appear as a well site location but also would be affected by the proposal?

A. Yes. And there are some locations that may have both open pits, they may have a blowdown, dehy, separator pit, tank drain.

Q. But certainly within an order of magnitude, this listing would be of a reasonable

estimate of the impact on the industry, is that correct?

A. I believe so.

Q. Let's go into a little more detail about what is going to be required of operators to comply with the proposed rule.

A. In order to comply with the proposed rule, the operator would have to replace existing unlined pits or discharges to existing unlined pits with either some type of tankage system or double-line pit system.

Q. In other words, you're saying no quantity of water be put on the ground? That you'll put in something to contain those fluids to prevent them from making contact with the ground, is that correct?

A. That's correct. All fluids will be contained and not be in contact with the ground surface.

Q. Mr. Anderson testified that one company's estimate was approximately $1,000 per pit, I guess, to comply with that. That's one company's estimate. Have you heard any other numbers?

A. No, I have not.

Q. Are you familiar with any situations of contamination which have required clean-up of ground water?

A. Yes, I am. That's my primary responsibility at the OCD is remediation of contaminated ground water.

Q. What are the costs of remediation where a water supply is affected?

A. Quite high. It would be in the hundreds of thousands to potentially millions of dollars.

Q. Again, as Mr. Anderson said, it's not an attempt here to penalize industry for past legal unaccepted practices, but rather it's an attempt to prevent future problems from occurring by an ounce of prevention, I guess? Is that a fair--

A. That is the Division's intent, to essentially eliminate source areas which have potential contaminate ground water--which have been documented to contaminate ground water.

Q. Let's go into more detail, then, about how the Division would recommend and propose that operators comply with the no-discharge requirement sought in this application.

A. We would recommend that they install a proper containment system pursuant to OCD Division guidelines.

Q. Do we have examples of those guidelines here to discuss and present to the Commission and the parties present?

A. Yes, we do, Exhibit 8 and Exhibit 9. Exhibit 8 are the Guidelines for Selection and Installation of Below-Grade Produced Water Tanks, and--

Q. Let's stop and talk about that one for a minute. Let's go ahead and look at Exhibit 8 and just kind of explain the structure of it and how does the guideline work? What does it mean?

A. Essentially the guidelines are just that. They are guidelines. They're not any type of rule or regulation. They set out a basic goal that needs to be attained.

In the case of the below-grade produced water tanks, is that they be contained within an impermeable vessel and have some type of, if it's below-grade, to have some type of leak protection mechanism to ensure that fluids do not escape.

Q. Okay, and the Exhibit 9 is, basically, the surface--for surface ponds, is that correct?

A. Correct. Exhibit 9 is the Engineering Design Guidelines for Construction of Waste Storage Disposal Ponds, and those are essentially guidelines for double-lined pits, as opposed to some type of tankage.

Q. Are you suggesting that these guidelines be incorporated into the Order?

A. No, we do not.

Q. Why not?

A. I think it would remove all flexibility in implementation of the regulation. Guidelines are just that. They are guidelines to assist the operator in, basically, attaining the goal. If someone can demonstrate that an alternate system will achieve the same purpose, that's taken into consideration and would be approved.

Q. You're talking about the goal and, again, what's the goal to be attained? That's the purpose of the proposal, is it not?

A. The goal is the purpose. The guidelines are just a tool for use by the operator, to help them comply with the regulation.

Q. And what you're asking the Commission to do is to issue a rule that says, don't do

something which will contaminate fresh water, or conversely, take actions with respect to produced fluids to prevent potential contamination of fresh water, is that correct?

A. Correct. And then installation of these types of systems be done pursuant to guidelines.

Q. Looking back at Exhibit 9, the Waste Storage Disposal Ponds Guidelines, these guidelines are applicable to large commercial facilities as well as single-well drip pit type collection pits, aren't they?

A. That's correct. These guidelines have been in effect for a number of years with the Division already.

Q. Some of the standards in here, for example, with respect to, say, spray systems, evaporation systems, aeration systems, would not necessarily be applicable to a small-volume pit at an individual well location? Is that an example of what you're talking about?

A. That's correct. There are certain items in each of the guidelines that may not apply to a specific location.

Q. Then the general principle of the

guidelines is that you put the fluids into a containment vessel of some sort, and that it be constructed in such a way as to not permit fluids to get onto the ground, and that as an extra measure of protection, there be a method to determine if there's been a failure of that containment system, is that correct?

A. That's correct.

Q. What if in a particular situation the discharges coming from a well or an operation were, in fact, fresh water as defined by the State Engineer, they met or exceeded the criteria for the water quality standards, what would be your recommendation in that situation?

A. I would recommend that there it would not apply to any type of a tankage system. Essentially, they're just discharging fresh water at that point.

Q. How would an operator know whether or not a discharge was in compliance? Is there a standard by which the quality of water is determined?

A. Yes. The quality of water would be determined by the New Mexico Water Quality Control Commission Ground Water Quality

Standards, which are Exhibit No. 10.

Q. In other words, if an operator felt that the water being discharged was of fresh water quality, it would be possible to collect a sample of the water and have it analyzed in accordance--to determine whether it met or exceeded these standards?

A. That's correct. Or if an operator was willing to install a system to make their water meet water quality standards, they would not have to apply to the, essentially, containment system recommendations.

Q. To make sure we know what we're talking about again, the exhibit we're talking about says "State of New Mexico Water Quality Standards" on the top, is that correct, and has a list of constituents, and the amount which is permitted to be in a water sample?

A. That's correct.

Q. If an operator felt he could install, if you will, a purification, a cleaning system, cheaper than he could install a tank, that would be certainly a permissible way to meet the objective?

A. That would be.

Q. If the Commission adopts the Division recommendations, certainly it would be difficult for immediate compliance, would it not, to all of a sudden have to comply with a new and rather stringent requirement?

A. It could not be done immediately.

Q. Is there a recommended timetable for the elimination of discharges into unlined pits within the new vulnerable area?

A. Yes. The OCD is proposing a phase schedule for implementation of recommendations for the current expanded vulnerable areas.

Q. And that is Exhibit No. 11?

A. That is correct.

Q. How is that identified on the top?

A. It is the "OCD Proposed Schedule for Implementation of Vulnerable Area Recommendations."

Q. I think it's worth spending some time to go through this to make sure people understand the structure of how it's being recommended, so they can look and say, what do I have to do when.

Would you take a couple of minutes and do that, please?

A. For eliminating discharges into unlined pits, the OCD proposes a three-year phase scheduling.

With the current vulnerable area and wellhead protection areas, eliminating discharges in those areas within one year from whatever the effective date of an order would be.

For major tributaries to the San Juan, Animas and La Plata Rivers, the OCD recommends a two-year scheduling for those systems.

For ease of location, we've listed those systems for all of the San Juan, Animas and La Plata Rivers.

Q. These systems are, on the map we've talked about, Exhibit 5, an operator could go to the map and these canyons are named on the map so that they could look and say, you know, geographically where it's located, is that correct?

A. Yes, they are.

Q. Okay. Please continue then. What's the third phase?

A. The third phase would be remaining tributary drainages, which would be essentially all other systems that are not listed in the

two-year schedule.

Q. But which are drawn on the map? You're not talking about areas not drawn on the maps?

A. No, we're only talking about areas that are drawn on the maps.

Q. Let me reiterate this, because I think it's important that everybody understand, that within the existing vulnerable area, that which is now defined as within 100 feet of the three rivers and within the wellhead protection area as it is being proposed today, the Division is proposing that operators be required to eliminate the discharge into unlined pits within one year of the effective date of the order, is that correct?

A. That's correct.

Q. Looking at this Exhibit No. 11, paragraph 1(B), the major tributaries to the San Juan, Animas and La Plata Rivers, with respect to any locations identified as being within any of these named areas that appear on the topographic maps, the Division is recommending that the discharges to unlined pits be eliminated within two years from the effective date of the order, is that correct?

A. That's correct.

Q. And with respect to Item No. 1(C), the remaining tributary drainages, the Division is recommending--and those tributary drainages are those areas drawn in on the maps which are not named in this paragraph B--that there be a three-year period in which to eliminate the discharges, is that correct?

A. That's correct.

Q. Now, let me back up for a moment. We're talking about the vulnerable area. We've talked about well locations being within the vulnerable area on the map. Now, is there not another consideration besides the actual location of the pit? For example, if a well were just outside the vulnerable area, might that be impacted by the order?

A. I don't think I understand.

Q. For example, if a pit were on the surface, say 10 feet above the line of the vulnerable area but on, say, a gravel surface, would that have an impact?

A. It could have an impact on the vulnerable area.

Q. Would you want pits which while they're

technically outside the vulnerable area but a reasonable probability that they would drain into the vulnerable area, also be required to longer be used or to be lined or tanked?

A. That would be one of our recommendations. The other recommendation that we looked at was registering all pits over five barrels per day with the Division so that the Division could assess whether or not these might pose a threat to the vulnerable area if they were located directly adjacent to the vulnerable area and receiving large volumes.

Q. Two different things, and I think one of the major concerns is this issue of am I in or am I out of the vulnerable area, and the definition is, you're physically in if you're actually located within the inside of the contour line that defines the vulnerable area?

A. Yes.

Q. You may also physically be in if your pit is technically out but could contaminate that vulnerable area?

A. That has direct seepage into the vulnerable area, yes.

Q. When you're talking about pit

registration, are we talking about pits anywhere that accept more than five barrels a day of fluids?

A. Anywhere in the Basin, just a straight registration with the Division of those pits so that we can determine areas that may be impacted upon the vulnerable areas.

Q. When you're talking about registration, you're talking about letting the Division know such and such pit is in such and such location that accepts X volumes of fluids which is in excess of five barrels per day?

A. That's correct.

Q. And no further action would be required of the operators unless the Division went out and made some sort of a determination that with respect to a particular pit, there is a potential contamination either because of volume or the geology of the surface where it could get to water or something of that nature, is that correct?

A. Yes. Any assessment would have to be on a site-by-site basis.

Q. Let's back up and talk about that for a minute because you're talking about something

essentially that's outside the rule. We talked about the authority of the Oil and Gas Act to protect fresh water. Does mere compliance with the no discharge into the pit order as proposed here, necessarily satisfy the statutory requirement of no contamination of fresh water?

A. No, it does not. Just because a pit is located outside the vulnerable area does not relieve the operator of any liability, should their operation result in direct contamination of ground waters or surface waters.

Q. In other words, the Division is trying to develop a rule that says, we're going to prevent contamination where we know there's a potential risk?

A. That's correct.

Q. But compliance with that rule and the fact that there is no rule specifically outside of the vulnerable area, does not relieve an operator of the underlying obligation to prevent the contamination of fresh water?

A. That's correct.

Q. So that's always a concern that operators could have, is to be aware of their obligation, which is statutory and independent of

OCD rules, to conduct their operations in such a way as to accomplish that result?

A. That's correct.

Q. Now, one of the more exciting issues in the discussions that have been had with the Study Committee has been, well, what do we do with existing pits. Would you go into a discussion of what the Division proposes be required to be done with those pits which are currently in existence?

I think it's important for you to emphasize that this is separate from the cessation of use.

A. Yes, this is separate. We feel that the main focus of any such order should be elimination of source areas, which would be elimination of discharges to unlined pits in these areas.

Secondary to that is there may be contamination at some of these pits which will need to be addressed, and we propose, again, that this be done pursuant to Division guidelines to allow flexibility for site-specific conditions.

Q. Those guidelines are contained in Exhibit 12, is that correct?

A. That's correct.

Q. These are guidelines which you are not recommending be incorporated necessarily--in fact you don't want them in the Division order, is that not correct?

A. They are very general and basically just act as a guide for closure. Closure has to be determined on a site-specific basis. All sites are going to have different conditions depending on the types of discharges, to the location.

Q. When you're saying on a site-specific basis, what will be the controlling element of that effort on the site-specific basis?

A. Well, essentially, you basically have to make some type of assessment of their site to determine if it poses a potential or future threat to ground water.

Q. In other words, test the site in some way? And the guidelines suggest a manner for doing that, is that correct?

A. They suggest a manner for doing it, and they also provide options for any other method if they want to determine that it is not a hazard or does not present a hazard to ground water.

Q. And then the remediation that might be required of a site would depend upon what those findings are with respect to the presence of contaminants at the site?

A. That's correct.

Q. It may be a simple matter of going in and finding there are no specific contaminants and simply close the pit in accordance with the guidelines, correct?

A. Correct. If there was no significant impact, then closure would just be backfill around the location.

Q. Conversely, it is possible in some situations there could be some contaminants that go fairly deep and require excavation and removal in an appropriate manner?

A. That's correct. And the guidelines just set out goals that we look to to be attained, and do not try and tell the operator how they will attain the goal.

Q. And the goal is to get rid of contaminants which might reasonably contaminate fresh water supplies?

A. That's correct.

Q. What about timing on the closure plan?

Does that tie into the cessation of use? It is separate, is it not?

A. That is a separate issue, and it's gone through considerable discussion through the committee meetings that have been held.

Q. And what is the Division's recommendation at this hearing with respect to the timetable for closure of existing pits?

A. The Division's recommendations are that existing pits be closed, that a closure plan, not closure, but a closure plan be submitted within 60 days of a final date for cessation of discharge in that particular area.

For example, if they were in the current vulnerable area, they would comply with the one-year scheduling. A closure plan would have to be submitted within 60 days of the end of that one-year date.

Q. What would the Division like to see in the way of a closure plan? What will the Division look at to determine if it's reasonable and acceptable?

A. Essentially, the closure plan would detail the company's procedures that they would institute for assessing and evaluating potential

risks at well sites for those particular areas, which could be done either on a site-by-site basis or could be some type of generic plan that would be implemented at all sites.

Q. We're talking about the current vulnerable area, they cease use within a year and come in with a report that says, I've got 55 sites within this area. These are my first priority, and I'll close them within a year, say, test and close, and other sites could be extended out further beyond that? An additional one-year beyond the closure filing time?

A. Correct. If it was in the two-year area, it would apply 60 days from submission of the closure plan itself. The closure plan would also include the company's proposed implementation schedule.

The Division does not look to a proposed implementation schedule, because in the various companies, some may have more pits than others and they have to apply different schedules because they cannot physically close the number of pits that they have in the same time frame as someone who has five pits.

Q. In other words, the requirement to

close the pits isn't as immediate as the requirement to eliminate the discharges?

A. The immediate focus is to eliminate potential source areas of ground water contamination.

Q. Now again, is it not true that in some of the committee meetings, some operators have expressed some concern because originally what the Division proposed was that they submit a closure plan within 60 days of cessation of use, is that correct?

A. That's correct.

Q. And that caused operators some concern because they may have already stopped using the pit and they didn't want to have to submit a plan within, effectively, 60 days of the order?

A. That's correct. Effectively, if the closure plan was required to be submitted within 60 days of elimination of discharge, it would essentially penalize people who wanted to look to eliminate their discharge sooner than others.

That does not mean that with the scheduling proposed, the one-year area, the one year and 60 days, that an operator could not get a closure plan in sooner than that, just that

that be the final date for submission for those areas.

Q. Everything will key around where it's located within these areas as defined on Exhibit 11, and the timing required for that, as far as the submission of a plan, is that correct?

A. That's correct.

Q. And that operators will, in fact, be given the flexibility and freedom to adopt a reasonable closure plan which makes some sense, from an operational standpoint as well as from an environmental standpoint?

A. That's correct.

Q. Is it not a fact that this modification of that proposal was the result of some industry input?

A. It was the result of extensive industry input, through the last two meetings we had this fall and a meeting the OCD had with the Environmental Affairs Committee just last week.

Q. Now, many operators, I think, are concerned that the impact on the low-volume wells could be to make those wells uneconomic to continue operating, which would result in the premature abandonment and waste of oil and gas.

Has that been taken into consideration in making the recommendations?

A. Yes, it has. Essentially, the OCD has proposed some variances that could be applied for on the--

Q. Well, before we go into the variances, let's talk a little bit about the economics. We're talking about, in terms of the economic impact of this order, is the installation of some sort of containment vessel, be it a below-grade pit or a tank, is that correct?

A. That's correct.

Q. And the elimination of the discharges within that, over a three-year period, depending on the location?

A. That's correct.

Q. And then a closure of existing pits in accordance with guidelines and an approved plan over a period which will probably extend considerably beyond that three years, is that correct?

A. That's correct.

Q. If an operator were to determine that the requirements of this proposal made the operation of a well uneconomic, what requirements

would be imposed on an operator at that time with respect to that well?

A. If the operator was looking to abandon the well, the same closure requirements would be required.

Q. At the time of abandonment?

A. At the time of abandonment, yes, and not according to the schedule that's proposed.

Q. So it's as much a matter of timing of the obligation as it is the actual cost itself, is that correct?

A. The actual cost of closure will be the same whether the well was abandoned or if the regulations are complied with.

Q. So the incremental cost of this rule is really the requirement to put in a line pit or a tank?

A. That's correct.

Q. Do you have any idea what that cost is, roughly, in comparison to, say, the cost of plugging a well?

A. I'm not familiar with plugging wells myself, and costs, but we've had one estimate on pit replacement at approximately $1,000 per pit, which I assume would be considerably cheaper than

plugging the well.

Q. So in considering economics, and also considering the things you talked about before, the costs of reclamation, which can be extremely high, is that right?

A. That's true, if ground water contamination is a result.

Q. So, in other words, the Division has not been ignorant or inconsiderate of the economic impact of its requirements, and has tried to come up with something that is reasonable and makes some sense to accomplish the necessary results?

A. That's correct, which is the development of the phased-in approach for the areas.

Q. Has any consideration been given to allowing some other timetable other than that which is proposed in Exhibit 11?

A. I think that's 13, and I think I'm missing it.

Q. I think I have an extra copy that I can pass up to you.

Identify Exhibit 13. What does it say on the top?

A. No. 13 is the OCD Proposed Variances.

Q. Okay. We're talking about the timetable that's paragraph 2 of these proposed variances, is that correct?

A. We're talking about, for elimination of discharge prohibitions, that the discharger could apply to the director for a variance to the discharge prohibition if, as we discussed before, the discharge quality would meet New Mexico Ground Water Quality Standards, or if protectable ground water, as defined by the New Mexico State Engineer, will not be effected by the discharge at that discharge location, and the discharge is not located within the wellhead protection area.

Q. I was asking about paragraph 2 but you've done 1. Let's continue with paragraph 1 here.

The first variance we're talking about in paragraph 1 of these proposed variances, is that if there's no water to protect, there's not a necessity to protect it, is that what you're saying there?

A. That's correct.

Q. If a operator can come to the Division and say, in this particular area, although it's

within the defined vulnerable area as is shown on these maps, I can demonstrate that there is no water to be protected, therefore--

A. Or will be effected by the discharge.

Q. Or will be effected by the discharge, based upon geologic, hydrogeologic evidence that either there's a barrier between the surface and the water, or the water doesn't exist, or something like that? Is that what you're talking about?

A. That's correct, or if the discharge quality is essentially fresh water.

Q. That's the other part of that. One is what's in the ground to be protected, and the other is what's coming on to the ground to get to it?

A. That's correct.

Q. If a operator can demonstrate, in essence, that continuation of discharges onto an unlined pit will not have an adverse impact on fresh water, then the operator may be able to get a variance from the requirements of the rule?

A. That's correct.

Q. And the exception you're saying is that within a wellhead protection area, the Division

has recommended that such a variance not be granted. Why is that?

A. Essentially due to a lot of completion procedures that are used on fresh water wells. A lot of wells are gravel-packed back to the surface, and even if this was a deep well with some type of geologic barrier, whether it be clays, shales between specific zones, that well can act as a direct conduit for contamination.

Q. Which, in effect, would be hard to show that it would have a potential to contaminate fresh water?

A. It would be difficult to demonstrate that.

Q. What about if an operator comes to the Division and says I'm willing to comply but I want to do it on a different timetable, other than as provided for in the recommendation of the order, does the Division have any opinion as to whether that should be granted or not?

A. Yes. The OCD would propose that, for good cause shown, the director would administratively allow an extension of the phased time scheduling for up to one year.

So, if you were--essentially, this goes

for people who have large numbers of pits to replace. You cannot physically replace them in the time frames allotted.

Q. In other words, if a substantial portion of someone's wells were in the current vulnerable area and they only had one year to cease the discharges, they could come in and say, I need to spread this out over a longer period of time?

A. That's correct, because they could not possibly physically do it within, say, one year.

Q. I do want to go back and clarify one thing. We've thrown out a $1,000 number as the cost of installing a tank. The Division is not suggesting that that is the maximum or average cost but rather that's only a number that's been heard and it's worth whatever you want to take it for, is that correct?

A. That's correct. It's a ballpark figure from one company.

Q. We certainly would invite operators to discuss costs involved and would like to have substantive information on those costs if any operator wishes to present it?

A. That's correct. The operators have the

best knowledge of what the cost would be for replacement at those sites.

Q. In making those assessments, it's important to distinguish between the cost of eliminating the discharge than the cost of closure down the road?

A. That's correct.

Q. The elimination of the discharge is the immediate cost, and it's really the incremental cost that operators have to be concerned with in terms of this proposed rule-making?

A. That's correct.

Q. Is there anything else you would like to say with respect to the recommendations of the Division in this matter?

A. I believe there was one item we left out which had been discussed at previous committee meetings, which was transfer of fluids out of the vulnerable areas to other unlined pits.

The OCD would recommend that the district manager could approve transport of fluids to permitted sites, essentially, outside the vulnerable area, whether they be centralized, commercial disposal facilities.

Q. When you talk about permitted sites and transportation, you're talking about, in effect, a facility that it would be taken to would be a commercial facility, which would require some sort of permitting by the OCD, is that correct?

A. Or a centralized facility, if the company, pursuant to subsequent Order R-7940(A), companies can develop centralized facilities for disposal of produced water. So, it would be either centralized or commercial facilities.

Q. If a company owns its own facility and takes only its own water to its own facility that's a centralized facility, then it's authorized under 7940(A)?

A. That's correct.

Q. But if a company takes water to a facility that's owned by another company and disposes of the water, then that's a commercial disposal facility and that's permitted under a different process, under Rule 711, is that correct?

A. That's correct.

Q. In other words, you don't get by the rule by hauling the water off and putting it somewhere else? There has to be some control

over where that water goes to present contamination elsewhere?

A. That's correct, and to prevent just moving it from one unlined pit to another outside the vulnerable area, essentially, unless it was specifically permitted for that use.

Q. Now have we covered everything with respect to the Division's recommendations?

A. I believe so.

Q. Have Exhibits 5 through 13 either been prepared by you, by members of the Environmental Bureau of the Division, or are part of official Division records?

A. Yes, they are.

MR. STOVALL: I move the admission of Exhibits 5 through 13, and I have no further questions of this witness.

CHAIRMAN LEMAY: Without objection, Exhibits 5 through 13 will be admitted into the record.

Let's take about a 15-minute break and then we'll have some cross-examination.

[A recess was taken.]

MR. STOVALL: Before the others begin their cross-examinations, I would like to ask Mr.

Olson another question.

DIRECT EXAMINATION (RESUMED)

BY MR. STOVALL:

Q. We've talked about a figure of $1,000 for a tank. Do you consider that a good number for the cost of a tank, Mr. Olson? For putting a tank in and complying with this rule?

A. I don't think we've really got a good handle on an actual cost. That's a ballpark figure from one company.

Q. But that's a minimum ballpark figure, is it not? The Division doesn't assume that that is a valid number and make an economic analysis based on that, is that correct?

A. No, they do not.

MR. STOVALL: Okay. I have no further questions and I would offer Mr. Olson for cross-examination if anybody wants to do it at this time.

CHAIRMAN LEMAY: Fine. Ready for cross-examination, Mr. Padilla? Care to ask any questions? I'm just going to go down the list here.

MR. PADILLA: Mr. Chairman, at this time I would like to also make an appearance for

Harry L. Bigbee. On Exhibit No. 7, the list of wells shows that Harry L. Bigbee operates some wells. We don't believe that's correct but, none the less, for purposes of entering an appearance I'll do that at this time.

Also, for the record, I would like to move a continuance to the April 9th Commission hearing. I have a conflict on March 12th for an entire week. I mentioned that to you during the break which necessitated your comments, but I would like to have that on the record.

CHAIRMAN LEMAY: Fine. Thank you. So noted.

CROSS-EXAMINATION

BY MR. PADILLA:

Q. Mr. Olson, let me see if I understand correctly in figuring out how you made these maps. Did I understand you, essentially, to say that the 50-foot vertical height was determined on the basis of geography and not on the basis of any contamination?

A. It was a decision that was reached at the committee meetings of the Long Term Produced Water Study Committee back in 1987, 86-87.

Q. In answer to my question, your mapping

essentially involves a geographic procedure and it's not based on known water contamination at this time, is that correct?

A. It's not.

Q. It's not correct?

A. It is based upon, essentially, providing protection for the drainage problems in those areas, and is a geographic measure that was projected on the maps.

Q. But your projection is not based on known water contamination today, is that correct?

A. The projection itself is not. It's based upon the drainage areas.

Q. And it's based upon the 50-foot height limitation?

A. That's correct.

Q. Let me ask you in regard to your own study on the 13 wells, do you have a list of where those wells were located?

A. We have that available in the files. I would have to pull that out. It's not provided in the report.

Q. By township and range?

A. By township, range and section.

Q. It's my understanding that those wells

are located within the vulnerable areas that exist today, is that correct?

A. Actually that's not correct. There are a couple of wells that are actually in the proposed expanded area.

Q. How far away from the known or the vulnerable area are those two wells located?

A. Oh, two of them were in Canyon Largo, approximately a couple of miles--a couple of miles up from that six-mile bridge up there. That's a few miles above the current vulnerable area.

Q. Those wells were located in San Juan County?

A. Yes, they were.

Q. Your wells do not include any wells that would be located in Rio Arriba County or Sandoval County, is that correct?

A. For the study?

Q. Yes.

A. No, they do not.

Q. When you say that there is a reasonable probability of contamination, I would like for you to clarify that statement for me, please.

A. What exact statement are you referring

to?

Q. During your testimony you included areas that had a reasonable probability of contamination.

A. I think I said a reasonable probability of containing shallow ground water.

Q. What does that mean?

A. Essentially, they are surface water drainages that perceive a lot of surface waters which then infiltrate in and, therefore, have a reasonable probability of containing shallow ground water.

Q. Did you make a study of the aquifers listed by the State Engineer as being fresh water aquifers in any kind of study or information that the State Engineer may have?

A. That was not the purpose of the study. We did not make a listing of those. That is available through the--

Q. In your mapping that you made or in any of the studies that you made, it is your testimony that no study of fresh water aquifers in the San Juan Basin was made?

A. Our study was a study of fresh water aquifers.

Q. But those fresh water aquifers are not located in any of the mapping, is that correct?

A. Well, they're located in the current area and the proposed expanded area.

MR. STOVALL: Mr. Padilla, are you asking if the fresh water aquifers are mapped on these maps? Is that your question?

MR. PADILLA: Right.

A. No, they're not.

Q. But it's my understanding, from answering my questions, that you did not make a study of the fresh water aquifers as currently classified by the State Engineer?

A. You're talking about deep water aquifers?

Q. Well, any kind of water aquifers that exist in the San Juan Basin.

A. Well, there were mapped aquifers in the Basin area that were, essentially, deep-water basins. There is little information on the shallow water systems.

Q. Let's just take Rio Arriba County. You don't know what particular wells may be affecting the shallow water aquifers in Rio Arriba County, is that correct?

A. No, we do not.

Q. Mr. Olson, can you tell me, have you made a study as to what type of effect the proposed rule-making would have on shortening the economic life of marginal wells in the San Juan Basin?

A. No, we have not.

Q. Did you make a study on how many wells would probably be plugged as a result of the proposed rule-making?

A. No.

Q. Did your study involve any type of information or conclusion in whether future development would be inhibited in the San Juan Basin?

A. Whether future--

Q. Future development of undrilled oil and gas properties.

A. Well, I think the future development would not be impacted by this because they're looking at a cost of, essentially, at a thousand to a few thousand dollars for additional on the cost of a well.

Q. But you did not make--that was not included in your study, is that correct, that

issue, as to whether or not future development would be inhibited?

A. No. We did not think that would be relevant.

Q. Did your study include any type of issue regarding economic waste or reservoir waste that might occur as a result of your proposed rule-making? And what I mean by waste, is waste of liquid hydrocarbons.

A. I don't think I understand.

Q. Well, would there be any liquid hydrocarbons that would be left in the ground by virtue of the proposed rule-making?

A. If wells are abandoned, I would expect there would be.

Q. And how about economic waste? In other words, costs that might not be necessary if there's no known water contamination at this time?

A. I believe we documented that there's ground water contamination at this time.

Q. And that documentation is based on the 13 well sites in the existing vulnerable area, as well as those two additional wells, is that correct?

A. That's correct.

Q. Mr. Olson, would you clarify for me what you mean by that term in the variance, wellhead protection area? I think that's the term. Correct me if I'm mistaken.

A. It doesn't refer to oil or gas wells, it refers to a wellhead. Which would be a water wellhead protection area. It's a common term used by EPA for natural wellhead protection areas, is what they call them.

Q. If there is an oil and gas well, what's the distance limitation involved in the variance?

A. It's a radius of 1,000 feet.

Q. If there's an oil and gas well within 1,000 feet of the fresh water well or spring or something of that nature, a variance would not be granted, is that correct?

A. That's what we propose.

Q. Even though a producer might show that there's no contamination of the fresh water source?

A. Well, it's our recommendation that there not be one, at that point, a variance.

Q. Let me ask you with regard to how long it took your study, how long did that take to

compile, Mr. Olson?

A. The actual field work took place over approximately one and a half years.

Q. And that was the total time it took you to compile this study?

A. No, it did not. After we completed the field work, the Division ran out of money to pay me. So I left employment and sought employment with the Environmental Improvement Division for a few years, which I then completed the report for my master's work during that time period.

Q. How much total time do you think it took to compile the entire report and come up with the recommendations proposed today by the Division?

A. The recommendations themselves have evolved over the last six and a half years, since the inception of Long Term Produced Water Study Committee. The actual recommendation for elimination of the discharges was first proposed back at the, I believe, December 1987 committee meeting.

Q. Do you know how that initial committee meeting or the committee members were chosen?

A. I do not. I was not involved with the

formation of committees. They were already in existence when I was employed by the Division.

Q. Do you know how notice was given there after the initial committee meeting, regarding committee meetings?

A. Originally the committees were chaired by industry members. I believe the first chairman on the San Juan Produced Water Study Committee was a member of Meridian, and it was later on chaired by a member from Northwest Pipeline, Lori Komatar.

Notices of the meetings at those times would have been from the chairman, I assume.

Q. From looking at the exhibits, it appears to me that the members of the committee were the only ones who received notice of those meetings. Is that fair to say?

A. I do not know, I do not mail those out so I don't have knowledge of that.

Q. You have no independent knowledge of who participated in those meetings and who received notice of those meetings?

A. Not from when the committees were chaired by Northwest Pipeline and Meridian.

Q. Do you know whether notice of these

meetings were given to individual producers, such as my client, BCO, which is an independent producer?

A. I don't have any direct knowledge of when they received notice. I was contacted by them a week ago, when they informed me that they had received a copy of the recent memo.

Q. Do you know whether the Long Term Study Committee, do you know how that was organized originally? I think I may have asked you that question in a different manner just now.

A. I do not know how it was originally set up. It was set up here somewhere during the time of the original R-7940 Order, but I was not involved with it and I don't have knowledge of how it was set up.

Q. Let me ask you about your estimate on the $1,000 per well. How did you get that ballpark figure?

A. That is not my estimate. That is an estimate that was provided by one of the companies during their comments on our recommendations, so it is not my figure.

Q. And you have no idea whether that's accurate or out of the ballpark?

A. I do not.

MR. PADILLA: Mr. Chairman, I believe that's all the questions I have at this time.

CHAIRMAN LEMAY: Thank you, Mr. Padilla. Mr. Roberts?

MR. PADILLA: I reserve the right to recall Mr. Olson.

CHAIRMAN LEMAY: Yes. The witnesses will be available at the hearing on the 12th for additional questions at that time.

MR. PADILLA: Thank you.

CROSS-EXAMINATION

BY MR. ROBERTS:

Q. Mr. Olson, would it be fair to say that your report, which was, I think, published in December of 1989, formed the substantive basis for the OCD recommendations that are before us today?

A. For the recommendation of elimination of discharge to unlined pits, yes.

Q. I want to focus primarily on the activities of the Long Term Produced Water Study Committee. I believe there were two committee meetings subsequent to the publication of your report published in December of 1989. Do you

recall those particular meetings?

A. The only meetings I was not involved with were the meetings, I think, June 16th and 17th of 1988.

Q. So you would have been in attendance at the meetings of August 21, 1991, and October 30, 1991?

A. That's correct.

Q. You could tell us how the committee functioned at those meetings?

A. That's correct.

Q. Let me ask you, at those two meetings, was your report the general topic of discussion?

A. No, it was not.

Q. When was your report discussed by the committee?

A. Oh, the original results of the study were presented in, I believe, 1987, at the time we got preliminary results in. So the first results were a number of years ago.

Q. Can you describe how this committee functioned? Was there an internal organization to it? I know you indicated to Mr. Padilla's question that there was a chairman of the committee at various times.

Let's focus now on this time frame of August to October of 91, those two committee meetings. Who was the Chairman of the committee at that time?

A. There was essentially no chair of the committee at that time. Well, the committee essentially lapsed in 88 after--pretty much I had left the Division and a lot of things weren't carried upon due to lack of staffing at that time, as I understand it. I wasn't with the Division.

Q. At the time the primary discussion of the preliminary findings of your report were discussed, can you remember who was active on the committee?

A. The chairman of the committee at that time, I believe, was Lori Komatar of Northwest Pipeline.

Q. Can you remember other representatives of companies or company names who were active in discussions at those committee meetings?

A. I believe Meridian was. I believe that would be reflected in the one exhibit that was presented earlier. The attendance sheets would list the actual attendees at the meetings. We

could not find an attendants sheet for the June 16-17, 1988 meeting. All the attendance sheets were compiled as an exhibit. Meridian, El Paso Natural Gas, Northwest Pipeline are some companies that stand out.

Q. Would you identify for me, once again, which committee meeting it was that your preliminary findings were discussed?

A. I believe it was in December of 87, but I would have to go back to my notes and take a look at it. That's approximate. It was prior to leaving OCD.

Q. As a part of Exhibit No. 4, there's an attendance list for a Long Term Produced Water Study Committee meeting of December 9, 1987. Could that have been the time frame that the preliminary findings were discussed?

A. It was in that time frame, the end of 1987.

Q. Let me mention some names here and ask you to attempt to recall whether these people were active--they were in attendance, but I want you to try and recall whether they were active in the discussions that took place at that meeting, to the best of your recollection.

Jami Bailey, representing the Oil Conservation Division?

A. Yes.

Q. She was active in the discussions?

A. All members that were there were active in the discussions.

Q. Scott Lindsay, Meridian Oil?

A. Yes.

Q. Edith Pierpont, League of Women Voters?

A. Yes.

Q. Do you recall what her interest was at the time?

A. Just in keeping track of development of regulations of the Oil Conservation Division.

Q. The other attendees at that meeting were Chris Shuey, I believe, Southwest Research and Information Center?

A. That's correct.

Q. Was he active in those discussions?

A. Yes.

MR. STOVALL: Mr. Chairman, I hate to interrupt Mr. Roberts,, but I think Mr. Olson testified that all members were active in the discussions. I don't want to drag this out.

Q. Well, instead of pursuing it along

those lines, let me ask if you have any recollection of any kinds of specific concerns any of these people had who were in attendance?

A. I don't know. You mean specific concerns about--

Q. About your preliminary findings.

A. They were concerned that these activities, of course, could result in ground water contamination, and they were looking at evaluating it themselves, I'm sure.

Q. At any time, did any person representing a company who attended a meeting of the Long Term Produced Water Study Committee, dispute any findings that you made in your report?

A. No, they did not.

Q. No one ever raised any point of contention to those findings?

A. No, they did not.

Q. I want you to refer to your memorandum which was dated January 7, 1992 and was sent, apparently, to interested parties?

A. That's correct.

Q. To members of the Long Term Produced Water Study Committee?

A. To members on the mailing list, which was an exhibit.

Q. Interested parties are one in the same as members of the committee?

A. Essentially. There are potential active members. Some people don't show up on a regular basis and may have another individual represent the company.

Q. In that memorandum, you've referred to the initial vulnerable area recommendations of the OCD dated September 25, 1991. Can you tell me who drafted those initial recommendations?

A. The initial recommendations were, essentially, written by a Mr. David G. Boyer, which were a compilation of the Bureau's recommendations with the Division.

Q. So the actual recommendations of the Bureaus came from actual staff people within the Environmental Bureau?

A. That's correct.

Q. And the draft was actually written--drafted by Mr. Boyer, and he's with the Environmental Bureau or Division?

A. No, he's not.

Q. What was his position at that time?

A. He was Bureau Chief.
Q. Of the Environmental Bureau?
A. Of the Environmental Bureau.
Q. To whom was this draft submitted for review?
A. That draft was submitted to all members of the mailing list at that time.
Q. Your memorandum indicates or implies that there was an opportunity to provide comments to the initial recommendations and implies that they were received by you or your staff, comments on those recommendations. Do you recall receiving comments?
A. We received comments. I believe the memorandum asked for interested parties to attend the Long Term Produced Water Study Committee meeting on October 30th to discuss the recommendations, and at that time we asked for comments, and I believe we asked for comments in the memorandum, I believe.
Q. I would like for you to see if you could recall what kinds of comments were submitted to you.
A. We got comments on both the recommendations that are contained in the

September 25th memorandum, and additional information that was handed out to participating parties at the committee meeting, such as the closure guidelines, the below-grade tank guidelines, and the double-lined pit guidelines.

Q. I believe your memorandum indicates that some of the comments you received were actually incorporated into the more recent draft of the OCD recommendations?

A. That's correct.

Q. What kinds of comments were incorporated into this final draft?

A. Into the final draft? I don't have the memorandum in front of me right at the moment.

Q. Well the memorandum, I don't believe, indicates what comments were incorporated.

A. You're correct.

Q. Can you recall what kinds of comments were incorporated?

A. I believe we had comments in about protection of ground water. I would have to go back and look at the two memos to see what the differences were between the two.

Q. Did you or your staff review all of the comments that were submitted?

A. Yes, I did.
Q. Did you or the Long Term Study Committee review all the comments that were submitted?
A. No, they did not.
Q. Were they made aware of the kinds of comments that were submitted?
A. No, they were not. They were submitted to the OCD for comments from the individual companies.
Q. Was it a function of the committee to review comments?
A. No.
Q. In your opinion, should they have been given the opportunity to review comments from interested parties?
A. I don't see why not. A lot of the comments that were submitted were, essentially, problems with interpreting the recommendations because of the way they were written. They were somewhat confusing.
Q. Were there any minutes taken of these committee meetings? Did anybody document what was said at those meetings?
A. I don't believe so, except for meetings

back in--there are minutes that do exist for some of the meetings in 1986 and 1987, I believe.

Q. Do you have those available?

A. Those are available in our records, uh-huh.

Q. Now, who drafted the most recent form of the OCD recommendations?

A. I drafted the most recent form. You mean, what was presented today?

Q. Yes.

A. Yes.

Q. And what input did you have on which to make that final draft?

A. Most recent input was what we received from a discussion at the Environmental Affairs meeting last week.

Q. What kind of input did you receive there?

A. Concerns regarding the submission of closure plans, timetables for submission of closure plans was probably of the main focus.

Q. At any time any input has come to you or to the committee, has there been any challenge to the underlying basis for your findings that are published in your report?

A. Documented ground water contamination of unlined pits?

Q. Yes.

A. Not to my knowledge.

Q. Did the committee discuss or raise the issues of economic impact on the industry associated with implementation of the proposed rules?

A. It was raised at the time of the committee meeting this last fall.

Q. Can you recall those discussions?

A. That it was going to have an economic impact upon them. Specifically, there was no dollar figure. It was just going to have an impact upon them, and they were concerned about scheduling.

Q. Was it an item of real concern to them? Would you characterize it that way?

A. Sure.

Q. Were there any figures tossed out by members of the committee as to what the cost of compliance would be?

A. No, there was not.

Q. You indicated that in your opinion costs will be incurred regardless of what

happens, to eliminate the discharges, and closure costs are going to arise out of that cost to the industry. If an operator chose to plug and abandon wells as opposed to eliminate discharges, there would be a cost to the operator at that point.

Have you given any consideration to any further consequences of operator actions to plug and abandon wells?

A. I don't think I understand your question.

Q. Can you see any further consequences of operator actions to plug and abandon wells?

A. I still don't think I understand what you're asking.

Q. Let's talk about reserves under these wells. If wells are plugged and abandoned, would you agree though that those reserves would, theoretically, be lost permanently?

A. They would be temporarily lost because no one is producing it.

Q. If they're lost, would you agree that there would be no sale of those products?

A. Sure.

Q. If there's no sale of the products, the

state, who realizes a benefit of royalty and tax income, would not receive those benefits?

A. It's a likely consequence.

Q. Have you given any thought to what the magnitude of that consequence would be?

A. No, I've not.

Q. Mr. Olson, your exhibits, I believe, 8, 9 and 12, are guidelines for the recommendations that have been proposed by the OCD. Who participated in the formulation of those guidelines?

A. The guidelines for closure were drafted by me. The guidelines for 8 and 9, the below-grade tanks and pits, were developed by the Division and I was not directly involved with the development of those guidelines.

Q. Did the Long Term Produced Water Study Committee play any role or participate in any way in considering those guidelines or adopting those guidelines?

A. No.

MR. ROBERTS: Thanks, Mr. Chairman.

CHAIRMAN LEMAY: Thank you, Mr. Roberts. Mr. Meiklejohn?

MR. MEIKLEJOHN: Could you skip me for

a moment, Mr. Chairman? I'm not quite ready yet.

CHAIRMAN LEMAY: Mr. Verquer, do you care to ask any questions of the witness? Am I pronouncing that right?

MR. VERQUER: Not really. It's pronouned like V-A-R-K-E-R, Verquer.

COMMISSIONER LEMAY: Mr. Chessler, Joe Chessler? Do you want to ask any questions? I don't see him.

Mr. Carr.

CROSS-EXAMINATION

BY MR. CARR:

Q. Mr. Olson, I'm having some problem understanding exactly what we're talking about as the boundary of the vulnerable area, so I would like to first explore that with you so I'm sure I understand what you're talking about.

When we talk about the vulnerable area, you've defined certain areas that are major drainage courses, is that correct?

A. That's correct.

Q. And then you have, using that information, mapped an area that is 50-feet vertical contour above those measured drainage

areas?

A. Right, which would be 50 vertical feet on either side.

Q. How were those courses selected?

A. The bulk of those courses were selected--the bulk of those were selected at the time of the committee meetings, which they essentially sat down with maps of well records of oil wells for various areas and compiled lists of canyons that contained shallow ground water.

Q. Now today, if an operator wants to know what area is involved in the new expanded or proposed expanded vulnerable area, what do they look to? Do they look to these plats that are now available through Reprographics? Is that the place to go?

A. That would be the ultimate determining factor. I think what we were trying to get out, like for the list of operators here, get out a listing to be used as a guide in using the maps so you could first identify what wells we've seen that fall within the vulnerable area and then go back and confirm that on the maps.

Q. If you have a well and go to Reprographics and there is no topographic map for

the acreage on which that well is located, can we assume that that means that it's not in a vulnerable area, or should there be a map for every tract?

A. Essentially, I believe we've mapped most of the--that was the whole focus of this, to map all the oil and gas producing areas. There may be an area that may be outside of there.

Q. You should know that this morning Benson-Montin-Greer could not find certain plats covering properties on which BMG wells are operated. For that reason, we're hopeful that that can be corrected soon so we can rely on those maps, because I gather you're telling me that's what we should look to?

A. Sure. If they could identify those and we could produce those maps, I think as we've discussed in our testimony--

MR. STOVALL: Mr. Chairman, I think we're getting into a legal procedural area, so I'll step in to help clarify. It is our proposal that these maps which are sitting on the table right here, and as somebody knows who tried to go and copy one of them, I'm guarding them zealously and not letting them leave this room.

These are the official maps. What we propose to do is work with Reprographics and ensure that they have a Mylar of each of these maps from which an operator can make a copy. If there's ever any question about resolution, it's the Division's intent that this is the official set, which will have some sort of a certification and seal on it, will be the official set. And if there's a deficiency noted at Reprographics, we'll correct that deficiency. But that's not the official set of maps.

Q. (BY MR. CARR) If I understand these maps, you have drawn on this a contour line that is the outer boundary of the proposed vulnerable area?

A. That's correct.

Q. In your testimony you talked about--and I wasn't clear on what you were trying to say--there might be areas outside what has been mapped that because there was no production you had not currently mapped as a vulnerable area? Was that correct?

A. That's correct.

Q. So, in fact, is what you're saying, there are areas beyond what's mapped in this

official set that could be called or classified as being in the vulnerable area as oil and gas development continues in the San Juan Basin?

A. That's correct, as it expands outside these areas.

Q. How do we know that, that those plats become part of this record? How do we keep this current?

A. If someone was looking to produce in an area, they could contact us and we could produce a map for that area.

Q. So the operator then would need to contact you first to find out if in fact it needs to be in an area in which a map is going to be extended--I mean, the mapping of the area will be extended?

A. Only if they're going to have a discharge to an unlined pit.

Q. So if we're going to discharge into an unlined pit and it isn't within the mapped vulnerable area, we should probably check with you first to see if the area will be somehow automatically extended? Is that the plan?

A. That's correct.

Q. In effect, what we have here as mapped

as the expanded vulnerable area is the expanded vulnerable area today?

A. That's correct.

Q. And you anticipates it will change?

A. If exploration expands outside of these areas, yes.

Q. And that would go administratively? That would be an administrative procedure and we wouldn't be back, is that right?

A. That would be up to the Commission to decide how that would work.

Q. When you've drawn these 50-foot contour maps, these are topographical maps, I guess those are lines that are not subject to dispute like, say, a subsurface structure map, is that correct? Or do you have two people surveying, going out and saying, this is the 50-foot contour and the operator saying, no, it's over here. My well is in the middle. I mean, is this something that can be tightly defined, where this boundary line is actually going to be?

A. I would think it is. The boundaries themselves are on the maps. If you locate yourself outside of that, then you're outside the vulnerable area.

Q. What we would do, we would come in to you. We're planning to drill a well and dispose into a pit. We approach you and then that map is drawn, and that map becomes the authority as to whether we're in the vulnerable area or not?

A. That would be correct, I guess.

Q. You also have a thousand-foot radius area around a water well, a fresh water well. Today, if I have a well in the San Juan Basin that is outside the currently defined vulnerable area, a farmer comes along and drills a water well, am I automatically included in one of these areas and then subject to these regulations?

A. I would recommend, yes, that he come in and join these wells. Obviously it would be shallow ground water. They're now making a conduit, essentially, through that area.

Q. It's the rancher's conduit that then would extend the regulations to us?

A. Correct.

Q. Are there any particular requirements for water wells that are drilled in the oil and gas producing areas?

A. You mean, specific requirements for drilling?

Q. Yes. If you're going to drill a water well, do you know of anybody who says, if you're within a thousand feet of an oil and gas producing well, you better do certain things?

A. I would go to the State Engineer. I'm not sure if they have one.

Q. In conducting your study, your charge was to define areas where there could be potential pollution, is that correct?

A. Potential for ground water contamination.

Q. I'm not going to try and repeat what Mr. Roberts went through, but your Exhibit 6, your study--and I assume what we have here is the complete study, is that right?

A. Right.

Q. That was the technical basis for this proposed expansion?

A. Not for the expansion but for the proposed elimination of all discharges to unlined pits. The expansion itself was carried out officially, as I said, by the committee, which was directed by, I guess, the Commission, in its original order.

Q. Was there any other study or any other

technical information that the committee looked to in reaching its conclusion that, in fact, there was a need to seek an order terminating the disposal in these pits?

A. I think the original committee was looking along the lines of the original order, which was eliminating large-volume discharges in those areas.

Q. My question is, was there any other technical information, report or study or testing, that was looked to by this committee to make the determination that, in fact, what we're doing here today needed to be done?

A. You mean, whether they needed to expand the vulnerable areas?

Q. Yes, or to cease disposal into surface pits as being recommended? I'm just trying to find out, Bill, if there's anything else technical in nature that the committee looked to. Is this what they considered?

A. This study is what was considered for elimination of discharges, which was the OCD's recommendation to the committee.

Q. There was no other testing or other report or anything that was discussed or

considered? That's what I'm asking.

A. Outside of what was presented, I guess, at the original hearing on the vulnerable area.

Q. And in doing this, you were not looking at what impact these rules would have on any particular well, say a stripper well in a particular field in the San Juan Basin?

A. That's correct. We were looking at, essentially, exempt discharges under R-7940.

Q. And you didn't, I think it follows, and correct me if I'm wrong, you weren't looking at what impact it might have on production?

A. That's correct.

Q. You, on several occasions, have made these rules and proposals available for comment. When those comments came back in, procedurally how did you integrate those into the recommendation we're looking at today? Was it circulated within the group?

A. No, they were not. Within our group?

Q. Yes.

A. They were looked at by myself and Roger Anderson.

Q. Was there any vote for review before they were actually converted into recommendations

by the study group?

A. By the study group itself, no.

Q. If we look at your study, inside the cover page you characterize Commissioner Bailey as your cohort. The question I have, as I understand what the Commissioner said in your work, there was assistance in carrying out site investigations, but this report is yours, is that right?

A. I produced the report, yes.

Q. Basically, and I have not had an opportunity to read it yet, if I understand what you did, you had 13 wells and well sites that you identified that you were able to get your equipment out there and run certain tests, and that is the basis for the report, is that right?

A. That's correct.

Q. When you did that, can you tell me what you did? You drilled some monitor wells? Is that what you did?

A. Essentially, if you could say if you a hand auger that's drilling, I guess. But we put holes in the ground and developed and installed temporary monitor wells and followed all proper quality assurance, quality control for sampling,

and decon equipment and things like that.

Q. And it's the water samples from those wells that you utilized to base this report on?

A. Correct.

Q. Does this report tell us exactly where those wells are located in the San Juan Basin?

A. No, it does not give the exact locations. We have that in our file.

Q. We could get that from you to see exactly where they are located within the Basin?

A. Sure.

Q. If I looked at your proposed Rule 7(A), it talks about variances to discharge prohibition and reads, "The director of the OCD may administrative approve a variance to the discharge prohibition if the discharger can demonstrate that, 1) the discharge site is located outside the boundaries of the vulnerable area." Do you see that?

A. I think you're referring to the January 7th memorandum?

Q. Yes, I am, and it's the paragraph numbered 7 on that, and it's the subpart A and Roman numeral I below that.

A. That's correct. That's in the January

7th memorandum.

Q. The reason for this question is, if I read this, I understand an operator ought to file a closure plan with you, and then he may be exempted from that if he shows that it's outside the boundaries of the vulnerable area.

My question is: Does that mean what we should do is file a closure plan for every well and then come back for a variance?

A. No. I think that's why we removed that provision in the exhibit that we presented today, because that was a point of confusion among the operators.

Q. Now, if we go one step beyond this, your exhibit today is still in the form of a recommendation, is that correct?

A. Correct.

Q. Have you started developing an actual rule that we could look at that would be the rule that would be proposed to implement your recommendation to the Commission?

A. We have not made a proposed rule. That's what the Commission does.

MR. CARR: May it please the Commission, questions like this, that in

paragraph 7 of the recommendation attached to the January 7th memo appears to contain a wording change or wording that may be confusing, and for that reason, if it is possible to have proposed rules before the March 12th hearing, I think a lot of things like that could be addressed at that time which might avoid having to come back to you at a later date, and try to clarify things.

I think what we have here is a source of confusion that is being corrected, but it's still in the form of a recommendation. If it is possible, we would request that at least initial preliminary rules be circulated so we would have an opportunity to just avoid something like that surviving until the rule has been adopted and then having a problem.

CHAIRMAN LEMAY: I would suggest that the Bureau submit a memorandum of proposed rules rather than just recommendations. Isn't that what you're saying, Counselor?

MR. CARR: Yes, sir.

MR. STOVALL: I would like to address that when I get back into redirect.

Q. (BY MR. CARR) Now, Mr. Olson, the

docket for this case and also the legal ad, talks about what we're about here today. One of the things it says is to establish a special protection area of Lindrith, New Mexico. Is there anything in your proposal that still addresses that, and why or why not?

A. We had removed that, I believe you'll see it on the January 7th memorandum. The reason for that was, we feel that the wellhead protection area that we had proposed would cover those additional areas outside the proposed vulnerable area expansion.

Q. Am I safe in assuming that we're not going to be seeing, between now and March 12th, some special provision that is focused just on Lindrith?

A. No, we are not.

MR. CARR: That's all I have.

CHAIRMAN LEMAY: Do yo have a quick redirect, Counselor, or are you going to wait until all the--

What I want to do is take a break now because I don't think we'll be able to finish up by 1:00..

MR. STOVALL: In the sake of

efficiency, I'll do it after all cross is finished. Then I can go through everything at once, rather than responding to sets of cross.

CHAIRMAN LEMAY: Fine. Let's do that. We'll take a break and resume at 2:30. Again, my apologies. This is not something I could have avoided. I would have if I could have. We'll reconvene at 2:30.

[The noon recess was taken.]

CHAIRMAN LEMAY: I apologize for the delay.

We'll continue with the cross-examination. Mr. Kendrick, for New Mexico Oil & Gas Association and Amoco Production Company.

CROSS-EXAMINATION

BY MR. KENDRICK:

Q. Mr. Olson, if you could refer to your Exhibit 6, it's the study that you prepared that's the basis of the OCD recommendations.

Could you tell me what the depth to ground water was in the various wells or the various pits that you studied?

A. It's listed in the table. It varied from--actually, there was one site that was

shallow in 10-foot criteria, was six foot, and one was on the margin. Others were in the 10 foot, I believe, 35 foot.

Q. The deepest I saw was 31.5?

A. Okay. That sounds good. 31.5?

Q. Yes. Did you ever have occasion to study contamination from unlined pits where ground water was deeper than 31.5 feet?

A. In this study we didn't, no. We had availability of just using hand-augering since we were with limited funds, and the deepest we could hand-auger was about 28 feet.

Q. It looks like this particular report--

A. That well was actually drilled with a drill rig. We borrowed a drill rig for a few days from the environmental department, and that was of the ones that was drilled with a rig.

Q. So you have not found in this study any contamination from unlined pits where ground water was greater than 31.5 feet below surface?

A. Not as part of this study.

Q. How about another study?

A. At this point I couldn't say. I would have to review back through our files to see if we had any other information on pits that had

deeper ground water than that.

Q. So you're saying to your knowledge right now, you have no evidence of contamination from unlined pits hitting the ground water where the ground water is more than 31.5 feet below the surface?

A. Not unlined production pits. There is the Lea Acres landfill, of course, which was in the range of 50 feet to ground water.

Q. But we're focusing on production pits today. You don't know of any studies done on pits that were more than 31.5 feet?

A. Not on production pits.

Q. Of these 13 pits, what was the depth to ground water that was the deepest that was affected by contamination?

A. I believe it was the site looking at 31.5, which is looking at low-level contamination at that site.

Q. In your testimony, you made the comment that you would recommend that pits outside the vulnerable area be covered by the order if they contribute to contamination to the vulnerable area, I guess, through some kind of seepage.

How is an operator to know, if his

unlined pit is outside the vulnerable area, how is he to know if he's affected by this proposed order or this recommendation?

A. Well, effectively they wouldn't. I think that's why we recommended registering pits outside the vulnerable area that receive greater than five barrels per day so we could evaluate those pits to see if we're having impacts upon the expanded vulnerable area.

Q. If your unlined pit is outside the vulnerable area, your only requirement is to register it if it receives more than five barrels per day of fluids?

A. That's correct.

Q. About this registration requirement, I think I understood you to say that you're only talking about unlined pits in the San Juan Basin outside the vulnerable area. Only those pits have to be registered, is that correct?

A. That's correct.

Q. Referring now to the closure plan that has to be submitted, is it true that if an operator has numerous unlined pits, perhaps in the hundreds or thousands, that you would give that operator a number of years to phase-in the

closure of those pits?

A. That's likely. They couldn't physically do it in one or two years. That's why I think we've given those type of options that a closure plan will be submitted and that the operator provide a schedule for implementation, that would be subject to approval and would involve some negotiation as to what is an appropriate schedule. If it's a lot of pits, it ultimately is going to take a period of time to do.

Q. That period of time could be many years if an operator has hundreds of pits?

A. It could be.

Q. Now, in terms of the pits that have to be closed, I assume that you're talking about the pits to which discharges are prohibited under this proposed order or recommendation?

In other words, you aren't going back years to pits that ceased to operate years ago? You're only focusing on those pits that were being used and that now must stop being used because of this recommendation, is that correct?

A. That would include pits that were--I would think it would be reasonable to include

pits even up through January 1, 1991, if they were done not in accordance with the Division.

If people were trying to close pits to evade the regulation, I think those should be assessed to determine if they're posing a threat to ground water.

Q. You view January 1, 1991, as kind of a cutoff? If a pit was closed off after that date--

A. I think that's reasonable, since that's what most of the recommendations and discussions on this have been up through this last year.

Q. That would be the pits that were closed, to which discharges ceased after that date, would have to be closed according to your recommendations?

A. That were not closed in accordance with Division policy at that time.

MR. KENDRICK: Okay. No further questions.

CHAIRMAN LEMAY: Thank you, Mr. Kendrick.

CHAIRMAN LEMAY: Mr. McCord?

MR. ROBERTS: He has no questions.

CHAIRMAN LEMAY: Ms. Revelt?

MS. REVELT: No questions.
CHAIRMAN LEMAY: Mr. Thompson?
MR. THOMPSON: No questions.
CHAIRMAN LEMAY: Mr. Geven?
[No response.]
CHAIRMAN LEMAY: Mr. Meiklejohn, do you care to step forward?

CROSS-EXAMINATION

BY MR. MEIKLEJOHN:

Q. Mr. Olson, I'm Douglas Meiklejohn, an attorney with the New Mexico Environmental Law Center, and I'm representing Southwest Research and Information Center.

MR. VERQUER: Mr. Chairman, we can't hear.

MR. MEIKLEJOHN: I'm sorry, I'll try to speak up.

Q. I'm Douglas Meiklejohn. I'm a lawyer with the New Mexico Environmental Law Center and I represent Southwest Research and Information Center.

Mr. Olson, when you worked for the State Environmental Improvement Division, did you have any contact with clean-up of ground water projects involving clean-up of ground water?

A. Yes, I did.

Q. Mr. Anderson testified earlier about one clean-up that he's aware of in which the cost, he said, was between $200- and $250,000 thousand dollars. Do you recall that?

A. Yes, I do.

Q. Does that figure sound reasonable to you, in terms of what's required to clean up ground water?

A. It could even be a low figure, actually, depending on the magnitude of the contamination.

Q. Do you know what the projected cost of cleaning up ground water from the Lea Acres site is?

A. I don't know. They spent in the range of $5- to $6 million on investigation so far, as I understand it.

Q. Is it possible, in your opinion, to clean up ground water completely once it has been polluted?

A. That would depend on whether the contamination was due to just a purely dissolved phase product, dissolved phase water, or if there was an actual product involved.

If there's a product involved, you're going to get sorption onto the soil matrix and oil trapped dead-end pores that are continually going to bleed off levels of dissolved phased contaminants. So, in that case, it's likely that you never will achieve, at least, back to the original state.

Q. You discussed in your direct testimony the wellhead protection zone, and I believe you indicated that a reason for requiring protection of wellhead areas is that the wells present a conduit to ground water, is that right?

A. That's correct.

Q. Isn't another reason to protect those areas because the wells provide drinking water?

A. That's correct.

Q. What percent of drinking water in New Mexico comes from underground water sources?

A. As of last year, 90 percent of drinking water in the state is supplied from ground water.

Q. In the study that was done or the work that was done by the Long Term Study Committee leading up to this proceeding, were there industry representatives involved in that committee?

A. They were involved in all the committee meetings.

Q. Did they have an opportunity to provide the Division with data concerning the economic impact of what the Division was considering?

A. I believe there was opportunity that occurred over a period of years. I would say they had that opportunity, I guess.

Q. Was there ever any indication, that you know of, to those industry representatives, that providing such input would be inappropriate?

A. Would you repeat that?

Q. Was there ever any indication by the Division that the industry representatives in those committees should not provide input on the economic impacts of the Division's or the Commission's actions?

A. There was never--no one ever offered any direct figures, I know that, at any of the meetings. There were concerns about some impacts for scheduling, on the schedules we proposed, and whether or not things could be done at that time. No actual economic figures were ever provided.

Q. Did the Division at any time tell the

industry that it could not present such figures?

A. No.

Q. There was a question posed to you in cross-examination earlier about whether any studies have been conducted on loss of resources and on loss of revenue to the State of New Mexico in the form of taxes and royalties.

Did any industry representative ever provide that sort of information to you or the Division?

A. That was never provided to the Division, to my knowledge.

Q. In cross-examination, I believe Mr. Kendrick asked you about the greatest depth at which the Division has found contaminated ground water. Do you recall that?

A. Yes.

Q. That was a depth of 31 and a half feet?

A. During the study.

Q. During the study. During the study, did you examine ground water that was at a greater depth than that?

A. We weren't able to because we didn't have access to drilling equipment, except for one site that we looked at.

Q. So your testimony is not that there has been no contamination of ground water below that level, but you have not examined ground water below that level?

A. That's correct.

MR. MEIKLEJOHN: I have no further questions at this time. We would, however, reserve the right to question Mr. Olson further at the hearings in March.

CHAIRMAN LEMAY: Fine, Mr. Meiklejohn. He'll be available. Stay healthy. At this time, are there any of my fellow Commissioners who would like to ask questions? Or is there anyone else that would like to ask a question of the witness?

Commissioner Bailey.

CROSS-EXAMINATION

BY COMMISSIONER BAILEY:

Q. You mentioned that the EPA has a wellhead protection regulation. Do their regulations not cover the situation that you do want to cover now?

A. I'm not fully aware of their entire regulations. I know the state was, the environment department was working on developing

a wellhead protection program in cooperation with EPA at the time I left the EID environmental department. I don't know what the result of that was.

Q. Was this thousand-foot radius taken from the EPA wellhead protection regulations?

A. No, it was not.

Q. Okay. On Exhibit 11, the schedule for implementation, is that a result of a consensus of the Long Term Committee or is that something strictly based on the OCD decisions?

A. This is based on input from the committee meetings, but it is OCD's recommended schedule.

Q. So industry did have an opportunity at the Long Term Study meetings to have some input on this one-year, two-year, three-year?

A. Yes, they did get to comment on it, but we felt it was our recommendation to make, and that's why it goes as our recommendation at that point.

Q. On Exhibit 13, the variances, let's look at that one. I have a lot of questions on that one.

For clarification, if a company cleans

up their discharges to standards good enough for stock water, that does not comply with your regulations for variances? It has to be cleaned up to human health standards?

A. We've had circumstances before where we've had applications for stock water, and those I believe we treated as applied to New Mexico Ground Water Standards.

Q. Which are human health standards?

A. Which are the standards given in Exhibit 10.

Q. I notice letter B on this, "the discharge location will not be affected by the discharge" instead of "be further degraded by the discharge." Does that mean that if the existing water is not up to these standards, that it still has to be cleaned up to those standards? any produced water or any discharges?

A. Are you talking about the water is already--

Q. If the water is already degraded.

A. --degraded? We would also rely on the New Mexico Water Quality Control Commission regulations, that you cannot degrade any further from that point.

Q. It's not actually "be effected," it would "be further degraded"?

A. Unless it was already below standards, then you would look at that you could not raise it above standards unless it's already above standards. And if it was above standards, you couldn't degrade it any more than it already currently is.

Q. Okay. The issue of dissolved natural gas in the water will not be part of the standards?

A. There is no standard for methane in drinking water as a human health hazard.

Q. So they can clean it up to these standards but still have a large percentage of dissolved natural gas and would still comply?

A. That's correct, because most likely that would not be due to the pit operations but would be due to leaky casing connections from other types of wells.

Q. Does OCD have staffing to be able to cope with these regulations as put out?

A. It will be very time-consuming and it will put a burden upon staff to enforce regulations. There's no doubt about it.

COMMISSIONER BAILEY: Those are all of my questions.

CHAIRMAN LEMAY: Thank you, Commissioner Bailey. Commissioner Weiss.

CROSS-EXAMINATION

BY COMMISSIONER WEISS:

Q. Could you tell me a little more about this one case of contamination that cost $250,00 to clean-up? Was it a pit?

A. It was contamination resulting from a dehy pit.

Q. And was it before or after or during Rule-7940?

A. I believe this occurred about the same time as the original order. I believe it was first discovered in about, I guess, 85 or 86.

Q. And this thousand-foot radius, does that have anything to do with how far these contaminants travel, or where did that come from?

A. We basically used this exact example, which was approximately 300 feet away from a public water supply well, and thought we added a safety factor, say a thousand-foot to potentially add enough of a safety margin for protection.

Based upon we knew that we had ground

water contamination from a low-volume dehy pit that was 300 feet from a water supply well.

Q. Low volume is five barrels a day or something?

A. Or less.

COMMISSIONER WEISS: That's all the questions I have. Thank you.

CROSS-EXAMINATION

BY CHAIRMAN LEMAY:

Q. Mr. Olson, on your 13 test auger holes, were they all in the alluvium or did you get any bedrock water table analyses?

A. No, they were alluvium; sand, silt, gravel, clays.

Q. Do you have any evidence in your study to indicate that if there was pollution, then, the water table was in the bedrock, that the pollution or the pit would contaminate the water table in the bedrock?

A. If there was no shallow ground water, I guess?

Q. Well, if the ground water itself was bedrock, I'm thinking of generally the northern area of Animas, from--not Lea Acres, but--

MR. STOVALL: Cedar Hill?

CHAIRMAN LEMAY: Cedar Hill. Thank you.

Q. --where I think the water table does become into bedrock as it goes into Colorado.

A. We didn't have any equipment to actually access those waters. Actually the concentration and study was on the shallow alluvial systems.

Q. Just one other question. Have you made any calculations at all about the volume of additional water that would have to be disposed of in the event your recommendations were adopted?

A. No, we haven't, but it will significantly increase the volumes. Those waters will be lost into the ground.

Q. I was thinking in terms of volume of water and whether these disposal facilities were available to handle those additional volumes present?

A. At this time they may not, with the current facilities. The options are there for operators to apply under Order R-7940(A), to operate their own facilities as a centralized facility, which some companies already do operate

their own facilities for these programs.

CHAIRMAN LEMAY: Any additional questions of the witness? Yes, sir. Mr. Bayless?

CROSS-EXAMINATION

BY MR. BAYLESS:

Q. Shortly ago you were asked the percentage of people in New Mexico that receive their drinking water from wells. You gave an answer in a statewide population.

It would seem more pertinent for you to respond to the San Juan Basin, what percentage of people receive their drinking water from wells?

A. Well, the San Juan Basin, if you're looking at the Aztec, Farmington area, Bloomfield, most of those waters are supplied by surface waters. If you get outside those areas proper, most of the water is supplied or will be supplied by wells, such as the Lindrith area and a lot of other areas throughout the proposed expansion.

Q. I really would like to hear a percentage of what you estimate in the population. I heard an estimate for the state so I presume you have an estimate for the area

you're addressing?

A. I don't have an estimate for that particular area. Outside of the river valley itself, I would say essentially 100 percent of the people, just about, rely on wells, since they don't have the availability of city-supplied systems.

Q. I think you misunderstand my question. You discussed the population and addressed the three population centers of the San Juan Basin and said those people receive their water not from wells. So I presume you're driving to the point that the percentage of people in the San Juan Basin that receive their water from wells is minute?

A. No. The percentage of people in, say, Bloomfield, Aztec and Farmington, the bulk of the water is received by surface water delivery systems. There's still a lot of people with private wells. The Lea Acres area, all up and down through Aztec, Cedar Hill, and there are a lot of private wells also in the river valleys. An exact percentage I don't think I could give you.

CHAIRMAN LEMAY: Additional questions?

Yes.

CROSS-EXAMINATION

BY MS. REVELT:

Q. This is a clarification. When you were talking before you indicated that you felt that by January 1, 1991, all pits closed since that time will have to go by these new regulations. Did you mean January 1, 1992?

A. No, I meant January 1, 1991.

Q. Because during our meeting, I think the meeting in August, wasn't that the first time, in August of 1991, that those regulations were first put out or were first talked about?

A. They have been talked about for quite a while. There have been discussions among individual operators, when we had inspection sites and that over the last year. Whether they would actually need to be closed pursuant to those regulations--if they were closing pits pursuant to OCD action or overview at that time or approval, they would not be required to be any different than they are now, since they were approved pursuant to Division policy.

I think what we're trying to get at is looking at any people who were looking at trying

to close pits quickly to try and evade the regulation.

CHAIRMAN LEMAY: Anything else? Mr. Stovall, do you want to wrap it up with redirect?

MR. STOVALL: I would like to. And some of these questions will be scattered because I made my notes as people went through their cross-examinations.

REDIRECT EXAMINATION

BY MR. STOVALL:

Q. Let me first focus on your study, Mr. Olson, and make sure it is clear what the study is. I've forgotten the exhibit number on here.

A. It's Exhibit 6.

Q. Was it 6? Okay. All right. I'll take your word for it in a moment.

Am I correct if I say that the purpose and the result of that study was to determine whether or not small volumes of produced fluids discharged onto the ground can, in fact, contaminate ground water?

A. Yes, that was the purpose.

Q. And your study, you have testified that due to limited resources, primarily because the

Division was actually funding the work at the time that resulted in this, that limited resources prevented doing some of the things that perhaps you would like to have done in terms of further depths or broader aerial extent, is that correct?

A. That's correct. Actually it was funded under the Clean Water Act, Section 106. That was grant money to the State of New Mexico for the study.

Q. We've had a number of questions in cross-examination talking about, you conducted this study in a relatively small number of sites in a relatively small geographic area, yet we're proposing some sort of rule-making that applies, essentially, to the entire San Juan Basin.

The implication or the question is that your study does not confirm the presence of ground water in all the areas proposed to be included in the vulnerable area, does it?

A. That's correct.

Q. Now, in making a determination with respect to what the Division wants to recommend with respect to protection, it seems to me there are two approaches that the Division can take and

that the Commission can take, for that matter.

One approach is to say that unless there is a demonstrated need for protection, that is, a demonstrated presence of ground water or fresh water supplies--and I might add that since the study was begun, the statutory responsibility has expanded to include public health and the environment, but the focus has been on ground water, has it not?

A. That's correct.

Q. You could take the approach that unless there is a demonstrated need for protection, the protection will not be required? In other words, if the Division were to require some protective measures, they would have to show that ground water was present.

The other alternative would be for the Division to say, We are going to require the prevention of potential contamination unless it can be shown that there is no need for that protection; that is, either there is no water to be protected or that there are other ways--for example, talking about water being in the bedrock, that the natural geologic conditions will protect it or that the condition of the

produced fluids would reduce the need for or eliminate the need for a no-pit-discharge situation.

Do you understand what I've said so far? I've rambled a bit.

A. Yeah.

Q. What is your opinion as to which approach the Division is recommending? Are we recommending no protection unless a demonstrated need, or protect unless a demonstrated lack of need?

A. We are recommending to protect unless there is a--unless it's demonstrated that it would not be afforded protection because it is unwarranted, because there is no ground water that will be affected. This is due to, we have a mandate under the Oil and Gas Act to protect ground water. We think the conservative approach is warranted.

Q. If, in fact, the Division took the other approach and said, We won't require protection unless we know water is there to be protected, what would that require in terms of Division resources to go through that process?

A. Actually, I don't think the Division

could assess those types of sites because they wouldn't have the resources to evaluate whether or not there was ground water. The burden of proof would be upon the Division to prove that there is ground water at those locations in order to provide protection for it.

Q. Based on historical experience in terms of enforcement and clean-up and things you've had to deal with, isn't it true that in fact what you do, you find out there was water there when somebody's water got contaminated?

A. That's the likely scenario.

Q. The reason the Division is suggesting a vulnerable area definition as it is, is because it has a responsibility to protect water, and the way to do that is to protect possible sources of water and then to eliminate that need for protection if it can be demonstrated there's nothing to protect?

A. That's correct. And that's the way we've operated in the southeastern part of the state also.

Q. Within the statutory structure, is the requirement to protect water some sort of conditional thing, or is it evaluative or

comparative resource evaluation, or is it an absolute requirement?

A. It's an absolute requirement under the Oil and Gas Act.

Q. If the Division did not adopt the sort of proposals that are being proposed today, would an operator's obligation with respect to ground water protection change in any way?

A. No. An operator is still obligated to operate in a manner that they will not contaminate ground water, irregardless of where it's located.

Q. I think we've already discussed the fact and it has been emphasized over and over again, and we'll say it again, it's repetitive, that prevention is much less expensive than remediation, is that not correct?

A. That's correct.

Q. Now, with respect to talking about economic impact, because obviously that is a concern and I don't think the Division is not aware of that, the Division is very cognizant that there is an economic impact, but is the Division in a position to make detailed and specific economic evaluations?

A. I don't believe the Division is in that position. I think only the operators could provide that type of information.

Q. Why is that?

A. They know what they've got out in the field. They know what it's going to cost them.

Q. Those economics can vary from company to company, can't they?

A. That's correct.

Q. I think Mr. Meiklejohn asked you, have companies been discouraged from presenting that sort of economic analysis to the committee and to the Division?

A. No, they have not. We had only one estimate that I know of actually that I believe included estimated costs.

Q. Is that the one we talked about for?

A. And that was not a total dollar figure. That was the one we talked about before, the $1,000 estimate for tankage pit replacement.

Q. And then the Division, of course, with conversations had in this room today, we realize that's probably a low figure?

A. It could be.

Q. The other side of the economics is what

is the impact on the revenue picture and how does it affect the ability of those wells to continue to produce. And the Division has no way to evaluate that kind of economics, does it?

A. I don't believe so.

Q. Again I apologize for skipping around, but with respect to the sites that were selected for the study which resulted in your report, was there any input into the committee or at least a review of those sites by the committee in the early phases of its work?

A. Yes. In 86, when we were first beginning the site selection process, we reviewed the criteria we were using for selecting sites through the committee, and it seemed to be the agreement that that was a good way to approach the problem.

Q. Recognizing that a lot of work was done with basically public dollars through the grant you've talked about, were there any suggestions at any time, through the committee or by industry representatives, that additional studies should be conducted? And any effort made or recommendations as to how to fund those studies?

A. I can't recall any.

Q. I want to talk just a little bit about the committee process and the way it's worked. Perhaps to put it in some sort of context, are you familiar with the process for adopting regulations used by the federal government and the federal administrative agencies?

A. Not entirely. They're usually looking to get as much input as possible through comment, and then develop a regulation. The specific process itself, I don't--

Q. Let me say for the record since this is a rule-making hearing, a comment I believe that the federal process, as I understand it, is certainly much more rigid.

There's a notice of proposed rule-making published in the Federal Register, and then comment periods, then possibly formal hearings and then comment periods. It is a considerably more rigid process.

Is that the type of process that the state uses, to your knowledge?

A. No. We look to be as pretty much flexible as possible in accommodating everyone that needed to be--had a concern to be addressed.

Q. With respect to the specific efforts of

this committee, there's been some questions about what did OCD do with respect to the comments and input.

Let me first ask you: What method was used for interested parties to have input into both the committee work and the OCD recommendations?

A. Would you say that again?

Q. In other words, was it a formal process or was there a variety of means for interested parties to get information to the OCD and to the committee?

A. They could contact us by phone, they could submit written information, come in and meet with us. It was very informal.

Q. Again, if I compare it to, say, the federal process, very often you'll see in the federal process publication that six comments were received suggesting this, three suggesting this, and then there's documentation.

The OCD does not, at the present time, operate in quite that rigid a structure, is that correct?

A. No, we don't operate in that structure.

Q. I think Mr. Roberts expressed some

concern about, you know, was the industry input, did it become a part of this.

In these meetings themselves, and particularly just in the meetings in 1991, were comments received at that time and discussed and ideas discussed with industry?

A. There were comments. Particularly at the October 30th meeting there were a lot of comments about closure and requirements and implementation.

Q. Those comments, did they focus on the closure requirements rather than the broader general requirement of no discharge, is that correct?

A. Most of the comments that we have received have focused on closure. There have been comments on the scheduling and variances, but the bulk of the comments have been involved with the guidelines, the closure guidelines.

Q. One of the more significant mechanisms for getting input into the process has, in fact, been the means?

A. That's correct.

Q. And the method of advising industry of the fact of these meetings and the ongoing

activity, was not direct notice to each individual company, is that correct?

A. That's correct.

Q. But through the trade associations to which most of the producers in the state belong?

A. That's correct. And as people would contact us expressing an interest in receiving any documents, we just put them on the list and they received them after that.

Q. Now again, the OCD often functions through committee activities to come up with proposals. In fact, in many rule-making proceedings, when I stand up here and question a witness, I'm questioning the witness who is a representative of the committee who is making a recommendation. Are you aware of that?

A. Yes.

Q. Is that the situation in this case today?

A. No, it's not. These are OCD's recommendations. We felt with the wide-ranging groups we had and the varying interests, that we would not get a committee consensus on all issues involved, and made it clear at the meetings here in September--actually in August, excuse me, and

in October, that these were OCD's recommendations, and that we would look to get comments to see how we could modify our proposals and make them more workable.

Also, if they had specific concerns that they didn't feel we were addressing or they didn't agree with, that they could present those at the hearing.

Q. Which is now what we're doing and why we've granted a continuance?

A. Which is what we're doing today.

Q. In your opinion, was there an attempt by the OCD to try to push something through--how do I say this--to be heavy-handed in its approach?

A. Not at all.

Q. We recognize there will probably be some comments and suggestions and additional testimony which will help the Commission formulate the final rules which will come out of this process, is that correct?

A. That's correct.

Q. It's really a mechanical decision that the committee was going to have trouble reaching a consensus, as you say, because of a broad

variety of interests to be served, so it was used more as a format to input into OCD to help it formulate its recommendations?

A. To formulate OCD's recommendations.

Q. Now, in some of these discussions, are you aware that the OCD has requested suggested language with respect to some specific concerns on proposed rule-making?

For example, with respect to timetables and implementation, has the OCD suggested that operators submit suggested language as the suggestion that has been made that we put out suggested rules or proposed rules?

A. I'm sorry. What was that again?

Q. Some of the issues that the operators have been concerned with, some of them have to do with--I think Mr. Carr asked a question about what is the actual proposal, and he has suggested to the Commission that proposed rules be put out. Do you remember that discussion this morning?

A. That's correct.

Q. Has the Division not also requested that operators suggest some language which might be incorporated into proposed rules, at some of

the committee meetings?

A. Yeah, we've suggested that at committee meetings that if they have concerns that we're not addressing, they should introduce that language at the hearing.

Q. Would it not be appropriate or operators to do that in the course of this hearing, to make suggestions for proposals?

A. That would be appropriate.

Q. Even before the Division puts out some suggested rules, to help us incorporate those into the rules?

A. Sure.

Q. We talked about the applicability of the rules in the vulnerable area. The mapped area doesn't limit the definition of the vulnerable area, but in fact it applies through the San Juan Basin.

For the purpose of the rule, can we identify that as being the area that's under the jurisdiction of District III of the Oil Conservation Division?

A. Yes.

Q. That would basically be San Juan, McKinley, Rio Arriba and Sandoval Counties?

A. Yes.

Q. So they could rest assured that there is no vulnerable area outside that four-county area, is that correct, under this present proposed rule-making?

A. Under this present proposed, yes.

Q. Mr. Kendrick asked you some questions about pits that are not being used any more. I just want to clarify this to make sure we're all clear as to what your recommendation is, let's talk first about pits which are open, they have not been closed, but are no longer being used.

Is it your recommendation that those should be included within the closure plan that a company submits for the closure of those pits which are open at this time, even though they're not being used?

A. Yes.

Q. Okay. So anything that is still a depression in the ground that was used for discharges in a well is an open pit and needs to be included in a closure plan?

A. That's correct.

Q. The other aspect of what you were talking about, if I'm not mistaken, are pits

which operators have closed, that is, filled up with dirt or whatever. You're suggesting that any pits which have been closed since January 1991, which closure has not been approved or reviewed by the OCD, should be included within the scope of this rule?

A. They should somehow be assessed to see if they were closed properly, if it wasn't done in accordance with Division policy at that time.

Q. When you say "closed properly," what you're really talking about is determining if there were any contaminants left in the pit that might contaminate fresh water, is that correct?

A. Yes.

MR. STOVALL: Mr. Chairman, I don't believe I have any more questions for Mr. Olson at this time.

This is an OCD recommendation, and we certainly expect and welcome other recommendations or modifications to it.

Before you came back, I addressed the group and we talked about the process of building the appearance/mailing list in this hearing. I think we've got a sign-up list in the back which anybody who wishes to be on the list can sign or

they may send their appearance in within the next 10 days. On January 26th there will be a list published, which is the official mailing list for this hearing. From that point forward, anybody sending anything with respect to this case, it should go to all parties on this list.

That's the official list. Not to say you can't get on it later, but you're not assured of getting everything if you get on it later. That's the purpose of that. Once again, there is a sign-up list in the back for anybody that wishes to participate in that.

One other administrative matter, well first, first, I should give anybody a chance to ask questions if they would like to.

CHAIRMAN LEMAY: First I would like to maybe excuse the witness.

COMMISSIONER WEISS: I have one more.

CHAIRMAN LEMAY: Have you? Okay.

RECROSS-EXAMINATION

BY COMMISSIONER WEISS:

Q. What's the surface area of the vulnerable area?

A. I think we looked at, after we had this entered in the database system and eliminated

duplicates we had through some of those unit letters, I think it was involved with something like 62,000 unit letters. That's 40 40-acre tracts.

COMMISSIONER WEISS: Okay. Thanks.

CHAIRMAN LEMAY: Any other questions of the witness? He may be temporarily excused.

Now, I think we have one statement or--

MR. STOVALL: I have a number of people who have asked me about as far as presentation of statements. My suggestion to the Commission would be that the parties be allowed--my preference is, if they have a written statement that they submit it in writing and not read it into the record where there's a written statement, but that would be the Commission's choice whether they would allow them to read it at this time.

Again, that. That would not preclude them from presenting something at a later time.

CHAIRMAN LEMAY: There was one request early on for a statement, and I was going to honor that for some reason, maybe because she couldn't be here on the 12th. Did you want to read your statement?

MS. THOMAS: I do have a written statement, but I can merely submit it. I don't have to read it.

CHAIRMAN LEMAY: Certainly the record will be open for statements. Did you want to address some procedural issues?

MR. STOVALL: Also during the break I told some parties that I would address this with you. Apparently the Commission failed to consult school calendars when they set their schedule, and reasonably so because you didn't know this was going to be going on, but it appears that the March 12th hearing date is the public school vacation day in both Santa Fe and in Farmington, which are two of the largest affected areas. A number of parties have got vacation plans with their kids.

[Discussion off the record.]

MR. STOVALL: It was my understanding that people had some travel plans from Farmington, is that correct? And we're talking about not just one or two parties. It's my understanding there are several parties who have plans.

They have suggested to either

reschedule that Commission hearing or go to the April 9th hearing. I think As far as the Division is concerned, we would yield to the Commission's pleasure and wouldn't want to obstruct that. I told them I would deliver the message rather than having a bunch of people stand up.

CHAIRMAN LEMAY: I've received one request. Just to give us an idea, those that can't make it on the 12th, could you raise your hand? How about April 9th? Any of you can't make it on April 9th?

MR. MEIKLEJOHN: Mr. Chairman, in light of the data that has been gathered by the Division and in light of the threat to resources, we request that if the hearing is not going to be held in March, that it be held in February and that it not be moved back to April.

[Discussion off the record.]

CHAIRMAN LEMAY: I hear you. I also recognize that February is really not enough time to get all this together; March being a month where there are lots of travel, I would like enough input to this hearing process. We are balancing a lot of things, and I hear you. I

know we've had this but I guess we're talking about something less than 30 days where this process has been going on five years.

I would rather have all the input that we can, so consulting with my fellow commissioners, we will change the hearing date to April 9th for continuance of this case.

MR. STOVALL: Mr. Chairman, I think if there are any questions at this time as far as procedure, we've talked about the 10-day appearance. I think the next thing is, if anybody would like to have any sort of group discussion on the thing, I think we've agreed that that is appropriate, and I would suggest that Bill Olson will be the lead person on this and that can be coordinated through him. That of course doesn't preclude industry folks getting together on their own and having their discussions. But if you want to have some informal input.

As far as making actual recommendations, the Commission has indicated they would like to see, at least, some proposed rules. The question I would have, I would like to say no sooner than 30 days, because if

industry would like to have input into those, maybe we could do some things.

If we got a preliminary draft of proposed rules out in 30 days, and industry can let us know if they want to get together and discuss those and submit some comments?

CHAIRMAN LEMAY: I think to broaden that, not only industry but anyone who is interested.

MR. STOVALL: Interested parties. When I say "industry," I do mean interested parties..

CHAIRMAN LEMAY: Mr. Meiklejohn, did you have another comment?

MR. MEIKLEJOHN: I wanted to address another issue.

CHAIRMAN LEMAY: We'll let Mr. Stovall finish up, and I'll ask you for the issue you would like to address.

MR. STOVALL: And then I would suggest, as the Commission has suggested, that sometime prior to the April hearing that we have an indication from people what they intend to do at that time. Hopefully we can iron out many of the issues and concerns between now and then.

CHAIRMAN LEMAY: Might I suggest that

this extra month or less than a month be used constructively so that where there are disagreements that there can be some discussion and hopefully resolution of those disagreements.

Recognizing the process has been a little bit different this time than in the past. We've not had an "industry committee" to make recommendations, but I think there are reasons for that. I think Mr. Olson's testimony indicated there were certainly not any unanimous feeling about the rules and regulations that would come out of it. It wasn't the idea of trying to compromise various positions.

At this point I think we can talk a little more than we've done in the past, at least those of you that are involved and have a stake in this thing. This is an open-door policy. We have our people available. Hopefully those not only on the committee but those who have had an interest in this hearing, will become part of the informal process between now and when we hear the case on the 9th.

MR. STOVALL: With one exception, Mr. Chairman, that members of the Commission are not available for discussion.

CHAIRMAN LEMAY: We have not been up to this point and we will not be. Yes, sir.

MR. MEIKLEJOHN: Yes. We have a concern about the proposal for the mailing list in this matter. Southwest Research and Information Center is a nonprofit organization and we're not in a position to provide a large number of copies to everyone who is interested in making a statement or otherwise participating in this hearing.

My understanding of the Commission's rule is that entities wishing to be a party in the proceeding will be required to file a notice or statement of intent to present testimony by the Friday preceding the hearing. We did that, and I do not know whether other parties did not.

CHAIRMAN LEMAY: That's not a rule. What we did was adopted that standard so that we could to be more organized in our presentations. We've always allowed parties participation in our hearing process even though they did not file a statement of appearance.

So, although you're partially correct in saying that that was requested by the Commission, it's never been a requirement for

participation.

MR. MEIKLEJOHN: In any event, on the issue of the mailing list, we request that the mailing list be limited to a requirement that participants mail their submittals to other participants in the proceeding, that that be limited to those entities that are going to present technical testimony and possibly exhibits in the Commission hearing in April.

We're simply not in a position to produce a large number of exhibits, to mail them to all of the people in this room simply because they happen to put their names on a sign-up list.

CHAIRMAN LEMAY: Is there some discussion of that?

MR. STOVALL: My only comment on that, and I do understand Southwest Research's situation, the Division is, unfortunately, in the same situation. A question was asked earlier whether or not we have the reresources to do this. I guess I would have to ask Commissioner LeMay, since he was at the budget hearing.

CHAIRMAN LEMAY: No, we don't. We don't have any resources.

MR. STOVALL: My response to that would be, Mr. Chairman, the purpose of that list and the requirement of communication is to have as open a discussion as possible. As soon as you start saying because one group, the Independent Petroleum Association is a nonprofit group and they function off of budget and contributions, they would be faced with that same limitation.

My recommendation is that everybody comply and this be as open a process.

CHAIRMAN LEMAY: Why don't we do this. Let's try it out. Those people that are going to present testimony will get an exchange of exhibits. The Commission will have some exhibits, and those of you who would like copies can request those copies from the Division and you will be billed, however, for reproduction costs.

Does that sound like it's a workable deal?

MR. STOVALL: I'm not sure I understood.

CHAIRMAN LEMAY: Well, as I understand it, if I'm hearing you correctly, is that those of you that are supplying testimony don't have

the resources to supply everyone that wants to get on this list with copies of exhibits. I think that list could be a notification list.

But as far as these exhibits, 165 maps are difficult to reproduce and send to 200 people. Where we can reproduce, by a xerox machine, some of the exhibits and certain people that are not presenting testimony request that, I think we can supply the manpower to copy those exhibits. Not these maps here, necessarily, but maybe some other exhibits, and bill those people for the reproduction cost, the people that want them.

MR. MEIKLEJOHN: That's fine and I certainly did not mean to suggest a limitation on distribution.

CHAIRMAN LEMAY: It depends on how big this list gets. If it's not too big, and we don't know. If there are hundreds of people on that list and there are hundreds of exhibits, it can be pretty expensive.

MR. MEIKLEJOHN: Your suggestion is fine with us.

CHAIRMAN LEMAY: Does that meet most people's needs?

MR. STOVALL: But it's uniform for everyone who is a participant, not just the nonprofit organizations, right? It applies across the board?

CHAIRMAN LEMAY: All people who are going to present testimony will have to have or should have copies of exhibits. Those that have interest in the case that aren't going to present testimony can certainly get copies, but do that through our OCD office and will be billed for the reproduction expense.

MR. MEIKLEJOHN: That's fine. And our suggestion was meant to apply to everyone.

CHAIRMAN LEMAY: It would have to. Okay. That will be the procedure.

MR. STOVALL: In other words, when they sign up, they should indicate early on, within this 10-day period, that they intend to be an active participant.

CHAIRMAN LEMAY: Actively presenting witnesses and testimony, yes.

MR. STOVALL: So at the end of the 10 days we know who that list is?

CHAIRMAN LEMAY: That's right. Is that understood?

MR. STOVALL: Mr. Chairman, one last thing, and I think most of the group knows it, but we have the entire list of operators who are affected. Those of you who have not picked up your list, come and see me afterwards and I'll be glad to do it. We ran 40,000 copies in the last two days and have killed our xerox machine quite literally, I think, so we can't help you with anything else.

But I do have those lists, one list for each company, if you want to get those. And back again on the transcript one last time, let Carla know that you want a transcript. We're not going to make them available through the Division. You'll have to get them from her. There are just too many people involved for the Commission to do that. She's going to be giving you a substantial discount, so go ahead and order the transcript if you feel you're going to need one.

MS. MARGARET ANNE ROGERS: At some point will the maps be available some place else besides Farmington? Is it possible to get copies of the maps in Santa Fe?

CHAIRMAN LEMAY: We have these here. I think we would lock you in a room and make sure

you don't take any out after you examine them. If you have a suggestion in that regard? That's a resource problem and it's very difficult to make this thing reproduceable.

The Mylars are in Farmington, and with a telephone call you could probably get those copied and sent to you here in Santa Fe.

MR. STOVALL: Mr. Chairman, one thing I would suggest the Division do, again we're going to have to look at our dollars and cents, is that we have to guard these with our lives, so to speak, and I'm going to suggest that we get a copy of blue lines off those Mylars for public use. There's no way the Division can afford to make copies available for anybody. It's going to have to be an individual company expense.

CHAIRMAN LEMAY: I think the question was: How can they become available outside of Farmington? One suggestion, a long-distance call would allow them to run you copies and send them to you here in Santa Fe and bill you for them, like anyone else who will be billed for copies. I don't know what that bill is. Has anyone checked the price?

MR. STOVALL: $2 a map.

MR. CARR: $2.50. It's cheaper if you buy the whole set.

MR. STOVALL: And I suggest you wait a few days, because we'll communicate with Reprographics and make sure they have a single, complete set that doesn't have 350 maps when we only have 165 involved in the hearing. Give us a few days to get that compiled and coordinated with them.

MS. ROGERS: When will the index for these maps be available?

MR. STOVALL: Sometime next week, probably. There will be an index. I don't know how many of you are familiar with the U.S.G.S. map system, but each map has a name on it.

For example, I took the Chimney Rock quadrangle. This is a seven and a half, is it?

CHAIRMAN LEMAY: It's a 15.

MR. STOVALL: Or a 15. They publish a grid that shows the area. What we'll do is create that and get that grid copied in the area so you'll be able to look at it and say, I know, this is the map I need. A lot of the places in Farmington and Santa Fe have got these maps.

CHAIRMAN LEMAY: Those indexes are

around. We just didn't have one to coordinate it here.

Anything else? All right. This case will be continued to April 9th.

(And the proceedings concluded.)

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) ss.
COUNTY OF SANTA FE)

I, Carla Diane Rodriguez, Certified Shorthand Reporter and Notary Public, HEREBY CERTIFY that the foregoing transcript of proceedings before the Oil Conservation Commission was reported by me; that I caused my notes to be transcribed under my personal supervision; 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 January 20, 1992.

CARLA DIANE RODRIGUEZ, RPR
CSR No. 4

NEW MEXICO OIL CONSERVATION COMMISSION

EXAMINER HEARING

SANTA FE, NEW MEXICO

Hearing Date APRIL 9, 1992 Time: 9:00 A.M.

NAME	REPRESENTING	LOCATION
W. Kellahin	Kellahin Kellahin and Aubrey	Santa Fe
Maurice Trimmer	Byram	"
LARRY Schlotterbeck	TEXACO E&P Inc.	Farmington
Buddy Shaw	Amoco	FARMINGTON
Kevin McGord	Robert L. Bayless	Farmington
George Sharpe	Merrion Oil & Gas	"
PAT FLYNN	APPLIED ENVIRONMENTAL	DENVER
Jerry Hoover	Conoco	Midland TX
JOHN PHENIX	CONOCO	OKLAHOMA CITY
DAN McCOY	Conoco	FARMINGTON
Gary Dooley	WPI	Houston, TX
Charles Vaughan	Cavaliers	Farmington
Martin Boggs	Southern Union Exp. Co.	Farmington
Neal Schaffer	WT Environmental Consultants	Farmington
Matt McEwen	NEARBURG OIL	FARMINGTON, NM
Douglas Meikleyohn	NMT Environmental Law Center	Santa Fe
GEORGE SEITTS	GIANT INDUSTRIES	SCOTTSDALE, AZ.
MICHAEL J. CONDON	GCNM / GALLEGOS LAW FIRM	ABQ
BC Cobbley	GCNM / ESI	

NEW MEXICO OIL CONSERVATION COMMISSION

EXAMINER HEARING

SANTA FE, NEW MEXICO

Hearing Date APRIL 9, 1992 Time: 9:00 A.M.

NAME	REPRESENTING	LOCATION
Ernest L. Padilla	Padilla & Snyder	SF
Steve Gregory	Unocal Corp	SF
Clay Tilness	BCG INC	SF
D. Dan DeCrowell	NMOGA	SF
Chris Shuey	SRIC	Albq.
Ron Morgan	Marathon Oil Company	Midland, TX
Michael Wallace	SRIC	Albq.
CAROL Revell	NORTH WEST PIPELINE/ WFS	Salt Lake City
TOM O'KEEFE	WILLIAMS FIELD SERVICES	BLOOMFIELD
W. L. O'Grady	Mun Tex Liberglass Tanks Co	Amarillo, TX
C.P. MEAZZO	WILLIAMS FIELD SVCS.	GRAND JCT. CO.
Denny G. Foust	OCD	Aztec, NM
Kathy Brown	OCD	Santa Fe
Chris Eustice	OCD	Hobbs
Ruth Andrews	NMOGA	Santa Fe
Roger ANDERSON	NMOCD	SANTA FE
John Roe	Dugan Prod Corp	Farmington

NEW MEXICO OIL CONSERVATION COMMISSION

EXAMINER HEARING

SANTA FE, NEW MEXICO

Hearing Date APRIL 9, 1992 Time: 9:00 A.M.

NAME	REPRESENTING	LOCATION
NEEL L. DUNCAN	BCO, INC.	SANTA FE
DERIN WARREN	MERIDIAN OIL, INC.	FARMINGTON
James Walker	Navajo Nation EPA	Window Rock, Az
Dave Boyer	KLO Brown Env-Serv.	College Sta TX
Ned Kendrick	Montgomery & Andrews	Santa Fe
Kathleen T Bowden	El Paso Natural Gas	El Paso TX
CHRIS M. SERAZIO	CERI, INC.	SANTA FE
William L. MANSKER	WTENV ironmental Cons.	ALBQ.
Dirk Van Hart	MARA Inc.	Alb.
Alan Kelton	AK Geo Consult	Alb.
Morris Young	ENVIROTECH INC	FARMINGTON
Ilyse Gold	BLM	Farmington
Durrell Tafoya	BIA	Dulce NM
Phil Scotten	U.S.F.S. CARSON N.F.	Lobernator
Terry Hubele	Mobil E&P US Inc	Midland, TX
Margaret Anne Rogers	MARA, Inc,	Los Alamos, NM
Nancy Prince	El Paso Nat Gas	El Paso Tx
Clyde J. Benally	Mobil O:1	Cortez, CO
Tommy Roberts	Four Corners Gas Prod.	Farmington NM

NEW MEXICO OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

CASE NO. 10436

IN THE MATTER OF:

The Application by the Oil Conservation Division for the expansion of the San Juan Basin "Vulnerable Area" which was established by OCC Order No. R-7940 in 1985.

BEFORE:

WILLIAM J. LeMAY, CHAIRMAN
WILLIAM WEISS, COMMISSIONER
JAMI BAILEY, COMMISSIONER

State Land Office Building
Morgan Hall
April 9, 1992

TRANSCRIPT OF PROCEEDINGS

VOLUME II OF III

REPORTED BY:

DEBBIE VESTAL
Certified Shorthand Reporter
for the State of New Mexico

ORIGINAL

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CHAIRMAN LeMAY: This is the Oil Conservation Commission. My name is Bill LeMay; on my right is Commissioner Jami Bailey, representing the Commissioner of Public Lands; on my left, Commissioner Bill Weiss.

Those of you who are here by mistake to hear Workers' Compensation claims, you can leave now.

Before we call the first case, we have some other dates of Commission hearings that we'll put into the record. Those dates are subject to change. I think the record will reflect that we've had dates established through May, I mean through June. The May date being, of course, May 21st; the June date being June 18th. These are the other dates for Commission hearings, if cases are to be heard: July 16th, August 13th, September 10th, October 8th, and November 12th.

Those dates are sandwiched in between our normal Division Thursday hearings every other week. So, there again, depending on the availability of Commissioners, those will be the dates we'll be hearing cases. We can also have a meeting in December, if necessary. But years

past we've not had one.

We'll begin by calling Case 10436, which is a continuation from the January 16, 1992, Commission hearing. It's the application by the Oil Conservation Division for the expansion of the San Juan Basin vulnerable area. At this time I'll call for appearances in Case No. 10436.

Yes, Mr. Stovall.

MR. STOVALL: Mr. Chairman, Robert G. Stovall of Santa Fe representing the applicant, the Oil Conservation Division. I am going to recommend, although technically people have entered their appearances, I think there have been some realignments of representation and perhaps it would be useful to get full appearances and reswear all witnesses just to make sure we're covered on that.

CHAIRMAN LeMAY: Yes, we plan to do that. Thank you, Mr. Stovall.

MR. ROBERTS: Mr. Chairman, my name is Tommy Roberts. I'm an attorney in Farmington, New Mexico. Again, I'm appearing on behalf of Four Corners Gas Producers Association. At the January 16th hearing, I entered an appearance on

Southern Union -- on behalf of Southern Union Exploration Company. That has now been changed.

CHAIRMAN LeMAY: Who are you representing now?

MR. ROBERTS: Four Corners Gas Producers.

CHAIRMAN LeMAY: Only Four Corners?

MR. ROBERTS: Yes.

CHAIRMAN LeMAY: Yes, sir.

MR. MEIKELJOHN: Mr. Chairman, my name is Douglas Meiklejohn. I'm a lawyer with the New Mexico Environmental Law Center here in Santa Fe. I represent Southwest Research and Information Center, an organization that is located in Albuquerque.

CHAIRMAN LeMAY: Thank you. I'm going to ask, also, how many witnesses you're going to have. One, Mr. Roberts?

MR. ROBERTS: [Nodded.]

CHAIRMAN LeMAY: Mr. Meiklejohn?

MR. MEIKLEJOHN: We're going to have two.

CHAIRMAN LeMAY: Thank you. Mr. Padilla.

MR. PADILLA: My name is Ernest L.

Padilla of Padilla and Snyder for BCO, Inc., of Santa Fe, New Mexico. We have one witness.

CHAIRMAN LeMAY: Thank you, Mr. Padilla.

Additional appearances? Mr. Kellahin.

MR. KELLAHIN: Mr. Chairman, I'm Tom Kellahin of the Santa Fe law firm of Kellahin, Kellahin & Aubrey, appearing today on behalf of the New Mexico Oil and Gas Association. And I have two witnesses to be sworn today.

CHAIRMAN LeMAY: Thank you. Additional appearances?

MR. KENDRICK: Mr. Chairman, I'm Ned Kendrick, with the firm of Montgomery & Andrews, appearing today on behalf of El Paso Natural Gas Company. We have no witnesses.

CHAIRMAN LeMAY: Will you be giving a statement at the end?

MR. KENDRICK: We'd like to have a right to ask questions and possibly a statement at the end.

CHAIRMAN LeMAY: Sure, you bet.

Additional appearances? Fine.

Before we begin, on behalf of my fellow commissioners, I'd just like to make a few

statements concerning the case, and this would apply really to all cases, but I think especially to this one. I'm addressing my remarks mainly to the lawyers.

When you're making cross-examination, make your cross very distinct and to the point. If you have something to say, say it, but don't wander around. We're a Commission of fact. What we want is the fact; we don't want courtroom dramatics. We don't hesitation to ponder a problem.

We will begin by giving about a three-minute break before cross-examination. We're not going to break as far as getting out of the room, but it will give you all a chance to organize your cross. And we felt that this will probably be more effective for all of you in your cross-examination. We don't want you to wander around.

Commissioner Weiss stated it a different way, but we all agree with his statement: "We don't want fluff. We don't want a lot of fluff." We want facts. And we're a commission of fact-gatherers. And that's the spirit of which we want this hearing to be

conducted as well as other hearings.

With that in mind, we'll begin by entertaining a proposal by Mr. Stovall.

Mr. Stovall.

MR. STOVALL: Mr. Chairman, as you well know, we've taken what amounts to a three-month recess to have some discussions with various industry groups, environmental groups to try to come up with some sort of reasonably acceptable order which most everybody can accept.

What we've come up with is a good middle ground, I think. The Commission -- or the Division has distributed an order, a proposed order in accordance with our discussions with the groups. We mailed it out about a week or so ago, and that is the order which we agreed would be the order which we presented to the Commission.

I have supplied the Commission and everyone a document marked Exhibit No. 14, OCD Exhibit No. 14, which is the proposed vulnerable area order. It differs from the order which was circulated last week only in that two words -- or one word and one paragraph numbering were added.

On the fifth page, you note that there

were two paragraph Cs, and we've corrected that to be a paragraph D. On one other page -- oh, on the last page, on the first line, the word "be" was left out. And those are the only changes from what was circulated to industry and other interested parties.

At this time I'm going to propose that we allow the other parties to go forward in the interest of putting on direct information in your fact-gathering effort.

At the conclusion of the presentation by other parties, then I would probably recall Mr. Olson for some redirect examination and offer him at that time for cross-examination. I may also -- I'm going to have sworn Mr. Frank Chavez from the Aztec District and Mr. Roger Anderson, but I don't know to what extent they will be offered.

CHAIRMAN LeMAY: Is there any objection to that procedure? We've had Mr. Olson and I think Mr. Anderson previously testify in the January hearing. However, we recognize that you needed to get your stuff together, and that's the reason for the delay. Since he has original testimony on record, does anyone have any

objection to that procedure? He'll be available, of course, at the end, for additional testimony and cross.

MR. ROBERTS: We have no objection.

CHAIRMAN LeMAY: Anyone object to that procedure? Fine. That will be the way we'll be running the --

MR. STOVALL: I think the parties have agreed that the industry proponents represented, by Mr. Roberts and Mr. Padilla and Mr. Kellahin, will first make their presentations and then the Southwest Research Group will make their presentation and then any other presentations that may --

CHAIRMAN LeMAY: Mr. Meiklejohn, is there any problem with that?

MR. MEIKLEJOHN: There is no problem.

CHAIRMAN LeMAY: Again, I'd like to remind you, this is rule-making, not adjudicatory. And, therefore, in that spirit, we're trying to gather facts. We're not taking sides, although I recognize it's very difficult to say that and still not feel that there are sides in this issue. But under rule-making procedure, we truly are looking for the facts and

the rules to come up with.

All those that are going to be giving or may give testimony, at this time why don't you stand and be sworn in.

[The witnesses were duly sworn.]

CHAIRMAN LeMAY: Do you have anything, Mr. Stovall, or shall we start with Mr. Roberts?

MR. STOVALL: I have nothing else. Proceed.

CHAIRMAN LeMAY: Mr. Roberts.

MR. ROBERTS: Mr. Chairman and Commissioners, before we begin our presentation of our evidence and testimony today, I'd like to give you a brief preview of the direction that the Association is heading with that testimony and evidence.

Initially, that testimony and evidence will focus on past and current studies and technical and scientific data derived from those studies that would support a conclusion that the expansion of the existing vulnerable area and the associated requirements for absolute elimination of discharged or produced water into unlined pits located within the vulnerable area as expanded is not justified.

Those studies include studies conducted by various parties for presentation in conjunction with the 1985 original vulnerable area hearing. They include Open File Report 89-9, which was authored by William Olson, and which has been admitted into evidence in this case as OCD Exhibit No. 6. That was done at the January 16th hearing, and also includes a study of dry natural gas wells. It was conducted by an expert, who is retained by Four Corners Gas Producers Association for that purpose.

Although it is the position of Four Corners Gas Producers Association that the results of those studies would justify outright opposition to the OCD application in this case, we think that the results provide to Four Corners Gas Producers Association another option. And that option which Four Corners Gas Producers Association has decided to pursue is to support the OCD application on a conditional basis.

The condition of support is based in large part on the results of the studies I have mentioned to you. The condition is the issuance of an order in this case that, first of all, provides an exemption or exclusion from discharge

prohibition and pit closure requirements for dry natural gas wells located outside the existing vulnerable area.

Secondly, that provides an opportunity to obtain variances from discharge prohibition and pit closure requirements on a well-by-well or an area-wide basis.

Third, that provides a reasonable time frame for the elimination of discharges of produced water into unlined pits located in the vulnerable area as expanded and gives to the director of the OCD the authority to grant extension of those time frames for good cause shown.

Fourth, that provides for a definition of wellhead protection areas that is consistent with existing regulation in the state of New Mexico.

And fifth, that it is not operative with respect to pits closed prior to the effective date of the order or with respect to lined pits and below-grade tanks installed prior to the effective date of the order.

It is the position of the association that such an order will be supported by the

evidence and testimony that we'll submit today. It is also the position of the association that such an order will address the reasonable concerns of industry, regulators, and special interest groups, all of whom we believe have legitimate concern about these issues.

Mr. Chairman, with that may I call my witness?

CHAIRMAN LeMAY: Please do.

MR. ROBERTS: I call Mr. Randy Hicks.

Mr. Chairman, we do have an outline of the presentation that will be made by Mr. Hicks. And it's available for those of you in the audience who may not have received a copy of it. I don't know that we have enough copies for everyone. This is an outline that will not be submitted into evidence.

RANDALL T. HICKS

Having been duly sworn upon his oath, was examined and testified as follows:

EXAMINATION

BY MR. ROBERTS:

Q. Mr. Hicks, for the record will you state your name and your place of residence?

A. My name is Randall T. Hicks, and I live

in Albuquerque, New Mexico.

Q. By whom are you currently employed?

A. H+GCL, an environmental consulting firm in Albuquerque, New Mexico.

Q. And in what capacity are you employed?

A. I'm a vice president and a hydrogeologist.

Q. And how long have you been employed in that capacity?

A. Nine years.

Q. Mr. Hicks, would you briefly describe your educational background?

A. I got my bachelor's of science in geology from Beloit college and my master's from the University of New Mexico in geology. Beloit College was graduated in 1975, and my MS was awarded in 1980.

Q. Would you briefly describe your work experience?

A. I worked for, after I left Beloit College, I worked with Phillips 66 in Anaconda as a uranium exploration geologist. After my master's degree, I worked at the New Mexico Environmental Improvement Division, which is now NMED, as a hydrologist.

And at the New Mexico Environmental Improvement Division, I wrote, coauthored with Dave Boyer, the part 5 of the WQCC regulations. I provided review and investigations regarding environmental permits, and I applied the regulations of the WQCC standards to proposed discharge of pollutants.

After I left the New Mexico Environmental Improvement Division, I helped found Geoscience Consultants, Limited, an environmental firm in Albuquerque. There we spent our efforts on permitting and investigations, much of which was for the oil and gas industry.

We worked with the WQCC regulations as well as the oil and gas rules and regulations. We dealt with federal regulations involving RECRA and CERCLA. And we were consultants to the Environmental Protection Agency for enforcement actions as well.

Q. Do you have any professional certifications and registrations?

A. Yes. I'm a Registered Arizona Professional Geologist, and I'm registered in California as a geologist, and I'm certified by

the American Association of Professional Geologists.

Q. Why are you not registered as a professional geologist in New Mexico?

A. Because there is no registration for geologists in the state of New Mexico.

Q. Have you published any articles or other writings in the area of your expertise?

A. Yeah. I have put out several articles on investigatory procedures and remedial actions. And just recently I presented two papers on produced water to an international symposium in San Diego last January.

Q. In the course of your occupational experience, have you had any experience in working with Water Quality Control Commission regulations, underground storage tank regulations, and Oil Conservation Division regulations?

A. Yes, I have. Typically, the Water Quality Control Commission regulation work was done not only with the New Mexico Environmental Improvement Division, but subsequently as an expert with Geoscience Consultants, which became H^+ GCL, working for industry and federal

government.

The UST aspects and other oil and gas aspects of regulatory compliance and investigations were done while I was with Geoscience Consultants and H + GCL.

Q. Have you testified on any prior occasion before this Oil Conservation Commission?

A. Yes, I have.

Q. When was that?

A. In 1985 I was an expert witness for industry on the original vulnerable area hearings. I've also testified in front of the Water Quality Commission as an expert in conjunction with the promulgation or the development of the part 5 WQCC regulations.

MR. ROBERTS: Mr. Chairman, I would tender Mr. Hicks as an expert in the field.

CHAIRMAN LeMAY: Mr. Hicks' qualifications are acceptable.

Q. (BY MR. ROBERTS) Are you familiar with the application in this case?

A. Yes, I am.

Q. Who do you represent?

A. The Four Corners Gas Producers Association.

Q. For what purposes were your services retained?

A. Basically I was to look at the technical merits of the proposed order and the data from which the proposed order was based. I wanted to make sure that the conclusions that were drawn from these data were in fact valid. I wanted to make sure that the order was valid from a technical aspect.

I was also instructed to look at certain aspects of the order and given authority to look at any aspects of the order which I felt might require some further investigation. If investigations were warranted, I was authorized to conduct those investigations either to prove or disprove some of these questionable conclusions that may have been drawn by either side, if you will.

And I was to provide recommendations to modify the order to come into compliance with what I believed to be the technical merit and the data involved with the order.

I was charged with ensuring that whatever order was drawn up would protect human health and the environment, number one, and

number two would be applied with reasonableness, so there wouldn't be any unnecessary, and I want to stress "unnecessary" regulatory or economic burden.

Q. Have you undertaken certain studies and prepared documents based on those studies for use today?

A. Yes, I have.

Q. Would you briefly describe the elements of the presentation you intend to make today?

A. Well, it is in the handout. And the reason for this presentation is, for those of you that we didn't have enough handouts for, you can read along with us up here, and indeed what I'm going to start with is to discuss some of the previous work that has been done at produced water sites.

The basis of this is to -- this is what we based the creation of our field investigation on. And after I introduce some of the data that helped guide in the design of our experiments, I'll talk about the experiment that we did with respect to ten what we call dry gas wells and how the disposal sites at these particular areas may differ from what has been

studied.

Q. Briefly identify the previous fieldwork with which you are familiar and upon which you relied in performing this study for Four Corners gas production.

A. Well, we got six areas or six different series of documents that we did take a look at to assist us in creating this study. This is what was readily available to us. I'm certain that there may be more, but this is what we looked at.

First we looked at that time 1985 hearing data itself. We spent some time looking at the open file report 89-9. It's my understanding that the fieldwork for 89-9 was done, much of it was done in 1987. That's the reason for that parenthetical date.

We looked at Tenneco groundwater studies that were conducted from 1988 to 1989. And then we were -- we did have some available evidence from Amoco Gallegos Canyon Unit 153-E where wells had been installed in 1987. We also had evidence available to us from the Mobil Thomas No. 1 well. The work for that was done in 1990.

And then we were able to discuss and see some evidence from pit closure data, and I should expand, it's not only the pit closure data, but it's data that was developed in concert with the elimination of discharges from the existing vulnerable area. We were able to get this from various operators. Some of it is not publically available, but the work was basically done from 1990 to 1991.

Q. Based on your participation in the 1985 vulnerable area hearing, would you summarize the technical data that was presented at that hearing and summarize the conclusions that were drawn from that data?

A. Sure. There was a number of people that presented information at that 1985 hearing. And I think one of the most important things or the most important things that I have listed are on these two slides.

First of all, in the 1985 hearing there was documented contamination of groundwater at produced water sites. There the Flora Vista case was brought forward, Manana gas well, and also a case in Duncan Field of Hogback, I believe. Other cases were also presented that indicated

that indeed earthen pit disposal within the vulnerable area did create groundwater contamination.

There was other evidence presented in this case that discussed the natural remediation processes that occur at produced water sites. A fair bit of time was spent in the 1985 hearing discussing these various natural processes which occur.

There was also some information and data presented about three field studies, studies of three sites that showed that the contamination that was documented from the earthen pit disposal was generally very limited, limited to the area of the well pad in fact in 1985. Contamination was observed however. We found that the contamination did not move off the well pad.

There was also information about aquifer simulation models that were presented in in the 1985 hearing. And a series of models were produced and entered into evidence that talked about different, what I have, types of well sites.

In the 1985 hearing the existing vulnerable area and gas wells in general were

divided into several different categories of wells that shared hydrogeologic similarities. And model simulations were run to determine, to help predict what kinds of contamination may occur at these sites.

And I may say that basically the point of these models was as much to ensure that the field evidence that was presented did have some basis on general reality; that we weren't looking at any kind of -- with respect to the three sites that were presented as evidence in 1985.

And the conclusion was that there indeed should be more study; that the data were not absolutely conclusive to the original order that was proposed by NMOCD, and indeed that a certain classification of discharges should be removed from the existing vulnerable area and prohibited, and those were the discharges of five barrels a day or greater.

Q. What were the major provisions of the order that was issued as a result of the 1985 vulnerable area hearing?

A. Basically they were the existence of the vulnerable area itself; that it was defined, clearly defined, in the order and the elimination

of the discharges to unlined pits for greater than five barrels a day. And, again, the Commission did charge everyone involved with further study of the issue.

Q. What data introduced in the 1985 hearing supported the exemption of low volume discharges?

A. I believe, you know, in my opinion I think that the convincing evidence with respect to that was the field studies that were presented by Tenneco and Amoco where they demonstrated that at these three sites that we did discuss that the contamination from the discharge to earthen pits was limited in areal extent.

I think that the secondary line of evidence that allowed the Commission to indicate that perhaps small volumes needed more study was the fact that by remediation and other natural processes probably were active in the existing vulnerable area of the San Juan Basin and that these processes actually minimized the threat to human health and the environment.

And I think finally that the models also did add to some -- to the argument that more study was necessary; that these sites do not

represent, these three sites do not represent some kind of a fluke.

Q. You testified that you recall testimony and evidence being submitted regarding two contaminated sites, and I think you identified the Flora Vista and the Manana well site and Duncan Hogback sites.

A. Yes.

Q. Did these sites studied show concentration of groundwater near the disposal pit?

A. Yes, they did.

Q. What did the Tenneco and Amoco study show with respect to the movement of hydrocarbons away from the pit?

A. Basically I feel that these studies in 1985 showed that something was going on at the site that created -- that allowed these particular organic components to disappear with transport away from the area of discharge immediately below the pit.

And typically I believe that this disappearance, if you will, of the organic contaminants concerned occurred within 100 feet of the original discharge.

Q. How could you tell that?

A. Well, we put -- I must, to clarify, I was acting as the expert for Tenneco and Amoco, so when I say "we," I do in fact mean I was there for that time. We put groundwater wells down-gradient from the produced water pits and tried to look at how the concentrations changed.

And so when down-gradient from the pits at the edge of the pads, we found that the contamination was significantly reduced below standards.

Q. What made the hydrocarbons disappear?

A. Well, I think it was in fact the natural remediation processes that were discussed at the 1985 hearing. And these natural processes I'll talk about in a little bit.

Q. What did the aquifer simulations models that were presented in the 1985 hearing show?

A. Well, in a nutshell, those particular aquifer simulations models showed that dilution dispersion due to the underflow of the aquifer would effectively eliminate contamination from produced water sites a short distance from the source of the contamination.

Some sites, however, did show more

extensive contamination down-gradient from the site. But in 1985, with these particular models, we did not attempt to account for any biodegradation or volatilization of hydrocarbons in any of these simulations.

Q. Would the results of these models be valid today?

A. Well, I think they would be. And the reason I say that is there's many new models that are available that can account for a lot of different processes that are occurring. But the basic flow equations regarding contaminant transport are still the same. Those haven't changed significantly.

The interesting thing that I would like to say about the validity of the 1985 model is that I don't believe that there has been any subsequent field programs where individuals or organizations have gone out and actually tested produced water sites that demonstrate that the models predict anything that's significantly different than what we actually see in the field.

And I think that's a very important point. The models did show, the models of 1985,

did show that there would be contamination near the discharge point. It also showed that they would be cleaned up, disbursed, and diluted within a short distance of transport. And I believe that the field exercises continue to demonstrate that.

Q. Are you implying that groundwater contamination will occur at all produced water sites?

A. Oh, no. That's one thing I'm not doing. There are conditions at certain sites that would prevent contamination, any hydrocarbons from even reaching the groundwater system.

What I am saying, though, is that the model predicted, the model-simulated conditions that exist in the existing vulnerable area, it dealt with shallow groundwater; it dealt with relatively permeable soils; and it dealt with allowing an input to come to groundwater.

And when you have those conditions of shallow groundwater and loose soils, the model predicted that there would be contamination at the discharge point. I think the field studies also demonstrated that. But indeed I don't want

to imply that all sites would show contamination.

Q. So what makes some sites and models show contamination where others do not show contamination?

A. The contamination that was shown in the model, and I want to make sure that we understand the extensive contamination or contamination beyond the point of discharge, they were different conditions that were simulated.

Again, I want to come back to the point where we identify different types of hydrogeologic conditions which existed even within the existing vulnerable area. And when certain conditions such as, for an example, high hydraulic conductivity or high velocity of groundwater flow, we generally saw a more widespread contamination than where groundwater was very slow.

And so as a result we've got different output from the different models that -- or the different simulations of the same model. We got different output depending upon the different hydrologic inputs.

Q. Did the models agree with the field

studies that were conducted and presented at the hearing?

A. Well, we did three simulations in 1985 -- or we did three field studies in 1985, and they seemed to agree generally with the model.

Q. Why did you perform only three field studies?

A. Well, I only think that three were warranted at the time. We wanted to check the veracity of some of the conclusions that were being drawn. And we went out and did three sites.

There was a timing factor involved, but this was -- the results were fairly conclusive with respect to the data that were presented. And really only three sites, only three studies were warranted based on the data that were observed.

Q. Will you now summarize how the evaluation of the 1985 data helped you design the study for Four Corners Gas Producers Association in this case?

A. Well, the important aspects of how the 85 data helped guide our study was, first, we

understood from the 1985 data and our work out there that there was such a thing as different classifications of wells.

There were different hydrogeologic conditions which exist within the existing vulnerable area. And you can in fact create certain groupings of well sites and model them. Not every single site was unique. Groupings did occur.

We also understood that natural mechanisms were active at the site. The natural mechanisms of biomediation and volatilization and other components were acting to reduce the overall concentration of hydrocarbons as you moved away from the point of discharge.

We also showed that the 85 hearing -- in the 85 hearing the models did not account for this biodegradation, but we saw that it was happening and we wanted to do a little bit more testing in that particular area.

Q. What mechanisms would you expect to be active at produced water sites that would minimize the impact on freshwater or human health and the environment?

A. Well, let's show a slide here. This is

from the -- Dennis McQuillan produced this in 1986, I believe, for his study on volatile organics. And it was also reproduced in the Olson report. Something very similar to this was also presented in the 1985 hearing. And, in fact, these are the mechanisms that are going on at a produced water site. With respect to -- it actually reduced volatile organics occurring in the groundwater.

Just briefly, I'll go through each one of these, and that is, the first element there, number one, called flash volatilization. The concentration of hydrocarbons in water in the formation are higher than what we see in the produced water pit itself.

And that generally is due to the fact that when the water is initially discharged, the pressure gradient changes from that which is in the formation and in the gas line to atmospheric. And we get a considerable amount of loss of volatiles through that process, and that was documented in the Olson report.

And the Olson -- when I say the Olson report, that is the report 89-9, so there should no confusion. I'll be using those

interchangeably.

In item number two, evaporation and volatilization do occur in the pit where volatiles are also lost and water indeed is lost as well.

Item number three is identified as partially saturated flow. While this is not necessarily an attenuation mechanism, what it does, per se that is, it does not change, if you will, the structure of the organic compounds; it slows down the overall migration of produced water into the groundwater system.

At shallow sites partially saturated flow does not become a very important aspect at all, especially when you're dealing with loosely consolidated materials which have high permeability. Saturated flow will exist over a short period of time.

Item number four, evaporation and volatilization from the soil. We believe this to be an important case, an important mechanism, especially in fine grain soils where the residence time of hydrocarbons may be longer than the loosely consolidated sandy soil material. Volatiles are lost from the soils themselves.

Item number five, sorption. Hydrocarbons in general will sorb onto organic material within the sediments, and it will also sorb onto clay and other rock material to a much lesser extent. So, again, this process sorption is only important during the initial stages of produced water disposal. All the sorption sites are used up after a certain period of time, and the capacity of the soil to absorb any more hydrocarbons is lost.

And so while this along with partially saturated flow are important mechanisms for attenuation during the initial discharge of produced water, they become very unimportant when equilibrium exists after a long period of time, again, especially when the distance between the bottom of the produced water pit and groundwater is not all that great.

Number six, biodegradation. We think this is a very important mechanism for the removal of hydrocarbons. Our studies, and I think other studies, have shown that biodegradation is an important mechanism, both in the saturated zone and the unsaturated zone.

And this actually removes by biologic

activity, breaks down the hydrocarbons, the volatile hydrocarbons and other hydrocarbons. It uses the hydrocarbons as a food source. The carbon is used as a food source, and we actually break it down and eliminate it. That's a little bit different from some of these other mechanisms that we're talking about.

It's not different from item number seven, which is chemical transformation. I can't speak to, as much as an expert on exactly what kinds of chemical transformation occur, but there is indeed oxidation of the components involved here where, again, we get chemical breakdown and removal of the organic constituents of concern outside of the biological aspects of it.

Eight -- where's my eight? There it is. Photolysis. I can't testify all that much on photolysis either, the breakdown of products within the pit itself. It probably does occur, and I think it's worthwhile to be listed here as a potential mechanism.

Nine and ten, mechanical dispersion and chemical diffusion, these two elements, these two mechanisms, natural mechanisms, is what we simulated in 1985 in the aquifer. Now,

mechanical dispersion, chemical diffusion, those are elements that occur within the saturated zone after the contaminants of concern, these hydrocarbons actually reach groundwater.

They disburse and they diffuse, and the concentrations which are observed immediately near the pit, then, are reduced to lower concentrations which transport due to these processes, mechanical dispersion and diffusion in most instances.

And as this slide also shows, mechanisms number two, which is evaporation and volatilization; five, absorption; six, biodegradation; and seven, chemical transformation, all of those other mechanisms occur within the saturated zone as well.

They are not limited to the unsaturated zone, so we can get removal of hydrocarbons, transformation of volatile hydrocarbons and organic constituents of concern within the aquifer where the biology -- the microorganisms use the carbon as a source and break them down into harmless components, carbon dioxide for example.

So those are the mechanisms which we

believe are active at produced water sites.

Q. Mr. Hicks, can these mechanisms be accounted for in aquifer models?

A. Absolutely. In 1985 not as well. There was a lot of fudge factors that you would have to employ in 1958, and I think that's why we elected not to utilize those fudge -- when I say "fudge factors," that means that the models did have decay mechanisms that you could employ. But generally they were for radioactive decay, and you had to fudge them in to create a simulation that would be similar to biologic decay.

Now there are such models that indeed have components for biological decay, volatilization, and other methods. But, again, these models are highly dependent -- all models are highly dependent upon the input parameters that you need to use and you need to calibrate these particular models to the input parameters that are equivalent to the area of interest that you're studying.

You can get anything you want from a model. It can show you whatever you want it to show, depending upon the input parameters that you put in. That's why it's so important to

history match or calibrate a particular model to the conditions which exist at the site that you're interested in.

Q. Mr. Hicks, what other information have you relied on in designing your study that you've undertaken for Four Corners Gas Producers Association?

A. I think the next slide will show some of the information that we used from Report 89-9, which is the report that was authored by William Olson.

Again, first, we saw that hydrocarbons were observed in groundwater at nine of the sites. However, in this particular report, the limits of the contamination that were observed were not defined; that is, the lateral extent was not defined.

MR. ROBERTS: Mr. Chairman, for the record, we want to note again this has been admitted as Exhibit No. 6 on behalf of the Division in this case.

CHAIRMAN LeMAY: So noted.

Q. (BY MR. ROBERTS) How many sites were studied by Mr. Olson?

A. Well, let me just push through the rest

of this slide first --

Q. Okay.

A. -- so I don't derail my own train of thought. A couple of other aspects here is that as Mr. Olson noted in his testimony that, you know, the sophistication of the study was somewhat limited by resources, he was constrained by the resources that were allowed him. And this report, which again is an exhibit by the OCD, was the basis for the application to expand the vulnerable area and eliminate small discharges.

How many sites?

Q. Right.

A. Let's see, Olson studied three sites from the original 1985 hearing, went back out and looked at the three sites that were presented by Amoco and Tenneco and ten additional sites that were also selected, giving a total of thirteen.

Q. Did the results of Mr. Olson's study surprise you?

A. Well, that contamination would exist immediately adjacent to and down-gradient from produced water disposal pits was predicted and observed in the past. And that was really not a question in my mind that that would occur.

That some of the pits would not show any contamination was also not a question. There again, there are certain types of pits and perhaps certain types of operational environments, top-side conditions of the well and the production characteristics of the well that would prevent contamination from entering groundwater. That was also not that much of a surprise.

However, I must admit I was a little bit surprised at the number of pits, the number of sites that actually showed contamination until I looked a little bit more closely at the methods of investigation that were used.

Q. In your opinion did Mr. Olson use proper methods of investigation?

A. His methods were totally proper. And indeed for many of the investigations that we perform, we use these same methods. But I did have a few problems with the approach that was was used. And, first, I've got four elements that I'd like to define with respect to that.

First, Mr. Olson in that study did not really use a random sample selection. There was not -- it was not a random sample. It was

strictly based on the -- or it appears to me that it's based on the ability to hand-auger holes to a certain depth.

Again, this is a constraint by resources that I was talking about. The sample -- he had to have access, and he had to have access to groundwater. And if he could not hand-auger a site, it could not be considered as part of the study.

He did use a hollow-stemmed auger at one site, but I think the basis for the site selection was shallow groundwater and loose soils so that he could be able to use the methods that were available to him.

Another aspect of the study that I have a little bit of a problem with, but again we've used these techniques before in the past, and that is the short screen length that was used in the study.

It's my understanding that three to five feet or less of saturated interval was part of the -- was the monitoring well protocol and that these screens were at the top of the aquifer. That does -- that will bias your sample when you compare it to some other methods that

are typically used.

Another aspect that I had a problem with is that the wells were drilled immediately adjacent to the produced water pits, and thus as a result, he didn't define the areal extent of the contamination. So I believe it was absolutely a worst-case scenario here.

But, please, let me say that the data were developed by Olson in terms of the chemical data, the results and the way that he put it in are valid. Those aspects of the study are valid. I'm not questioning the data that came forward. I'm questioning the approach. I have problems with the approach that was used.

Q. In your opinion is the Olson study statistically valid?

A. Well, generally when a study is performed, you're trying to determine the characteristics of an entire population. And in order to define the characteristics of a population, you generally take a random sample from that population.

The random sample needs to be large enough to meet your own criteria for confidence. There's confidence intervals that are involved.

So depending upon what confidence interval you're interested in, you take a sample size that would meet your confidence level objective. If a sample size is small, the confidence level may also be small. And if the sample size is large, generally you have a better opportunity to get a higher confidence level.

But if a sample is selected in a nonrandom manner, the test results could be skewed. And in my opinion, the sample, and when I say sample, I'm talking about the thirteen wells which represent the sample of a population, that particular sample of thirteen wells I don't believe is representative of all the wells that are in the San Juan Basin.

I don't believe that that sample of thirteen wells is representative of the population of wells that exist in the expanded vulnerable area. And I don't believe that that sample of thirteen wells necessarily is representative of the population of wells which exist in the existing vulnerable area.

Now, I'm not a statistician, and I'm not trying to put forward any statistical arguments here that are outside of my expertise.

This is what I believe. But the results that Olson has put forward indeed have a high level of confidence that contamination will occur in produced water pits where conditions are similar.

Where conditions are similar to that which are studied by Olson, I believe the data are absolutely clear that contamination will exist near those pits. And so what I'm saying is that Olson's study can't be used to characterize all produced water sites in the existing or expanded vulnerable area.

Q. How would a longer screen length affect the concentration of contaminants in a monitored well sample?

A. Near a contamination source, you're getting an input of contamination generally from the surface of the ground. And when hydrocarbons, volatile hydrocarbons, any species that are less dense than water would generally tend to be maintained at the upper portion of the aquifer if it's maintained as a separate phase.

If it's dissolved in the water, mechanical dispersion and diffusion would still create a zone of high levels of contamination

near where that is initially introduced, which is at the groundwater table itself.

So a monitor well that is screened near the surface is going -- near the surface of the groundwater table is going to collect the sample that is absolutely the highest contamination because it's near the insult to groundwater.

A monitor well that's screened with ten feet within the saturated zone would not only collect the worst contamination near the top of the aquifer, but it would also collect the lower portion or the portion that's below the plume that is less contaminated and you would see some dilution within the wellbore itself.

Q. By way of summarization, then, why is a ten-foot screen normally used in monitor well construction?

A. Well, you know, I asked that question in 1980, 1981, when I first went to work for the Environmental Improvement Division: Why are we using ten-feet screens? Because when we went out and performed investigations for compliance purposes, we were using ten feet of screens. And the answer that was given to me then is probably just as good now, and that is that we tried to

simulate a domestic water well.

Generally, a domestic water well that would be completed at the water table surface would use about ten feet of screen at a minimum. Typically, of course, you'll see that they use quite a bit more. But to generate any water at the groundwater surface itself, generally you'd use ten feet of screen. You've got to account for some ten feet in the saturated zone because you've got to account for some pump drawdown and be able to get water into the unit, into the well itself.

Now, with wells that are completed below the water table, you can use a shorter screen interval depending upon the formation characteristic itself. But for compliance purposes, in permits and in investigations, we've always used this ten-foot interval of saturation because it was believed that this simulates the, quote, "worst-case scenario" for a domestic water well that is completed at the groundwater surface.

Q. And what kind of screen length did Mr. Olson use in his monitor wells?

A. I believe they were five-foot screens

or so with three or four feet in the zone of saturation.

Q. Based on the limitations of Mr. Olson's report that you have identified today, how broadly should the findings and results of his study be applied?

A. Well, again, I'd like to say that the report does not provide a characterization of all wells in the San Juan Basin. I'm not convinced that it adequately characterizes the wells in the existing vulnerable area. The study is limited in that it studied the particular type of wells. And these wells that he studied were in the existing vulnerable area and immediately adjacent to the existing vulnerable area.

Additionally, six out of the thirteen wells in Olson's report showed contamination of groundwater; that is, when I say "contamination," I mean that -- I believe I showed a slide that said that nine sites showed contamination. Nine sites showed hydrocarbons in groundwater. Six sites showed contamination, that is, levels of hydrocarbons that are above the standards. That's how I define contamination.

This particular percentage, six out of

thirteen, could very well be true that you could probably duplicate it over and over and over again. It's probably true for the wells that fit that particular classification.

But again, it is not -- this percentage, this extrapolating that to all of the wells in the San Juan Basin is not fair in my opinion. It's not applicable. It's not supported.

The concentrations that were observed in Olson's study are not representative of what would be drawn out of a constructed monitor well for compliance purposes or, in my opinion, a domestic water well supply that is typical. And the results of the study clearly do not represent the wide variety of hydrogeologic conditions that exist in the expanded vulnerable area.

Q. What kind of oil and gas well does Olson's report characterize in your opinion?

A. Indeed there's another limitation in that the wells that Olson looked at all produced liquid hydrocarbons in quantities that were recovered at the surface. Oil-water separators storage tanks, they recovered quantities of liquid hydrocarbons. That is also a limitation,

if you will, that represents an operational type of wells.

The wells that he studied were located in areas that could be penetrated with a hand auger, shallow groundwater. All of the sites, I believe, were, you know, less than 35 feet to groundwater, and so again, we're dealing with constrictions in this particular study.

Q. In your opinion does the Olson report provide sufficient evidence to support the NMOCD application to expand the vulnerable area?

A. To expand the vulnerable area, no.

Q. To your knowledge is there other evidence available which would support the OCD application to extend the vulnerable area?

A. I don't know of any.

Q. Summarize how the data you have just identified, the Olson report, assisted you in designing the study you have conducted for Four Corners Gas Producers Association.

A. After we looked at Olson's report and understood the limitations of it and how the study was done, we saw that Olson studied wells immediately adjacent to the vulnerable area or within the vulnerable area. And there hadn't

been any wells that were studied outside the existing vulnerable area and not many in the expanded vulnerable area.

We also saw a very important fact that Olson studied wells where liquid hydrocarbons were recovered at the surface. And there's many wells in the expanded vulnerable area, many wells in the San Juan Basin where liquid hydrocarbons are not recovered at the surface.

It was our belief anyway that the use of disposal wells at sites where liquid hydrocarbons are not recovered, that this disposal may not cause a threat to human health and the environment.

Q. Mr. Hicks, is there other information on which you have relied in designing this study for the association?

A. Yes. The next slide shows some studies by industry that were available to us. We mentioned them in terms of the studies that were conducted by Tenneco, the work that was done at Gallegos Canyon 153-E, and the work that was done at the Mobil Thomas No. 1 well. These are the studies of industry that I'm talking about here.

When I say standard methods, the

ten-foot screen was generally employed. At Thomas No. 1 for example, the method that was used by Olson was used at the Thomas No. 1. Thomas No. 1 is a well where H + GCL did the work. I was the individual that supervised the work and had general oversight over it, was the quality assurance officer, I should say, for that particular project.

And we used the same methods that Olson used in his report for that thing, for that figure study. So the standard methods of a ten-foot screen were generally employed at these particular sites. And again we saw that contamination was limited to the area of the well pad at four of the five sites that I mentioned here.

I think I've got one more slide for industry. For these sites in industry, all of them, they were generally less than 35 feet to groundwater. One of them may have been 36 or so, but I think it was all less than 35 feet.

And from evaluation of these studies, all of which were groundwater studies, we came to the conclusion or that the contamination beyond the well pad seemed to occur only where

free-phase hydrocarbons, that is, floating condensate or liquid hydrocarbons were observed actually on the groundwater surface.

So this helped us out a little bit. We're beginning to see some patterns here of contamination. And this gave us a little bit more information from which to design our study.

Q. Do you have knowledge as to why these studies were undertaken?

A. Indeed. The Tenneco sites, for example, the three Tenneco sites -- oh, boy, I've got to remember them now -- Valdez, two Valdez wells and one Riddle well, all of them are in Olson's report, 89-9, where contamination was found.

Tenneco then hired Geoscience Consultants at that time to go out and install some monitor wells and find the limits of contamination. So the Tenneco studies were done as a result or as a response to the work that was done by Olson identifying contamination.

At the Amoco GCU, Gallegos Canyon Unit, 153-E, that was also an Olson study where contamination was found, and again Amoco elected to respond to this contamination by trying to

determine the extent of the contamination.

At Thomas No. 1, there was a leak in the line between the storage tanks and the well, and there was a release of free-phase hydrocarbons condensate. And, again, this was a response to a documented release.

Q. Where are these sites located?

A. All of them are in the existing vulnerable area. Riddle might be outside, but it would be immediately adjacent to the existing vulnerable area.

Q. Are these sites representative of the sites studied by Mr. Olson?

A. Yeah. In fact, four out of the five sites that we're mentioning here are part of the Olson study, so they're clearly representative. The other one is four feet to groundwater right in the middle of the vulnerable area.

Q. Summarize how this data helped you design the study for the Four Corners Gas Producers Association.

A. It's this observation of this three phase product on groundwater that -- further, it supported our idea concerning this liquid hydrocarbon at the well site. We felt that

perhaps this more extensive contamination was in fact associated with liquid hydrocarbons, and we thought that this might be some kind of a key to understanding where more extensive contamination may occur and we wanted to look at the effect of liquid hydrocarbons and how that may impact contamination at specific sites.

Q. Mr. Hicks, is there still other information on which you have relied in designing this study?

A. Yeah. The next slide shows this pit closure and discharge elimination data. As many of you are probably aware, many companies in response to the original order of course are eliminating the discharge of five barrels a day or more into unlined pits in the vulnerable area. So work was done at these sites.

Additionally, some people are replacing the lower volume pits in the vulnerable area, and there's been exhibits put forward to demonstrate that. So there's work going on in the existing vulnerable area, for example, and this work generates in some instances some data relating to depth of contamination, depth of hydrocarbons, I should say.

Some of these data aren't publicly available. I've got them through discussions and review of some data, but some of them are just strictly not publicly available at the present time. This is O&M, operation and maintenance, O&M efforts.

But one of the things that we saw from these discussions and from the review of data is that the soil contamination -- and, again, let me define contamination, visible contamination, black material, organic-rich material. Maybe it smelled. Maybe there was analyses done. Maybe they performed a field analysis.

This particular contamination that was observed by the operators was limited to 35 feet. So again we're seeing a number of patterns being developed.

This particular data was collected for many types of wells in many locations throughout the existing vulnerable area. And although I can't say for certain sure, my guess is that much of it came from outside of the vulnerable area, as well, outside the expanded vulnerable area.

And, again, we came to a conclusion based on this 35 limit of what we were seeing as

a general observation, this 35-foot limit, that there must be something going on. And these natural processes may in fact be eliminating the threat to groundwater.

Q. Now, summarize how this data has assisted you in developing the study for the association.

A. A couple of things about this. When the industry went out to perform pit closure data, to perform an assessment perhaps in relationship to pit closure, they often used hand-auger techniques. So we wanted to find out if that was going to be successful or not because we wanted to see what kind of mechanisms may be available to do a study. So the mechanics of doing it were very important.

And, you know, one of the things about this 35 feet, it helped us define how deep we might have to go at some of our sites. So we used it -- we used these data mainly for mechanical purposes and for identification of our approach.

Q. Mr. Hicks, I think we're ready for you to now begin to discuss the study you have conducted for the Four Corners Gas Producers

Association in this case. Would you briefly describe that study?

A. Okay. First, I'm going to go through what we're talking about with respect to a dry gas well. What does it mean to us and in relationship to the study? What were the objectives that we started out with in respect to this study? What methods did we use? A little bit, present the results and summarize our conclusions.

Let's define dry gas wells to start with so we have an idea of what we're dealing with. We defined the gas wells, dry gas wells, as having a gas-to-oil ratio that is greater than 100,000, and that's in Mcf per day over the measurement of barrels per day. Nothing necessarily magic about this particular definition. It's what we used. We found it to be convenient in that it identified a wide variety of wells.

However, there is several other aspects that are very important as well, and that is that liquid hydrocarbons are not recovered at the well site. We don't have storage tanks. We don't have lines that are recovering liquid

hydrocarbons. And less than one barrel of water is discharged per day.

You can see that third definition is pretty important because if we just used the first two, coalbed methane wells, which produce, you know, tens of gallons a minute, gallons per minute would be included, and we had no desire to do that whatsoever. That was not the kind of well that we wanted to study here. So this is the definition that we moved forward with in our examination.

Q. Mr. Hicks, what is meant by the phrase, "Liquid hydrocarbons are not recovered at the well"?

A. Well, only gas, gas and water, are gas-phase and the liquid-phase water are separated at the sites. No separation equipment on the site, no storage tanks for oil or condensate, as would be required if, you know, liquid hydrocarbons would be recovered at the well site.

Q. For purposes of clarity and brief review, I want you to again go through the basis for the definition.

A. Well, the previous studies that we took

a look at suggested that the discharge of liquid hydrocarbons into the environment may create a potential for contamination of soil in groundwater. We recognize that. We believe that a large number of wells within the San Juan Basin do not have the potential for this kind of discharge. There was not a potential for liquid hydrocarbons to enter the pit.

The first two parts of our definition -- could we have that definition slide back up there just to keep my place? The first two elements of the definition allowed us to be sure that liquid hydrocarbons would not be disposed of in the pit.

We also understood that gas wells would produce from coal seams and have large volumes of water associated with it, so we created this third part of the definition. And we clearly wanted to exclude that from the studies, so that's the basis again.

Q. To your knowledge were dry gas well sites the subject of any field investigation that was conducted for purposes of the 1985 hearing or the Olson study or any other study?

A. We found nothing, zero, on dry gas

wells. No information whatsoever.

Q. What were the objectives of the study?

A. Now, first we wanted to determine the depth of hydrocarbons in the soils that we were going to observe at these dry gas well sites and because I want to keep in mind here that the charge of the whole investigation, the charge that I was given was to ensure that human health and the environment were going to be protected.

The Four Corners Gas Producers Association understand that there's such a thing as being a good neighbor and liabilities and other issues like that. And there's no intent to contamination groundwaters or soils. And we wanted to -- and this was a primary objective. If these particular gas wells were going to have a great deal of contamination, we wanted to know about it. If they weren't, we wanted to know about that as well. What was going to be the depth of contamination?

And, secondly, we wanted to determine the types of hydrocarbons that may be observed in these particular soils. It was our understanding from looking at that graphic that we presented about the natural processes, perhaps the

hydrocarbons we were looking at were not harmful. Maybe this black material did not contain contaminants of concern, yet still contained petroleum hydrocarbons. And so we did want to take a look at the types of hydrocarbons.

Q. On what basis were the sites selected for this study?

A. I think we've got one more objective here.

Q. Okay.

A. And this is another important part of the objectives, and that is that we felt that the order created a hypothesis that the NMOCD was presenting. The way that the original order was written indicated to us, indicated to us that the NMOCD had a hypothesis that the discharge to unlined pits of low volumes of water produced from all gas wells, including dry gas wells, from all gas wells represents a threat to human health and the environment within the proposed vulnerable area, the expanded area.

This, we believed, was the OCD hypothesis. We felt that we had identified a particular classification of wells where this hypothesis may not occur. We wanted to test this

OCD hypothesis.

Q. Now, let me ask you, on what basis were the sites selected for the study?

A. First of all, all the sites that we took a look at had to fit the definition of what we call a dry gas well. Secondly, we wanted to ensure that produced water was currently being discharged to unlined pits.

When we first went through the exercise, we identified a number of wells. And when we went to field check them, there was a lined pit or a fiberglass pit there, and we weren't interested in trying to test what had gone on in the past. We were interested in the active sites.

Thirdly, we wanted to ensure that the surface soil and geology, which were represented by our sites, were at least representative of the proposed vulnerable areas. We didn't want to use just one formation. We wanted to pick a number of different formations which fit the definition so that we would try to get some kind of representation here.

Because of the time frame involved of our study, they needed to be relatively close to

Farmington and we had to have reasonable access to these studies, we wanted to make sure that if we were out there performing the study and it rained, we would be able to get our equipment back out.

And we also wanted to look at some different operators to try to get some kind of cross-section of what these dry gas wells may be showing.

Q. What protocol did you follow for the collection of samples?

A. First of all, we collected soil samples from the center of the pit or at the edge of the saturated soils adjacent to the pit. We always used a hand auger to penetrate to the interval, the sample interval that we were going to choose.

And then we used a common technique of a slide hammer, a hand-held slide hammer, and a soil sampler. We collected the soil samples in a brass sleeve in this particular soil sampler.

We collected the soil samples at two feet, five feet, ten feet, fifteen feet, or in some cases, if we could go deeper to auger refusal, unfortunately in most instances, we saw

auger refusal prior to fifteen feet.

We also evaluated the samples in the field for total volatile hydrocarbons using what's known as a photoionization detector and a head-space method. That particular method is consistent with what is used for evaluation of soils at underground storage tanks.

The deepest sample from all of the holes we sent to Intermountain Analytical Laboratories in Farmington for EPA method analysis. The remaining samples we evaluated using this head-space method that's consistent with investigations at underground storage tanks.

We also performed logging of the borehole; that is, lithologic logging by a trained geologist. We constructed a site map. We sealed the boring. We took, in these ten wells, we took a total of 34 samples for evaluation by the photoionization detector technique, head-space method.

Sixteen of the samples that we evaluated were analyzed by the laboratory. With respect to the 34 samples that were evaluated using the head-space technique, I'll just spend a

brief moment on that.

The soil sample was taken from the auger itself -- in all instances it was not taken from the brass sleeve, many times it was -- and put into a sealed jar. The jar was then brought to ambient temperature. The jar was sealed with a septum of aluminum foil, and it was kept on ice until we brought it back to the motel room, generally to try to have uniform conditions, brought it up to ambient temperature using the scientific heating mechanism which is in all motel rooms, the heater, and brought it up to ambient temperature, and then utilized the photoionization detector to determine the concentration in the gas within the vile of volatile hydrocarbons.

Q. Who took the samples?

A. Mark Mohorcich of my staff took the samples, I believe, in all the instances. If he didn't, it would have been another individual from my staff. But Mark Mohorcich did the bulk of the samples.

Q. Were you involved in taking samples at one of the locations?

A. I took the samples, in fact, at Claude

Smith No. 1 well, which we will be discussing later on. I was present for the entire sampling exercise. And I will say that my staff followed the protocol at all of the sites that we talked about. I was the one that designed that protocol.

Q. Is your staff qualified to do these procedures?

A. The staff that were assigned to this project are currently engaged in sampling efforts at the South Valley Superfund Site, where they are routinely taking soil and groundwater samples. And there is an incredible amount of scrutiny involved from regulatory agencies, public interest groups, and the clients with respect to the ability to take such groundwater and soil samples.

The staff that was assigned to this project have also participated in soil sampling exercises at hazardous waste sites, underground storage tank sites, and are fully familiar with the sampling protocol.

Mark Mohorcich, for example, was the project leader under my supervision for the Thomas No. 1 well site investigation, so he's

fully familiar with produced water sites as well.

Q. When were these samples taken?

A. In early March 1992.

Q. Is it your testimony, then, that you or your staff followed the accepted industry or EPA procedures for the collection and handling and analysis of these samples?

A. Yes, indeed. All of our samples were collected pursuant to the same protocol that's used on oil field sites and the same protocol that we would use if we were sampling at any EPA site where we were dealing with enforcement action as consultants to the EPA.

All the equipment was fully decontaminated between the sampling exercises with a steam cleaner. Between each sample we used chain of custody procedures. The samples were preserved on ice or maintained at a temperature prior to analysis. They were delivered the same day to the laboratory for analysis. And appropriate sample containers were used. We followed appropriate techniques for the sampling.

Q. Do you have any photographs depicting the sampling technique or protocol you employed?

A. Yeah. I'd like to go through these.

Q. Before you begin to discuss what is shown by these photographs, we need to ask you a few other preliminary questions, Mr. Hicks.

A. Sure.

Q. Who took these photographs?

A. Mark Mohorcich of my staff took this particular one. I directed several of the -- of course, we took a lot of photographs. And when I was on site, I directed all of the photographs. And the other photographs were taken by Mark Mohorcich.

Q. So you were present when the photographs were taken?

A. For several of them, for others I was not present.

Q. Briefly describe what is the subject of the photographs that you will place up on the slide or on the projector.

A. Okay. This is a typical produced water pit that we studied. This is from the Mandana No. 2 well site. This is not on your handout. I hope you all -- can you all see it well enough?

This shows the discharge pipe associated with the equipment, the production

equipment. We have produced water shown by this reflection in here, and indeed you can see the muddy nature of it in here. This is, obviously, an active site. This is in fact produced water.

You can see the zone of saturation. Soil saturation goes from the edge of the standing water up to this point and forms a halo around the existing standing water in the pit.

We talked a little bit about volatilization of constituents in soils. This is, this area is one area certainly where we're going to see quite a bit of volatilization in soils as well as exterior to that.

When we took a sample, we would try to -- well, we would put a borehole adjacent to, as close to this saturated material as we possibly could. And generally we found the closer we got to saturated material, the worse our problems were with collecting samples, and I'll be getting into that in a little bit. But generally we hopped down in here, and with a hand auger, we grabbed a sample.

Q. Mr. Hicks, does this -- let's leave that photograph up.

A. Sure.

Q. Does that photograph accurately depict the conditions of pits as you know them to exist in the area of your study?

A. Yes. Not only in the area of my study, but I have looked at well over 100 produced water disposal sites, you know, as an environmental geologist examining them for assessment purposes and other reasons as well, but all with an environmental eye, if you will.

And this is very representative of many, many produced water sites and is clearly representative of the dry gas well sites that we are studying here.

Q. Let's look at the next photograph.

A. Okay. This is from Western Federal No. 6. And we see our smiling crew, happy, happy to be in the field taking samples and doing the work. In this case we've got a dry pit in that there's no standing water.

There was evidence of a current discharge into this pit, but the volume of discharge was so low that it evaporated either in the soil, infiltrated into the soil and evaporated, there was no standing. That's very common, again, especially with these dry gas

wells. And remember that we are looking at dry gas wells that produce less than a barrel of day of produced water. So this is very common.

In this case we were able to go with a hand auger right down through the center of the pit. And the pits are fenced. Commonly we would be able to get to the five, ten, or fifteen feet in a given case.

Q. Is it, then, the hand-augering methodology here that you're trying to depict by this photograph?

A. Absolutely. The first two slides -- and I confess that I was not present for particular slides -- is to help with the envisionment of the methodology. Sometimes you can't see it as well on your handout as you can actually in the field here. Strictly to help in the clarification of the methods.

Q. Let's take a look at your next photograph.

A. Backwards. We want to make sure that L & L Oil Field Service gets their plug in here, so I didn't want to put that up backwards. This is from the Claude Smith No. 1 well. I took this picture. Yeah, that's close enough.

This shows what we pull out with a hand auger. This is not the brass tube. This is not the soil sampler. In this case you can see that a soil sample is in here. We observed what the soil sample looks like, and we make a determination as to whether or not we're going to be taking a brass sleeve sample.

You can see the size of it. It's about two inches. And we have -- well, we did have, in addition to my staff, and I want to make sure that this is clear, in addition to my staff out there, we also had an individual from L & L Oil Field Service to help us with the boring itself.

So we did -- the Armstrong method was used in all of these. And you know how office scientists can get sometimes, you need a little muscle out there, so we used the folks from L & L to help us out.

Q. I believe you'll be coming back to this photograph later on in your testimony, but does it accurately depict the conditions as you observed them at that particular site?

A. Yes, it does. In this case the individual is standing away from the produced

water pit. In the background is just native ground. It's not a produced water pit at all. The point of this is to show what the samples looked like as we pulled them out of the pit.

Q. Mr. Hicks, did you prepare an exhibit to represent the results of your study?

A. Yes, I did.

Q. And how has that been designated?

A. It's our Exhibit No. 1, I believe. Where is it? I didn't bring a copy of it up here to make sure you all understand what it is.

With respect to the exhibit, we submitted an exhibit on time to the OCD. And subsequent to that you may be seeing in the front of your exhibit that it says revised April 8, 1992. I'd like to briefly point out the revisions that have occurred so that you understand that there is minor differences between what was originally submitted as an exhibit and this exhibit that, this copy of the exhibit that we see here today.

I'm not going to go through every typographical issue that we're dealing with here, but I will say as you compare, as an example on Section 1, which shows the maps, McHughs Nassau

5R in the upper right-hand corner, I believe, was originally designated as A-36-27N-12, and we added the "W" so that you would see that it's from the west range. That's the nature of the changes that have occurred in the map section.

There was a clarification of the unit number or the clarification of township and range. That's it. Locations did not change. Nothing changed.

Q. Why don't you briefly describe the contents of the exhibit.

A. Okay. Section 1 is in fact a series of maps that shows the locations of all of the sites that we studied. Section 2 contains the lithologic logs for each one of the samples that we took. Each one of the borings that we did shows a little site map so that we could identify where it is we took the sample.

And Section 3 is the chemical analyses. The data that came back from both the laboratory and our photoionization detector technique.

Q. Do you have some excerpts from this exhibit that you would like to discuss initially?

A. Sure.

Q. Do you have a slide that you would like to work from?

A. Yeah. Let's work from here. This is in your handout. This is in the exhibit: Name of the operator, name of the well where we were, location, site of where the borehole was with respect to the pit, separator. And in many cases the individuals that -- the separator here refers to, of course, the gas-water separator. Discharge into the pit.

This is a representative well log. It's obviously not a geophysical well log that is familiar with the oil industry. We did not have Schlumberger come out to these 15-foot holes. We did perform a geologic description. This particular description of the sands and the silty shales or silty sands are very common.

As you go through the exhibit, you would see that this is not dissimilar to anything that we saw in here. Sand, silty sand, permeable unit throughout. Common -- a common lithology that you would find within the vulnerable area.

It tells our, what we call, HNu here in your logs so that you can -- so the audience understands, HNu is the manufacturer of the

photoionization detector equipment that we used. The vernacular in the field for us is an HNu reading, 10 ppm. This is from the photoionization detector.

This is where we took a sample. You can tell from this particular number, sample ID, here at 4.9 feet. Another sample was taken again at the base of the hole. HNu readings throughout.

The field representative, Mark Mohorcich, is clearly identified with some comments in here. This particular one that we were talking about here for Western Federal No. 6, which happened to be the photograph of the individual standing inside the pit, the pit bottom is two feet below grade. The Td on this hole, Td, total depth, of the hole right there, 20.1 feet.

We saw no visible stain or odor within the pit. There was a very small separator. There was a little water discharge. In other words, water was discharging, but it was a very small amount.

Low producer of a well, meaning it's a low -- this is either a stripper well or, I

believe, in this particular instance when Mr. Mohorcich, an environmental geologist says it's a low producer of a well, he's referring to the water that's being being discharged.

Here's an important point that we'll be coming back to, HNu, it's a photoionization detector, not reading properly. We'll come back to that in a little bit. But that's how to read these particular logs.

And what I want to say about this is that they've been developed for each one of the boreholes, and indeed this is representative of what we would see in the vulnerable area.

Q. Mr. Hicks, could a third party who's not familiar with the test site and the tests that you had actually run at this site take the data that's represented on this well log and reproduce the study you've made at that site?

A. I believe so. The location of the boreholes was given, the location of the well was given, and an individual could go out and repeat this experiment.

Q. Now, did Mr. Mohorcich prepare this well log?

A. Yes, he did.

Q. Is he qualified to do that?
A. Yes, he is.
Q. And do you have a well log for every site that was a part of your study?
A. Yes, I do. And they're all in the exhibit.
Q. And do you have a well location map for every site that was a part of your study?
A. Yes. They were prepared, and they're all in the exhibit.
Q. Mr. Hicks, do you have a slide tabulating the chemical analysis of the samples that were taken at each site?
A. These are all in your handouts. I'd like to go through it so that you can understand how to read these particular handouts and understand what the abbreviations would be.

Well name is obviously the name that's associated with the well on well records when you go out to the site. Generally always, at least where we were, we always found a sign that identified the well name.

This is produced water in barrels per day. "TSTM" is too small to measure. Oil field units of measurement are in barrels. And so when

a description "too small to measure" is given at a particular well, it does not mean that there is not a discharge. It means that it's too small to measure in terms of barrels.

And that's why, when you look at the well records on file at the OCD, where the barrels of water is in fact described "TSTM," or too small to measure, it is something that you will actually see there.

Q. Mr. Hicks, let me interrupt you there. Would it, then, mean that too small to measure actually represents a fraction of a barrel?

A. That's how we have interpreted it.

Q. Okay.

A. When we went out to these places that were too small to measure, there was evidence of discharge. The sample number is the sample that we sent to the analytical laboratory. It's identified by this number, 92, meaning the year it was taken, the third month, the fourth day, the ninth hour, and the fifteenth minute of that particular day.

The Environment Department and OCD may recognize that sample numbering system. I'd like to thank the Environment Department for giving

that to us. We've used it for ten years now.

The depth of the sample below the base of the pit, it has a range. The sample that we take has somewhat of a range, and so we've represented this range here. Initially, 1.6 feet to 2.2 feet, we took a sample. Here we took a sample for analysis sent to the Intermountain Laboratory.

The Intermountain Laboratory gave us the results. The results for this particular sample, which is the first samples that we took in the order, if you'll notice the order in your handout is in fact the order that we took the samples. That's why they're arranged this way.

Benzene was not not detected in the soils. Toluene, ethylbenzene, xylene was not detected in the soils. Total petroleum hydrocarbons were not detected in the soils. A little bit here, "ug" per -- that's micrograms per kilogram. This correlates to parts per billion. It's a soils measurement. You're dealing with weight per weight.

Micrograms for kilograms is the same thing as saying "ppb." A strict chemist may disagree with me, but as far as we're concerned,

you're going to be hearing me utilize those terms interchangeably. So with respect to parts per "B," parts per billion, we're not getting any detection here from the laboratory.

Item No. 2, and I'll point this out in the last part, this is a footnote which will tell the reader what the detection limits were for that particular sample.

Now, you'll note for the "PID," the photoionization detector, we give a label of 175 parts per million. So here, again, you'll see that's going to be milligrams per kilogram, different from micrograms, parts per million, parts per billion. So make sure that you're aware of that difference between the readings of TPH and all of these other components of concern because we changed the scale, if you will.

But in each case for the photoionization detector, I used parts per million. That is how the machine reads. It reads in parts per million. That's the designator. It's a gaseous -- rather than weight per weight, if you will, it's an analysis of how many units are counted on an ionization detector. And it is a gaseous medium that we are

analyzing here. So that's always parts per million.

We have a 1 as a footnote here indicating that initially our HNu machine, we did not feel it was working properly during the entire first day, and we can discuss that in a little bit. But that's how to read these particular charts.

And we do see on this particular page that sometimes we are seeing some -- in the laboratory analysis, and I want to draw your attention to the laboratory analyses -- we're seeing non-detective total petroleum hydrocarbons and xylenes, toluene, more toluene and xylenes as we go.

Here's Claude Smith No. 1. We're going to spend a little bit more time on this well. I'll be bringing this slide back, so, John, if you would keep this separate we're going to come back to this slide a little bit later.

The next slide is much the same, the same types of readings. Different series of wells. One, two, three wells in here. Obviously the deeper we got on a particular unit, the more samples we got. 20.4 feet here.

For this No. 4 we only got to 3.6 feet and 1.5 feet before we hit auger refusal in these particular cases, and that's why we stopped. We stopped pursuant to the protocol, which indicated we would stop when we couldn't drill any further. Those of you who have been out in the field would recognize that limitation.

The next slide, I'm not pretending to explain all of the data on the tables; I just want to make sure you're familiar with all these different units. Two wells are located here. Here we're getting a little bit deeper, 14.9 and 19.9. Again, we're seeing xylenes and total petroleum hydrocarbons are observed, and the PID reading is zero drop here.

Again, you'll see from the laboratory a different footnote than what we originally saw. Here's laboratory with a 3 footnote. And the last slide presents these different detection limits that were observed at each sample to make sure that you understand that "TSTM," too small to measure, "ND" -- all the "NDs" that you were seeing on your table were not detected.

The "PID," the photoionization detector, is "NA," is not analyzed. That only

occurred a couple of times, and I'll be bringing that slide back up to tell you why we were not able to analyze the particular sample at a given point.

CHAIRMAN LeMAY: Mr. Roberts, is this a good place to take a break since he's gone through the book?

MR. ROBERTS: I've got a couple of questions. And I think just two more questions, and then we're at the point where we could break.

CHAIRMAN LeMAY: Okay. Fine. Let's go ahead.

Q. (BY MR. ROBERTS) Mr. Hicks, what is the relationship between the photoionization detector values and the lab analysis values depicted on the chart?

A. Let's look at one. Why don't we go back to where we see -- there we go. How about the other one where we've got something that's working. Have we got something other than -- Here we go. This looks good.

Here's a sample where we've got the same sample has a photoionization detector reading and a total petroleum hydrocarbon reading. Again, let me emphasize that we've

included the PID under total petroleum hydrocarbons. Strictly speaking, that's not what it measures. It measures the total volatile organic material that's existing in the gaseous phase.

We've put it in this column for convenience sake, because many times there's a correlation or comparison that many people draw between the PID reading and the total petroleum hydrocarbons. That's why we put it in there, for convenience. It means nothing more than convenience -- the scientific basis for that. Putting them in the same column might be questioned, but it certainly works for display purposes.

One part per million PID, 4.6 parts per million from the lab. The PID is used as a screening tool to assist the on-site hydrogeologist in the selection of samples, a determination of what samples may be selected to be brought forward to the laboratory.

I always compare it to a very sensitive nose. It smells hydrocarbons and volatile constituents without creating a health risk to the individuals on site. So it is a screening

tool, and that's what we've used it for in this case.

Q. As one follow-up question, and the last question before we break, how does that photoionization detector actually work in the field?

A. Basically what we would do is there's two mechanisms that we may employ. The photoionization detector itself -- I should have brought one -- but it is a box with a pump, a probe, if you will, with a pump in it, and it draws air through an ionization detector.

The air that it draws -- an individual may put the photoionization detector probe adjacent to a particular sample. The volatile organic material which would exit the sample would be drawn into the detector by the pump, air pump. A reading would then occur. That's how it works in the field. We also use it. It's also a health risk monitoring instrument used to make sure that there aren't any health risks associated with the work on the site.

Then with respect to the -- I think I also described the head-space method where we put it in the vile and bring it up to ambient

temperature, again, puncturing the septum and the air is drawn up through a detector and read directly as parts per million.

MR. ROBERTS: That would be a good place for us to break.

CHAIRMAN LeMAY: Let's take a 15-minute break. Be back here at about eight minutes after the hour.

[A recess was taken.]

CHAIRMAN LeMAY: Take our seats and we'll continue. Mr. Roberts.

Q. (BY MR. ROBERTS) Mr. Hicks, please discuss in greater detail the field results and the laboratory analysis of the samples that were taken at the study sites.

A. Why don't we move to the summary slides. Why don't we move to some of the next slides that show summary. Keep that one table out for Claude Smith, and we'll talk about the results.

What I've tried to do with the summary slides is help you get through the data a little bit easier than wading through the individual tables. Basically, just to summarize these results, we've got -- we did tests for benzene.

And in all of the laboratory samples that we tested for benzene, we did not detect it. It was below the detection limits in all the samples.

With respect to toluene, which was another constituent of concern that we tested for in laboratory analyses, we detected it in six samples. The maximum depth of detection was at 20.1 feet, at a limit of -- concentration of 22.5 parts per billion. And the maximum concentration for toluene that was observed in laboratory analyses was 33.9 ppb, and that was at 4.9 feet.

Ethyl benzene was also detected or was detected in five samples. The maximum depth that it was detected was 4.9 feet at a concentration of 17.2 ppb. The maximum concentration -- the concentrations that were observed at the Claude Smith well and that was 970 parts per billion at 4.8 feet.

And then the sample that was below that one was at 98 parts per billion. That was the total depth for Claude Smith. That was at 5.9 feet. The next highest concentration outside of the Claude Smith well was at 23.1 parts per billion, 4.9 feet.

Total xylenes were detected in 15

samples. They were detected at the maximum depth of 19.8 feet, which was the total depth of one of the boreholes at a concentration 59.1 parts of per billion. The maximum concentrations, again, were identified at the Claude Smith well where we found 4,523 parts per billion at 4.8 feet. And the sample that was immediately below that was 2232 parts per billion at 5.9 feet.

Outside of the Claude Smith well, the next highest concentration was at 193 parts per billion, 4.9 feet. Total petroleum hydrocarbons, again by laboratory analysis, this is not using the photoionization detector; this is a laboratory analysis. It was detected at 14.9 feet at a maximum of 2.9 ppm.

Again, the maximum concentrations were observed at the Claude Smith well. 220 parts per million were observed at 4.8 feet, and the sample which was immediately below that, 164 parts per million at 5.9 feet. Outside the Claude Smith well, the next highest concentrations, 4.6 parts per million, 4.9 feet.

Basically, as you will see from the analysis of the well logs, the lithologic logs that were prepared by Mr. Mohorcich, that

alluvial sediments, soils and bedrock were encountered in all of these particular borings.

All of the pits that we looked at showed evidence of recent discharges. Some pits had standing water in them as a result of these discharges. Many of the borings encountered saturated sediments as you penetrated below the base of the pit.

Most of the samples, however, were not moist at total depth. Careful evaluation of those well logs would show that the upper portion of these borings were noted as moist samples, and indeed some of them were saturated with water. But most of the samples were not moist at total depth.

Q. Benzene was not detected in any of these soil samples. Did you test for benzene in the produced water at these sites?

A. No, we didn't perform any testing at all of produced water. We really weren't that interested in what was going into the pit. We were more interested in what was going on in the pits and might be coming out of the pits. We were concerned with the potential impacts.

There's been a lot of analyses of

produced water. And they all show a level of hydrocarbons associated with the produced water. It is true that we did not find any analyses of the produced water for dry gas wells.

As I indicated before, we didn't have any information at all on these dry gas wells. But, you know, we did make the assumption that either benzene was not in the produced water associated with dry gas wells or something is happening within the pit, within the very shallow soils that's removing the benzene that's there.

I can't tell you which is true. We did not sample for produced -- we did not sample the produced water and take chemical analyses from these dry gas wells.

Q. Would you expect the chemical analytical results that you had shown to be any different based on the time of year the samples were taken?

A. Well, in August when the thunderstorms and rainfall is most heavy in the San Juan Basin area and when perhaps gas demand is low and there may not be as much production, we might find some higher -- I'm sorry, lower concentrations of the contaminants that we're dealing with here because

the rainfall would in fact dilute or could dilute the constituents that we're seeing in the soil samples. And if there's no discharges because a well might be shut-in due to the demand, again there would be some volatilization and natural remediation, so the results might be lower.

My feeling is that we did collect these samples that had been dry for a period of time. I don't believe that there has been any dilution of these samples due to rainwater. And I think that, if anything, we may be able to say that we're dealing with kind of a worst-case scenario for these particular dry gas wells.

Q. The analytical results indicate that the highest concentrations of the BETEX constituents were found in the Claude Smith soil samples. Is there any explanation for that?

A. Let's take a look at the -- we're going to take a look at this sample, this table first. First we're going to slide this over, please. Recognize that this is the Claude Smith well at the bottom, and you can see it in your handouts. We took two lab samples.

Now, let's move over to this particular area. This is one of the areas, to start out

with, where "NA," not analyzed, we hit bedrock at this particular well at a relatively shallow depth, and we were trying to penetrate through sandstone.

As a result of that, we could not collect enough sample for analysis by the laboratory, as well as the sample that would be required for the utilization of the head-space technique. There just wasn't enough. We made a choice not to analyze using the photoionization detector and utilize both of these samples for laboratory analyses only.

Please look at the footages here, 4.8 feet, 5.9 feet. Again, benzene is not detected. Toluene is not detected. We do have ethylbenzene detected here. We do have total xylenes detected here, again, parts per billion. Parts per million in levels of total petroleum hydrocarbons, 164 and 220.

And there is a reason in my opinion why we're seeing these values here in this lower sample. And I think I can illustrate that by three slides really. First, I'd like to indicate where in the -- I don't have a slide of the Claude Smith well.

This is again from the Mandana. The Claude Smith well, we took the sample immediately adjacent to saturated sediments, totally saturated sediments with the produced water. We also utilized an angle borehole at this particular instance so we would get down below produced waters.

So we had a slight angle on it, as we did when there was standing water. We generally put a slight angle on it so that we could actually look at the materials below the zone where there would be a discharge. So at the Claude Smith well, we had an angled borehole going in immediately adjacent to and trailing underneath these saturated sediments.

In the sample from 4.8 feet the higher-most sample --

Q. Mr. Hicks, let me interrupt you. This is not a photograph that you had previously --

A. Oh, yes. It's a new one.

Q. -- shown on the projector. Who took this photograph?

A. Mark Mohorcich.

Q. And were you present at the time the photograph was taken?

A. That's my foot, that's my glove, and I was in them both.

Q. What does this photograph depict?

A. What we have here is a sample, auger sample, very similar to the one that you saw before, a little bit more clearly in the one before. You can see the auger bit here, and there's another one down here. And this is just, looks like it's totally black and in the shadow, this is in fact a mixture of organic matter, hydrocarbons, saturated, that we detected at 4.8 feet.

You can also see, if you were to get up close, that indeed this core barrel itself in here, this sample barrel, is coated similar to the way that this auger tooth is coated with organic material. This is from -- this particular coring, this particular sample, is taken from immediately above the 4.8 foot sample that we took.

And so after we drew this one out, we inserted the brass sleeve into a different sampling device and used the slide hammer to collect a sample of this particular material. This is relatively semi-consolidated sandstone, I

mean, it's broken up. We penetrated this without that much difficulty.

Q. Mr. Hicks --

A. But this would be what we saw.

Q. -- let me ask you another question. Does that accurately depict what you observed at the site?

A. Yes, it does.

Q. Okay. Now, go ahead and continue on with your explanation regarding the Claude Smith No. 1 well.

A. Then we took the sample with the brass sleeve, and we cored down a little bit further, not much. You can see from the slides that we only went from 4.8 feet to 5.9 feet between the two samples that are represented on your chart.

This is from the sample. This is a core sample -- or not a core sample, an auger sample where you can see the teeth. You can see that it's still coated with hydrocarbons to some extent, but this is from the sample or the column immediately above the lowest sample that we took. And you can see that this is relatively clean material in here.

However, right in here toward the edge

of the core barrel, the edge of the sampler and over in here, the edge, and even in here somewhat, we see some black stained material. We had a very difficult time in preserving sample integrity at this particular well site. The penetration through that zone of hydrocarbons and organic material smeared the borehole. It was saturated sediments. It was caving in on us to some extent, and we tried to keep it open as well as we could.

But we hit -- this is a sandstone unit here. It is highly consolidated. It was very difficult to drill through this particular unit. And after we saw that we were getting out of this black material, we elected to take a sample with the slide hammer in the brass sleeve. And we understood at the time that there would be a problem with some cross-contamination of samples. We understood that, and we did our best job under the circumstances that were permitted at the time.

But in my opinion, when we pulled out the sample with the brass sleeve, we still saw this kind of contamination of hydrocarbons, if you will, from up-hole on the edges of the sample

that was submitted to the laboratory. The interior of the sample was very similar to this, a fresh, clean appearing sandstone unit.

And so if we go back to that particular description here, it is my opinion that our sampling protocol in this case, albeit consistent with EPA techniques and we've done this time and time again, you still are faced with some unexpected occurrences.

And indeed I think that in this case, it's my opinion that this particular sample, which is represented here, is not truly representative of what we would anticipate finding if we could have provided some surface casing or another kind of technique that would isolate that upper zone of contamination, which is truly represented here. I'm not disputing by any stretch these results.

MR. STOVALL: Mr. Chairman -- I'm sorry, Mr. Hicks -- I just want to do one thing for the record. He is pointing to slides and lines on the slide, and there's going to be no way when you read the transcript you're going to have any idea what he's talking about. Could we identify the samples or something?

MR. ROBERTS: Sure.

Q. (BY MR. ROBERTS) Would you identify this sample by its sample number?

A. 9203051542 Is the sample that was immediately above No. 9203051617 on the first page of the data tables in the exhibit.

The upper sample, which again is 1542, is a sample with integrity. It does represent the hydrocarbon concentration of the sample. You could go out and you could repeat the experiment again with more sophisticated techniques, with isolated surface casing, and you would see similar results.

The sample labeled 1617, the complete name is 9203051617, I don't believe this is repeatable. I believe that if you would go out with more sophisticated techniques where you can isolate the upper portion of the zone which is contaminated, that you would find lower values than what are represented here.

Q. Is it your conclusion, then, that the sample taken at 5.9 feet did have up-hole contamination?

A. Yes, it is.

Q. Now, why did you not dig deeper at this

site?

A. At this particular site we encountered a consolidated sandstone and were unable to penetrate further using the hand auger techniques.

Q. By way of summary of your answer, let me ask a couple of questions. First, what is the black material that's depicted in the photograph of the soil sample? Could we put that particular photograph on the projector?

A. I believe that that is a combination of petroleum hydrocarbons that were discharged into the pit over time. I believe it is also a decomposition of products, biodegradation of these organic hydrocarbons that creates this black mat.

Q. What do you mean by organic hydrocarbons or organic material?

A. Well, the organic material is, in fact, we have discussed at some length the fact that biodegradation can occur at many of these sites and that microorganisms utilize the petroleum hydrocarbons as a carbon source as a food.

And as this particular colony may decompose or create waste products, there would

be decomposition products and that would indeed be represented by this black material, not all that dissimilar to what you might find in a septic tank leach field where the soils have been stained black due to an active organic colony.

And so I don't mean to represent that that's all this is. I believe there's hydrocarbons in there as well that's documented by the analysis, and additionally there is clearly some decomposition products to turn that black.

Q. Do you mean that the liquid hydrocarbons are being remediated by natural processes?

A. That's exactly what I believe is happening.

Q. Now, if you were to repeat the sampling program at the Claude Smith well, would you expect to observe similar results?

A. Let's put that data table back up with the showing of Claude Smith. We talked about the repeatability of this and how an individual could go out and repeat it.

If you were utilizing the techniques that we used with a hand auger, I believe that

1542 and 1617 probably would be repeated because I believe that no matter how conscientious you are, you're going to get up-hole contamination.

However, if we went out to redo this experiment at this site, we would probably use some surface casing. We would take more robust methods to prevent this up-hole contamination.

If we would go out to repeat this experiment, we would find different results than what are presented here for the sample 9203051617. I do not believe that more robust, the mechanics of taking the sample or a different approach would change the results of sample 9203051542.

Q. Let's change gears a little bit.

A. Let me mention one thing about that particular slide. It's interesting to note here that despite our sampling techniques, despite the flaws that we saw, that we do see a decrease by order of magnitude of ethylbenzene between the sample that we believe has integrity and one which we believe has been contaminated by up-hole material. Despite the fact that we are suspect of this particular sample, we still see an order

of magnitude decrease in the upper benzene concentration.

Additionally, the total xylenes decrease, as do the petroleum hydrocarbons decrease as well. And so I think it's important to note that despite this problem that we had in the field, that the same story that we're seeing over and over again of natural remediation and biodegradation seems to be occurring. That story is even portrayed here where we have questionable sample integrity.

Q. Mr. Hicks, in looking at the analytical results, you've talked a lot about standards. What are the standards for BETEX and TPH constituents?

A. Well, this is what I'm presenting here. It's in your handouts as well. And we're using these for comparisons. The OCC, to my knowledge, has not promulgated any numerical standards relating to soils at oil and gas sites.

The OCD is charged with the administration of the Water Quality Control Commission Groundwater Regulations, which are shown there on the right, WQCCGW, the groundwater

standards. But with respect to soils, they are charged with the protection of groundwater in the environment, and there are no standards for that.

Now, there is a set of standards that we've been looking at, and I must admit I'm not convinced that standards per se for this UST soils we have listed there may not be the right word.

The regulations, as it shows here, the New Mexico UST regulations, cited on the bottom there, do talk about the closure requirements for underground storage tanks holding, in this case, petroleum hydrocarbons, gasoline, diesel, those kinds of materials. The kind of materials really aren't that significantly different from condensate in the natural gas areas of the San Juan Basin.

But here, in order to consider a site to be closed clean, clean closure, where you do not have to do any remediation of soils, the benzene concentration in a soil measured using appropriate laboratory tests needs to be less than 10 parts per million.

And to translate that a little bit back

into the parameters that we were dealing with in our tables, that would be 10,000 parts per billion, orders of magnitude difference here.

And they also, you'll notice that we don't have anything specifically here for toluene, ethylbenzene and xylene, but they do address that in the UST soil regulations where the total aromatic hydrocarbon value needs to be less than 50, again ppm, not ppb.

They also give a unit for TPH, which is not that dissimilar than what we've been talking about here in the earlier testimony, where 100 ppm would be used to determine whether a site would require remediation or removal. And, again, that's consistent with the NMUST soils regulations.

And I'd just like to make sure that we've contrasted these regulations with respect to soils to that of groundwater, and you can see that again we're dealing with -- again, that's in milligrams per liter, which is equivalent in this case to parts per million.

And you can see that there's quite a bit of difference between 10 ppm and .01 ppm for benzene. And there is no standard for

groundwater for total petroleum hydrocarbons. It's dealt with these other parameters concerned instead.

And so these are kind of what we compare some of the results that we found in our study of dry gas wells to find out what may be acceptable or tolerable or that don't demonstrate any risk to human health and the environment.

Q. When you refer to "NMUST" standards, are you referring to New Mexico Underground Storage Tank standards?

A. Yes, I am.

Q. And when you refer to "WQCC" standards, are you referring to Water Quality Control Commission standards?

A. Yes, that's true.

Q. Now, are these standards risk-based?

A. Let me talk about the Water Quality Control Commission Groundwater Regulations. In the development of these regulations, generally there has been a fair degree of toxicological evidence submitted with respect to the health risks involved with the ingestion of this kind of material.

In this case of BTEX, these are health

based, health risk standards. They aren't nuisance or some of the other -- I can't remember the exact title. But these are health based standards, and they are indeed related to the risks involved with ingestion.

With respect to the soil standards, if you will here, generally in my opinion, and I was not involved with the development of the UST regulations, but there is empirical evidence that you can draw from the investigation of underground storage tank sites that would demonstrate in my opinion or that should be able to demonstrate where soil contamination is at or below these limits that are presented here, that that soil would not create a risk to human health and the environment.

And so in one side of this particular slide of standards, we're dealing with toxicological studies by, you know, doctors and toxocologists. And on the other side, in my opinion, we're dealing with not the ingestion of material, but the risk that this concentration poses to human health and the environment generally due to continued leaching into groundwater or other kinds of risks.

Q. Again, in order to elicit in your opinion, in your opinion would the discharge of waste at or below these concentrations create a risk to human health or the environment?

A. The discharge with respect to Water Quality Control Commission regulations, which is dealing with liquids, in fact the Water Quality Control Commission regulations permit the discharge of fluids that are considerably higher than these standards.

These are not discharged standards by any stretch of the imagination. They are in fact standards for ingestion. And the Water Quality Control Commission regulations allow the discharge far in excess of these standards.

Q. What do the Water Quality Control Commission standards or regulations actually regulate? What are they applied to?

A. Well, they govern the discharge from industrial and municipal sites, also from federal facilities. They create a permit process to permit the discharge of material. And that is what the WQCC regulations permit.

I might also want to add that there is another series of regulations that permits

discharge in excess of these standards, and that would be the liquid waste provisions which allow a septic tank and leach field to discharge certain material, in this case relatively high nitrogen content above the standards, for example.

And that's another series of regulations, which are not listed here, but another series of regulations which permit the discharge in excess of standards.

Q. Why would the state permit or allow discharge in excess of these concentrations?

A. The Water Quality Control Commission regulations protect groundwater for present and reasonably foreseeable future use. The regulations do not protect the water that can't be used for these purposes.

Thus dischargers are allowed to put contaminants into the ground and in fact into the groundwater provided that it will not adversely impact water for the reasonably foreseeable future beneficial use of that water.

Q. What is beneficial use?

A. It's a very long answer, but basically it involves consumption of water by man or

wildlife, agriculture, industry, recreational uses, a wide variety of uses that would be considered to be beneficial not only to man, but to other species as well.

Q. How would these state regulations be applied to the discharge of produced water?

A. Well, in fact produced water discharges are exempted clearly from the Water Quality Control Commission regulations, but, you know, let's go ahead and proceed with an example as though they were.

The discharge of produced water in excess of the standards would in fact be permitted into earthen pits as long as a certain set of conditions were met. And the discharger into a earthen pit would have to demonstrate that the groundwater contamination that would result underneath the pit, for example, would not create an adverse impact to groundwater at a point of reasonably foreseeable future use.

The WQCC regulations would allow contamination below the earthen pit provided that that individual who is making that discharge could make the demonstration.

Q. Now, with respect to the Water Quality

Control Commission regulations, how is this point, "reasonably foreseeable future use," defined?

A. I have always seen the permits be approved and applications be set forth with the point of compliance for this as being the point where a property line or a loss of control, if you will, of the groundwater.

In other words, an individual can contaminate groundwater on his own property or where that water is clearly controlled by that individual. It is the point where the contamination leaves the control of the discharger that the regulations and the point of compliance exists.

Q. So it is your testimony that the discharger under these regulations can contaminate the water at the point of discharge?

A. Under the Water Quality Control Commission regulations, the discharger can contaminate water underneath his own property, and the reason for that is because they control the water and there is no risk involved.

There's no exposure to human health and the environment because of the control that the

discharger exercises over that water which he has contaminated.

Q. Mr. Hicks, in your opinion is there any reason why the Oil Conservation Division should regulate the disposal of produced water in a manner different than the manner in which the Water Quality Control Commission regulates the disposal of wastes that are under its jurisdiction?

A. Well, it's my understanding that both the Water Quality Control Commission and the Oil Conservation Commission have charged respective agencies for the protection of groundwater. And so it seems to me that they both have the same charge, and they're giving that charge to the regulators. And so I don't see why there should any difference between those two sets of regulations.

Q. Is there any evidence that you are aware of that produced water is more toxic or creates a higher risk to human health or the environment than those wastes that are regulated by the Water Quality Control Commission?

A. No. In fact, the Water Quality Control Commission regulations apply to waste of very

similar characteristics to that of produced water. They also apply to waste that would be more toxic as well as to waste that would be less toxic. So they bracket the range.

Q. Do the Water Quality Control Commission regulations apply to soil?

A. The regulations apply to soil to some degree, but the standards that are presented here are for groundwater, and there are no standards for soil.

Q. Are there a set of state regulations that do apply to soil?

A. Well, these UST regulations were as close as I could come, and indeed these standards, again, are associated with the closure of underground storage tanks and what remedial action may have to be taken at underground storage tank sites based on soils' analyses.

Again, to emphasize that where contamination of soils are less than these figures here, it's been determined -- or it's been determined that there is not a significant risk to human health and the environment, and those soils can stay in place.

Q. What state agency enforces the

Underground Storage Tank regulations?

A. The New Mexico Environment Department.

Q. Now, do the soil samples from the ten dry gas well sites fall within the standards set forth in the Underground Storage Tank regulations?

A. Well, with the exception of the Claude Smith well, where we have two samples that show total petroleum hydrocarbons greater than the standards, all of them in fact are within the state standards listed for USTs.

Q. In your opinion would the samples from the Claude Smith well meet the standards if the samples could have been collected without any up-hole contamination?

A. The sample at 5.9 feet, which is the lowest sample in my opinion based on what I saw in the field, would probably meet that contamination criteria; that it would be below the standards set forth here. With respect to the sample that was immediately above it, no, it would not.

Q. What conclusions do you draw from the dry gas well study?

A. Basically we can say that there was no

BTEX, benzene, toluene, ethylbenzene, xylene, concentrations above these acceptable levels. If you sum them up, they come far below 50 parts per million.

Once I did show total petroleum hydrocarbon concentrations above these New Mexico Underground Storage Tank regulatory standards, if you will, the deeper samples in general, I mean in terms of the study, in terms of future studies, deeper samples can become contaminated by this up-hole material, especially where you create or penetrate a saturated unit.

And this hypothesis that was put forward by OCD that the discharge to unlined pits of low volumes of water produced from gas wells represents a threat to human health and the environment within the vulnerable area by this hypothesis, again, this is our interpretation of what was being being presented in the rule.

These words were not being spoken by the OCD. This was not a hypothesis that was presented in evidence. This is not a hypothesis that OCD has even spoken to me about. But this is a hypothesis that I draw from the rule, and our data do not support this.

Q. Mr. Hicks, in summary, what are the traits or characteristics you found to be common among the disposal sites you tested and sampled?

A. Basically all of the sites that we tested and sampled meet the definition of a dry gas well. They all, everyone that we looked at, produced less than one barrel of water. The gas-to-oil ratio was less than 100,000. In all of these liquefied, liquid petroleum products, condensate and oil were not recovered at the site.

The other thing is that all of these sites were outside the vulnerable area.

Q. Now, what's the significance of the one-barrel-per-day volume that you have utilized in the definition of a dry natural gas well? Couldn't it just as easily have been five barrels of day or three barrels? Why did you choose one barrel?

A. We had to choose one barrel principally because the data that we collected, the sites that were selected, the sites that we looked at, none of them produced more than one barrel a day. So with respect to a definition, we don't feel that we have an adequate database to support

anything more than one barrel a day.

In my opinion, based on the data that I saw here, if we were to go out and do some sampling at other wells that produced more liquids, more produced water, perhaps that one barrel a day could be brought up. But we don't have the data to support it, so we felt that we can't give a definition that says anything more than our data can support.

Q. What's the significance of the existence of these common traits or characteristics?

A. These characteristics that we're dealing with here are operational characteristics where they have a series of characteristics that create a type of well, not dissimilar to what we found in the 1985 hearing. There are certain types that exist.

In 1985 we defined types of sites based on hydrogeologic criteria. Here we've developed a type of well that's based on operational criteria. And we find that, based on this operational criteria, it appears that this particular type of well does not cause a threat to human health and the environment by the

discharge of produced water into earthen pits.

Q. So do they represent a set of conditions under which contamination of soil and groundwater is not occurring?

A. Certainly very minor soil contamination may be occurring, but clearly the bulk of the -- at one site -- but clearly the bulk of the samples show that groundwater could not be contaminated at all of sites based on the evidence that we've seen.

And in soil contamination, if it's present at all, is highly restricted to the area of the saturated sediments associated with the produced water.

Q. Is your study of the soil contamination at these ten sites a statistically valid study?

A. Well, it is not a random sample. It is indeed not a random sample, and I don't propose that this series of tests would be to represent all of the wells within the vulnerable area, all of the wells within the San Juan Basin by any stretch of the imagination. It is not a random sample.

But I believe that the data that have been created from this sample could be used with

a relatively high degree of confidence to say that these ten wells are fully representative of dry gas wells.

Q. And in your opinion can the results of that study be applied to all other wells having similar traits or characteristics with the assurance that freshwater or human health and the environment will not be in danger?

A. Yes, I believe that if the statistical evaluation of this data were performed, and we did not do that, but if it was to be performed, that you would see a high level of confidence based on these data that we see, a high level of confidence, that you can extend this to all dry gas. You can extend the findings of this to all dry gas wells. They would not cause a threat to human health and the environment.

Q. I'd like to you elaborate a little bit more on why wells sharing these traits, common traits and characteristics, would not endanger freshwater, human health, and the environment?

A. The traits that we've developed here about no liquid hydrocarbons and relatively low volumes of water being disposed to earthen pits appear to permit these natural processes that

we've been discussing of volatilization and bioredmediation to act very well at these sites.

And, in fact, these natural processes are remediating whatever insult there might be posed to the soils of these particular sites. And so natural remedial processes are active at these sites, and that is the reason why these common traits are so important.

Q. Does your client request an exemption or exclusion from an order that might be issued in this case for dry natural gas wells?

A. For dry natural gas wells that are located outside of the existing vulnerable area, an exemption from this order is requested.

Q. Why does it not seek the exemption or exclusion for dry natural gas wells located within the boundary of the existing vulnerable area?

A. Well, interestingly enough, the scientific data that was presented here today would support such an exemption from the rule. We do not see significant contamination in depth. However, the Four Corners Gas Producers Association realizes that the existing vulnerable area is the center of population for

the San Juan Basin. And as a result, there's going to be higher risks in this existing vulnerable area.

Additionally, there is a desire on the part of the Four Corners Gas Producers Association to work with and cooperate with the Oil Conservation Division. And we also recognize, the Four Corners Gas Producers Association recognizes that the discharge of produced water is a matter of concern to the public in general.

And we believe that in the spirit of being a good neighbor and in the spirit of risk-based analysis where there is a population center, it makes sense to eliminate all discharges of produced water to earthen pits within the existing vulnerable area.

Q. Now, would that elimination in your opinion -- should that elimination within the existing vulnerable area be subject to a variance procedure?

A. Well, indeed within the existing vulnerable area, there will be certain characteristics, even within the existing vulnerable area, there will be certain

characteristics which would prevent the contamination of groundwater and exposure to risks to human health and the environment.

And within the existing vulnerable area there should a provision for a variance from the elimination of discharge and any closure requirements in the existing vulnerable area if certain demonstrations can be made.

Q. Let's talk about some conditions or traits or characteristics that if shown to exist in disposal sites or a disposal site or a group of disposal sites might warrant some treatment in the form of variance from the operation of an order. Can you identify any of those kinds of common characteristics, traits, or conditions?

A. Indeed we've been thinking about how about this and have come up with a series of conditions which may alone or together may create an adequate demonstration that there would not be a threat to human health and the environment. And they are things like, for example, land use.

There are certain land uses that create higher risks. And I think that the Four Corners Gas Producers Association understands that the land use in the existing vulnerable area, there's

a lot of wildlife, fish, humans, agriculture. There's a lot of use within this particular area, and the risks are relatively high.

And so we, based on this land use, we have indicated that a broad characterization for -- we're not asking for exemptions from the rule. On the other hand, there may be areas where land use is an important factor in determining a common characteristic where the risks are not great.

Another characteristic that may cut across a number of different wells would be the maximum depth to groundwater. And there's, to give you an example of where some further investigation may be warranted, in the upper reaches of phase 3 of the vulnerable area expansion, there are some very wide areas of the vulnerable area where the 50-foot contour line away from washes extends for thousands of feet away from where known areas of groundwater are known to exist.

And there may be a broad classification of wells that would not have any chance of contaminating the documented shallow groundwater associated with these ephemeral washes. And

perhaps there should some study or review of that portion of the vulnerable area for an exemption or for a variance of some sort because once you get thousands of feet away from the -- or perhaps in some instances, even hundreds of feet away from these ephemeral streams where groundwater may exist, you may be hundreds of feet to groundwater. And that may be an area a variance or even an exemption is warranted.

Many sites may also exist on the same geologic formation. And there may be a wide geographic area that's characterized by shales or very low permeability sediments that would prevent the movement of produced water or any contaminants into a groundwater system. And here clearly a variance for this population or this type of well would be warranted.

Additionally, we want to make certain that, you know, we've got a similar chemistry of the produced water and a similar volume of produced water to be factored into these kinds of variance criteria.

Q. Now, assuming that any of these conditions could be shown to exist in that their existence would enable the discharger to show

that there's not a threat to freshwater or human health, or the environment, in your opinion should the disposal sites be subject to an order and rule that requires the elimination of discharge of produced water into unlined pits and the closure of those pits?

A. Clearly not. I think that if the demonstration could be made that there's not a threat to human health and the environment to the disposal of water into earthen pits, that those should be subject to a variance for many reasons.

Q. When you speak of a variance, are you limiting it to a variance in a well-by-well basis or site-by-site basis?

A. No. Indeed, as we are suggesting here, we have identified a type of wells that would be subject to exemption. In the same manner, there may be a type of wells that are characterized by shales, for example, where they are completed, the earthen pits are all completed in a shale, and there is no chance of contamination of groundwater or a threat or risk to human health and the environment. And all of those wells should be able to be subject to a variance on a area-wide basis based on the population or the

traits that they share.

Q. Why are you not here today suggesting that where those kinds of conditions can be shown it would not be appropriate for an exclusion or exemption from the operation of this rule?

A. We only have the data for dry gas wells. That's all we've collected. We don't have any data that we can present to the Commission that would support any other position than what we have supported for dry gas wells.

As the Commission indicated, this is a place to present data. Had we had data for other wells, we would have presented it with respect to exemptions or exclusions. We don't have it, and we can't present it. We can't support it.

Q. In your opinion, should this variance procedure apply not only to the proposed expanded vulnerable area but also to the existing vulnerable area?

A. Indeed there may be conditions within the existing vulnerable area that traits or characteristics would warrant a variance on a well-by-well basis or by a grouping of wells.

Q. When we talk about the existing vulnerable area, what are we referring to?

A. The vulnerable area that was defined by the 1985 hearing.

Q. And what are we talking about when we refer to the proposed expanded vulnerable area?

A. The expansion of the vulnerable area is defined in the proposed rule by OCD.

Q. Now, assuming that the result of this hearing is the issuance of an order and rule that requires elimination of discharges of produced water into unlined pits, do you have an opinion regarding the time period within which the discharges should be eliminated?

A. Yes.

Q. What time period or periods do you propose?

A. The Four Corners Gas Producers Association and myself, as an expert in this field, would propose a one-year period of time for the elimination of existing discharges within the existing vulnerable area.

We would also indicate that around municipal supply wells that a one-year period be permitted for the elimination of discharges. With respect to what is known as the phase 2 expansion of the vulnerable area, I would

recommend three years for the compliance period to eliminate discharges pursuant to the order.

And I would also recommend that three years be used by wellhead protection areas associated with public water supplies that are different from that of municipal water supplies. And a five-year period for the elimination of discharges associated with the phase 3 expansion.

And five years also for a wellhead protection area that would be associated with a domestic water well supply or private water well supply, windmills, those types of water well supplies.

Q. Do you also suggest that there ought to be some discretion with the OCD director to grant extensions to those time frames?

A. Absolutely.

Q. Now, you've referred to the phase 2 expansion of the vulnerable area. And I want to make sure we understand what that is. Is that not the major drainages and tributaries to the major river systems, the San Juan River, the Animas River, La Platta River?

A. The named tributaries in the order,

that's correct.

Q. Now, what factors support this proposal for this time frame for elimination of the discharges?

A. Olson's report and other studies have indeed demonstrated that there is existing contamination around produced water pits within the existing vulnerable area. Although we do admit or would argue for a variance, in some instances it clearly does show that there is the potential for contamination within the existing vulnerable area.

This is the area where the greatest population exists. It is the highest risk. It deserves attention. And a one-year period from the date of this order would be fully acceptable to the Four Corners Gas Producers Association, and I would recommend it as an expert.

However, with respect to the expansion of the vulnerable area, there are certain logistical considerations which must be understood that, because of our agreement and because of our understanding with respect to the risks associated with the existing vulnerable area, we believe that the resources that are

available to industry need to be focused and expended on eliminating the discharges within 12 months within the existing vulnerable area. That's where the resources should be expended, and we believe that's where the resources will be expended.

Now, some dischargers, some oil producers, despite the fact of concentrating their efforts in the existing vulnerable area, there's so many wells and there's only so many crews that are available to replace these pits. There needs to be a provision for a variance or an extension of time, not a variance, an extension of time to permit these individuals to complete the process.

There are indeed a lot of wells out there. But, again, with that provision for an extension of time, clearly this existing vulnerable area 12-month period would be adequate. And they will be expending the resources to do that.

As a result of that, my feeling is, as an individual that's associated with the closure of pits and the assessment of pits and the replacement of earthen pits, that there's not

going to be any time or resources necessary to take a careful evaluation of what's actually necessary to be closed and eliminated in the expanded vulnerable area.

And so I believe that more time is necessary in the expanded vulnerable area to perform certain studies to ensure that certain groupings of wells which do not cause a threat to human health and the environment would be permitted to be studied and that variances then can be presented to the agency for review.

I don't believe that we want to burden the industry or in fact burden the OCD with a lot of work for sites that are not warranted because they do not create a threat to human health and the environment.

And so what I'm saying is that because of the expenditure of resources to close the pits in the existing vulnerable area, there will not be time, there will not be resources to look at the expanded area.

Additionally, with a tighter time frame, my feeling is that the OCC, OCD will see an incredible number of requests for extensions and perhaps even many requests for variances that

are not fully supported by scientific data because there has not been time.

As a result, there's going to be an incredible administrative burden put forward on the OCD to deal with many of these variance cases and to deal with the extensions, and they will not have -- they, too, will be diluting their own resources from that which the true contamination cases, the true potential where they need to be expending their resources, they might go tilting against windmills for issues that do not pose a threat to human health and the environment, and we believe we'd like to avoid that.

Additionally, I want to make certain that people understand that the time frame involved here is not significant. We're dealing with five years maximum. Many of these wells have already been disposing of material into earthen pits for tens of years. And yet despite this disposal, there are precious few contamination cases of domestic water well supplies, of municipal water well supplies, especially in areas outside the vulnerable area.

And indeed we aren't looking at a gloom and doom immediate threat. The natural

mechanisms that we've been talking about here are providing us with a certain degree of time for evaluation. And we believe that this particular proposal of a one-, three-, five-year period with the provision for further extensions, if the director should so allow, does make sense based on both the scientific and the logistical considerations.

Q. Now, Bill Olson in his testimony given at the January 16, 1992, hearing recommended the creation of an area that lies within the radius of 1,000 horizontal feet of all freshwater springs and wells within which discharges of produced water of unlined pits would be eliminated and prohibited.

Now, I know that Oil Conservation Division is now proposing a different, some different parameters for that, but those are not yet in the records. So I want to deal with what's in the record at this point.

In your opinion is this recommendation reasonable or necessary?

A. I don't believe that a thousand-foot limit is reasonable or necessary.

Q. Why not?

A. Well, there are already a set of existing regulations. They are the New Mexico Drinking Water Regulations. And in those regulations it discusses certain setback requirements for domestic water well supplies and public water well supplies as well.

And these setback requirements are inconsistent with 1,000-foot radius. And to me, as an expert in hydrology, it makes very little sense to offer the same level of protection to a windmill, that produces a quarter of a gallon a minute for stock, to offer that same level of protection to that well as you would for a municipal supply well that produces 350 gallons per minute and services the town of Farmington, for example.

I didn't understand that, and it didn't make sense to me as to why that would occur that way.

Q. Do you have an alternate proposal?

A. Yes, I do.

Q. And what is that?

A. For these municipal supply wells, these large production wells, 1,000 feet does seem very reasonable to me. And I think that that 1,000

foot should be applied as a wellhead protection area for municipal supply wells.

Q. Mr. Hicks, where are you going to find most of those municipal supply wells?

A. Indeed you're going to find them within the existing vulnerable area or the expanded vulnerable area. But if there was one that was outside the existing or the expanded vulnerable area, the wellhead protection area should eliminate the discharge of produced water into earthen pits in that 1,000-foot radius, of course, again subject to a review by the agency under the variance procedures.

Q. And when you say, "the expanded vulnerable area," again, what are we talking about?

A. The phase 1, phase 2 named washes --

Q. Okay.

A. -- and tributaries thereof.

Q. Go ahead with your proposal.

A. Around private water wells or stock wells, these small producers, if you will, where there's only one hook-up generally, and that is defined indeed in the New Mexico Drinking Water Regulations, 100-feet radius of influence for a

wellhead protection area is what's presently afforded.

For a well which would serve more than one person, more than one hook-up but fewer perhaps than 25 people or a category that would be more than one person but less than a municipal supply well, if you will, 200-feet radius of influence seems to be a logical wellhead protection area, one which is supported by the New Mexico Drinking Water Regulations.

Q. So is it your testimony, then, that your proposal tracks the parameters that are set forth in the Safe Drinking Water Standards Act or the regulations that have been implemented pursuant to that act?

A. Indeed there is already a set of regulations that exists that protects these domestic water well supplies. And if the OCC wants to, you know, change those regulations or modify them or deal with them in some other manner, you know, it's up to their discretion because there is discretionary language in here that the director can modify certain aspects.

But it does indicate that from a pollution source, which is what we would define a

produced water earthen pit as, as a pollution source, there are already requirements in here that I think deserve some investigation.

Q. In your opinion after the effective date of this order, should protection be afforded to discharges that exist prior to the drilling of a water well, and say the water well is drilled after the effective date of this order and there's an existing discharge?

A. Well, indeed these regulations that we've been talking about, the drinking water regulations, would prohibit a drilling of a domestic water well supply, for example, within 100 feet of a pollution source, as defined as a earthen pit disposal site. So, I mean, that person couldn't do it anyway.

Q. So in those circumstances the discharges ought to be permitted to continue?

A. Yes, I believe so.

Q. Now, Mr. Hicks, there may be instances where produced water pits are closed prior to the effective date of an order that would be issued in this case. In your opinion should such pits be subject to the provisions of this order?

A. No, they shouldn't be.

Q. Why not?

A. Well, again, we're going to have, in my opinion, an incredible administrative burden placed on the OCD with respect to the closure requirements on many, many sites where there is no threat to human health and the environment.

And, again, the OCD would be expending their efforts on areas that may not have a benefit, have a reasonable benefit. And I think it's important that the OCD would concentrate those efforts at those sites where they believe a threat actually does exist, and they have that authority to do so presently.

I think also we have to understand that these sites that have been closed, the discharge is stopped. There is no continuing discharge. We've got the processes of natural remediation occurring for many of these sites.

And it doesn't make sense to me to burden the industry nor burden the OCD again with tilting after so many windmills when they should be concentrating their efforts on the sites which have documented problems or where the potential for a problem is indeed documented.

Q. There may also be instances where lined

pits with below-grade tanks have been installed to replace unlined pits prior to the effective date of this order. In your opinion should those pits be subject to the provisions of an order that might be issued in this case?

A. Again, my feeling is that we should be concentrating on the areas that there are problems and not tying to increase a burden on to industry and the Oil Conservation Division where it is warranted.

The Division has the authority to go back and look at sites, and they should do so where they think there is a reason. But to apply retroactive standards to pits that have been installed does not seem reasonable to me, and it seems like it would create a wasted effort for many, many sites.

Q. We have one final clean-up matter, and then we're finished. You were talking earlier in your testimony about pit closure data that you were familiar with and upon which you had relied --

A. Yes.

Q. -- in developing the case study for Four Corners Gas Producers Association that

you've presented today. You indicated, I think, that there was contamination found in some instances at a depth of 35 feet.

Now, was that generally the case, or was that an isolated case? Is it possible that there were no contaminants found in many of the circumstances?

A. Thirty-five feet was reported to me to be the maximum that was found. And it was also reported to me that most of these sites did not extend more than a few feet. I think it's interesting to note that the study we did on dry gas wells indeed showed that for this category of wells soil contamination either was not present at all at these sites or it extended only three or four feet.

So the information that was presented to me by the industry, which is again not publicly available but it helped us develop our study, the information that many of the sites didn't see more than a few feet of contamination is indeed supported by our limited study for dry gas wells.

And I would assume that what was told me, that many of the cases did not show

contamination beyond a few feet, is in fact the case and that 35 feet was in fact the maximum that was found in some isolated cases.

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

A. Yes, it was under my direction, by me, and under my supervision. Others did participate, but it was always under my supervision.

MR. ROBERTS: Mr. Chairman, we'd move the admission of Exhibit No. 1.

CHAIRMAN LeMAY: Mr. Roberts, are both these Exhibit No. 1?

MR. ROBERTS: We do not intend to introduce the outline of the presentation.

CHAIRMAN LeMAY: This will be Exhibit 1, so noted?

MR. ROBERTS: Yes.

MR. STOVALL: That is, if I may clarify, the data from the study of the produced water disposal wells.

MR. ROBERTS: Has it not been marked?

CHAIRMAN LeMAY: It has not been marked.

MR. ROBERTS: I'm sorry. We'll do

that. Do you want me to go ahead and physically place a stamp on that?

CHAIRMAN LeMAY: You can do that, please. And we'll accept that without objection?

MR. STOVALL: No, I have no objection to that one.

MR. ROBERTS: We have no other questions on direct.

CHAIRMAN LeMAY: Fine.

MR. STOVALL: I'd like to ask Mr. Roberts a question with respect to the other exhibits. A lot of the testimony has been pointing to the outline and the certain slides, particularly to the color slides. Do you intend to admit those, Mr. Roberts?

MR. ROBERTS: I think we got the testimony in that we wanted in. We can submit them as exhibits if there's a preference for that.

MR. STOVALL: My only concern is that to be able to read a transcript and Mr. Hicks refers to pointing to something and there's nothing to look at, I would prefer --

CHAIRMAN LeMAY: I would suggest for

the benefit of the record that the outline of the presentation, as submitted to us here and some copies in the audience, be submitted as Exhibit 2 only to back up the record.

MR. STOVALL: I would also request the admission of the color slides of specific tests, because there was some specific testimony where I think it would not make sense to read it without being able to look at something that says what he was pointing to and talking about.

MR. ROBERTS: Let us do this then. We'll designate the data from the study of produced water disposal of ten gas wells in San Juan County, New Mexico, as Four Corners Gas Producers Exhibit No. 1.

We'll designate the outline of the presentation --

THE WITNESS: Those are my only copies. We'll have to make some.

MR. ROBERTS: -- as Exhibit No. 2. And then we will --

MR. STOVALL: Mr. Roberts, if I might add, I'm really just trying to make a record. I'm not trying to give you a hard time. I think it would be useful if we just had him say which

slide was which and put a number on it because it made some descriptions talking about the dotted line.

MR. ROBERTS: Can I say that?

MR. STOVALL: Sure. I don't care, just so we know which one.

MR. ROBERTS: The photograph of the Mandana No. 2 well would be designated as Four Corners Gas Producers Exhibit No. 3. Do you want any further description than that one?

MR. STOVALL: No. I think he referred to that specifically.

MR. ROBERTS: We will designate the photograph of the Western Federal No. 6 well as Exhibit No. 4, Four Corners Gas Producers Association.

MR. STOVALL: Can I see that? I think, just for information, that's the well of the two people in the pit augering the bottom of the well, so we know what we're talking about here.

MR. ROBERTS: Then we'll designate the photograph depicting the clean core sample from the Claude Smith No. 1 well as Exhibit No. 5. And we'll designate the photograph of the dirty core sample from the Claude Smith No. 1 well as

Exhibit No. 6.

And I would move the admission of Four Corners Gas Producers Association Exhibits 1 through 6.

CHAIRMAN LeMAY: Without objection, Exhibits 1 through 6 will be --

MR. ROBERTS: I better qualify that.

Q. (BY MR. ROBERTS) Did you either prepare these exhibits or have them prepared under your direction and supervision?

A. Yes, I did.

MR. ROBERTS: I move their admission.

CHAIRMAN LeMAY: Without objection, they'll be admitted into evidence.

MR. ROBERTS: Mr. Chairman, can we get copies of these slides to you?

CHAIRMAN LeMAY: Yes.

THE WITNESS: Would paper copies be better for you? Because we can have those color Xeroxed at that scale and it's going to be easier for you to handle.

CHAIRMAN LeMAY: Either way, we'd like to have the exact copies of that made, as long as it's legible as they were on the screen.

THE WITNESS; Yeah.

MR. STOVALL: Mr. Roberts, if you wouldn't mind, after he does that, I think it would be great to have Xeroxed copies and then just attach an affidavit from him that those are copies of the originals submitted at the hearing for record purposes only.

MR. ROBERTS: That will be fine.

CHAIRMAN LeMAY: Any objection to that procedure? If not, we'll take a break till 1:30, and we'll resume with cross-examination at that time.

[The lunch recess was taken.]

CHAIRMAN LeMAY: We'll resume. I think before we call for cross-examination, Mr. Stovall has a proposal here, is it, or some discussion? Off the record or on the record?

MR. STOVALL: Mr. Chairman, the point was brought up during the break that it does not appear that we will get through this thing by noon tomorrow when the Commission is going to have to recess.

And there is a concern raised that that gives some parties an unfair advantage of giving them some additional time, two weeks to a month, to prepare their case. It has the potential to

protract the case because some of the witnesses who have already testified may go back and prepare some additional stuff.

What has been suggested, and given the nature of this hearing as a rule-making, I think it's a valid and viable suggestion, is that all the direct presentations be made today and I anticipate tomorrow morning.

We've discussed it amongst the attorneys. Mr. Padilla believes he's going to take about an hour. Mr. Kellahin will take 30 to 45 minutes, according to his estimate right now. And Mr. Meiklejohn says three to four hours to get his direct presentation on.

I think we could do this, possibly going a little past 5:00 this evening and then convening early tomorrow morning, I think we can get all the direct on without rushing it.

That may in fact eliminate the need for cross-examination or any extensive cross-examination in the nature of the rule-making proceeding, where you are really prospectively acting rather than adjudicating a particular set of facts.

CHAIRMAN LeMAY: Mr. Padilla, is that

something you agree with or do you have any viewpoint on it?

MR. PADILLA: Mr. Chairman, I agree with that in terms of cross-examination, I had very little cross-examination based on what we have. Now, based on testimony, that may be a different matter.

CHAIRMAN LeMAY: Would you rather do it after the witness, or do it collectively at the end?

MR. PADILLA: Essentially what I wanted to do was rather than cross-examine extensively, I wanted to come back with rebuttal, recall my expert witness once everybody has gone and done --

CHAIRMAN LeMAY: I think when you get in the rebuttal, we're talking about something beyond tomorrow noon though.

MR. STOVALL: Exactly.

CHAIRMAN LeMAY: Mr. Roberts, how do you feel about that?

MR. ROBERTS: It was my suggestion, and I think it has a lot of merit to it.

CHAIRMAN LeMAY: Mr. Meiklejohn.

MR. MEIKLEJOHN: Mr. Chairman, we do

not have a problem with the notion of holding off on cross-examination, except that our witness who will be -- has just left and will be back tomorrow morning is going out of town, and I don't know how long he's going to be out of town. I'm a little concerned about whether he will be back when the hearing is rescheduled.

With that caveat, we don't have any problem with the suggestion.

MR. STOVALL: We're all aware of that, Mr. Chairman.

CHAIRMAN LeMAY: Mr. Kellahin.

MR. KELLAHIN: It's acceptable to me, Mr. Chairman.

CHAIRMAN LeMAY: Mr. Kendrick, you don't have a witness, I guess, but how about your cross? Where is he?

MR. STOVALL: Apparently he doesn't care.

CHAIRMAN LeMAY: Let's try it and see.

MR. STOVALL: What I would suggest, however, is for the Commission's benefit, if you have any cases of witnesses, I think go ahead --

CHAIRMAN LeMAY: I think it's important for us to ask questions. We'll try that

procedure because it helps in our clarification of the direct. So if you don't mind, if the witnesses can make themselves available right after testimony for our questions.

CHAIRMAN LeMAY: Mr. Hicks, just to remind you we'll reconvene here and you're still under oath.

THE WITNESS: Yes.

CHAIRMAN LeMAY: I will ask Commissioner Jami Bailey if she has some questions.

EXAMINATION

BY COMMISSIONER BAILEY:

Q. Mr. Hicks, at the beginning of your testimony, you discussed a portion of one of the provisions of R-7940, which dealt with the disposal of greater than five barrels of produced water per day. But there was also another provision of R-7940, which dealt with ancillary pits or produced water with greater than 10,000 Tds.

In your investigations did you study any high pits, any ancillary pits that would have fallen under those provisions?

A. No, we did not.

Q. Okay. The length of the screen that you talked about should be ten feet instead of the five feet that Mr. Olson used during his work. And their effects on the analysis, the chemical analysis of the sample taken with the five feet rather than the ten feet.

Looking at the WQCC regs, which you referred to quite often, is there a distinction between where that sample is taken, or is it that level of contaminant allowable under the WQCC?

A. The WQCC allows -- those standards apply to groundwater quality. And groundwater quality is derived from monitor wells and samples therefrom. You can screen a well at five feet worth of screen or ten feet worth of screen, for example, and you will get different results due to the dilution effects that I've discussed.

The WQCC regulations permit or generally when a work plan is presented or a monitor well design is presented for compliance purposes under the Water Quality Control Commission Regulations, a ten-foot screen interval in the saturated zone is acceptable. So is a screen interval that is less.

And generally screen intervals much

greater than ten feet are not acceptable. And indeed the agency generally would not approve monitor well construction with excessive lengths of screen.

And so when you talk about compliance, what I'm saying is that a compliance monitor well will generally have ten feet of screen, and that is a sample from that kind of a well will be used to determine whether or not a discharger is in compliance with those standards or not.

Did I answer your question?

Q. Yes. I infer that it doesn't matter where that sample is taken from if it exceeds the groundwater quality level that is set by WQCC, that is immaterial where within the aquifer --

A. That is correct.

Q. -- it is taken?

A. That's correct.

Q. The detection limits for some of these wells that were listed in your table for No. 2 indicated that the benzene detection limit was 20 micrograms per kilogram. You also referred to the fact that that is not what is used for the UST regulations. But yet you referred to the Water Quality Control standards for toluene and

xylenes and all the others.

If we were comparing apples to apples and used the WQCC regs for benzene, would this detection limit have been in correlation with those standards, or isn't it way above the allowable level of benzene within the groundwater?

A. Well, yes, but those are soil samples, not groundwater samples. And as a result, you get a much higher detection limit for soil samples. And so if we had collected groundwater samples, and I think if you look at the comparison between groundwater samples and soil samples, you'll find that when groundwater samples are taken, the detection limit is extremely low compared to that of a soil matrix.

As a result, we can't compare -- there isn't a direct comparison between soil samples and the detection limit and the results and the concentrations that exist in soil samples and groundwater standards which come from a liquid media, where the detection limit is significantly orders of magnitude less in many cases.

The detection levels that exist for the soil samples are clearly well below the

acceptable limits for soil samples under the UST regulations.

Q. For benzene?

A. For benzene.

Q. And total hydrocarbons?

A. Yes.

Q. Looking through the list of the wells that you did sample, I recognize at least one that has produced more than a barrel a day produced water during the life history of this well.

A. I think there is only one that did, that produces one barrel a day.

Q. In your recommendations you're asking for all dry gas wells with less than a barrel. But for clarification, is that taking into account the life history of any of these dry gas wells that may in the past or in the future produce more than your criteria of less than one barrel per day?

A. Well, if it were in the future to produce more than one barrel a day, it would no longer meet the definition, and therefore it would not be subject to an exemption under the order as we have recommended. It still may be

subject to some kind of a variance application, but it would not be defined as a dry gas well any longer.

With respect to the past history, I can't testify to that. My assumption was that the numbers that are on that chart, which came from the OCD records and the records of the oil companies, were in fact representative of what that well had produced and certainly is producing now.

With respect to larger discharges in the past, that may be the case. But if that was the case, certainly the soils data indicate that despite that potential larger discharge, there still doesn't seem to be a threat.

Q. The PID that was used as a screening tool to tell when to take samples, many of these -- some of these well logs indicate that the PID was not working properly.

A. Yeah, for the first day.

Q. At what point were you aware that it was not working properly? At the time that you were taking samples or not taking samples or later?

A. We suspected it, you know,

throughout -- after we had initially taken the samples, during the first day. In fact, if you look at the charts, you'll see that after the first day the problem was corrected. As we continued to take samples during the day and we got consistently -- readings that didn't seem to be consistent with one another, we thought it might be out of kilter due to the trip from Albuquerque.

These instruments are calibrated in Albuquerque, and then they go out in the field and they're calibrated and examined at the end of every day. And that is why during the first day of our exercise we see a problem with the PID, and then after that we don't see a problem.

And I think it was a matter of we recognized that the samples were quite humid and we had calibrated it in Albuquerque to a standard gas but we hadn't calibrated it to deal with humidity. And so that problem -- whether that was the problem or not, I'm not exactly certain, but the problem was corrected by the second day.

Q. Was it recalibrated that night?

A. Yes.

Q. Or the next day?

A. Yes, that night I'm confident we took it apart and put it back together.

Q. Just a point of clarification on protectable water. You did stress the present or foreseeable beneficial use. But isn't there also part of that definition a Tds qualification, anything less than 10,000 Tds was considered protectable water?

A. Absolutely. That's true.

COMMISSIONER BAILEY: That's all.

CHAIRMAN LeMAY: Commissioner Weiss.

COMMISSIONER WEISS: Yes.

EXAMINATION

BY COMMISSIONER WEISS:

Q. If funding was unlimited, how many sites would you have examined?

A. Based on -- possibly we would have gone through this first exercise and sampled ten sites, evaluated the data, and made a determination as to whether more sites would be required for sampling.

Because in my opinion the data were so strong and showed a very consistent story, I would do a -- I can't tell you an exact number, but I can tell you how I would do it. I would do

a confidence test based on that data to determine at what confidence interval or what confidence limit I could have in making the extrapolation of that particular data.

And if I felt with a 95 percent confident level that those ten sites, because of the consistency of the data, that it represented the entire population of wells that I was looking at, I wouldn't suggest that we sample any more sites at all. So I'd have to do a test first in order to give you the answer but --

Q. Now, the work that you did do, who funded it?

A. Four Corners Gas Producers Association.

COMMISSIONER WEISS: Thank you. That's all the questions I have.

CHAIRMAN LeMAY: One question.

EXAMINATION

BY CHAIRMAN LeMAY:

Q. Your definition of dry gas well, did you take Btu into consideration at all?

A. No.

Q. In that classification?

A. (Witness shook head.)

Q. Do you know any correlation between the Btu of the wells that were discharging and maybe solids as you define them?

A. I don't know.

CHAIRMAN LeMAY: That's all I have. You may be excused.

Mr. Padilla.

MR. PADILLA: I think Mr. Kellahin is going next.

THE COURT: If you want to go next, that's fine. I just have a list here. You're certainly welcome to go next.

Mr. Kellahin.

MR. KELLAHIN: Thank you, Mr. Chairman. At this time I'd like to call Darwin Van De Graaff.

DARWIN VAN DE GRAAFF

Having been duly sworn upon his oath, was examined and testified as follows:

EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Van De Graaff, for the record would you, please, state your name and occupation?

A. My name is Darwin Van De Graaff. I am Executive Vice President of the New Mexico Oil

and Gas Association.

Q. As part of the business of the association, do you regularly, in the course of performing that business, compile industry data and information on various topics?

A. Yes.

Q. And do you regularly undertake to gather economic data on behalf of the association and its membership and present that data to state of New Mexico agencies when they're considering the promulgation of rules and regulations?

A. Yes.

Q. As part of the performance of your regular duties, do you compile and poll your membership on economic data that is utilized in presentations to the New Mexico State Legislature?

A. Yes.

Q. Did you undertake a survey of your membership with regards to the proposed adoption by the Commission of an expansion order for the vulnerable water area in terms of the economic impact of adoption of that proposed order?

A. We took a survey of some of our members in the San Juan area.

Q. Describe for us the methodology that you employ in polling the membership that was potentially impacted by this proposed rule.

A. We anticipated that the impact of such a rule would be greatest on the independent operator simply because the independent had fewer resources. Therefore, we concentrated primarily on independent operators in that area. We tried to determine, through telephone and other mail contacts, those who may have an interest in the area being defined and those who may have data available which would be pertinent.

We did get response from several independents who were active in the area representing -- just a moment I have that -- approximately 15 percent of the wells active in the proposed area. We also got some actual data from some other companies who have had experience in the pit closures in that area.

Q. Have you categorized the data and presented it in terms of some spreadsheets that we have circulated to the audience and to the Commissioners?

A. Yes.

Q. Let me direct your attention, Mr. Van

De Graaff, to what has been marked as NMOGA Exhibit No. 1. And before we discuss the specific information on that display, describe for us the topic at issue in that presentation.

A. This is the actual cost averaged for 17 pit closures, off-site disposal, no groundwater contamination, and the installation of tanks. These were actual costs as experienced by member companies.

Q. What's the purpose of the display?

A. Trying to anticipate the economic burden that would be placed on the wells to maintain their operation in the area and that, in such case, that the cost of the continued operation in fact exceeded the revenue from the well.

Q. Lead us through the example of the actual costs for the pit closure in compliance with the adoption of a rule similar to the one the Division has proposed to the Commission.

A. For the 17 pits that we had actual data on, the average depth of the contaminated soil was 11 feet. We had the average of a 16-by-16 foot pit, which meant we removed 20-by-20 square feet of soil. That averaged 205 yards per pit.

The average closure cost was $12,237.

Now, you will note footnote (a), we have broken those costs down to be more specific to total the $12,237. The tank cost, cost of the tank put on site, raises that total to $15,737. Our best estimate, based on data provided us by the OCD and by the BLM, is that there would be approximately 7,000 pits in the area.

If industry were to comply in total, the cost would be $110,156,558.

Q. Now, the fiscal impact of the adoption of this proposed order, assuming closure of the 7,000 pits, also includes a component so that the well would continue to produce and the produced water then is discharged into a tank; am I correct in understanding the display?

A. That is my understanding as well, yes, sir.

Q. And the incremental cost, then, was $3500 per pit to replace the unlined pit with a tank?

A. Correct.

Q. If you go through the analysis and assume that the operator does not replace the unlined pit but in simple fact closes the

facility, that cost, then, is itemized in the lower portion of the display?

A. That is correct.

Q. Let me ask you to turn your attention to Exhibit No. 2, Mr. Van De Graaff. Would you identify and describe that display?

A. This is estimated cost of closure in conformance of pits off-site disposal and no groundwater contamination. The verified costs that -- we had received a specific cost, which is historic.

We also asked some of our members, to their best information and knowledge and by asking for and receiving bids from various service providers, what their estimated costs would be to do the same. And you will notice, please, that it's talking about replacing with the tank or replacing with the fiberglass pit liner.

The estimation here was that instead of the 11-foot actual experience, we considered a 20-foot depth, all other assumptions being similar for the same. We have shown the cost in the same way. The cost on these estimates, these are not actuals, but they are studied and we

think fairly accurate estimates.

The closure is $12,750, which is very similar to the figure on the previous page. And the replacement cost, $3500 versus the $5,000, for the tank versus the pit liner, total cost, $16,250 versus $17,750, and the total cost to industry again, assuming the 7,000 pits. And again below that, we have itemized the breakdown of these costs.

Q. Having polled your membership about the actual and estimated costs of compliance, should the Commission adopt the Division's proposed rule, give us your opinion, having assimilated the economics, what is the range, then, of the potential impact?

A. We anticipate that allowing, if we might, that a marginal well by definition price and other cost factors are variable, we are assuming the parameters that are provided by the Department of Finance and Administration dealing with the price of gas and the price of oil production, those marginal wells that do exist by those definitions we anticipate between 20 and 20 percent of the wells in the area would end up being closed because they have marginally reached

their economic limit.

Q. Having determined a range of potential physical impact when you look at the cost of closing a pit, did you attempt to analyze the fiscal impact in terms of the potential number of wells that might be affected, the revenue impact, the loss of reserves that might otherwise be produced?

A. Yes, we did.

Q. Let me ask you to turn your attention to Exhibit No. 3. Before we discuss the specific details, tell us the topic or the subject you were tying to address with this particular exhibit.

A. A loss of estimated reserves and a loss of state revenues and taxes, it was our intention to try to itemize the actual loss of reserves that were in place, recoverable reserves, at the prices as provided in terms of the estimates by the Department of Finance and Administration.

Using those parameters, we took a random sampling, or a sampling of -- random selection of our member companies in the area to determine the number of wells they were operating, the reserves that they had in place,

and in fact which of those would reach their economic limit under the proposed regulation.

As you can see, we have the number of wells lost is 186. The current production in those wells, both oil and gas, is shown and the lost reserves, that is, the recoverable reserves that we believe to be in the ground at the established prices, would be lost to production.

We do not believe that this is true conservation and leaving those reserves in the ground when they could be economically produced.

Q. Excuse me. I've lost the number of potential wells that are impacted under this analysis.

A. One hundred and eighty-six wells would be closed under this analysis from those seven companies that were sampled. We believe that those seven companies represented approximately 12 percent of the 7,000 wells that would be affected by the expanded area and that if we can extrapolate that figure, we would be talking 20 to 25 percent of the total wells in the area would be lost.

Q. All right. And when you look at the total number of wells in the San Juan Basin that

are potentially impacted by the proposed order and then reduce that to the wells that would be shut-in or lost under this analysis, what is that number?

A. We are estimating between 20 to 25 percent of the 7,000 figure.

Q. Okay. Under that assumption, then, it's $12 million of lost revenues to the state of New Mexico in severances and other production taxes?

A. Yes.

Q. Did you go about trying to analyze the potential physical impact of the order in any other way?

A. Excuse me. I guess I don't understand your question.

Q. Yes, sir. I want you to turn to Exhibit No. 4 and describe for us the topic that is being analyzed under this exhibit.

A. This Exhibit 4 is the San Juan Basin Marginal and Stripper Wells' Production Taxes and Royalties. We have anticipated the total wells in the San Juan Basin area. We have determined those which are by definition marginal or stripper. That information was given to us by

the BLM and by the OCD, and those are the exact numbers.

I would point out to you that the numbers, the definition of marginal used here is very conservative. By statute the state of Utah defines a stripper well as 20 barrels a day.

COMMISSIONER WEISS: Excuse me. I want to point something out. You've got Exhibits 3 and 4 mixed up.

THE WITNESS: The title of Exhibit 4 is "San Juan Basin Marginal and Stripper Wells."

CHAIRMAN LeMAY: That's Exhibit 3 in ours.

THE WITNESS: It may be.

MR. KELLAHIN: Try this one.

Q. (BY MR. KELLAHIN) Let me take you back, now that I've given you the current copy of what everyone else has, Mr. Van De Graaff, let me go back and let's look at what we were discussing as Exhibit No. 3. Let's start at that point because I think from there on --

A. Exhibit No. 3, if I read the title again, is "San Juan Basin Marginal and Stripper Wells' Production, Taxes, and Royalties"; is that correct, Mr. Kellahin?

Q. Yes, sir.

A. And, Mr. Kellahin, the exhibit that I discussed before dealing with the estimated reserves and state revenues and taxes is now Exhibit No. 4, and we have had discussion on that sheet already, as I understand it.

Q. Right. Let me go back and clarify, at least for my own self, Exhibit No. 4. Let's start with that one. This represents the tabulation of economic data in terms of lost revenues to the state of New Mexico, taxes and production, taxes, if you will.

A. Yes, sir.

Q. Okay. The selection of the category of wells lost, the 186 wells is simply a compilation of information received from seven of the members of your organization?

A. Yes, sir.

Q. Based upon those assumptions, then, for those 186 wells at risk under the proposed order, there's a potential economic loss to the state of New Mexico of how many dollars?

A. Total lost taxes and other revenues on oil production is $375,874; gas production is $356,661 annually.

Q. Okay. The assumptions made in Exhibit 4 with regard to price are footnoted at the bottom of the display?

A. That is correct.

Q. And the source of that information is what, sir?

A. The Department of Finance and Administration.

Q. Okay. Where did you get the volumes that are displayed in the upper right-hand corner under the category "Lost Reserves"?

A. Those are the figures provided by the individual companies.

Q. Okay. Let me have you turn back with me, sir, and look at Exhibit 3. Let's talk about the definition of the marginal well category for the gas wells. What is the definition that is utilized in this analysis?

A. The definition is in the footnote B underneath a marginal gas well as defined as producing 15 Mcf per day or less.

Q. And the source of that information is attached as the last Exhibit No. 5 --

A. That is correct.

Q. -- to the package.

A. A mailing from the Oil Conservation Division in which they use that definition.

Q. All right.

A. It was at that point, sir, that I was commenting that it's a very conservative definition because, by statute, oil well, stripper oil well is defined in Utah as 20 barrels a day, and in federal statute, it's 10 barrels a day.

We don't anticipate using those high of figures. We're comfortable using those provided by the OCD. But I would point out they're very conservative.

Q. And that is the low volume used by the Commission when it adopted its alternative measurement methods for low volume gas wells?

A. That is my understanding, yes, sir.

Q. Describe for us the other information shown on Exhibit No. 3. You've got the total number of San Juan Basin wells?

A. The number of stripper or marginal wells shown for both oil and gas, the total annual marginal and stripper well production, that is, the volumes received from those wells and assuming those dollar figures as defined by

DFA, the dollar amounts involved state direct taxes on the marginal or stripper production and other state revenue, meaning primarily royalties and those federal royalties that are returned in kind, showing the direct, the total direct taxes and revenues on marginal or stripper wells. And, therefore, we're talking at the very bottom, the combined total of $12,550,445 annually from stripper production.

MR. KELLAHIN: All right. Thank you, Mr. Van De Graaff.

That concludes my examination of Mr. Van De Graaff.

CHAIRMAN LeMAY: Commissioner Bailey, would you like to ask him some questions?

COMMISSIONER BAILEY: Sure.

EXAMINATION

BY COMMISSIONER BAILEY:

Q. The excavation of each well site is a major part of the proposal figures that you're giving for each of these wells. Is there a reason that you would assume that the OCD would require total excavation of each produced water pit prior to closure for all 7,000 wells where there's no groundwater contamination?

A. Bringing the well into compliance to continuous operation would require that we meet the regulatory definition and requirement. Those marginal wells, where the costs of the continued operation would not sustain the modification, would have to be shut and closed. It would then have to be reclaimed.

I don't know that it would have to necessarily be all 7,000. What we were talking about is 20 percent of that figure.

Q. Okay. So this closure cost requiring excavation of all the materials on that well pad would not necessarily be representative of all 7,000 wells?

A. That would be my understanding, yes.

Q. Okay. The number of wells that you've listed in Exhibit 3 for oil and gas, are those within the entire San Juan Basin, or is that number confined to those within the vulnerable area and the expanded area as under discussion?

A. The figures on Exhibit 3 on the San Juan Basin total wells, 16,000 and 3,000 at the total basin.

COMMISSIONER BAILEY: Okay. That's all I have.

THE WITNESS: Thank you.

CHAIRMAN LeMAY: Commissioner Weiss.

EXAMINATION

BY COMMISSIONER WEISS:

Q. How many of the 7,000 pits are dry gas wells? Do you know?

A. No, sir, I do not.

COMMISSIONER WEISS: Thank you. That's all I have.

EXAMINATION

BY CHAIRMAN LeMAY:

Q. Mr. Van De Graaff, the assumption is that you have to actually, on page 1 there for removal of soil and transportation to offsite facilities, that's assuming there would be no on-site remediation that could be done to qualify the pit for closure?

A. I believe.

Q. In other words, can you get in there and get -- stir it up a little bit and get the volatiles off?

A. Well, the site remediation, backfill, and reseeding has a cost of $3,000, which we have shown.

Q. How about the $8,637, the removal?

Actually, you're assuming there's soil removal on each one of these?

A. That's correct, sir. Those figures indicate that the soil is in fact removed and disposed.

Q. Was there any discussion or was there any alternative presented by anyone in New Mexico Oil and Gas Association to on-site remediation work on those pits?

A. We did not figure the economics of that. That was not an option that we looked at in this economic analysis.

Q. Would you agree that if that could be reduced substantially, that the economics would certainly change?

A. Well, the economics would be reduced by whatever the amount the reduction could be, but I'm not the technician to make that analysis.

Q. The other thing, I guess, would be that once the site, if there was a rule of regulation for pit closure when the well was eventually plugged, no matter vulnerable area or not, we're just talking about in this case trying to narrow in on the issue.

The pit closure, as tied to plugging

the well or tied to the continual production of the well with either a -- with a tank put out there or with some kind of a line pit, if you still had -- if you plugged the well, if you still had to handle the pits, wouldn't you still have this kind of cost?

A. That's exactly the question that I raised. And obviously we would have to close it. It's one of the reasons why we want the extension of time, as has been suggested. We believe that if we can operate it a longer period of time without experiencing all of the costs, we can certainly afford to do it.

I would point out to you, if I might, I'm not trying to get off your subject, but there has been previous testimony concerning the availability of service companies, technicians, et cetera.

Our experience in the oil patch has been that whenever you have a requirement, or may I call it a mandated compliance, that the actual -- that the market drives those costs up rather than down because we have a very short time frame that we have to accomplish a specific task. Service cost, personnel cost, those kinds

of things accelerate during that period of time.

So I believe these are very conservative actually.

Q. Did you have any recommendation concerning the previous witness on time frames for compliance and closure?

A. We have reviewed that very carefully, Commissioner, and the recommendations that were given we support.

Q. By Four Corners Gas Association?

A. Yes, we support those.

Q. Gas Association?

A. You have those. I guess I could repeat them if necessary.

Q. I think we have them in the record unless either Commissioner would like to have you repeat them. It's called the -- I think the 135 Rule.

A. The 1335.

Q. 1335?

A. Yes.

CHAIRMAN LeMAY: That's all I have.

THE WITNESS: Thank you very much.

CHAIRMAN LeMAY: Mr. Kellahin.

MR. KELLAHIN: Mr. Chairman, I'd like

to call Mr. Tom O'Keefe. Mr. O'Keefe is the manager of the gathering system for Williams Field Services in Bloomfield.

TOM O'KEEFE

Having been duly sworn upon his oath, was examined and testified as follows:

EXAMINATION

BY MR. KELLAHIN:

Q. Mr. O'Keefe, would you, please, state your name and occupation?

A. Tom O'Keefe, Manager, Williams Field Services Gathering, San Juan area.

Q. On prior occasions have you testified before the Division?

A. Not before the Division, no.

Q. Would you summarize for us your educational background?

A. I have a degree in civil engineering, New Mexico State University, 1966.

Q. Subsequent to graduation would you summarize your employment experience in the oil and gas industry?

A. I was employed in a number of technical and managerial positions prior to joining Williams Field Services. I did work five years

for Shell Oil Company. Immediately after graduation, subsequent to that, I joined Xerox and Continental Airlines, which are not related, of course, to the oil and gas business.

I joined Williams Field Services, well, its predecessor, Northwest Pipeline, in 1979, and most recently took this position in 1980 -- excuse me, 1989, three years ago.

Q. Summarize for us your particular employment responsibilities as they are applied to the subject that's at question here before the Commission today.

A. As manager of the gathering business in the San Juan Basin, I'm responsible for the system operation and maintenance for contract, compliance, for contract rates, and terms, for regulatory compliance, for achievement of financial goals.

Q. Have you made an assessment for your company of the economic impact of the proposed order and what that impact will be for your company?

A. Yes, I have. And it's a different viewpoint than has been presented to the Commission. This would be the viewpoint of a

transporter, not a producer.

Q. Let me ask you, as part of your duties, then, you're familiar with the proposed order that's under consideration today?

A. Yes, I am.

Q. And based upon the draft order, you have made an inventory of your wells and attempted to assess the economic impact of compliance upon your company with this order?

A. Yes, I have.

MR. KELLAHIN: Mr. Chairman, we tender Mr. O'Keefe as an engineer with expertise with regards to the operational impact that this order will have on his business.

CHAIRMAN LeMAY: His qualifications are acceptable.

Q. Let me have you describe, sir, the role of Williams Field Services in the San Juan Basin.

A. Williams Field Services gathers and processes gas from approximately 2800 wells in the San Juan Basin. Those are conventional wells. We also have a coal seam gas gathering system, which gathers and treats upwards of 500 million cubic feet of coal seam gas per day.

The conventional system has a deliverability into our system of approximately 400 million cubic feet per day.

Q. In addition to those wells that you service, how many wells do you operate with any of your affiliated companies?

A. We also operate 293 wells for an affiliate company, Williams Production Company, in the San Juan Basin.

Q. Have you made an attempt to determine the number of wells that are in either the existing vulnerable area or in the proposed expanded vulnerable area?

A. Yes, we did. We plotted the vulnerable area as defined in the draft order on our system map and took an inventory of the wells. There hasn't been time to do a lot of analysis of the individual wells. But we did identify the number of wells within that vulnerable area.

Q. In looking at wells that were potentially subject to the rule change, do you have any operations in the original or the existing vulnerable area?

A. They are very limited. Our area of operation is simply outside of the original

vulnerable area by and large. There may be a couple wells impacted, but there are only a very few.

Q. For convenience when we describe the wells that are impacted by the order that you operate, they are going to be in the expanded area?

A. That's correct.

Q. And how many wells have you determined would be affected by the order?

A. There are 460 wells within the expanded vulnerable area that we gather gas from.

Q. Describe for us what your conclusions are about the assessment of an economic impact for compliance.

A. The impact for compliance will be chiefly, at least an incremental impact, will be chiefly that of installing a tank or lined pit. And we agree, incidentally, with the cost estimate for that work to be done at our locations in the $3500 to $5,000 range.

Q. Your actual experience, as you project it, is going to be consistent with what Mr. Van De Graaff's poll of his membership has determined to be a range of cost?

A. That's what we expect, yes.

Q. Using your current economics for your particular wells, have you determined a threshold level at which on a producing rate in Mcf of gas per day the well would no longer be economic if it has to comply with the order?

A. Yes, we have. Based on direct operating costs only and considering our current rate structure, a break-even volume from a well in the San Juan Basin of 35 Mcf per day is required.

Q. Mr. Van De Graaff's analysis of potential economic impact scenario has assumed a 15 Mcf a day threshold limit.

A. There are so many different ways of analyzing that that, even when I talk with my peers in other companies, we don't agree. We don't argue about it, but we simply have different measures. I'm confident with my figure for our operation of 35 Mcf a day.

Q. Fifteen Mcf a day figure would be simply too low for you and your operational costs would exceed the volume of gas produced and sold at the 15 Mcf rate?

A. That's absolutely right.

Q. Have you tried to make an assessment of the number of wells out of the 460 wells that will have deliverabilities of less than the 35 Mcf a day?

A. Yes, we have. There are 138 wells of those 460 that have a deliverability less than 35 Mcf per day.

Q. Those wells in effect, then, would be lost wells?

A. Potentially lost. There are alternatives that need to be considered before we simply walk away from the well. And I would be pleased to discuss those, but they are potentially lost.

Q. Describe in a summary fashion the kinds of analyses that have to be undertaken for the 138 wells that are at risk.

A. I'd be happy to. I'd also like to enlarge on my previous statement regarding those 138 wells. They represent a volume of approximately 2 million cubic feet per day and a remaining reservoir of approximately 16 Bcf. In fact, it's closer to 17 Bcf.

I would also point out that that volume of the reservoir is significantly larger than was

presented by Mr. Van De Graaff, and that figure comes from our reservoir engineering department. We're also confident in that figure.

Q. The 16.7 Bcf of gas is producible gas that would otherwise be recovered if you could take the wells down to an economic limit exclusive of this particular order?

A. Assuming the operator continues to operate the well, that's correct, that's the remaining reservoir according to our analysis.

Q. All right. Sir, describe for us some of the operational decisions that you're going to have to make concerning these wells.

A. It might help to first describe a conventional location in the San Juan Basin. Commissioner Bailey asked about ancillary pits, dehydrator pits, and, of course, I represent that end of the business.

On a typical location, in addition to the wellhead, there is a production unit and an associated pit, then there is a dehydrator and an associated pit, and then a meter run, and then subsequently the gas flows into the pipeline. That's a typical arrangement.

There are atypical arrangements.

Sometimes we share a pit with the producer when that's possible. Sometimes we have the only separation equipment on the site. So the picture is somewhat complex.

But considering just the typical, which is probably three-quarters of these wells, there would be three options for those marginal wells, which we would not spend $5,000 on in order to continue gathering gas from.

One option would be for the operator to install a pit that serves our dehydrator at the operator's costs, and then the operator would need to maintain that -- I think I said pit a minute ago. I meant tank or a lined pit. The operator would then need to maintain that tank or lined pit.

A second option would be for the operator and us to share the operator's lined pit or tank. There are many occasions when that will not work. If the distance is too great from our dehydration equipment and particularly if there is any terrain irregularities in getting over to the operator's tank, we would experience freezing problems in the winter and consequently would not be able to accept gas in the wintertime. That

well would have to be shut-in at a time of the highest price that the operator would receive.

The third alternative, of course, is that we would simply take care of the existing pit, as would be required, and then disconnect our measurement equipment and the dehydrator and use it in a more profitable location.

Q. One of the issues under consideration is the timing for compliance, the phasing in of the various areas in a particular period of time. Have you given any consideration to the operational aspects of the timing sequence in which the various stages of the order ought to be implemented?

A. Yes, we have. In our view the time limits in the order are quite compressed from an operational standpoint. In dealing with these 460 wells, one way or the other, and in dealing with many operators, we don't have just one or two customers. We gather gas from dozens of operators in the basin, and I'm sure at least a dozen would be represented in these 460 wells.

Arriving at some practical means to keep these wells producing in a manner that works and in an economical way and in a safe way, which

is extremely important to us, I think would test severely the ability of our company and resources in order to comply in one, two, or three years, as the draft order now states.

Q. Do you and your company have a recommendation that is consistent with the request of the Four Corners Gas Producers Association for a timing sequence for compliance?

A. The timing sequence suggested by the Four Corners organization is acceptable to my company.

Q. Let me ask you a different topic. One of the other issues is the topic of a variance. And if a variance is adopted, whether the variance needs to be site specific or whether or not it will include language that would allow a certain area to be applied for in obtaining a variance, do you have any comments from an operational standpoint with regard to that issue?

A. From an operational and administrative viewpoint, given my observation, a great many common qualities of wells in a geographic area with regard to its siting, its location and relative to population and distance to

groundwater, if we were able to request variances on a wider basis than site specific, it would certainly be more doable.

And to do otherwise, again, would be an extreme administrative undertaking on our part, and I'm sure on the part of the OCD. We went through that with pits and nets a couple of years ago. And we filed 1400 waiver requests, and that had to be burdensome to the OCD, even though many characteristics of the pits were the same.

Q. Okay. Do you have any other comments you'd like to address to the Commission with regards to the proposed order?

A. I would make one suggestion, in considering the previous testimony and questions from the Commission, that I'd like the concept of the dry well and from a gatherer, one who operates equipment typically downstream from a production unit, which separates the liquid from the gas, it seems from my viewpoint that considering a dehydrator serving such a well should be considered as a -- I'm getting the words twisted around -- but as a dry well; that in fact the dehydrator is there to take water vapor out of the gas stream, not to take produced

water, separate produced water from the gas stream.

That's the primary responsibility of the upstream equipment. There are only occasional times when a dehydrator downstream of a production unit needs to deal with water. And there's a small separator section typically in dehydrators just for that reason, but the volumes are very small.

MR. KELLAHIN: That concludes my examination of Mr. O'Keefe.

CHAIRMAN LeMAY: Commissioner Bailey.

EXAMINATION

BY COMMISSIONER BAILEY:

Q. You just discussed the quality of the water that was taken out in the dehydrators downstream in the well. Have you ever characterized the liquid that comes from that dehy?

A. We have not characterized the liquid. I mentioned the volume of water but not the quality. We haven't characterized the quality. Simply that the volume that the dehydrator encounters is typically extremely small.

Q. The basis for your prediction that the

35 Mcf per day was a threshold limit, was that also based on the same figures that Mr. Van De Graaff gave which reflected total excavation of all the soil from the pit area?

A. The two are not related. The 35 Mcf per day break-even volume is independent of the rule. That's the volume required to cover the costs of gathering the gas at a typical well connected to our system in the San Juan Basin.

And any volume less than that, then, does not support an expenditure beyond the normal operating and maintenance costs associated with the well. It wouldn't support the $5,000 cost to install a tank or lined pit.

Q. Okay. So we're talking just the costs of the tank or the pit, not excavation of the materials or any of the other items that were on the last exhibits?

A. I want to be sure that the information I give you is understood. And when I relate to the $5,000, a well that produces less than 35 Mcf will not support that $5,000 figure, nor would it support any figure for closure of the pit. However, we recognize we do have a pit. And so I'm considering the incremental cost.

If we were to leave that well site, disconnect, that pit has to be dealt with in some way. So I'm only addressing the incremental costs of the tank or the lined pit, the $5,000.

COMMISSIONER BAILEY: That's all.

CHAIRMAN LeMAY: Commissioner Weiss?

COMMISSIONER WEISS: Yes, I have a question.

EXAMINATION

BY COMMISSINER WEISS:

Q. You say you have a small volume of water discharged; that was from a dry gas well?

A. I was suggesting that given the fact in those cases where the dehydrator is downstream of a production unit, that the pit associated with the dehydrator be considered the same as a pit would be associated with a dry gas well, as Mr. Hicks presented in his testimony.

Q. What's the volume out of that dehydrator?

A. It can range from nothing at all to a matter of gallons. It's not measured in barrels per day.

Q. Okay. And then is that independent of whether you have a dry gas well or a wet gas

well? Presumably there's a wet gas well?

A. Wet has different terms in the gas industry.

Q. Yeah.

A. If there's a production unit upstream, then it should not matter whether the well produces a large volume of water or not with regard to our dehydrator and its associated pit.

COMMISSIONER WEISS: That's the only questions I have. Thank you.

CHAIRMAN LeMAY: Mr. O'Keefe, I've got a couple.

EXAMINATION

BY CHAIRMAN LeMAY:

Q. I probably should have asked Mr. Van De Graaff this, too, but you agreed with his figure of $3500 per tank. So do you happen to know if that's a 25-, 45-, or 92-barrel tank?

A. I need to get my calculator. It's about 8 feet in diameter and about 4 feet high. And you need some free board there, so whatever quantity of barrels-wise that calculates to.

Q. Double-bottomed, double-walled?

A. Would be double-bottomed, double-walled, leak detected, yes.

Q. First class operation?

A. Well, it would be proper. One thing we're struggling with is exactly how do we do this? We did install some fiberglass tanks in Colorado. And those tanks floated; they're buoyant. And we had a wet spring, and so the tanks came up above the surface, broke the dump line. That's a safety issue and, of course, an expense issue.

Q. I was going to bring up fiberglass, if that's an alternative for this or considered not because of the problems they've had with it?

A. Companies are using fiberglass. There may be a good way to do it, but there are some major concerns. There's also a concern with flashes. Fiberglass can generate static electricity when the dump is open and operators then could be exposed to burns.

So there are a lot of aspects to consider before we just go out and start popping tanks in the ground.

Q. The 35 Mcf a day, I have to ask you this. That's higher than 15. Could that be a reflection of Williams' gathering charges?

A. They're obviously way too low.

Q. Competitive-wise. I'm sorry. You don't have to --

A. Not for the record.

CHAIRMAN LeMAY: That's all I have. Thank you very much. One more, Commissioner Weiss?

COMMISSIONER WEISS: I forgot one.

FURTHER EXAMINATION

BY COMMISSIONER WEISS:

Q. Do you have a feel for how many of the 7,000 wells in the proposed area are dry gas wells?

A. I was thinking about that this morning. And up until May of 1991, we operated a little more than 800 wells. We now operate 293. When we had the 800 wells, we had a little more than 300 condensate tanks.

So if our situation is representative, then something less than half of the wells produce condensate in recoverable quantities, which was part of definition of the dry gas well.

Now, the one-barrel-per-day of water, I have no feel for it at all.

COMMISSIONER WEISS: I was thinking of

the one barrel per day of water. Thank you.

CHAIRMAN LeMAY: You may be excused. Thank you very much.

MR. KELLAHIN: Thank you, Mr. Chairman.

CHAIRMAN LeMAY: I think we'll take a 15-minute break, and then we'll resume, I think, with Mr. Padilla.

[A recess was taken.]

CHAIRMAN LeMAY: Mr. Padilla, it's your show.

MR. PADILLA: Mr. Chairman, at this time I'd like to call Clay Kilmer, and also I'd like to make a brief opening statement.

First of all, I'd like to thank the Commission for the continuance granted in January because I think it allows us to get much better informed information to the Commission as far as the area which BCO is operating.

As a small company, BCO has undertaken a study and entered in to decide whether there has, and determine whether there has been any contamination as a result of oil and gas operations. And what we have designated as the Lybrook area in the vicinity of Lybrook, New Mexico, where BCO operates.

Secondly, whether contamination might occur in the future as a result of continued and future operations.

And, third, whether we could come up with a recommendation as a result of this study to determine whether the rule is appropriate for this area.

In terms of the variance provisions of the proposed order, I think that we have what I consider a fairly good case for exemption from the application of the rule. Essentially, that is what we plan to put on. And the conclusion that we have come up with is that, yes, indeed an exemption should be granted for this area.

CHAIRMAN LeMAY: Could I interrupt you just for a minute, Mr. Padilla? If the Commission did provide a rule, like we have in the past, and provide for exception to that rule through the hearing process, would this testimony, your presentation, be more fitting in that type of setting?

MR. PADILLA: Well, it would be, Mr. Chairman, at the same time because of the nature of the rule and because of the testimony presented by Mr. Olson, we felt that the

information, as well as the information given by Mr. Hicks this morning, we felt that as a small company we could not undertake a complete San Juan Basin study and we felt that we come within what might be considered an area-wide variance.

And to answer your question, yes, but at the same time there is also room for the Commission to make a determination at this time that this is one of those areas that really the rule would not fit.

CHAIRMAN LeMAY: In other words, we would exempt the area under the rule rather than under a variance?

MR. PADILLA: Correct.

[A discussion was held off the record.]

CHAIRMAN LeMAY: We have had a little discussion as to what happened to your taking. I think if there's no rule, there wouldn't be a variance to that rule. But if the testimony gives us criteria to establish the rule or lack of a rule, then I think that's the type of testimony that's beneficial to the Commission.

MR. PADILLA: Well, the type of testimony we will present, Mr. Chairman and members of the Commission, applies to the

vulnerable area as defined by the Oil Conservation Division's case in January.

It's very pertinent to this proceeding, and we're not asking for a variance obviously since there's no rule from which to ask for a variance. If we want to be technical about it, I suppose we're asking for an exemption from the proposed regulation.

CHAIRMAN LeMAY: Why don't you continue. As I say, what's helpful to us is dealing in generic terms, not necessarily specific as it applies to one company, one area, although if that has basin-wide or at least region-wide application, I think it's significant, so please continue.

CLAY KILMER

Having been duly sworn upon his oath, was examined and testified as follows:

EXAMINATION

BY MR. PADILLA:

Q. Mr. Kilmer, for the record, would you, please, state your full name?

A. Yes. My name is Leland Clay Kilmer.

Q. Mr. Kilmer, you're going to have to speak up because I'm sure there's some people at

the back of the room that are not going to hear you. Where do you live, Mr. Kilmer?

A. I live at 3312 June Street, Northeast, in Albuquerque.

Q. Where do you work, Mr. Kilmer?

A. I work with Geohydrology Associates, also in Albuquerque.

Q. Have you been hired by BCO in connection with the subject matter of this hearing to conduct a study and to make recommendations to the Commission and to BCO?

A. Yes, we have.

Q. Mr. Kilmer, have you previously testified before the Oil Conservation Commission?

A. No, sir, I have not. I have, however, been qualified as an expert witness in proceedings of District Court in the State of New Mexico and in proceedings of the State Engineer's Office.

Q. As a hydrologist, I take it?

A. Yes. Yes, sir.

Q. You are a hydrologist?

A. That's correct.

Q. Mr. Kilmer, would you give us your educational background in this field?

A. Yes. I received a bachelor of science degree in geology from Eastern New Mexico University in 1978, and I'm currently enrolled in a master's of water resources administration program in the University of New Mexico.

Q. What is your work experience in this area, Mr. Kilmer?

A. My work experience in hydrology dates back to my date of graduation in 1978 from Eastern New Mexico University. I've been employed in some capacity ever since with Geohydrology Associates for the first couple of years with my term of employment as a hydrologic technician, and then dating from 1981 as a hydrologist.

I have a few publications pertaining to hydrology --

Q. Before you get into that Mr. Kilmer, let me ask you, do you have any experience in the oil and gas field?

A. Yes. I worked as a consultant, as an exploration consultant, for numerous independent oil and gas producers in southeastern New Mexico and West Texas between the years of 1981 and 1986.

Q. Mr. Kilmer, have you authored any papers that are relevant to the scope of this hearing today?

A. Yes. I have a couple of publications that focus on areas within the San Juan Basin. The primary one I would refer to would be one that's going to come out with the New Mexico Geological Society's fall guidebook on the San Juan Basin area. It pertains to the hydrologic characteristics of the Ojo Alamo Sandstone.

Q. Does that cover the San Juan Basin of New Mexico?

A. Yes. That's an aquifer within the San Juan Basin.

Q. What other papers have you authored dealing with the San Juan Basin or even oil gas?

A. I've authored a couple of papers that appeared in the early 80s in the Oil and Gas Journal pertaining to oil exploration techniques, prospect generation. And I have participated on numerous consultant reports with Tim Kelly, of Geohydrology Associates, on hydrology aspects of jobs centering in the San Juan Basin.

Q. Can you give us an example of some of those papers that you have worked on in the San

Juan Basin?

A. Yes. One of the more prominent ones that I worked on was some shallow water hydrology that we did back in 1981 for Pittsburgh and Midway Coal Mining Company in McKinley County, New Mexico. And that pertains to fuels-related contamination.

In the last couple of years, I did a site characterization for a fuels contamination study in Cuba, New Mexico, pursuant to compliance, regulatory compliance, for underground storage tank leakage site.

Q. You regularly deal with the underground storage tank regulations or the New Mexico Water Quality Control Commission Regulations?

A. Yes. Since about 1986 I think I've either served as a principal investigator or participated on approximately 25 site characterizations pursuant to regulatory compliance for leaking underground storage tank sites.

Q. Mr. Kilmer, are you a member of any professional societies, and if so, tell the Commission what societies those are.

A. Yes. I'm a member of the Albuquerque

Geological Society. I'm also a member of the New Mexico Geological Society, and I'm also a member of the Association of Groundwater Scientists and Engineers.

Q. Mr. Kilmer, are you familiar with the proposed order, and have you studied the paper presented in the first hearing in January by Mr. Olson of the Oil Conservation Division?

A. Yes, sir, I have.

Q. And have you made a study of the Lybrook area insofar as the proposed rule is concerned and BCO's operations?

A. Yes. As you alluded to a little bit earlier, we were retained by BCO, Inc., to provide an assessment of the groundwater conditions and the condition of any contamination that may exist in the vicinity of BCO producing properties near Lybrook.

MR. PADILLA: Mr. Chairman, we tender Mr. Kilmer as an expert in hydrology.

CHAIRMAN LeMAY: His qualifications are acceptable.

Q. Mr. Kilmer, let's get on to what we have marked as Exhibit No. 1, and I want you to generally describe what that is and what it

contains. We'll get into more detail later on as far as what's in that study or that report. But just briefly tell the Commission what it is.

A. Okay. Exhibit No. 1 is entitled, "Assessment Report for Lybrook Area Properties of BCO, Inc., at Duffer's Point, Escrito, Lybrook, and the Alamito-Gallup Oil Pools in the San Juan Basin, New Mexico."

And this is basically a geohydrologic report, treats the geologic units that are present, and the groundwater resources in the area as well as an investigation into potential contamination of groundwater near BCO properties.

Q. Mr. Kilmer, would you, please, identify what we have marked as Exhibit No. 2 at this time?

A. Okay. Exhibit No. 2 is a table contained within the report, Exhibit No. 1, and this is a reporting of the analytical testing results performed on water samples that we collected from wells and springs in the Lybrook area.

Q. Mr. Kilmer, is this a replacement table for the table No. 2 that is found in the Exhibit

No. 1?

A. Yes, sir, it is. It is a replacement. The table found in Exhibit No. 1 contains information only on the benzene component of the fuels related studies and also does not contain an analytical result from testing of the so-called Loco Spring.

Q. And those, sir, are the only changes; they are actually additions to table 2 as originally -- or as shown on Exhibit 1?

A. Right.

Q. Do you have Exhibit No. 3 up before you, which is -- please identify that, please.

A. Yes. Exhibit No. 3 is disposal point data for BCO properties that are located -- BCO disposal points that are located within the proposed extension of the vulnerable areas. And this data were compiled from C-115 forms submitted to the OCD and represent water discharge measurements to these disposal points, which are located within the vulnerable areas. And this data was compiled, this most recent data available is for last month's operating.

Q. Mr. Kilmer, were Exhibits 1, 2, and 3 prepared under your supervision or by you

directly?

A. Yes, they were. Exhibit No. 3 was not prepared by me but was information that I requested.

Q. And that came from BCO C-115s; is that correct?

A. Yes, sir.

Q. Let's go back now and have you tell the Commission now, Mr. Kilmer, about what instructions you were given -- you were given by BCO management and also by myself in trying to, as far as conducting and performing your study?

A. Okay. We had basically four directives. The first directive was to identify groundwater resources within the Lybrook area near BCO producing properties.

Q. Mr. Kilmer, before we go any further, would you be a little bit more precise as to what we have termed the "Lybrook area," in terms of township and range and that sort of thing?

A. Yes, I would. If I may, if you refer to the map diagram, this is entitled, "The Lybrook Area Map." And this is approximately a little bit more than a six-township area, which ranges from Township 25 North to Township 22

North and covers the Ranges 7 and 8 West.

Q. Mr. Kilmer, you're now referring to what is figure No. 1 in the report; is that correct?

A. Yes, sir, that's correct.

Q. And you're looking at a map there that has some red coloring on it. Could you explain whether that map differs from other maps that are hanging on the side of this auditorium from the ones that the Commission has in its packet?

A. Yes, sir, I will. The areas that are outlined in red on this map correspond to the areas that are outlined by prominent black lines on the other maps. And it's fairly easy to see that these areas are the proposed extended vulnerable areas by the new order.

Q. Okay. Let's go back now to continue your testimony on the objectives that and instructions that you were given in terms of your study.

A. As our second objective, we were requested to determine if BCO's operating activities and their extractive activities in the area have resulted in fuels type contamination to any of the water supplies that existed in the

area.

And as a footnote to that objective and possibly another objective would be to assess the potential for future contamination resulting from these activities.

And then our fourth objective was to determine if the proposed vulnerable area extensions would result or provide an environmental benefit or an additional protection of groundwater in the area.

Q. Mr. Kilmer, what conclusion or what recommendation did you arrive at as a result of your study?

A. Based on the observations that we made, we recommend that BCO should be exempted from the requirements of lining surface disposal pits in the proposed extended vulnerable areas, and additionally that as a closure procedure, they only be required to restore the sites to pre-activity conditions and to reseed.

Q. Mr. Kilmer, let's go now to have you tell the Commission what your study found as far as the geologic and hydrologic conditions in the Lybrook area.

A. Okay. First, I'd like to kind of fill

you in a little bit on the procedures that we went through to arrive at this recommendation. And the study basically consisted of two parts.

First, we performed a file and literature search of published and unpublished geologic and hydrologic data on the area so that we could focus a field investigation that was to follow the final literature search a little better and arrive at the most information that we could for the least available cost.

And basically if I could have this overhead -- no. Wait a minute. I want to describe a couple more points on this map. Our field investigations consisted of sampling some wells that are located in proximity to BCO disposal points near Lybrook.

And we basically selected wells on a couple of different rationales. One, obviously, is proximity to disposal points. Another rationale would be, there is a public water supply well in the village of Lybrook which we wanted to sample.

We also sampled some spring discharges in the area. Specifically we sampled four springs. There's one spring, which we will refer

to as Loco Spring, that's located approximately four miles north of Highway 44, just approximately one mile west of the Rio Arriba-McKinley County line -- San Juan County line, excuse me.

Q. Are the springs on that map, that figure 1 that you're looking at, are they shown by the blue dots?

A. Yes. These springs are denoted by the blue dots.

Q. Okay. Go on and tell us where generally the other springs are located in terms of figure 1.

A. Okay. We sampled another spring, which is known as Iron Spring, which is approximately two miles north of Highway 44 just north of Lybrook. A third spring that we sampled is known as Escrito Spring, which is just a few feet north of Highway 44 in Lybrook. And then the fourth spring that we sampled is an unnamed spring, which is approximately two miles southeast of Lybrook.

Q. While you're at that map, Mr. Kilmer, would you explain the legend that is shown at the top since you're there already?

A. We've already talked about the outline of the proposed extensions for the vulnerable areas. These maps also have diamonds which denote gas wells or oil wells that are operated by BCO, Inc., within this area. There are also squares which denote wells that are operated by other operators in the area.

Again, we've already described the symbols for the springs. And we also identified water wells in the area, and they're denoted by black circular symbols.

Q. Mr. Kilmer, do you have anything else by way of general information regarding figure No. 1?

A. Yes. I would like to point out that we constructed a geologic cross-section in the area that goes from A, to the south, to A-prime and goes through Lybrook and through Escrito Springs to the south and through Iron Springs to the north.

Q. Now, on that map you also have identified the four pools that are designated by the Oil Conservation Division; correct?

A. Yes, that's correct.

Q. And what are those pools?

A. The northernmost pool is known as Duffer's Point; the northeasternmost pool is known as Escrito; and then the pool near Lybrook is referred to as Lybrook; and then the southernmost production is in the pool known as Alamito.

Q. And BCO, as well as other operators, have wells in that area?

A. That's correct.

Q. Approximately how many wells does BCO operate in this area?

A. BCO, I believe, has 110 producing wells in this area.

Q. How many of those wells would fall within the proposed expansion of the vulnerable area?

A. The number of wells that fall within the proposed extensions is a little bit different from the discharge points because some of the discharge points accommodate water from more than one well. But there are 24 discharge points that fall within the proposed extensions.

Q. Anything further on that map, Mr. Kilmer?

A. Oh, I'm sure we've forgotten something,

but we'll talk about it later if we have to.

Q. Are you ready now to talk about the -- are you ready now, Mr. Kilmer, to talk about the question I asked you earlier concerning the description of the general hydrologic and the geologic conditions in this area?

A. Yes, sir, I am.

Q. Do you want to refer to the cross-section that you have prepared?

A. Yes, sir. The cross-section will help everyone visualize.

Q. First of all, is the cross-section contained in your report?

A. Yes, sir. This cross-section, I believe, is figure 2 in the report entitled Exhibit 1.

Q. Is that the last page?

A. Yes, sir, I believe it is. Well, it's the last page before the references.

Q. And you prepared also an overhead showing the same information; is that correct?

A. That's correct. The overhead projected here is the identical image that you have in your reports.

Q. Tell us, Mr. Kilmer, what this

cross-section shows.

A. Well, basically, we have three hydrogeologic units in the area of Lybrook. And I'll start with the shallow-most unit first. There's a massive ledge-forming and bluff-forming sandstone within the San Jose Formation. And that is exposed in the higher elevations.

This sandstone acts as a recharge area for the springs in the area that we sampled.

Q. Mr. Kilmer, are those springs in the proposed vulnerable area?

A. No. These springs are not in the proposed vulnerable areas. They're, in every case, they're topographically high to the vulnerable areas.

You can see in the cross-section one of the vulnerable area extensions in Blanco wash occurs at a lower elevation than Escrito Spring on the left side of the cross-section.

Q. Would you show that to the Commission exactly where that vulnerable area of wash is?

A. Yes. That vulnerable area of wash is indicated on our map here on this cross-section, and it's right here where the cross-section crosses Blanco wash. And it's between the red

lines.

Q. And where is that? Where is that vulnerable area shown on the cross-section?

A. Well, basically, the vulnerable area goes from here, as its north side, to here, as its south side.

Q. Mr. Kilmer, before we proceed, you have a legend down at the bottom that says, "Vertical exaggeration equals 5X." What does that mean?

A. That means that the scales on this cross-section are not the same in the vertical dimension as they are in the horizontal dimension.

And basically the scale for the vertical dimension has been exaggerated to five times that for the horizontal dimension so that some of the topographic features that we think are important are a little bit more evident.

Q. But you have some kind of a dip to the north; is that correct?

A. Right. Generally speaking, the geologic, the sediments that are present in the Lybrook area slope towards the north and east.

Q. Okay. Let's go on. You were discussing before the top geologic information.

Can you continue with that, please?

A. Yes. The first hydrogeologic unit, as I said before, is the San Jose Sandstone. Again, it's a massive bluff-forming sandstone and outcrops on the ridges and mesas in the area. This sandstone does produce water to springs in the area and we feel is the source of all the spring water that we sampled at all four locations.

The origin of these springs is basically precipitation that falls on these permeable outcrop areas and infiltrates down until it hits the underlying unit, which is in the upper part of it.

The Nacimiento Formation is predominantly a shale unit and is very impermeable. And basically water moves vertically until it hits the Nacimiento Formation and then moves horizontally in response to gravity to an outcrop area.

Q. Mr. Kilmer, you have some little circles up there with a little tail on them. What does that depict?

A. These symbols denote spring discharges. Again, this is Escrito Spring, which

we identified a little bit earlier. And this is Iron Spring up on the north side of the cross-section.

Q. Is that the actual location for the Escrito Spring? Is that to the south?

A. Well, actually the spring, it's difficult to denote the spring in its real location because the spring actually issues from the San Jose Sandstone basically at the bottom of a bluff.

You have a bluff-forming sandstone with a shale, which is in the Nacimiento Formation, below that, and the spring issues right at the very lower-most point of the San Jose Sandstone as it meets the Nacimiento.

Q. What's the next -- tell us with the Nacimiento.

A. Okay. Basically the Nacimiento Formation at Lybrook is approximately 1200 feet thick and is composed primarily of shale, dense shales, which are relatively impermeable. There are laterally discontinuous, silty, sandy zones within the Nacimiento Formation that do bear water.

Wells completed in the Nacimiento yield

small amounts of moderately- to highly-mineralized water. And in no case that we find water quality within the Nacimiento to be acceptable for potable consumption. In other words, in every case it was over 1,000 milligrams per liter in the total dissolved solids.

Q. What else, what lies under the Nacimiento, Mr. Kilmer?

A. Okay. A depth of approximately 1200 feet near Lybrook lies the Ojo Alamo Sandstone, which is approximately 150 feet thick and represents the only potable water supply in the area.

The Ojo Alamo Sandstone is generally composed of two producing sand bodies that are separated by shale. It's an artesian aquifer, which means that a well completed in this Ojo Alamo will have a static or a non-pumping water level at some height above the top of the aquifer.

The Ojo Alamo Sandstone being at a depth of 1200 feet beneath the Nacimiento Formation is highly protected to surface -- from surface discharges originating in the Lybrook area, and additionally being confined, would be

impossible to migrate any contaminants into that zone.

Q. Why is that, Mr. Kilmer?

A. Well, again, like I said, it's a confined or an artesian aquifer. And basically if you had a crack or a zone of weakness that allowed any sort of hydraulic communication between the surface and the Ojo Alamo, the tendency would be for water to migrate vertically out of this zone.

In fact, the Ojo Alamo Sandstone is one of the regulatory targets of the State Engineer's Office. And anybody drilling and completing a well for water supply purposes in the Ojo Alamo Sandstone is required to set a surface protective casing into the Ojo Alamo and to run a grout or cement protective curtain behind the well casing to circulate using the Haliburton cementing technique all the way from the aquifer back to the surface.

Q. How many Ojo Alamo wells are located in the Lybrook area?

A. We were able to identify three different wells completed in Ojo Alamo.

Q. Mr. Kilmer, do you have anything else

at this time regarding your cross-section?

A. I think for now we can move on.

Q. Could you tell us about the specific aquifers that you encountered in your study? In other words, what aquifers do you find in the San Jose and Nacimiento and, of course, the Ojo Alamo?

A. Okay. The San Jose, as I alluded to a little bit earlier, is the shallowest water producing zone in the area. It occurs on topographic salients or the tops of mesas or ridges. It's a quartzose sandstone. At least in the vicinity of Lybrook, there's not a lot of fine grain material within the San Jose.

It produces water at least to the springs of variable quality. It ranges anywhere from a pretty high quality of water to a fairly mineralized water. It's important to note that the San Jose sandstone doesn't produce any water for wells in the immediate vicinity of Lybrook because saturations in the San Jose are exceedingly thin.

Basically, where you have water migrating along the contact between the San Jose Sandstone and the underlying Nacimiento

Formation, the water is -- the area is highly dissected, so you have a lot of -- you have small portions of the San Jose Sandstone that are remaining after the erosion has take place such that the water that infiltrates the San Jose either discharges the springs or seeps typically on the down-gradient or down-dip escarpments such that the majority of the water is lost either to the spring discharge or to evapotranspiration.

Q. Does any of this water find its way into the Nacimiento?

A. Not that we know of.

Q. Well, why is that?

A. Well, again, the Nacimiento, at least at this contact, is a dense shale that really prohibits a downward migration at least of any magnitude of water into the Nacimiento Formation.

Q. Is this the type of shale that Mr. Hicks talked about this morning that could be the subject matter of area-wide exceptions from the proposed rule?

A. Right, at least in the vicinity of Lybrook. Right at this contact between the San Jose Sandstone and the Nacimiento Formation

you've got a very clayey, dense shale that is much of the same description as the type of shales that Mr. Hicks alluded to as being highly protected and very low level of vulnerability.

Q. When it rains or snow melts in this area, where does the water go?

A. Most of it penetrates a small -- well, let me rephrase that. Most of the water would be lost to a runoff flow event. Runoffs in these erosional channels that are cut down into the Nacimiento Formation, after a short period of rainfall, you have a certain amount soaking a short distance into the top of the Nacimiento Formation. But the lion's share of it would be lost with runoff.

Q. How about the water, the Nacimiento water aquifers or aquifer?

A. Okay. If you look in the literature, I think Brown and Stone published a deal with the New Mexico Bureau of Mines, I believe it's Technical Report 9.

Q. You say they filed "a deal." What do you mean by filed "a deal"?

A. Well, there was a paper published on the hydrogeology of the San Juan Basin. And the

Nacimiento Formation was one of the units that was treated in that study. And the Nacimiento Formation is defined in that work as locally an aquifer, which means that there are laterally discontinuous zones of permeability within the Nacimiento Formation.

Q. Does figure 1 show which well -- let me have you go to figure No. 1 and have you identify for the Commission those wells which are completed to the Nacimiento.

A. The wells that we sampled, there are two wells, both located in the southeast of Section 10.

Q. Why don't you turn around so that the Commission can see.

A. There are two wells completed in the Nacimiento Formation right in Lybrook, southeast of Section 10 and 23 North, Range 7 West. And --

Q. Are those shown by one dot?

A. Yes, those are denoted by one dot. They are approximately 75 feet apart. And these dots are, on the scale of this map, are probably on the order of 7- or 800 feet, so that one dot depicts both wells.

Q. And how about the other black dots in

the area; are those Nacimiento wells?

A. Most of these wells are completed in the Nacimiento Formation. They're completed as stock wells. They're low-yield and, according to the records, produce small amounts of moderately-mineralized water.

Q. Where did you find your information regarding these wells?

A. We located the lion's share of these wells through our file search of the State Engineer's Office records. The other wells we located through interviews and personal knowledge of BCO Operating Company's personnel.

Q. Which is the Lybrook community well on that?

A. Okay. The Lybrook community well is located just east of Escrito Spring. It's also in Section 10, Township 23 North, Range 7 West. This community well is completed in the Ojo Alamo Sandstone at a depth of approximately 1200 feet.

Q. And you said there were no San Jose wells on that -- in this area that you found; is that correct?

A. There was one San Jose well, and I believe it's this well up here in Section 7 of

Township 24 North, Range 7 West. Most of these wells penetrated through the San Jose Formation and were completed in the Nacimiento Formation below.

And we can basically assume from that condition that the San Jose formation was dry at that point or failed to produce enough water to justify completing the well.

Q. How deep is the San Jose from the surface?

A. It ranges anywhere from -- excuse me, could you --

Q. How deep is it? Where do you encounter the San Jose from the surface, or is it at the surface?

A. Well, the San Jose is basically at the surface everywhere with the exception of these erosional dissections, which are basically the proposed extended vulnerable areas on an outcrop line that roughly goes northwest to southeast, about through Lybrook, such that the topographic salients in this northeastern area of the map are capped by San Jose Sandstone. And the erosional features cut down through the San Jose Sandstone in the proposed vulnerable area extensions have

Nacimiento outcrops within them.

Q. Are you saying that the Nacimiento is at the surface in the proposed vulnerable area?

A. Yes, that's correct.

Q. Mr. Kilmer, while you're at that map, generally where are BCO's wells located? And we've already said that they operate wells in the four pools, but can you generally describe where they're located on that map?

A. Okay. The BCO wells tap Gallup Sandstone pay primarily. There are a couple of wells that commingle production from the Dakota, I understand. But it's basically an arcuate-producing trend that moves down approximately like this.

Q. And in a counter- or a clockwise fashion from up at the spring at the top of the map?

A. Right.

Q. What is the depth of the Nacimiento wells in that area generally, the average depth, or can you tell us more about that?

A. Well, the shallowest Nacimiento, the depth of water that we could find is the well that we sampled here in Lybrook. There were

other locations where completions have been made as much as 600 feet in depth within the Nacimiento Formation.

Q. What wells did you actually sample as shown on that map?

A. Okay. We sampled the Lybrook community well completed in the Ojo Alamo Sandstone, and we sampled these two wells completed in the Nacimiento Formation in Lybrook.

Q. Did you try to sample other wells in the area?

A. Yes. We made attempts to sample this well here in Escrito Canyon, which is located in Section 18, Township 23 North, and Range 6 West. And that well was equipped with a nonoperating submersible pump, and we couldn't draw a sample from that well.

Additionally, we tried to sample this well here, located in Section 34, Township 24 North, Range 7 West. That well was completed in the Nacimiento Formation. And that well is equipped with windmill rods and pump, which are also nonoperational. We were unable to collect a sample there.

Q. Did you try to sample any other wells

in the area?

A. No. I believe those were all the ones we made attempts to sample.

Q. Are those wells representative of other wells in the area in your opinion for the Nacimiento?

A. We think they are. I'd like to repeat that our rationales for selecting the wells that we did sample was, one, we wanted to try to collect samples particularly from the Nacimiento wells which exhibited as shallow a depth of water as we could from a groundwater protection standpoint.

Basically we were trying to find places where contamination was most likely to have occurred resulting from BCO activities.

Q. And where would contamination have been more likely to occur, if it had, as shown on that map?

A. Well, the most likely places we would expect to find it would be in the springs that issue from the San Jose Sandstone. There's one location up here, the so-called Loco Spring, up by Duffer's Point production, where during the late 60s BCO was disposing of approximately 50

barrels per day of co-produced water.

They were making a lot of water because there was some waterflood going on at the time. And we considered that to be a real strong candidate for contamination, at least resulting from past disposal activities.

And the other springs for the same reason, although, you know, they were less likely candidates, but they were also proximal to BCO disposal activities.

We selected these Nacimiento wells located in Lybrook primarily because they exhibited shallow water levels and also because they were close to BCO disposal points.

Q. Mr. Kilmer, are you ready now to tell us about the results of your sampling?

A. Yes, sir.

Q. Before we do that, let's look at the well information that you collected, and it's identified as table 1 in your report. And that's at page 9; is that correct?

A. Yes, sir, that's correct.

Q. What does that table show?

A. That table shows the locations, the names, the total depths, and the producing

formations of approximately fourteen wells and four springs, well, I guess there are only three springs since we don't have the so-called Loco Spring on this version of the table. But there's approximately fourteen wells on there and then the three springs.

Q. What do the depths of the wells indicate to you, Mr. Kilmer?

A. It's an indirect indication of the depth of groundwater. We looked at the total depth of the well as reflected in the records. And we assume that if you drilled 508 feet to make your completion in the well, that you didn't hit significant quantities of water at depths appreciably shallower than that. So it's an indirect indicator of the depth of the water.

Q. Why is that important or significant?

A. From a groundwater protection standpoint, the deeper it is to groundwater, the less vulnerability to contamination you'll have from surface sources.

Q. Again, which are the shallow wells -- or let me ask this. Where are the two wells? Can you identify the two wells on this table that are located in Lybrook?

A. Yes. The two wells located on this table are referred as to Rincon well and the Andres well. They're both located in Section 15, Township 23 North, Range 7 West.

Q. Can you explain to the Commission your identification of the wells as these two wells are identified as being in Section 15.22A and 22B? What does that mean?

A. Well, this is United States Geological Survey's system of identifying well locations in which a section is divided into successive quadrants such that the designation 15.2 would refer to the northeast quadrant of the section.

And further, you could divide the northeast quadrant of the section into four additional quadrants such that the 15.22 would refer to the northeast quadrant of the northeast quadrant of Section 15.

Q. And both of those wells are located in the same quadrant?

A. Right. They're approximately 75 feet apart.

Q. Are these the shallowest wells out there as far as the Nacimiento is concerned?

A. In terms of the probable depth of the

water, we believe they are.

Q. But you also find the Nacimiento well completed at a depth of 508 feet as shown by that windmill No. 6 well in Section 22.33?

A. Right.

Q. When you have a well completed at 508 feet versus, say, a well -- take the first well, the first well is the San Jose well; is that correct?

A. Yes, sir, that's correct.

Q. What's the shallowest Nacimiento well that you find there?

A. Well, I believe the shallowest one would be, what, the Rincon well.

Q. What does that indicate when you have the depth of 508 feet and the Rincon being at 152?

A. Well, basically if they Td'd the well at 152 feet, they had penetrated the water-bearing strata that they consider would produce sufficient water to justify completion. The well that's completed at 508 feet may or may not have intercepted quantities of water at shallow depths.

But apparently that is the depth that

the drillers at the time anticipated that they would have to Td the well at in order to produce the quantity of water that they were looking for.

Q. Mr. Kilmer, is there a significant difference in surface elevations to account for this kind of variation in the depths of wells?

A. It's kind of an interesting point because the Rincon well and the Andres well, which are located only 75 feet apart, have significantly different depths of completion. And we also made water level measurements in both of those wells. And we found that the water level in the Andres well was 210 feet below ground surface and that the standing water level in the Rincon well was only 139 feet.

What this indicates is that the zones that are produced by these two wells are laterally discontinuous zones and that they're not in hydraulic communication with each other.

Q. Did you find a diversity in water quality between these two wells?

A. With respect to the inorganic analyses, yes, we did. We drew water samples from both of these wells. We analyzed them both for total

dissolved solids content. We also analyzed them for BTEX content.

What we found was that the level of total dissolved solids varied significantly. The Andres well, we got 4200 milligrams per liter total dissolved solids. And in the Rincon well, we found 6200 milligrams per liter, which is further strong indication that the units these wells would produce from don't communicate with each other.

Q. Over how long a period would you estimate that there might occur communication between these two wells?

A. Both of these wells are inactive, capped wells. To our knowledge, there hadn't been any production from either well for a period of at least months and more likely years. And so we feel that those water levels are very representative of the static or undisturbed water levels in those two wells.

Q. Are you saying that over a great number of years there has been no natural communication that occurred as a result of drilling or any other pumping or production of these water wells?

A. Well, basically there are a couple of

lines of evidence to suggest that you have a very slow movement of fluids through the Nacimiento Formation here. One, of course, is the difference in water table elevation at the two wells.

And, of course, the overall level of mineralization of the water that we found from these wells would also suggest very slow rates of recharge and great susceptibility to mineralization of the water that's contained in that unit.

Q. Is it fair to say that the wells which have encountered water in the Nacimiento have actually encountered isolated pockets of water from the standpoint of a layman's description?

A. That's a very good characterization. When you think of the Nacimiento Formation, what you really think of is predominantly a shale sequence that has, at least in the Lybrook area, laterally discontinuous isolated zones of permeability that are formed by silty sands. They're not very thick, and they're not very widely distributed.

Q. Mr. Kilmer, are you ready now to talk about table No. 2, which is shown on Exhibit No.

2, that is, the results of your laboratory analysis?

A. Yes, sir, I am.

Q. Could you explain to the Commission what Exhibit No. 2 contains?

A. Exhibit No. 2 contains the reporting of the analytical laboratory testing results that we got from sampling the four springs and three wells near Lybrook.

The sample points are identified by spring or well location on the left-hand column, and then the common or locally used name for the Springer well, left of -- a little bit right of the left-hand side.

And then the central portion of the table consists of reporting of the results of the laboratory analyses for fuels type contamination or the BTEX components.

Those samples were analyzed using an EPA approved method which is capable of resolving levels of these various contaminants down to one microgram per liter or one part per billion.

Further to the right-hand side of the table is the results of the analyses for total dissolved solids. That's an inorganic

determination. Those are in parts per million, which is roughly 1,000 times greater than the reporting units for the organic components.

And then the right-hand column of the table lists the geologic units which these water samples came from, whether they be springs or wells.

One correction I'd like to make to the table is -- perhaps a couple of corrections. The two springs, down at the bottom of the table, the so-called Iron Spring and so-called Loco Spring, we feel have their origin in the San Jose Sandstone.

And we know that the water -- we collected the sample at Iron Spring at a location that was a few feet away from the contact between the Nacimiento Formation and the San Jose Formation.

And we believe that in a short distance that the water traveled through the Nacimiento Formation probably picked up some mineralization and as a result of that has caused the elevated level of mineralization. That 2500 milligrams per liter is somewhat higher, substantially higher, than some of the other springs that we

sampled in the area.

Additionally, the Loco Spring sample, incidentally, I collected all these samples myself with the exception of the sample that came from Loco Spring. At the time we were doing our field reconnaissance, the roads were basically impassable, which in the locations where the roads went through the erosional channels that are cut down in the Nacimiento Formation, the snowmelt in the area had soaked those shales to the point where they were very slick and the roads were basically impassable.

So the water sample that was collected from Loco Spring was collected by BCO personnel last week. Incidentally, the same individual that collected the sample that came from Loco Spring accompanied us on our original field reconnaissance and was instructed as to the protocol for sampling, sample preservation, and so forth.

Q. Now, Loco Spring again is the northernmost spring; correct?

A. Yes, sir, that's correct.

Q. Well, what does this information contained on this table 2 tell us, Mr. Kilmer, as

far as the proposed regulation?

A. Well, basically what it tells us is that, number one, the overall water quality available in the area ranges from pretty good in the San Jose Formation, all of which occurs outside the proposed extensions of the vulnerable area and would not be protected by the proposed order, to pretty darn terrible actually in the Nacimiento Formation.

The Ojo Alamo Sandstone makes fairly predictable water quality. It's almost always acceptable for public consumption.

Q. And how would you characterize 630 Tds as shown on that map as far as this particular -- in terms of standards for drinking purposes?

A. Well, the water that we drink in Albuquerque has an overall mineralization of generally higher than 630. So 630 parts per million total dissolved solids, assuming none of those -- none of what goes into making up that total dissolved solids is a real toxic substance, which in this case isn't, it's fairly good water. Very good water in fact.

Q. And, of course, the best water out there apparently comes from that unnamed spring,

which is the southernmost spring on the map; is that correct?

A. Right. That's correct. Additionally, we want to point out that the results of our sample analysis, and we've talked about the overall water quality, but basically the laboratory found no indication of any fuels related contamination. There were no BTEX compounds found in any of the water samples.

Q. What kind of limits were you looking at? What was the detection limit, I should ask?

A. Again, the detection limits on the method of this laboratory analysis were one microgram per liter for each of these compounds. They can actually see them at a little bit lower levels than that. But the protocol of the method forbids them from actually quantifying anything less than one microgram per liter.

The drinking water standard for benzene is ten micrograms per liter, and for ethylbenzene, toluene, and total xylenes it's in the hundreds.

Q. Anything further on the table 2, Mr. Kilmer?

A. I think I'm satisfied.

Q. Mr. Kilmer, let's turn now to page 14 of your report. I'll direct your attention to the heading at the top of the page, identified as the "Alluvium." Would you please tell the Commission what that heading stands for and the discussion that is contained in that portion of the report.

A. Okay. In our view the proposed extension of the vulnerable areas is designed to protect shallow alluvial aquifers occurring in dissected ephemeral stream drainages in the San Juan Basin.

In our field reconnaissance in the Lybrook area, we found no accumulations of alluvium in these drainage valleys. Basically they were cleaned-off cuts down into the shale of the Nacimiento Formation.

And we think that's very significant because we think that that draws a stark distinction between what's proposed as a vulnerable area extension near Lybrook and the documented cases of very susceptible shallow aquifers in the Olson and in other studies.

Q. Do you agree with the Olson report insofar as the area of its locale is concerned?

A. The Olson report deals with alluvial aquifers primarily where the depth to groundwater is exceedingly shallow and the vulnerability to groundwater contamination from surface sources is very high.

And we concur with the findings of that report that those, what are currently considered by OCD to be vulnerable areas, are indeed extremely susceptible to contamination.

Q. And it's your testimony that you found no alluvium in the proposed expansion of the vulnerable areas in the Lybrook area?

A. That's correct. Therefore if there is no alluvium, there would be no shallow susceptible alluvial aquifer.

Q. How does water migrate in an alluvium?

A. Well, basically there are a couple of different mechanisms. If you have a storm runoff event, you'll have a lot of -- I'm talking about ephemeral stream drainages now. If you have a form runoff event, you'll have loss of water through the bottom of that channel, and it will percolate vertically.

Other recharge comes to some extent from precipitation that falls and infiltrates

from those permeable sediments away from the drainage channel itself.

Q. So if there's no alluvium there in the Lybrook area, then the purpose of the regulation really -- there's really no purpose in the regulation; is that fair to say?

A. Well, I think it's fair to say that what is proposed, as far as regulating the extended vulnerable areas at least near Lybrook, the areas that are going to come under regulation, in my opinion, are the least vulnerable areas out there. So, therefore, there would be no purpose in the proposal as it's written. Wouldn't provide any environmental benefits.

Q. Let me ask you now, Mr. Kilmer, based on your study, I know you've already talked about some of the conclusions that you've reached as a result of your study, but generally what are the major conclusions that you have reached from your study?

A. Well, I guess our first conclusion, we probably already talked about this at some length, is that the Lybrook area bears very little hydrologic and geologic resemblance to the

areas that Olson studied which form the basis of the proposed area extensions.

As I said before, the proposed extended vulnerable areas near Lybrook are situated on shale outcrops, which again are some of the least vulnerable areas out there.

The Ojo Alamo Sandstone is the only source of potable water in the area. And that unit is approximately 1200 feet deep through highly shaley sediments in the Nacimiento Formation.

And by virtue of its relationship to the Nacimiento Formation and the fact that it's an artesian aquifer is imminently protected from surface water discharge sources.

Additionally, the springs which we identified near Lybrook all issue from the San Jose Sandstone or thereabouts, the contact between the San Jose Sandstone and the underlying Nacimiento Formation. And they're all topographically higher than the proposed vulnerable area extensions.

In other words, the springs actually drain into the vulnerable areas, and no protection of those springs will be afforded by

regulating discharge in the vulnerable area extensions.

And, additionally, I think we'd like to stress that BCO has been operating in virtually the same fashion for the last 30 some-odd years as they are today. And we made a pretty good effort to go to some of the most likely places where you would expect to find contamination if it had occurred. And not seeing any, we don't feel like it has occurred.

And in view of the fact that operations are, for the most part, on the down-slope, there's probably less production out there today than there was in the past. And in the future there will be less than there is today. And so the likelihood for future contamination is not very high as well.

Q. Mr. Kilmer, let me refer you now to what we marked as Exhibit No. 3 and have you tell us what it contains.

A. Okay. Exhibit No. 3, as I said before, was prepared by BCO personnel at my request and consists of quantifications of daily water discharge to the 24 discharge points BCO currently operates which fall within the proposed

vulnerable area extensions.

Basically they've got 24 sites where they're disposing co-produced water out there. And the total disposal from all 24 sites is 12.2 barrels per day, which basically boils down to approximately one-half barrel per day being disposed at each site.

Additionally the greatest rate of disposal taking place at any site is the State H No. 7 at the top of the list, and that's 2.5 barrels per day.

Q. Mr. Kilmer, are you familiar with the concept of reservoir waste and economic waste in terms of oil conservation --

A. Yes.

Q. -- standards?

A. [Nodded.]

Q. How would implementation of the rule or promulgation of the rule in this area affect waste of oil and gas?

A. Well, I think Mr. Van De Graaff did a real good job of defining what some of the impacts were likely to be of extending these vulnerable areas.

From BCO's point of view, my

understanding is that the majority of these wells are so-called stripper wells that are operating right now at or near the economic limit. And to impose requirements of lining the pits and so forth at these producing locations would probably bring about a decision on BCO's part to suspend operation on a number of these wells.

Q. Mr. Kilmer, do you have an opinion as to whether the proposed expansion of the vulnerable area has any significant effect -- well, let's strike that.

Do you have an opinion as to whether exemption of the proposed rule for this area has any effect on human health or the environment?

A. My opinion, in view of the period of operation out there and the information that we generated with our reconnaissance, is that the proposed rule would not provide any greater public health safety than what is already in effect today.

Q. Would your opinion change, Mr. Kilmer, if you have had another two years to study this area?

A. If I were to look -- if I were to gather information from the same places, in other

words, if I were to continue to sample the same points, I don't believe that that opinion would change just because the period of operation is around 30 years. And if we don't see contamination today at those locations, we're not likely to in the future.

You know, if we had funding to go out and do a lot of studies, you know, there's no telling what we might turn up. But based on what we've seen so far, no, I don't think my opinion would change.

Q. Would you recommend to BCO to go out there and do more studies?

A. No, sir.

Q. Mr. Kilmer, do you have anything further to add to your testimony?

A. No. I think that about takes care of it.

MR. PADILLA: Mr. Chairman, we offer Exhibits 1, 2, and 3. And I have no further questions.

CHAIRMAN LeMAY: Thank you, Mr. Padilla. Without objection, Exhibits 1, 2, and 3 will be admitted into the record.

Commissioner Bailey, questions?

COMMISSIONER BAILEY: I have some.

EXAMINATION

BY COMMISSIONER BAILEY:

Q. Going back to the geologic cross-section --

A. Yes.

Q. -- that you've started at the beginning, I notice that there are no subsurface controls on which this cross-section is based when there are water wells and oil wells in the vicinity. Is there any reason why?

A. Well, typically the oil wells in that area, they don't run their logs up as high as the Ojo Alamo Sandstone. They're required to run pipe, my understanding, through the Ojo Alamo Sandstone. And, therefore, there's no downhole record of those.

We do have outcrop information. We have a geologic map that shows the outcrop of the Ojo Alamo Sandstone, and it outcrops approximately 14 miles southwest of Lybrook. And we know what the regional dip is and so the Ojo Alamo Sandstone component of this cross-section was derived from that source. The rest of the geology comes from superficial outcrops and

topographic maps in the area.

Q. I would think it would be very useful to your case if you could have incorporated some of the well logs or soil descriptions from the water wells that were very close in the area so that we could have had those as --

UNIDENTIFIED SPEAKER: If I may interject, since this is rule-making procedure?

MR. PADILLA: No.

A. We did utilize some water well information only indirectly in terms of the total depth of those wells by plotting those wells up in that topographic map, which is labeled as figure 1. Like I said, knowing what the total depth of the well is and what the regional dip is, we got a pretty good idea of which units those well were completed in.

Q. In some parts of your testimony, you discuss how the Nacimiento was considered an aquifer and other parts of the basin but not in this area. Then other parts showed that there were many wells here that are windmills that were completed within the Nacimiento?

A. Right.

Q. I hate to see the Commission get

sidetracked into potable water or nonpotable water in aquifers when the discussion is on protection of freshwaters defined in this order --

A. Right.

Q. -- which is 10,000 Tds or less.

A. That's correct.

Q. I just wanted that clarification for the record. Is it common practice for a water well driller to drill deeper than the water that he encounters in the formation for storage of water? The Tds, the total depths, that were shown on a lot of these water wells, we cannot necessarily take that as the water level of the formation?

A. That's correct. It's only an indirect indication. You can only assume that insufficient quantities were encountered above the total depth of the well for the purposes of the drilling project.

Q. Okay. I'm having difficulty visualizing the area. Sandstone cliffs with mass wasting, I came across that in one of the paragraphs, with very little to no weathering of these sandstone blocks as they arrive into the

washes or the arroyos, which means that there's no alluvium. But there are these large blocks of sandstone and maybe no vegetation because there's nothing for the rooting of these plants.

Is that -- am I getting a clear picture of the way you want us to see it?

A. The area of the sandstone outcrops are, as you say, you can envision mesas or buttes with, you know, bounded by bluffs on the margins. The areas in between where the Nacimiento Formation outcrops, I would describe as badlands. There's a minimum of vegetation in those areas and a large amount of erosion. Erosion rates are very high.

Q. We've only talked about the produced water that you see from BCO's operations, but yet the proposed order discusses all oil and gas wastes. Are we getting sidetracked away from and concentrating only on one type of waste rather than all the others that may be present?

A. My understanding is that the only waste disposed of at BCO properties are the separated water products.

Q. Okay. Only the produced water?

A. Right.

Q. And as far as you know, there are no other wastes on the BCO operations?

A. That's correct.

COMMISSIONER BAILEY: That's all I have.

CHAIRMAN LeMAY: Commissioner Weiss?

COMMISSIONER WEISS: Yes.

EXAMINATION

BY COMMISSIONER WEISS:

Q. How far away are the pits from the springs that you sampled?

A. I believe the nearest one is approximately 800 feet away.

Q. Are they in service, the pits today?

A. Yes.

Q. When you were sampling?

A. Yes, sir.

Q. Now, just in your personal experience outside of this study you've done, are there other such areas in the proposed vulnerable expansion?

A. I don't know of any personally, no, sir.

Q. Thank you. And then, let's see, I'll just comment. I'm glad you allowed this

testimony.

CHAIRMAN LeMAY: I was going to allow it. I didn't know where it was going, whether it was geared to get an exception to any proposed order or whether it was to enlighten the Commission.

COMMISSIONER WEISS: I think it certainly was to me. Thank you.

CHAIRMAN LeMAY: Additional comments?

COMMISSIONER WEISS: That's all I have. Thank you.

EXAMINATION

BY CHAIRMAN LeMAY:

Q. Couple questions. One, you said it wouldn't help to do any more work in the area, yet your closest pit, I guess you said, is 800 feet from your closest discharge point. Isn't it possible that some of the pits can be producing contamination of some of the waters, and yet would not be registered, simply sampling the currently available discharge points being the available wells in the area and the springs?

A. Well, certainly that would be the case. I think you need to bear in mind that we, like Mr. Olson, were operating with limited time

and limited resources, and we wanted to give it the best shot that we could at finding and identifying any contamination that might be present.

Obviously, Mr. Hicks, I think, did a very nice job of characterizing what you expect to find in the immediate vicinity of some of these -- of the disposal pits. And I think some of the groundwater modeling that's been done might give us an idea of what you could expect in the intervening areas between places where we may have looked and then correlative places where Mr. Hicks did some of his investigations.

Q. My question was in response to your answer to a question whether you had additional time and resources, if you might be able to do additional work in here that would enlighten us as to a possible contamination. And I guess the point I would raise if you could sample the pits, wouldn't that be an additional contribution to an understanding of the situation?

A. Yes. Any more information you have than you have today would provide more enlightenment, that's for certain.

Q. And just to follow up, I guess to

emphasize Commissioner Bailey's point, are you familiar that the State Engineer does require the protection of all waters having 10,000 parts per million or less, whether we consider them useful or drinkable or --

A. Yes. Yes, we are.

Q. So we're dealing with a regulation here that's very difficult for the Commission to exercise its own judgment?

A. I understand that. But I think it's worth noting, and this is similar to the comments that Mr. Hicks made regarding the wellhead protection areas and that, at least in my view, maybe not in anyone else's, if you've got water that's moderately mineralized and it has -- it's not fit for public consumption, then that resource deserves less effort at protection than a resource, a pristine water source that constitutes a very high quality water supply for public use.

Q. Mr. Kilmer, I might agree with you except for the fact that as a regulator we are really required to protect. And if the State Engineer changed their mind and the water could be declared by some form or fashion

non-protectable, I might agree with it, you might agree with it.

But under the current statutes, that's what we're faced with. We don't have the luxury of high grading whether the lesser quality of water could be contaminated but the higher quality should not.

A. Right, and I understand that. But I still think it deserves mentioning that some water is better than others.

CHAIRMAN LeMAY: Well, I agree some water is better than others. Thank you very much. I appreciate your testimony.

I'd like to get another witness in here. Let's take a ten-minute break, and then if Mr. Shuey would be available for our last witness of the day. Thank you.

[A recess was taken.]

CHAIRMAN LeMAY: We shall continue. For those of you who wonder about our time schedule, what we plan to do is to hear Mr. Shuey's testimony today and then continue it until tomorrow morning at 8:00 o'clock.

And at that time I think you have one more witness, and then we can go through any

cross, if the witness can be available, it would be helpful, or redirect to emphasize certain points. And I think we'll be able to wind it up somewhere in that time frame.

Mr. Meiklejohn.

MR. MEIKLEJOHN: Thank you, Mr. Chairman. My name is Douglas Meiklejohn. I'm a lawyer with the New Mexico Environmental Law Center, appearing today on behalf of Southwest Research and Information Center, a nonprofit organization in Albuquerque that is a party in this matter. And our first witness is Christopher L. Shuey.

CHRISTOPHER L. SHUEY

Having been duly sworn upon his oath, was examined and testified as follows:

EXAMINATION

BY MR. MEIKLEJOHN:

Q. Would you state your name and your business address, please, Mr. Shuey?

A. Yes. My name is Christopher L. Shuey. I go by Chris. I am employed by Southwest Research and Information Center, which is at Post Office Box 4524, Albuquerque, New Mexico 87106.

Q. Would you tell us briefly what

Southwest Research and Information Center is, and would you describe your work there, please?

A. Yes. Southwest Research and Information Center, which we abbreviate by the acronym S-R-I-C, and so if I you say "SRIC," that's what I mean, because you can't get "SRIC" out of SRIC, but we do. It's a not-for-profit public education and scientific organization founded in Albuquerque in 1971 for the purpose of providing information to the public on a wide range of issues that affect human resources, natural resources, and the environment in order to promote economic and environmental justice.

Q. And what is your position at Southwest Research and Information Center?

A. I direct the community water quality program.

Q. How long have you worked at the center?

A. Nearly eleven years.

Q. What do you in your capacity as director of the community water quality program?

A. I have two categories of responsibilities. One category is policy analysis, such as taking part in regulatory development proceedings at all levels of

government, local, state, and federal.

And the other part of it is providing technical assistance to community organizations, individuals, people in need of information and understanding on pollution problems, water quality matters. And I have some supervisory responsibilities in directing two people on our staff. And I also have responsibilities for the financial management of the organization.

Q. Have you been involved in your capacity in that position at Southwest Research, have you been involved in the proceedings that led to the adoption of Rule 7940 and in this administrative proceeding?

A. Yes, I have. I was a member of the Oil Conservation Division short-term produced water study committee, which was founded in 1984 and continued through into 1985 prior to the hearing in Case 8224 before the Oil Conservation Commission. I appeared pro se before the Commission during the hearing.

I've been a member of the Division's long-term produced water study committee since it was formed in 1986, assisted in the mapping of the proposed expanded vulnerable area. I'd also

add that prior to the 1985 hearing, I assisted the Division in collection of produced water samples for analysis, and those results were part of the hearing record.

I also participated in field investigations of groundwater contamination around unlined pits and assisted experts in presenting those data to the Commission in Case 8224. And I was a junior author of a scientific paper that was published as a result of that study at the Duncan oil field.

Q. Have you been involved in issues regarding disposal of oil and gas produced wastes in other states and on the national level as well?

A. Yes. I've testified before the US Environmental Protection Agency on its REPWA, Regulatory Determination for Exploration and Production Wastes. And I have continued to serve in an advisory capacity to the Interstate Oil and Gas Compact Commission's Council on Regulatory Needs.

I have represented national environmental and citizens' interests in the IOGCC's review of two state ENP waste regulatory

programs, the state of Wyoming's last year and the state of Oklahoma's program earlier this year.

Q. Have you prepared a statement that has been provided to the Commissioners, a bound statement?

A. That's correct. We provided to the parties in the proceeding a summary of our testimony and the exhibits. What we have done to facilitate the Commission's review is to prepare a written version of my testimony, again accompanied with all the exhibits, and including Mr. Wallace's exhibits for his testimony tomorrow.

In addition, I've prepared a one sheet back-to-back listing of proposed amendments to the Oil Conservation Division's proposed vulnerable area order. These are amendments being proposed by Southwest Research. I will discuss those in my testimony today. And again we thought it would be more convenient if you had one sheet of paper that had them listed.

Q. Is the first exhibit which is contained in the bound package your resume?

A. That's correct.

Q. Is that a current and accurate resume?

A. Yes. I'd like to add for the record that I have a Bachelor of Arts Degree in University Studies from the University of New Mexico, and my college studies did include courses, several courses, in geology, math through calculus II, and chemistry.

I have completed a short course sponsored by the Natural Water Well Association in hydrogeology. And I've been to numerous professional conferences pertaining to water pollution, groundwater contamination and monitoring, and waste management, including oil field waste management.

Q. With modifications that you will discuss, does Southwest Research and Information Center support the adoption of the OCD's proposed rule?

A. Yes, it does.

Q. Would you, please, outline for us the reasons for that and the research that you've done to support that?

A. Let me begin by saying that in preparation for this hearing since last September, I have spent -- I calculated more than

70 hours reviewing Oil Conservation Division files and talking in detail with Division staff about information and data on discharges of oil field waste to unlined pits in the San Juan Basin.

I have reviewed the proposed vulnerable area order that was dated March 27, 1992. And based on the experience I have in oil field waste management issues and the review of the proposed order, I'll want to testify on five different issues today. And I'll briefly list those, and then we'll go back through them one at a time.

First, available data demonstrate that discharge of virtually any amount of produced water to unlined pits will result in contamination of shallow groundwater at approximately 70 percent of pit sites and contamination of soils of virtually every pit site and that this record of contamination necessitates the elimination of discharges of produced water to unlined pits.

Secondly, technology does exist to phase out unlined pits and to replace them with lined pits or above-grade or below-grade tanks and that this is technology being implemented and

used by operators in San Juan Basin today.

Thirdly, operators that have closed pits in the basin since January 1, 1987, should submit information, records of investigations of those closures for approval by the Division.

Fourth, variances to the pit liner requirement of the proposed order should be granted only upon a demonstration by the operator that any suggested alternative to the pit liner requirement affords the same level of protection as that of a liner system.

Additionally, variance or applications should be subject to notice, comment, and hearing procedures before the Commission for Division Examiners.

And, fifth, the deadlines that are proposed by the Division for elimination of discharges should be tightened in two areas, those in the expanded vulnerable area and then all other areas unless the proposed exemption or the proposed up to two-year time limit is deleted from the proposed rule.

Q. Would you, please, tell us more detailed reasons for those positions and give us the results of your research on those issues?

A. Certainly. I'll begin with the first issue relating to discharges of produced water to unlined pits. In preparing for the hearing, I reviewed literally dozens of files in the OCD Santa Fe Environmental Bureau Office.

I spoke on 14 different occasions with the Environmental Bureau staff and with staff members of the OCD's Aztec District Office. And I also reviewed the testimony and the exhibits that were submitted in the 1985 case.

Based on that research, I compiled a list of investigations that have been conducted since 1983 on possible soil and groundwater contamination around unlined pits or other surface disposal facilities that are located in the vulnerable area in the San Juan Basin.

And I've prepared an exhibit, which is marked as exhibit SRIC 2, which shows the results of that compilation. Now, I need to emphasize that this list of investigations is based solely on information that is available to the public that is in the files of the Oil Conservation Division.

I am not privy to information generated by or developed by operators other than

information that the operators may have submitted to the OCD. The data and information that's contained in Exhibit SRIC 2 were obtained from a variety of sources and documents, again, all of which are in the OCD files.

On the second page of SRIC 2, the exhibit, I have made a list of the selected references and data sources so that each one of the 24 sites in the list had some reference to the available data. Because of the large amount of paper involved, I chose not to provide copies of this documentation.

This is it right here, and that's a stack of papers about two-and-a-half inches thick. I would be happy to provide copies if the Commission so requests, however. Included in this database is Mr. Olson's December 1989 open file report, which has been identified as OCD Exhibit 6.

I want to start to go through the table of SRIC Exhibit 2. First, calling your attention to the column that's headed, "Gwater Contam?" and that stands for groundwater contamination. The data and the information in that column show that groundwater contamination was detected at 17 of

22 sites for which analytical data from groundwater samples were reported. Now, that's a ratio of 77 percent, or roughly 3 out of every 4 sites which were investigated and for which data have been reported publicly.

Now, I'll stop here and say that I have a little bit different view of what constitutes groundwater contamination than earlier witnesses have testified to. In my view groundwater contamination is one of any three factors: One, the presence of a chemical constituent in groundwater in excess of a corresponding numerical standard under Section 3-103 of the New Mexico Water Quality Control Commission Regulations.

Or secondly, the presence of a chemical constituent in groundwater in excess of background concentrations as provided for in Section 3-101 of the Water Quality Control Commission regulations.

Or thirdly, the presence of a chemical constituent that does not occur naturally in groundwater and alluvial river deposits. So, for example, if seven parts per billion of benzene were detected in groundwater in an alluvial

valley, I would call that groundwater contamination, even though that is three parts per billion less than the Water Quality Control Commission standard.

Now, referring back to the table again, referring to the column headed, BTEX, "BTEX Contam?" the data and information show that aromatic hydrocarbons, which again are benzene, toluene, ethylbenzene, and xylenes, were detected in groundwater at 15 of 22 sites for which analytical data for groundwater samples were available.

This represents 68 percent of the sites for which groundwater chemistry was obtained and 63 percent of the 24 sites listed in the table. These ratios correspond closely with those determined by Mr. Olson's study which found BTEX contamination at 9 of 13 sites. That's 69 percent of the sites investigated.

Referring to the column that's headed, "BTEX>Stds?" again, the data information show that 11 of 22 sites for which analytical data were available had BTEX contamination of groundwater exceeding New Mexico Water Control Commission numerical standards. And those are in

Section 3-103(a) of the Water Quality Control Commission's regulations. And that ratio of 50 percent is very similar again to the statistic found by Mr. Olson of 6 out of 13 sites exceeding groundwater standards for BTEX.

Now, I'll note here that there were no groundwater chemistry data reported for 2 of the 24 sites that I have listed in this SRIC 2 exhibit. I have included those sites, which is site No. 6, the Gallegos Canyon Unit No. 250 and site No. 16, the Saiz No. 1, because there was documented soil contamination at those sites.

If you look closely at the table, you'll find that groundwater contamination was detected at 7 of 9 pits that had received 1 barrel or less of produced water per day. And the discharge volumes are under the column headed, "BWPD," for barrels of produced water per day.

Six of those 7 sites, pits were located greater than 10 feet to groundwater. And the depth to groundwater is headed in -- it's under a column headed, "DTGW," meaning depth to groundwater. In all, 11 of 15 sites where groundwater was greater than 15 feet, it

exhibited groundwater contamination. And 5 of 7 sites where the depth to groundwater was 20 feet or more exhibited groundwater pollution.

I think that these findings support OCD's proposed amendments to Order R-7940, which exempted discharges of produced water to production pits that received less than 5 barrels of produced water a day and were located more than 10 feet from groundwater.

I'll also note that, just to back up just a little bit, the 24 sites that are listed here include the 13 that are listed in Mr. Olson's study. And those 13 included the 11 sites that he actually did soil borings at.

Now, in putting this material together, I made some assumptions, one of which was that the analytical data in which conclusions were reached as to the presence or lack of groundwater contamination at each site, that those data were valid at the time that they were reported. I have no reason to believe that chain of custody or other quality assurance procedures were not used in the investigations.

I'll note that in most of these investigations samples were collected by either

operators or representatives of the Oil Conservation Division except in the case identified as site No. 14, the North Hogback 6 No. 11, which is the well at the Duncan oil field. And that was the site-specific investigation that I took part in in 1985 and for which I and two other people were the folks that collected the samples.

I also assumed that evidence of groundwater contamination was prima facie evidence of soil contamination, based on the understanding that pollutants that migrate vertically to the water table have to pass through the unsaturated zone, or the beta zone, leaving contamination in the unsaturated soils beneath the pits. And certainly some of the testimony that we have heard today I think verifies that.

Now, referring to the column that's headed, "Soil Contam?" in the exhibit, 20 sites were listed as having soil contamination, which means that there are 4 sites for which there is no data. Of those 20 sites, 6 are listed based on the availability of actual soil chemistry data and on information on the reports of spills and

appearance of oily residues and soils or on my own personal observations, the soil discoloration and hydrocarbon soils and hydrocarbons odors in soils excavated beneath the pits.

I, in addition to the Duncan old field investigation, I was present on a couple of occasions at the Flora Vista, Manana-Mary Wheeler site in 1983 and 1984 when well points were being installed in the alluvial aquifer there to detect pollutant movement.

I would also note for the record that there are three other sites that have been studied, and Mr. Hicks discussed those this morning. Those were the three Tenneco sites that were investigated and the results of those investigations presented to the 1985 hearing.

After reviewing the record of the hearings, I came to the conclusion that those investigations should not be counted in the total or on my list because of questions raised about the completeness of the studies, the accuracies of the reported quantities of discharges, and the validity of the results.

However, if those cases were to be added to the list, the percentage and incidence

of groundwater contamination from unlined pits would not change significantly at all because parts per billion levels of benzene were detected in groundwater at two of the three sites that consultants of Tenneco studied at that time.

This compilation of soil and groundwater investigations, in my view, demonstrates the discharges of small quantities of produced fluids to unlined pits in the vulnerable area; will lead to groundwater contamination in three out of every four cases; contamination of groundwater by aromatic hydrocarbons in two out of every three cases; and contamination by aromatic hydrocarbons that exceed state groundwater protection standards in about half the sites. And soils underlying unlined disposal pits are shown to be contaminated at virtually all sites for which data were collected and reported.

I think that this is convincing and compelling evidence that discharges to unlined pits should be prohibited regardless of the location of the pit in order to protect groundwater and soils.

The Commission is charged by the State

Oil and Gas Act with protecting freshwater supplies and with protecting public health and the environment. Groundwater and soils are part of the environment. It's my belief that the Commission has an obligation to protect them.

I think that there's one other reason to note that produced water should not be disposed in unlined pits, and that is because the industry recommends against such practice.

If it would please the Commission, I would like to read two short excerpts from the American Petroleum Institute's ENP Waste guidance document, which is officially called, "Environmental Guidance Document, On-Shore Solid Waste Management and Exploration and Production, Operations," published by API out of Washington, D.C., dated January 15, 1989.

On page 56 of the guidance document, API states, quote, "Produced water pits have been used in lieu of tankage. Produce water pits should be lined and only be operated as a substitute for process vessels," close quotes.

Again on page 56, API recommends that "Surface evaporation pits should be lined where groundwater or usable soils may be in danger.

Thus lined pits or tanks for the storage of produced water are not novel or even radical approaches to ENP waste management. They are necessary to protect freshwater supplies, public health, and the environment, and they are the standard that industry itself recommends."

The second issue that I'll talk about is the technology exists to phase out unlined pits and to replace them with liner systems or tank systems and that this technology is being used in the San Juan Basin.

Again, I investigated records in the Division's files pertaining to compliance with the existing Order R-7940 here in the Santa Fe Office Environmental Bureau. I summarized the information that I found in that file in what is marked as SRIC Exhibit 3, which is titled, "OCD Approved Tanks or Lined Pits in Vulnerable Areas, San Juan Basin."

Upon evaluating the information, I determined that since late 1986, early 1987, at least 562 pits have been or eminently will be replaced with above-grade or below-grade tanks or with manufactured liner systems, synthetic liner systems.

At least 17 different operators in the basin, large companies, medium-sized companies, small companies, are complying with existing Order R-7940 or are anticipating compliance with an amended R-7940 by installing tanks or liners to Division specifications.

I will say that the exact number of pits that have been replaced to date I am not aware of how many that -- how much that number is because that information is not discernible from the files that OCD has.

I wanted to provide the Commission with some examples of these tank system and liner systems that operators are using. Now, tanks that meet the Division design requirements are being used as pit liners. And one typical tank design is shown in what I have marked here as Exhibit SRIC 4, which is a letter dated October 28, 1986, from Manana Gas Company to the Oil Conservation Division.

On the second page of the exhibit there's a typical tank design. It shows both a cross-section and a plan view of the pit system. You'll notice that this is a tank with a perforated drain pipe under it and overlying a

synthetic underliner. So this is a double-lined system with leak detection. And this was implemented by Manana Gas Company.

The approval by the Division is contained in the following page, an October 30th, 1986, letter from then Director Stamets. I learned from my inspection of the OCD files that this same tank design has also been implemented by at least two other companies, Kimbrell Oil Company of Texas and Tenneco before Tenneco got out of the oil business.

Another pit lining system, again as an example of what's happening now, is contained in what is marked as Exhibit SRIC 5. Now, this is a synthetic double-liner system sold by a company called Frank Liner Systems, Frank Liner Fabrications of Farmington. It was approved by the Division for installation in pits owned by Snyder Oil Company and UNOCAL Corporation.

And SRIC 5, the exhibit, is a letter dated September 13, 1991, from Roger Anderson of the Oil Conservation Division's Environmental Bureau to Snyder Oil approving their pit design. The subsequent pages are material submitted by Snyder Oil to the Division, which lists the sites

at which this system will be installed or has been installed.

And the fourth page of this exhibit actually shows a cross-section diagram of the liner system. Again, a two PVC, or I mean two plastic layers with material between them and leak detection between them as a -- in my view this is the kind of technology that actually prevents groundwater contamination.

If there is a failure in the first liner, the leak detection system will pick it up and, provided that there is ongoing operator surveillance and maintenance of these facilities, the operator should be able to detect any leakage into the area between the two liners. It sure beats installing groundwater monitoring wells or beta zone monitoring wells which are much more expensive.

Compliance with the proposed prohibition on small quantity discharges to unlined pits was technically feasible in 1986, when operators were implementing requirements of the original Order R-7940.

Referring to typical pit registration forms, which are marked as SRIC Exhibit 7, these

were submitted by El Paso Natural Gas and Meridian Oil Company in 1986. It shows that they installed 50-barrel fiberglass tanks in pits that received as little as .4 barrels of water per day or a half-a-barrel, or less than half a barrel.

Going on to SRIC Exhibit 8, which is a letter dated October 24, 1986, from Martin Buys of Tenneco Oil Company to the Oil Conservation Division, there is a list of, what he says in the cover letter, as 31 sites and in the attached list is actually 32 sites, in which a tank liner system was installed in pits that were operated at that time by Tenneco.

Now, I should point out that 16 of these pit sites were reported as receiving no discharge, and only 1 pit reported as receiving more than 5 barrels of produced water a day.

I think that these, the pit, the registration forms submitted by El Paso Natural Gas and Meridian, and then the actions taken by Tenneco show that there is the capability of operators and the desire of operators to implement a no-discharge no-unlined pit order. They did so when they didn't really have to after the 1986 order.

Tanks and pit liners are, in my view, not only environmentally beneficial, but they compare favorably in cost with costs associated in cleaning up groundwater and soils that are contaminated by leakage from unlined pits.

Referring to what is marked as Exhibit SRIC 6, which begins with Meridian Oil Memorandum, dated September 30, 1986, in this document Meridian calculated that installing fiberglass tanks, and this is in 1986, six years ago, with leak detection systems at 44 pit sites would cost $52,586.73. And that list of sites and their calculations of those costs are on the second page of the exhibit.

I calculated simply that the average cost per site was a little less than $1200. That kind of cost pales in comparison to costs of remediating a soil and groundwater contamination problem at a pit site.

We heard from Mr. Anderson in the January portion of this hearing that it was his understanding and knowledge that about a quarter of a million dollars had been spent on the investigation and remediation at the Manana-Mary Wheeler 1-E well site near Flora Vista, which is

listed as site No. 11 on my Exhibit SRIC 2.

That's not, that figure that Mr. Anderson gave the Commission is not surprising and it could be low. I reviewed the Flora Vista contamination files in the OCD's Environmental Bureau, and I learned that this investigation and clean-up at this site has included the installation of several monitoring wells, the drilling of numerous soil borings, the collection and analysis of dozens of groundwater and soil samples, the excavation and off-site disposal of the contaminated soils in the polluted alluvial material, and replacement of at least one of the polluted water supply wells in the community.

I'm sure that folks with El Paso and Manana didn't work for free, and so there were salaries and benefits and professional fees on top of that. Obviously, those are extreme costs associated with a contamination problem.

Preventing contamination by lining pits or replacing them with leakproof tanks is far more economical than remediating groundwater contamination. Prevention, which is the intent of the proposed prohibition on use of unlined pits for produced water disposal, is wise public

policy in a state that depends so heavily on groundwater for drinking water as New Mexico does.

Approximately 90 percent of all drinking water comes from the ground in this state. Allowing contamination of freshwater supplies is simply not wise or careful stewardship of our water resources.

The third issue is the reporting requirement that we are recommending, that Southwest Research is recommending, for operators that have closed pits since January 1, 1987. We believe that the operators should submit data and information pertaining to pit closures to OCD for approval and possible additional corrective actions, if it's warned.

I believe that this requirement is needed to ensure that the pits that were closed after the deadline for compliance with the original Order R-7940 are protective of freshwater supplies, public health, and the environment.

To make that kind of determination, OCD must be furnished with results of investigations and details about the closures. The information,

the documents on how many pit sites have been or are being investigated, and how many have been or are being closed is not now furnished to the Division on a routine basis.

We've heard Mr. Hicks this morning talk about information that he had obtained from operators, and it was important to note that that information is still not publicly available. Without this kind of information, the state may never know the locations or conditions of closed pits until or if they become contamination problems.

My assumption is that, as was pointed out, the vast majority of closed pits, because fluids are no longer being loaded, will not be problems. But without the information, the Division has no way of knowing if they're going to be problems and therefore preventing them from becoming problems.

I would note that at least two major operators, Amoco and Meridian, are conducting soil and groundwater investigations at their pit sites. Mr. Frank Chavez of the Aztec District Office and Roger Anderson have told me on separate occasions that the results of

site-specific investigations by operators are being furnished to the Division really only when OCD requests such information or when the operator voluntarily submits it. So right now there's no ongoing affirmative reporting of this information.

As such we have, or I have, proposed additional language which would be an additional paragraph to be inserted after the first paragraph of what is now proposed Rule 6 of the proposed vulnerable area order.

Mr. Chairman, I could read this into the record if you'd like. You have it in front of you. And it doesn't matter to me.

CHAIRMAN LeMAY: For those in the audience, you might want to read it.

THE WITNESS: We would add the following paragraph: "For pits closed prior to the effective date of this order and after January 1, 1987, the operator shall submit to the Division for review and retroactive approval all reports, analytical data, and other pertinent information pertaining to such pits.

"Information shall be submitted within 180 days of the effective date of the rule. The

Division may require additional investigations, monitoring, or corrective action as may be needed to protect freshwater supplies or to protect public health and the environment.

"Any corrective action conducted under this section shall be carried out pursuant to applicable Division closure guidelines."

And I -- we selected a six-month compliance deadline in order to give the operators plenty of time to locate, compile, and submit this information and these records on pit closures to the Division.

The fourth issue pertains to the variances. In my view, the evidence of groundwater contamination from unlined pits that receive virtually any amount of produced water is substantial, considering that groundwater contamination has been documented at 70 percent of the sites that have been studied in detail.

As such, the prohibition on disposal of produced water in unlined pits should be the rule. And any exceptions to that rule should be granted only pursuant to a variance procedure in which the burden of proof lies with the individual who is applying for the variance.

I believe that OCD's proposed variance procedure incorporates those principles. The applicant must demonstrate, according to the proposed rule, to the satisfaction of the director that the quality of the discharge does not exceed the Water Quality Control Commission be numerical standards or that freshwater will not affected by the discharge and the discharge is not located in a wellhead protection area.

Southwest Research proposes that one additional criterion be added to the three factors now proposed. And in a second I'll read the additional paragraph that we are proposing here. I'll state now that this additional criterion, I think, will ensure that there will be -- that there will continue to be an equivalent level of protection of freshwater in the environment should a variance from the prohibition on the use of unlined pits be granted.

The way that I've structured this, I think it would allow the director to consider site-specific factors, such as geology and soil characteristics, in determining whether the proposed alternative prevents contamination of

soils and groundwater.

I also think that this additional criterion is consistent, again with the API guidance document, which recommends the, quote, "On-site" -- excuse me, "Unlined, on-site pits used for disposal of waste should be restricted to areas where soil conditions, hydrological factors, and rainfall prevent significant soil or groundwater contamination." And that's the API guidance at page 55.

The proposed, Southwest Research's proposed additional criterion would be inserted as a new subparagraph after proposed Rule 7-A (3), and it would read: "In no case shall the Director approve an application for a variance to Rule 3-A where the applicant has not demonstrated that the proposed use of an unlined pit affords the same level of protection to freshwater supplies, public health, and the environment as that afforded by a liner system or tank system with leak detection."

Again, my view is that we must prevent releases to the environment. The three criterion that are -- one or two criteria that is in the proposed rule will do that in most cases but not

in all.

Variances by their nature should be granted only in rare circumstances. And because they are exceptions to a rule, they should, in Southwest Research's view, be subject to public notice, opportunity for comment, and hearing.

Certainly the owner of land upon which an unlined pit is sited should be informed of the filing of an application for a variance from the pit liner requirements of the proposed order. The interest of the landowner is the protection of his soils and his groundwater supplies, or hers, as the case may be.

The interest of the public in being informed of the application is whether freshwater supplies, public health, and the environment are being or will be protected. As such, again, Southwest Research has developed an additional paragraph that we would propose be inserted after what is now proposed Rule 7-B. And this would become Rule 7-C, and it would state:

"The discharger shall file with the Director an application for a variance to Rule 3-A. Such application shall address the criteria established in Rule 7-A. The Director shall

provide for public notice of the application and for the public an opportunity to comment and to request a hearing before the Commission or Division Examiners.

"Such provisions for notice and hearing on variances to Rule 3-A shall be consistent with the Commission's existing notice and hearing requirements."

And then finally in regard to the compliance deadlines, the evidence of adverse effects to groundwater resources from small volume discharges to unlined pits is another reason to tighten the deadlines for elimination of discharges to the expanded vulnerable area.

Southwest Research supports the proposed one-year deadline for eliminating discharges to unlined pits in the existing vulnerable area. However, the two-year and three-year deadlines for major tributaries in remaining drainages respectively are likely to allow continued and additional contamination of soils and groundwater.

The deadlines that the Division has proposed are, in my view, even more lenient if you consider that the proposed Rule 7-B would

allow an extension, an additional time extension, of up to two years for phase-out of discharges to unlined pits in the expanded vulnerable area.

Under the Division's proposal, an operator could receive for a pit in the, what I think Mr. Hicks referred to as the phase 3 vulnerable area, up to five years to comply with the requirement of Rules 3-A and 3-B, which is the elimination of discharges in unlined pits. In my view, that's just simply too long.

So in order to prevent additional contamination of soils and groundwater, we propose changes to the Division's draft proposed vulnerable area order. Under Rule 3-B (2), that is for the expanded area in terms of the major tributaries, the phase 2 vulnerable area as Mr. Hicks referred to, we would change the two-year compliance deadline to eighteen months. And for the remaining areas under Rule 3-B (3), we would change the compliance from three years to twenty-four months.

In addition, it's our recommendation that no more than one year be granted for time extensions under the variance procedures. Alternatively, we would support the time, the

compliance dates as proposed by the Division if the time extension variance was eliminated.

My concern is that certainly under the proposal that we heard from witnesses for operators today, compliance could take on the order from three to seven years if the two-year extension is maintained. That's simply too long.

And any length, any more lengthy period of time for compliance is simply not warranted when you, as I have, you observe the history of this rule-making. I have been involved in this issue since 1986 in terms of the long-term produced water study committee.

The genesis of the proposal that we're here today discussing, that is the prohibition on discharges to unlined pits, was during meetings of the long-term produced water study committee six years ago. I know this because I attended the meetings. And at the request of the members of the committee, I kept the notes of the meetings, and I prepared the meeting minutes.

And for the record, I have provided as SRIC Exhibits 9 and 10 copies of those minutes of, under SRIC Exhibit 9, a copy of the minutes

of the December 9, 1987, meeting, the long-term produced water study committee, and under SRIC Exhibit 10, a copy of the minutes of the November 18, 1986, meeting.

These exhibits, as you will note, are accompanied with the transmittal letters that I sent to Mr. Boyer, both with the November 86 minutes and the December 87 minutes. And I also sent the December 87 minutes to Lori Komatar, who was the committee chair at the time.

I'd like to point out for the Commission's information and consideration a couple of items that appear in these minutes. First, from the minutes of the November 18, 1986, meeting, details of what became Mr. Olson's study were discussed at length.

Mr. Olson and Mr. Boyer talked about the goal of the additional investigations was determined if discharges of less than five barrels a day of fluids to unlined pits per day posed contamination threats. They covered the process by which they would select pit sites for detailed study, the methods to be used to install monitoring wells, even the hand-augering method was discussed, the protocols for sampling, and

analysis of groundwater.

And then following the discussion, members of the committee broke up into small groups to map special vulnerable areas. And those include many of the expanded vulnerable areas that are at issue in this hearing.

The minutes of the December 9, 87, meeting show that Mr. Boyer and Mr. Olson discussed in detail the results of the investigations, small quantity discharges into unlined pits.

And the minutes show that representatives of oil and gas operators acknowledged these findings. And I'd like to cite and quote from the minutes in one brief paragraph, and this is the verbatim from the minutes.

MR. ROBERTS: Mr. Chairman?

THE COURT: Yes, sir.

MR. ROBERTS: Mr. Chairman, I'm going to object to anything that is attempted to be introduced into evidence here that would represent what somebody at a meeting said who is not going to be here available to testify as to what they said and who could be cross-examined.

It appears that from the section that Mr. Shuey is going to read from that he is going to attribute a statement to an individual who was at that meeting who is not here. If they needed his testimony, they should have asked him to be here. It's hearsay.

MR. MEIKLEJOHN: Mr. Chairman?

CHAIRMAN LeMAY: Yes, sir.

MR. MEIKLEJOHN: It's an official business record. It's an exception to the hearsay rule. Mr. Shuey will testify, if the Commission desires, about whether he received any objection to those minutes or any indication from anybody that they thought they were inaccurate.

CHAIRMAN LeMAY: Well, I think we're getting too legal. I think basically what we want to do is rule-making. I think, based on what he's saying here, let him read it into the record with the stipulation that we will weigh it appropriately, which means that party is not here to defend, deny, or accept those statements. They're public record, but without explanation from that party, they're certainly worth less than if that party were here to clarify what he said.

So, Mr. Shuey, go ahead. I'll overrule the objection.

MR. MEIKLEJOHN: Thank you.

THE WITNESS: Thank you, Mr. Chairman. The quotation is, quote, "Boyer said Olson's studies at the 11 sites showed that low volume discharges, that is, discharges less than 5 Bpd, into production in ancillary pits can cause contamination of groundwater that is greater than 10 feet deep."

Quote, "Small discharges in the vulnerable area appear to pose significant risks of contamination and are a serious problem," close quotes. He said, quote, "About one-half of the pits cause contamination, and several monitoring wells have floating product," close quote.

He said the problem was not limited to produced water pits, but extended to dehy pits and tank drain pits. Based on the information presented, Marty Buys said that OCD, quote, "has demonstrated that vulnerable area is vulnerable and more vulnerable than previously thought," close quote, end of the citation.

MR. STOVALL: Mr. Chairman, I might

point out something here, perhaps to help Mr. Roberts, is that this isn't actually a statement attributed through Mr. Boyer to Mr. Olson, but in terms of the actual content, of course, Mr. Olson has presented the study and is available for cross-examination. And it's really his work that's being quoted.

CHAIRMAN LeMAY: Thank you. But I think my comment still stands, that we can weigh the information in light of a lot of factors.

Let's continue. Thank you.

THE WITNESS: Thank you, sir. You will, the Commission would note that in each of these sets of minutes, the participants of the meetings were listed. And many of the individuals who attended these meetings in 1986 and 1987 are some of the same individuals representing some of the same firms that are represented in this proceeding today.

Now, I submit that oil and gas operators in the San Juan Basin have had ample time and ample warning to prepare for the day in which discharges of produced water to unlined pits are finally and justifiably prohibited.

Unlike the case, the record in Case

8224 in 1985, the record in this proceeding is clear and unmistakable. Discharges of oil field waste to unlined pits cause contamination of soils and groundwater.

The Division's proposed vulnerable area order is not just a timely response to a demonstrated need to protect freshwater supplies, public health, and the environment; it's long overdue regulation.

Let me add just a couple of other points. To emphasize the importance of protecting water supplies of a natural concentration of less than 10,000 milligrams per liter, there have been statements made to the effect that there is less importance attached to protecting private water supplies or private water wells, springs, windmills that have fewer people using them than, say, a municipal public water supply well would receive.

As the owner and user of a private water well, I object to the characterization that those should somehow receive less protection or less timely protection. The water in private water wells is still protectable if it is less than 10,000 milligrams per liter. And that's the

additional point that I would like to make. And that concludes my direct testimony.

Q. (BY MR. MEIKLEJOHN) Thank you, Mr. Shuey. Did you prepare SRIC Exhibits 1 through 10 and the list of proposed amendments to the OCD's proposed order?

A. Yes, I did.

Q. Are those accurate?

A. Yes, they are.

MR. MEIKLEJOHN: I move the admission of Exhibits 1 through 10, and I request that the list of proposed amendments be numbered 14, since we already have three exhibits numbered 11, 12, and 13.

CHAIRMAN LeMAY: Fine. Without objection, Exhibits 1 through, what now will be 14, will be admitted into the record.

MR. STOVALL: Excuse me, Mr. Chairman.

CHAIRMAN LeMAY: Yes.

MR. STOVALL: First, on the admission, it's through 10 and 14 at this point, I believe.

CHAIRMAN LeMAY: I'm sorry.

MR. STOVALL: 11, 12, and 13 have not. And I'd like to make one thing clear. I think the Commission understands this, and I'm sure the

attorneys do, but I want it in the record, that the Commission has a bound copy which includes essentially the fully-written notes from Mr. Shuey.

For the purpose of the record, unless anybody feels differently, I would move that these written notes not be considered an official part of the record. And should this transcript in the future be used for an appeal of any Commission order or any other purpose, that in fact that record, Mr. Shuey's testimony be what appears in the transcript, not what appears in the notes, and only the actual exhibits from this bound packet be considered part of the official record.

MR. MEIKLEJOHN: That's fine.

CHAIRMAN LeMAY: I think that's acceptable since there is no possibility to cross-examine or there is no testimony here given on the notes. They're just part of our document, like a statement would be without being part of the record.

MR. ROBERTS: Mr. Chairman, I renew my objection to Exhibits 9 and 10.

CHAIRMAN LeMAY: Fine. So noted. I'll

note the objection to those.

MR. MEIKLEJOHN: We have no further testimony to present from Mr. Shuey. He will be glad to answer questions from the Commission.

CHAIRMAN LeMAY: The Exhibits 1 through 10 plus 14 will be admitted into the record with the noted commentary and objections by counsel.

And thank you, Mr. Meiklejohn. We'll start with Commissioner Bailey.

EXAMINATION

BY COMMISSIONER BAILEY:

Q. You mentioned that 70 percent of the pit sites which had shallow groundwater were contaminated by virtually any amount of produced water to unlined pits. The question, of course, arises how shallow is shallow?

A. Commissioner Bailey, referring to SRIC Exhibit, or Exhibit SRIC 2, the table, the depth to groundwater column shows in fact the depths to groundwater, each of the sites, and there are two sites for which the available data did not say what the depths were. And so the depths shown in the table range from as little as a fraction of an inch to as many as 36 feet.

Q. I would like to look at this Exhibit

No. 2 more closely. The sites, are they all located within the existing vulnerable area, or are some of these within what would be the expanded vulnerable area?

A. Commissioner Bailey, that's a good question. I did not have an opportunity to consult the master copy of the vulnerable area maps, and I am uncertain as to whether site No. 22, called the Dogie Canyon Compressor station, is in the existing or expanded vulnerable area. It is in an area with shallow groundwater. And if that is not part of the expanded vulnerable area, would be covered by all of the category, the phase 3 category.

I believe that all the rest of them are within the existing vulnerable area.

Q. To your knowledge, are all of these disposal operations still going on, or have some of these been shut down because of R-7940?

A. I would have to spend some time looking at the list. There are several that have been shut down. I can't remember exactly how many. I would have to go through all the files to figure that out. Certainly the Lee Acres Landfill, site No. 11, is shut down, and there's no bulk load

going on there.

The pits at the North Hogback site were closed, I believe. I believe that the Thomas 1 site there is no longer a use of pits, and I believe that the tanks have even been replaced. That's all I can say for sure at this point.

Q. I'm looking at the BTEX contamination, which is established by the WQCC regs?

A. Uh-huh.

Q. And then I'm looking at your column of groundwater contamination, which you said was based either on WQCC, which we just eliminated because that would show up in the BTEX contamination column, or contaminants greater than background or not a natural constituent of the back groundwater.

Under WQCC regs is it permissible now, is it legal now for contaminants to come to the levels as set out in the WQCC regs? In other words, can contamination come up to those standards as set in WQCC regs and still be perfectly legal?

A. I believe you're correct, up to the standard.

Q. Okay. Was the sole contamination field

tested or was that lab tested, to call it yes, or unknown, or no?

A. From my recollection, without again going through the documentation for every site, the vast majority are laboratory analyses.

Q. Of the soils?

A. Pardon me?

Q. Of the soils? I'm looking at the soil contamination column.

A. Oh, of the soils. No.

Q. Okay.

A. I had stated in testimony that I made an assumption that if there was documented groundwater contamination, then there was soil contamination. Now, at six of the sites, and I listed them in the document that you have, there was actual either analytical reports of the soil concentrations or observations by individuals from either the operators, the companies, or the state or myself as to physical appearances of the soils.

Q. I have a note here: Is there any correlation to the Tds analysis of the produced water or the discharges to the ancillary pits in regard to these specific wells? You've only

looked at the BTEX but not any of the Tds contamination?

A. Commissioner Bailey, you'll note that I stated that under the groundwater contamination column, there are 17 of 22 sites that had contamination. Under the BTEX contamination column, there are 15 of 22. That means that there were 2 sites that had contamination other than BTEX.

One site had chromium contamination, and another site had Tds and chlorides that were greater than an up-gradient monitoring well. And I think that was one of Mr. Olson's sites, but again without going back through and looking at specifics, I couldn't tell you off the top of my head which one.

Q. You've worked closely with the OCD, and you've made these recommendations of one-year, one-and-a-half years, and two years, and then you've also recommended that they have approval of the past pit closures that have been done since the last order.

Would you feel like that all could be accomplished within a reasonable amount of time?

A. Well, I think it could be. I am fully

cognizant of the staffing difficulties that the Division has, as all state agencies have. I don't perceive that the retroactive approval of the closure data would be -- would involve a significant review time by the Division staff.

The intent of that requirement or that proposed requirement is to furnish information to the Division such that if there is a problem, it will stand out. Right now the Division has no basis for knowing if there are problems at those sites that have been closed.

And I suspect that the Division staff, being experts at prioritizing their work in the face of limited resources and limited time, would devise a system whereby their retroactive approvals would be fairly simple. So yes, I think that it could be done.

COMMISSIONER BAILEY: Those are all the questions I have.

THE WITNESS: Thank you.

CHAIRMAN LeMAY: Thank you, Commissioner Bailey.

Commissioner Weiss?

COMMISSIONER WEISS: Yes.

EXAMINATION

BY COMMISSIONER WEISS:

Q. This is a nice compilation of what's happened. Were the current rules and regulations a reason for what happened?

A. The existing Order R-7940 was the reason that at least 562 sites have some sort of liners or the pits were taken out of service and tanks were installed or gathering lines installed and, you know, for off-site disposal. So yes, the existing order has helped them protect the environment.

Q. And then on the cost data, I can't find it in here, but I remember you talking about it. On the tanks versus what we heard earlier, that seems quite a discrepancy. I wonder if that could have been because this only included, your information, only included the hardware, do you think, or that was -- that's a variance?

A. Commissioner Weiss, there's a couple of reasons, one of which is that the example that I chose, and again, it was not to establish that all tanks are only going to cost $1200, because they don't. And that was six years ago when Meridian made its estimate based on actual costs, I believe.

I just provided it as an example, at least at that point in time, of what the costs were and how those costs compare with the costs of cleaning up a polluted site. And from what we have heard today from Mr. Van De Graaff and others about the costs associated with purchasing tanks, the $3500 to the $5,000, and then removing for off-site disposal soils at a closed pit site, those numbers still are low compared with responding to a pollution problem.

But yes, I have -- I was not intending to suggest that tanks are only $1200 these days.

Q. And then one final question. You do have something to do with the finances of your company. If additional research was required, could you share in the expenses of this?

A. No, sir.

COMMISSIONER WEISS: Thank you. That's all the questions I have.

EXAMINATION

BY CHAIRMAN LeMAY:

Q. Mr. Shuey, on your Exhibit No. 2, Commissioner Bailey asked the question I wanted to regarding the location. The answer you gave, these are all in the vulnerable area except for

the Dogie Canyon Compressor station, you think?

A. Again, without looking at the maps, I can't really tell.

Q. It would help to know the location.

A. If it would help, I would be happy to submit to the Commission and the other parties a list of whether they're in or out. It would take me a couple weeks to do that because I'd have to get back up here and --

Q. That's fine. I mean, we'll look at that with that in mind, that you think it is but you can't --

MR. STOVALL: Mr. Chairman, the Division can assist with that and get that information.

CHAIRMAN LeMAY: I think it can. I thought maybe Mr. Shuey had a map or something that spotted these things so that we could see.

Q. The other thing, the Lee Acre stands out. In order to weigh this exhibit, we're talking not necessarily about contamination only from discharges to unlined pits in the oil patch, are we?

If you have contaminants at Lee Acres, I think that that landfill has been shown to

contain quite a bit of dumping that wasn't really related to -- I mean, some of it was the refinery definitely and a whole bunch of other stuff?

A. Well, Commissioner LeMay, as you may remember, part of the fluids that were bulk loaded into the unlined pits at the Lee Acres Landfill were produced water from off-site leases.

I included it because it is an unlined pit. It is within -- at the limit of what was the existing vulnerable area in an alluvial river valley setting. And so it is a site that meets all of the criteria that is in effect for or would be in effect for the implementation of this order.

Q. I guess my question was, I would agree that the inclusion of that was to show the highly permeable nature of the alluvium as compared to the possibility of contaminants being discharged and therefore contaminating groundwater solely from discharge from producing wells because, as I understand that contaminating plume, it's a contamination of quite a few things?

A. I believe you're correct. I didn't list it to suggest that produced water pits

receive septic tank effluents or other weird things that have been found in the Lee Acres Landfill case. I make the assumption that that's a true statement.

Q. Thank you. Your recommendations to the Commission concerning the time schedules are based on the fact that you and others at Southwest Research just feel enough is enough as far as time goes, or were there any cost considerations as to the acquisition of equipment and so forth, and therefore, the economy is taken into consideration?

A. Well, Commissioner LeMay, I consider economies in my daily life, and I suspect that I'm not -- let's put it this way. I'm not oblivious to the economics of the oil industry. I remember back in 1985 supporting what then was about an eighteen-month phase-in period on the grounds that the operators were saying it's going to take some time to gear up.

And it just seems to me that six years later, with the handwriting on the wall as early as 86, 87, that there has been plenty of time to already gear up. And I think that there's evidence, and plenty of evidence, that many

companies are already geared up and are gearing up.

There are companies that are essentially complying with what the, if the Commission adopts the proposed vulnerable area order as drafted by the OCD, there's companies already complying with the requirements of that prospective order.

I believe that if a long phase-in period is allowed, that there will be requests for extensions of time and we still may be talking about this five to seven years down the road, and that's too late.

Q. But your reason for saying too late is a personal conviction involved in the time frame?

A. Yeah, personal conviction based on what I've observed and what I think is reasonable.

COMMISSIONER LeMAY: Thank you. I have no further questions.

MR. MEIKLEJOHN: I have nothing further.

CHAIRMAN LeMAY: Nothing further today. Tomorrow we'll resume at -- we did it before 6:00, how about that. You were quicker than you said you would be.

MR. STOVALL: Mr. Chairman, I'd like to ask after we adjourn this hearing that the attorneys get together for a moment.

CHAIRMAN LeMAY: Let's do that destruction tomorrow. Meanwhile for those of you that stayed around, thanks, and we'll see you again tomorrow at 8:00, if you're at all interested. We'll wrap this thing up tomorrow.

[And the proceedings were adjourned at the approximate hour of 5:57 p.m.]

CERTIFICATE OF REPORTER

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

I, Debbie Vestal, Certified Shorthand Reporter and Notary Public, HEREBY CERTIFY that the foregoing transcript of proceedings before the Oil Conservation Commission was reported by me; that I caused my notes to be transcribed under my personal supervision; 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 April 23, 1992.

Debbie Vestal

DEBBIE VESTAL, RPR
NEW MEXICO CSR NO. 3

NEW MEXICO OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

CASE NO. 10436

VOLUME III

The Application by the Oil Conservation Division for the Expansion of the San Juan Basin "Vulnerable Area" which was Established by OCC Order R-7940 in 1985; San Juan, Animas and La Plata Rivers in San Juan, Rio Arriba, McKinley and Sandoval Counties, New Mexico.

BEFORE:

COMMISSION CHAIRMAN WILLIAM LEMAY

COMMISSIONER JAMI BAILEY

COMMISSIONER BILL WEISS

STAFF SPECIALIST FLORENE DAVIDSON

Morgan Hall

State Land Office Building

April 10, 1992

9:00 a.m.

ORIGINAL

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CHAIRMAN LEMAY: Please come in and take your seats and we'll continue the hearing.

For those of you who might have wandered in by mistake, this is the Oil Conservation Commission. My name is Bill LeMay. On my right is Commissioner Jami Bailey, representing the Commissioner of Public Lands, and to my left is Commissioner Bill Weiss.

We're hearing the continuation of Case No. 10436 on direct testimony. The plan is to hear the direct testimony today, and I understand we only have one witness left on that, adjourn, and then conduct all cross-examination at the next Commission hearing date, which is May--I don't have my calendar, I think it's the 21st--May 21st.

We're doing that so we can get all the cross-examination together. I think it's fair that, at least with our discussions yesterday with the lawyers, that everyone needs to have kind of the same situation. If we started cross-examination, we would not be able to finish it up today, and that would leave kind of a continuation where we would have a month in between that phase, and it wouldn't be fair to

those that gave their cross early.

So we'll have that as the first case on May 21st, and we'll continue onto the 22nd, if necessary, but the assumption is that we could probably get all the cross-examination and redirect in one day, but if necessary we are going to keep going on that one until we finish it up.

So with that, where we left off is with Mr. Meiklejohn. You may continue with your witnesses.

MR. MEIKLEJOHN: Thank you, Mr. Chairman. Our next witness is Mike Wallace.

MICHAEL G. WALLACE

Having been first duly sworn upon his oath, was examined and testified as follows:

EXAMINATION

BY MR. MEIKLEJOHN:

Q. Would you state your full name and your business address for the record, please.

A. My name is Michael G. Wallace. I work for Re/Spec, Incorporated in Albuquerque, New Mexico. That's R-E/S-P-E-C. The office is located at 4775 Indian School Road, N.E., in Albuquerque, Suite 300.

Q. What do you do at Re/Spec, Mr. Wallace?
A. I'm the senior hydrogeologist.
Q. How long have you been working there?
A. Two years.
Q. Would you please give us a brief outline of your educational background?
A. Yes. I have a Bachelor of Science in plant and soil science from Southern Illinois University in Carbondale, Illinois. I have a Master's degree in hydrology from the University of Arizona in Tucson. Do you want to know the coursework or--
Q. Have you taken particular courses, either in obtaining those degrees or in the course of your work in hydrogeology, contaminant transport and groundwater modeling?
A. Yes, I have.
Q. Would you tell us what those were, please?
A. I don't remember every course in detail, but my focus was in groundwater hydrology at the University. I took several graduate-level courses in groundwater modeling, groundwater hydraulics, statistical methods and field methods, covered the other courses that are

required, to give a broad, overall education in groundwater hydrology. It was an emphasis on quantitative methods.

Q. How long have you been working at Re/Spec?

A. Two years.

Q. Could you tell us, please, what you do there?

A. I do a number of things. I do groundwater modeling to a large extent. I do field investigation programs for landfills. I've worked on water resource issues. Basically, a continuation of the work I've done for four years before that at International Technology Corporation, where I worked on a large number of superfund sites, RCRA sites, deep well injection, hazardous waste sites, and numerical model development and other water resource groundwater contamination studies.

Q. Who have your clients been in your work at Re/Spec?

A. At Re/Spec I've done some work for the Army Corps of Engineers, Holloman Air Force Base, the Department of Energy, the Governments of Sweden, Finland. That's all I can think of at

the moment.

Q. Have you ever testified or done work for a nonprofit organization before?

A. No, I haven't.

Q. Have you been involved in cleanups of contaminated groundwater?

A. Yes, I have, on several occasions. One of my main jobs, when I was at I.T. Corporation, particularly, was designing remedial systems to clean up contaminated aquifers. And I worked on approximately seven of those. Most of those were driven by the commonly known Superfund Act.

Several of them were aquifers in which the aquifer was contaminated by petroleum hydrocarbons, in many cases large, nonaqueous phase liquids that floated on the surface over vast aerial regions.

I've done field investigations at such sites. I've also conducted modeling studies to help design means to clean up the contamination on occasions.

Q. Have you taken any courses and done any work involving statistical analysis?

A. Yes, I have.

Q. What have those been?

A. I've taken at least three graduate-level courses that involve statistical analysis. One was a graduate-level course in engineering statistics, one was in statistical hydrology, and one was in groundwater resource management, which covered, quite extensively, many statistical techniques.

In addition, many other courses covered statistics, and it's very ubiquitous in the kind of work I do.

Q. Did you do some modeling work that was the basis for the no-migration petition on the Waste Isolation Pilot Plant in Southeastern New Mexico?

A. Yes, I did. I performed a modeling study that helped the DOE win the no-migration petition, or the first five-year grant of that. It was a groundwater modeling study of waste transport from the WIPP site.

I've also helped numerous other industrial clients win exemptions or petitions for their waste management operations, including three hazardous waste deep well injection clients in Texas, and the Department of Energy at a hazardous waste landfill at the Nevada test site.

Q. Mr. Wallace, this has been marked as Exhibit SRIC-13. Is that your resume?

A. Yes.

Q. Is that a current and accurate copy of the resume?

A. Yes, it is.

MR. MEIKLEJOHN: I would move the admission of the resume. I believe that it's in the--

CHAIRMAN LEMAY: To just interrupt you briefly, I don't think you qualified Mr. Shuey yesterday or Mr. Wallace today, but--

MR. MEIKLEJOHN: If I'm allowed to do that, I would ask that.

CHAIRMAN LEMAY: Well, retroactively I think Mr. Shuey would be qualified as an expert yesterday, at your request now.

MR. MEIKLEJOHN: Thank you. First I would move admission of SRIC-13. That's Mr. Wallace's resume.

CHAIRMAN LEMAY: Fine.

MR. MEIKLEJOHN: And we would request that the Commission recognize Mr. Wallace as an expert in the field of hydrogeology, contaminant transport, groundwater modeling and statistical

analysis.

CHAIRMAN LEMAY: He is so qualified, and Exhibit 13 will be admitted into the record without objection.

MR. MEIKLEJOHN: Thank you.

Q. (BY MR. MEIKLEJOHN) Mr. Wallace, have you reviewed the documents that are the basis for this proceeding, specifically Order R-7940, the study prepared by Mr. Olson, the Division's Proposed Order and filings by the Division and other parties in this matter?

A. Yes, I have.

Q. Did you undertake some work in connection with this proceeding at our request?

A. Yes.

Q. What did we ask you to do?

A. You asked me to determine whether or not small-quantity discharges into unlined pits could lead to groundwater contamination.

Q. What did you do in order to answer that question?

A. I conducted two groundwater flow and contaminant transport modeling studies.

Q. And are those studies the subject of Exhibit SRIC-11, that I just handed you?

A. Yes.

Q. Could you tell us, please, in more detail, what those studies involve and how you conducted them, and explain to the Commission what is set out in SRIC-11?

A. Yes. There are a number of different physical processes and conditions that can influence whether or not discharges, small-quantity discharges into unlined pits, can contaminate groundwater. There are a number of issues revolving around that basic problem.

I wanted to look at, first, the transport of discharged water and contaminants from a pit through the unsaturated zone to the water table. That was the subject of my first study.

My second study looked at the transport of the contaminants through the saturated zone, or through an aquifer, to a point a thousand feet away. That was the basic broad outline of the two studies.

I wanted to try to be as realistic, yet conservative as I possibly could, given the resources that I had available and the time constraints that I was under, so I elected to use

groundwater flow and contaminant transport modeling to conduct these studies.

Through doing so, I was able to take account of a number of factors that have been brought up in hearings previously, such as natural remediation measures, natural attenuation factors, biodegradation, dispersion, retardation. I was able to take into account these factors in doing these analyses.

Q. As a preliminary matter, on Exhibit SRIC-11, are there several mistakes at the bottom of, I believe it's the first page of that exhibit?

A. Yes, there are.

Q. Could you tell the Commission, please, what those are?

A. Okay, and I'll get into this more later, of course, but some of the parameters that affect the transport of the contaminants are listed in this table.

I used values from literature and from testimony at previous hearings, at the hearings in the mid-80s that were held on this issue. So these ranges, I used ranges--in fact, some of these values I've listed here are not incorrect

values, but they are not the values I actually used in the model.

For example, the parameter of saturated hydraulic conductivity, the values that I've determined from the literature range from--actually from 2.5 to 2,500 feet per day. In my modeling studies, for the unsaturated modeling study, I used a value of 2.5 feet per day, and in the saturated modeling study I used a value of 250 feet per day.

In the case of pit water loading, I initially wrote down 5 barrels per day, but in my modeling study for the unsaturated zone, I actually used a rate of 2-and-a-half barrels a day.

At the bottom of that page I have a term I call biodegradation decay rate of 0.095 percent per day. I actually used a value of .95 percent per day. And I'll explain what that value means later on in my testimony.

Q. Did you first develop a conceptual model of--

A. Yes, I did.

Q. And how did you go about doing that?

A. I had to take into account all the

information that I could obtain concerning the processes that govern the flow through the soil and through groundwater of these contaminants. Then I had to take into account the limitation of the tools I had to work with to evaluate this.

I can see that basically as water is discharged into a pit, an unlined pit, it generally moves vertically downward until it reaches the water table. It also attenuates horizontally as it moves downward. It is retarded.

By that I mean that the contaminant plume moves at a slower rate than the groundwater does, and that's because of a number of factors. One of them is that individual molecules of the contaminant are absorbed onto electrically charged surfaces of the soil particles.

I also had to take into account that it disperses, through mechanical mixing and rounding motion and other factors. Like an ink dot in a lake, it diffuses outward, so some of the contaminant won't reach the water table due to that.

I assume there are microorganisms in the soil that are actually consuming the

contaminant, and I had to account for that in the model, which I did. I had to assume that an unsaturated zone exists, and that groundwater moves through that according to the physics, as we understand them today, regarding unsaturated flow, which is distinctively different than saturated flow.

I had to assume that water enters the system that I'm looking at and water leaves the system, through various means. The system, as I defined it, I will show later in a diagram about the model.

This model that I selected has been around since 1984. It's called SUTRA. It stands for Saturated Unsaturated Transport, and it was developed by Clifford Voss of the U.S. Geological Survey. It was available back at the time of the hearings in the middle 80s, and I'm using the version that was available back then. It has been used all over the world. It's one of the most commonly used groundwater flow models in the world, to the best of my understanding.

SUTRA can simulate all of those processes that I mentioned. One thing that SUTRA cannot simulate is three-dimensional flow. I do

recognize that the movement of discharged water into an unlined pit is a three-dimensional flow problem, and I would like to show that slide now, please.

I'm going to go into the design of the model for the unsaturated flow system. These are some sketches I made. This bottom sketch shows a conceptual model of an unlined pit. The small square in the middle I've assumed is 12 feet by 12 feet, so it's 144 square feet.

MR. STOVALL: Mr. Chairman, I think I'll jump in early to preserve the record, can we go ahead and mark this, so when you look at the record you'll know what it is and his testimony will make some sense?

MR. MEIKLEJOHN: I was going to suggest that. That's fine. Unfortunately this is not something that is in the pamphlet that we provided to the Commission. We did not have it when we provided that to the Commission.

CHAIRMAN LEMAY: As each one of these are put on the screen and displayed, at that time give it an exhibit number, put that in the record, and then we'll have a reference between what's in the record and what you're showing on

the screen.

MR. MEIKLEJOHN: May we go off the record for just a second?

A. These figures are just to clarify my modeling design and they do lead to figure 11.1 in the exhibit.

CHAIRMAN LEMAY: I don't want to interrupt you again, but we're back on the record, now, and this is Exhibit No. what?

MR. MEIKLEJOHN: This is the document to which Mr. Wallace is referring, which is Exhibit SRIC-15.

A. So that bottom figure is a pit design. There are plants on the surface, and then I've shown a cross-section cutting through the soil as it projects downward.

That cross-section is a two-dimensional, vertical cross-section. The arc, right here, is important, and I'll talk about that later. It represents part of the contaminant moving down through the soil. Just part of it.

If I were to take a cross-section, cutting directly through the pit continuing this cut, going all the way to this point and then

down, and then I looked at a hypothetical contaminant plume, it would look like the second figure up here. I hope that's easy to understand.

These two segments here represent a 12-foot length of pit, and the contaminant is moved down below the pit and it's formed a semi-circle of contamination.

Now, one assumption, modeling unsaturated flow is very time-consuming and requires very powerful computers to do it effectively. Fortunately, at my office I have a computer called a spark station that's roughly a hundred times faster than a typical PC-486 type of machine. It's very fast.

Nonetheless, the computations required were so lengthy that I still had to try to keep the problem to as small, as simple of a scale as I possibly could. I took advantage of the fact that through symmetry--I am going to stand over here and show you, through symmetry, flow on this half of this dotted line is identical to flow on that half.

Q. Would you please indicate specifically which figure in the diagram you're referring to?

A. I'm referring to the middle figure. I'll rephrase that. Flow on the right half of that figure is identical to flow on the left half of that figure. Therefore, I was able to simulate only one-half of the figure, which is the top drawing there.

Q. And is the top drawing identical to figure 11-1 in Exhibit SRIC-11?

A. Yes, generally. It's not exactly identical, but--

Q. All right. Mr. Wallace, was it your professional opinion that the SUTRA model was the best model for this particular job?

A. Yes, undoubtedly so.

Q. Would you tell us where you obtained the values for the parameters that you used, please?

A. Yes. Going back to that table on the first page of the exhibit, I'll just work down the line. Saturated hydraulic conductivity--would it be helpful if I explained some of these parameters?

Q. Certainly.

A. That's probably a term familiar to all of you, but just for the record, a common analogy

to what saturated hydraulic conductivity is, would be the resistance of a wire to electrical current. The greater the resistance, the more difficult it is to pass electricity through a current of wire. The lower the hydraulic conductivity of a porous medium, the more difficult it is for water to move through.

I selected values from the literature and from previous testimony at the previous hearings. For my saturated model, which I haven't discussed yet, I used the value of hydraulic conductivity of 250 feet per day. For my unsaturated model, which I've just been talking about, I used a value of 2.5 feet per day, and that is for saturated hydraulic conductivity. I'll work down later. For porosity--oh, okay.

The parameters, the references I got that from, include the study by GCL back in the mid-80s, "Field Investigations, Vulnerable Area," work done by Dave Boyer and Doug Earp at the previous hearings, and a study by the U.S. Geological Survey focused on the Lee Acres area.

For the value of porosity, 0.35. Porosity is the measure of the relative amount of

voids in a soil. That value doesn't change much, and the outcome of modeling simulations are not very sensitive to porosity, and there is not an extensive amount of data on porosity of soils in the San Juan area. However, the value of .35 is roughly equivalent to values used by Earp and Boyer, and it also fits in parameters I obtained from a textbook called "Groundwater," by Freeze and Cherry, on page 37.

For the pit water loading, I think it's common knowledge that 2.5 barrels per day is something that's within the range of discharges into unlined pits.

The pit area, I think that's also common knowledge, that 144 square feet is an average size for a pit receiving those types of discharges.

The average annual precipitation of eight inches per year I obtained from Boyer, from previous testimony, and I think that that's also substantiated by the report by Stone, by the New Mexico Bureau of Mines, and the other Bureau of Mines Report on the Aztec quadrangle.

The next two parameters are a little bit more complex--the next three. The regional

average hydraulic gradiant, that is a measure of one of the forces that drive groundwater flow, and regional gradiants are a common term in groundwater modeling studies or groundwater studies. I used the value of 0.003.

COMMISSIONER WEISS: "3" what?

THE WITNESS: It's a dimensionless number. Usually it's called feet per feet. In essence, it's a measure of the drop in the water table in feet over a linear distance in feet. That previous study by GCL done in the mid-80s, that I previously referenced, used that value or had a value close to that, and work by Boyer also used that value. That's for the saturated model.

For the unsaturated model, it's not such a simple thing to assign, but the gradiant was quite variable. I'll get into that when I talk about the next two parameters, which is the soil moisture versus hydraulic conductivity relationship, and pressure versus hydraulic conductivity relationship.

As I mentioned earlier, the flow of water through the unsaturated zone is substantially different than through the

saturated zone. That's why there aren't that many models that simulated in the first place. It's more complicated.

As the water content in the soil decreases, then the space for water to move through also decreases, in such a way that the hydraulic conductivity is profoundly affected by that. The hydraulic conductivity is no longer a constant. It can vary over eight to nine orders of magnitude.

So, depending on the moisture content, the hydraulic conductivity can be, for example, 10,000 times less than it is in a saturated case. And the lower the hydraulic conductivity, the more difficult it is for water to move through the soil, the more slowly it moves through the soil.

The pressure relationship is another factor. As the water content in the soil decreases, there is a force called capillary suction that drives the flow of water through the soil. Capillary suction and gravity are the two main forces that drive water flow through the unsaturated zone.

The drier the soil is, generally, the

more potential there is for water to be driven through the system, because there's like a dryness factor, and, just like a wicking factor, water will move into drier areas. As those areas get moist and become saturated, then the only impetus for water to move is gravity, at that point.

The study of these phenomena is covered in vast quantities of literature. And, as a rule, you would like to have site-specific data to try to determine precisely what is going on at a specific site. The process is very nonlinear, too, and difficult to simulate properly.

We have no site-specific data on these parameters for the San Juan Basin anywhere, to the best of my knowledge. However, I've done a large number of modeling studies of this type in the past, in alluvial sediment similar to this. And, taking into account my experience modeling these types of processes, and utilizing what the SUTRA model had as a default parameter assignment here, I designed a system that simulated those processes through the soil that I felt were meaningful.

What I used was their default model

called the Van Genuchten model. That is a type of equation that is embedded into the SUTRA code that simulates these relationships of hydraulic conductivity and capillary suction through the moisture content.

The depth to groundwater parameter, I think that's also common knowledge. Actually, it probably ranges from 10 to 40 feet or more in the alluvial areas of the San Juan Basin. Nonetheless, I could cite the study by Olson, the work by Brown and Stone on the Aztec quadrangle.

I would also point out that in that work by Brown and Stone for the New Mexico Bureau of Mines, they relate that there is considerable fluctuations in the average depth to groundwater, and that it can vary by up to 20 feet. It's been observed to vary in a single well by up to 20 feet. They have measured areas where the depth to groundwater was only five feet, and other areas where the depth to groundwater was 32 feet. That's all I'll say about that.

The depth to groundwater, by the way, has no relevance to my saturated modeling study.

The aquifer thickness parameter of 10 to 40 feet, I also obtained from reviewing the

literature. In studies in the previous hearings, Boyer used a value of approximately 15 feet. Brown and Stone, in the Aztec quadrangle paper, related that the aquifer thickness varied from 40 to 100 feet.

Specifically, I used a value of 30 feet in my saturated modeling study, and that parameter was not relevant to my unsaturated modeling study.

The concentrations of BTEX-like solute in pit water, from looking at the literature I had available, I came up with a range of 1 to 30 parts per million. In the modeling study that I performed, I used a value of 30 parts per million at a source for both studies, for the saturated zone study and for the unsaturated zone study. And 30 parts per million is roughly equivalent to a number of pits and groundwater contamination concentrations that were investigated by Olson.

The next two parameters are related to these natural remediation processes that were brought up by Mr. Hicks yesterday, the linear adsorption coefficient and the biodegradation decay rate, and the following parameters on the next page as well.

Linear adsorption coefficient is a term commonly used by people, chemical engineers and groundwater hydrologists that look at contaminant transport through groundwater. It's related to this factor I called earlier known as retardation, and it's based on observations that contaminant plumes do not move at the same speed as groundwater does.

This has been broken up into a number of different factors used by scientists to try to explain this phenomenon. Adsorption has been widely cited as the main cause of retardation.

There are different models of adsorption, different ways to simulate it. SUTRA has three different methods to simulate adsorption. I selected their linear adsorption option and came up with a value of 1.35 times 10 to the minus fourth, which is roughly 1/10,000th, I believe, cubic meter per kilogram.

That doesn't have a physical analogy that's very easy to describe; however, it is based on my studies of the literature, including Freeze and Cherry, page 404, where they define the linear adsorption coefficient. It's called (KD), and it's related to the retardation

factor.

And then another reference, which I will need to add later as an exhibit, by a researcher named El Kadi, where he provides a retardation coefficient for Benzene of 1.4.

Using that retardation coefficient for Benzene of 1.4, I back-calculated this number, this linear adsorption coefficient.

The biodegradation decay rate, I think I ought to reiterate what that means. It's actually a process by which contaminant is removed from the system permanently. It is meant to simulate some process by which that happens.

There are many ways in which contaminant can be removed from a system. If this was a radioactive contaminant, then it would be through the process of radioactive decay. This isn't a radioactive contaminant, it's an organic contaminant, and it's been widely acknowledged that microbial organisms consume BTEX-like contaminants.

This was a difficult parameter for me to find because it is a widely varying parameter, and it's very specific to a number of conditions. I wanted to find a reference in the

literature that dealt with microbial consumption of BTEX in a similar type of environment to the San Juan area, and I found a reference in the literature that did that.

This reference was by a gentleman called Chiang, and a number of other researchers. They studied a plume of BTEX contaminants moving through an alluvial aquifer, and they specifically focused on the microbial degradation of that contaminant plume.

Not only was the aquifer also an alluvial aquifer, and not only was the contaminant also a BTEX contaminant, but the relative concentrations of BTEX were very similar to the concentrations that I modeled, that I simulated, and that's very important. As the concentrations of BTEX go up, the amount of dissolved oxygen goes down and the population of microbes also goes down. So the consumption rate of the BTEX, therefore, goes down as well.

So it's important to find a study that looks at the right concentrations of BTEX as well. If I was looking at the degradation rate for free-phase hydrocarbons, which is a pure petroleum hydrocarbon product, this value

probably wouldn't have been the best value to select.

But that's the value I used, and that value, I should restate, is .95 percent per day. .95 percent per day is basically one percent per day. That means basically that throughout the system that I modeled, one percent of it was being destroyed or eliminated every day of the simulation, which is a fairly high quantity.

Q. Mr. Wallace, would you explain, then, how you used those parameters and what the results were, specifically referring to figure 11-1 in Exhibit 11?

A. I would like to add the other dispersion coefficients on the next page.

Q. I'm sorry. Go ahead.

A. Dispersion is another attenuation factor that was cited in previous studies by GCL in the previous hearings as one means by which contaminants never get to high enough concentrations to threaten public health and the environment.

Dispersion is a process by which contaminants spread throughout a system. As they

spread, they also get diluted. As a result, it's quite a trick to find out whether, through the spreading process, they get diluted to such a point where they're no longer a threat to the human health or the environment.

It's a very difficult number to estimate. It has a scale dependence associated with it. Dispersion can be measured in the laboratory in the soil column. When it is, the number is relatively low, consistently. It can also be measured in a field test, such as a tracer test, where a tracer, such as a die or a salt is injected into the groundwater and then measured somewhere else.

When you measure dispersion in that kind of situation, the value goes up by orders of magnitude over a soil column study. If you perform a large regional groundwater modeling analysis covering hundreds of square miles, the dispersion coefficient goes up yet again several orders of magnitude.

So, depending on the size of the system you're evaluating, you will be looking at different types of dispersion coefficients. There are reasons for that, but it's not a fully

understood process.

But, given what I did, I did two modeling studies, as I said before. One, the unsaturated modeling study, only looked at a 20 foot by 20 foot cross-section directly under a pit, and I used lower dispersion coefficients for that modeling study than I did for the larger saturated modeling study.

The saturated modeling study was over a thousand feet long and approximately 500 feet wide, and so I used larger values.

I should also say that the values of dispersion that you use affect the conversions of your model, and your numerical model, SUTRA, has to converge to a correct solution. The way you implement that is very dependent on the dispersivities that you assign.

For the unsaturated zone model, the components of dispersion are dispersivity and molecular diffusion. And, for the unsaturated zone model, referring to that previous paper on biodegradation by Chiang, he selected values of .08 for longitudinal dispersivity, and .03 for transverse dispersivity.

For my model, I selected--and Freeze

and Cherry, the textbook on "Groundwater," has shown ranges ranging from .08 meters to over a hundred meters.

So, given that range of values for the unsaturated zone model, I used a value of .15 meters for longitudinal dispersivity; I used a value of .05 meters for transverse dispersivity, and I used a value of 1 times 10 to the minus 9 meters squared per second for molecular diffusion.

For the saturated zone model, I used 60 meters as a longitudinal dispersivity value, 30 meters for transverse dispersivity value, and one times 10 to the minus 9 meters squared per second for molecular diffusion.

Q. Would you explain, please, what you did with the model, and explain to the Commission how that is indicated in figure 11.1?

A. Okay. This model is the cross-section I mentioned earlier. It is 20-feet wide by 20-feet high. As I showed earlier, the pit is represented by a line segment of six feet, in the upper left-hand corner.

The vertical boundaries of the model, well, all the boundaries, had to be assigned

boundary conditions to run the analysis. What I'm simulating is the flow of water contaminant down from that pit towards the water table.

In order to do that I had to set up the model with these parameter values I just discussed, as well as other parameters. I had to assign initial conditions and boundary conditions, as well as other material properties.

The assignment of boundary and initial conditions have an important effect on the model, and I think it's important that I just discuss them here because they can influence the outcome.

The lower boundary of that model, which is six meters in length or 20 feet, I assigned a pressure along that boundary that is equivalent to a water table condition, so I assumed that the water table is 20 feet below the surface.

However, I'm aware of the fact that in some cases the water table is only 10 feet below the surface or less, and that's why I have a dotted line going across the middle part of the model that shows the approximate water table level.

My intent by showing that was, as I simulate the movement of a contaminant down through the soil zone, when it hits various levels where the water table might be, that can be noted, and meaningful conclusions can be drawn from that.

At the upper boundary, I simulated a constant flux boundary condition. At the location of the pit, I have a constant flux of discharged waters entering the soil at a rate that is equivalent, if you redimensionalize it, to 2.5 barrels per day spread out over 144 square feet. That translates into a specific rate of water. And I assign a constant concentration of contaminants to that water of 30 parts per million.

Basically, what this model is really simulating is two-and-a-half barrels a day of discharged water that's contaminated with 30 parts per million of BTEX.

The rest of the top boundary of the model I assign a constant flux boundary condition equivalent to eight inches of rainfull per year moving through the soil, so those were the boundary conditions.

The initial conditions that I assigned concerned the ambient moisture content of the soil. As I mentioned earlier, that affects the whole flow process. I assigned a condition equivalent that 70 percent of the pore space was saturated with water; the other 30 percent was unsaturated, or dry.

When I do that, that lowers the hydraulic conductivity from 2.5 feet per day down to .00175 feet per day. Basically, the hydraulic conductivity drops over a thousand percent. And, as I said, this is a very conservative analysis because it definitely slows down the process of water moving through the soil. To the best of my knowledge, this type of a study has not been done relevant to this issue in the past, regarding these hearings.

What I come up with when I ran this model, I started from a time (T = 0), and then I ran it for 60 days. To simulate the process of unsaturated flow for 60 days took the computer that I used over four hours. And if I would have run more analyses--in fact, I easily could have had I had more time or run this analysis for a longer period of time, I would have had more data

to present today.

But I just ran this analysis for 60 days, which is a month-and-a-half, and I looked at the output from the model, I looked at what the model showed, and I diagramed part of what the model showed on this figure.

Q. Pardon me, Mr. Wallace, did you run the model for 60 days or for 44 days?

A. I'm sorry, I ran it for 44 days, which is six weeks. I'm getting my sixes and fours mixed up. I ran it for six weeks. And what this arc on the figure shows is the area where the contaminant has reached a concentration of five parts per million after six weeks.

Between that arc and the pit, all the soil there is contaminated with a concentration of BTEX greater than five parts per million and, in fact, the concentration progressively increases to a maximum of almost 30 parts per million just below the pit. 30 parts per million is the source concentration.

If I saw any concentrations higher than 30 parts per million in this area, I would be very concerned that the model was not giving me valid output and that I would have done something

wrong, but I did not detect any irregularities in the concentration throughout the model.

Outside of that five parts per million contour is where the soil and the groundwater is contaminated with less than five parts per million; and, in fact, the concentration progressively decreases with distance from the source. You can see where that arc intersects the approximate water table level.

This demonstrates that after only six weeks, discharges of 2.5 barrels per day into an unlined pit has led to concentrations of BTEX at a level where groundwater can be found, greater than New Mexico Water Quality Control Commission standards.

For example, if this were Benzene, or any of those BTEX components, five parts per million, I think it exceeds all of those standards.

Now, I would like to show the other slide, because I did not only look at the model-produced values at other points in time.

MR. MEIKLEJOHN: For the record, we have marked this as SRIC-16.

Q. Go ahead, Mr. Wallace.

A. Okay. I prepared a simple graph, and I am going to modify it right before your eyes. I had three data points to prepare this graph. This graph shows the concentration of BTEX at a point 10-and-a-half feet directly underneath the pit, in my model, with time. At that point, this axis represents concentration in parts per million.

Q. Could you explain, please, for the record, is that the vertical axis or the horizontal axis?

A. The vertical axis represents concentration, and the horizontal axis represents time. I selected three points from my model output. At the beginning time, where the concentration at 10 feet below the pit was zero parts per million and, at approximately three-and-a-half weeks where the concentration was nearly two parts per million, and at a little over six weeks when the concentration was--I'm sorry, was nearly .2 parts per million at three weeks, and then at six weeks, where the concentration was over three parts per million, or nearly three parts per million. I've put a line or a curve to these points.

Okay. Three parts per million is about 3,000 parts per billion, and the source concentration is 30 parts per million, 30,000 parts per billion. What I'm showing here is that--or what this figure indicates, is that I cut off my analysis a little early, and the concentration at 10 feet below the pit is continuing to rise at a very extreme rate.

I feel, based on my experience doing large numbers of simulations like this, that the concentration at 10 feet would continue to rise until it approached 30 parts per million, and also the concentration at 20 feet below would continue to rise as well. So, had I had the luxury of running my analysis longer, I would have been able to give a more comprehensive idea of the contaminant movement.

Nonetheless, I think this is compelling evidence that shows that I've already documented that contaminants exceed the standards at 10 feet after only six weeks, and I just wanted to indicate that the problem could be much more severe than that.

I would like to restate that this simulation is taking explicit account of those

natural attenuation factors brought up on several occasions by industry as remedial influences, including a decay rate of one percent per day.

Q. Mr. Wallace, would you explain to the Commission, somewhat more briefly, what you did with the saturated flow model and how that's indicated at figure 11-2?

A. Yes. This is a bird's-eye view of a system. The bull's-eye down in the central southern part of this figure represents a source of contaminant. I'm not injecting contaminant into this aquifer, it's just a small region where the groundwater is contaminated with BTEX at 30 parts per million.

That is based on--largely based on Olson's work, where he looked at areas and found groundwater contaminated with 30 parts per million or more of BTEX contaminants.

Once again, this is the same SUTRA model that I used before. It's 1,500-feet long and 900-feet wide. I've applied those parameters I discussed earlier, a gradiant of .003. Given that and the hydraulic conductivity value of 250 feet per day, I came up with an average groundwater velocity of two feet per day.

And two feet per day moving through the groundwater is consistent with other published work and reported work on groundwater flow in alluvial systems in the area. The Lee Acres study by the U.S.G.S., table 4, page 33, cites the range of values encompassing that figure. The work done by Doug Earp at the previous hearings supports that number. I believe that many people, including GCL, have looked at velocities higher than that. So, once again, that's a conservative scenario.

So, basically, I also incorporate those dispersivity and diffusion values I talked about earlier. And given all that, I ran this simulation for five years. Because it's a saturated physical problem, it didn't take nearly as long to run on a computer; a few minutes, I believe, to run.

The arcs that are shown, the closed arcs, represent different concentrations of BTEX within the groundwater, after five years of a source residing in the saturated zone. As you can see in the area immediately around the source, the concentration is very high. It rapidly drops off, such that approximately 500

feet from the source, to the north, the concentration has dropped from 30 parts per million down to 1.5 parts per million.

The dotted line going across the figure represents an area that is 1,000 feet--or that line, at its closest point, is 1,000 feet from the contaminant source. 1,000 feet is an important issue I have learned regarding wellhead protection factors.

I show that the contaminant has exceeded .15 parts per million at that distance. .15 parts per million, if this were Benzene, that would exceed the New Mexico Water Quality Control Commission standards for Benzene in groundwater.

I've used the dispersivities and the retardation coefficients and the degradation rates that have been cited by industry in the past, as a remedial natural attenuation features. Nonetheless, the model still indicates contamination at that point.

I've also purposely avoided putting in a well at that point. Had I put in a well, either domestic, municipal or public, pumping groundwater from that point, I have no doubt that

the concentrations would be exceeded at that point because the gradiants would be greater and the well would create a cone of depression drawing even more contaminants towards that point. I regard this as a conservative analysis. It also demonstrates contamination.

Q. So, what is your professional conclusion on the basis of the modeling that you've done?

A. Regarding?

Q. Regarding the disposal of small quantities of wastewater into unlined pits?

A. I've concluded that such practices can lead to contamination of groundwater in soil in excess of levels that are protective of the public and the environment.

Q. Is it your professional opinion that the models that you ran and the results that you obtained are accurate?

A. Yes.

Q. What is your opinion about what the impact on the results would be if, for example, the loading rate was reduced?

A. Well, I would have to conduct another analysis, you know, to look at the specific

loading rate in question. However, the soil and the groundwater, depending on loading rate, can still get contaminated. Of course, if the loading rate is reduced to zero, then you're not going to have contamination. As you raise the loading rate, the amount of contamination and the distribution of contamination will increase.

Q. Is the same true of fluctuations in the concentration of contaminants in the fluids being loaded into the pit?

A. Yes.

Q. Mr. Wallace, you have said that you have reviewed Mr. Olson's study, is that right?

A. Yes.

Q. Were you here yesterday when there was some testimony by Mr. Hicks about whether that study was representative of the pits in the San Juan Basin?

A. Can you repeat that, please?

Q. That's impossible. I'll try to rephrase it.

A. I reviewed the study. I think it's representative of--to the best of my knowledge, his study was representative.

Q. Have you conducted a statistical

analysis of the likelihood that Mr. Olson hit upon the only 14 pits that have caused groundwater contamination?

A. Yes, I have.

Q. This has been marked as Exhibit SRIC-12. Does that set forth that analysis?

A. Yes, it does.

Q. Would you explain to the Commission, please, what that analysis involves and what your conclusions are from that analysis?

A. Yes. The data has shown that approximately 70 percent of the sites where investigations have taken place, where groundwater has actually been sampled, 70 percent of the sites that have been investigated have shown contamination.

I've also learned that there are probably 6,800 or more production sites at issue here. Only 21 or so sites have been sampled out of 6,800, so it has been brought up in the past that not enough sites have been sampled; that just because 14 or 15 out of 21 have been found to be contaminated, one can draw no conclusions that 70 percent of all the 6,800 sites are contaminated.

Although I've never seen any probability calculations or statistical methods applied up to this point, I decided to conduct a probability analysis. I made an assumption. I went backwards, basically. I assumed--I took the example, what if only 14 sites out of 6,800 were contaminated and that these investigations just happened to find the only 14 sites that were contaminated.

I used a standard probability equation that's used widely in engineering and the science literature called the hypergeometric probability distribution. It's an equation that makes one implicit assumption, that your samples are random. And I'll get into that later, about the randomness of Mr. Olson's study, the random sampling aspect of that.

But I would like to give a real-world analogy to this kind of problem. It might be cards, drawing cards out of a deck. An analogy would be, if one were to draw 10 cards from the deck, what would be the likelihood that seven of them were spades.

In such an example, you would divide the population of cards into two sets. One is

the cards that are not spades, and one is the cards that are spades. There are 13 spades in a deck of 52 cards, and there are 39 non-spades.

If you draw 10 cards out and you get seven spades, the probability of that can be calculated exactly, assuming the cards aren't marked, et cetera, and that type of thing.

There is a direct analogy to this issue and that is, there are two populations here. There are pits that do not have contaminated groundwater and there are pits that have contaminated groundwater. That's how I divided it up.

Assuming, then, the samples were random, and 21 samples were looked at, and given the fact of these two populations, my first case I looked at was the population of noncontaminated pits is something like 6,800, or 6,789, and the population of contaminated pits is 14.

Then, given that, the probability that someone looked at 21 random sites and found all 14, the probability is 2.27 times 10 to the minus 38. I think you would have more probability of winning every lottery in the world than coming up with such a number.

So, I think it's safe to say there are more than 14 pits that have contaminated groundwater in the area.

Now, I would ask the next question. What is the likelihood that there is only 100? and I think 100 might be an important number because 100 is something to be very concerned about, versus 14, in my opinion.

Once again, just changing that one factor that there are 100 contaminated sites and that there are 6,800 sites that are not contaminated, once again, what is the probability that you would find 14 contaminated sites out of 21 sampled? That drops down to 9.18 times 10 to the minus 22nd, which, once again, I think you would still have a chance of winning every lottery in the world.

Finally, I looked at the possibility that there were 1,000 total sites that have contaminated groundwater. Once again, you find 14 sites that are contaminated out of 21 sampled. The probability drops down quite a bit but it's still 7.9 times 10 to the minus 8. That is really equivalent to one-millionth of one percent of a probability.

That means that--well, basically, what it comes down to, in my opinion, it's extremely likely that at least hundreds of pits are contaminated or have contaminated groundwater, at least hundreds, and it's probably very likely that it's thousands of pits, based on this sampling that has been done.

And I would like to add, new testimony has been brought up yesterday regarding, and I know we're going to get into that, but the study that was done by H^{+}GCL never looked at groundwater contamination. None of their boreholes, to the best of my recollection, went down to the groundwater level and looked at contamination of groundwater.

Even if I had, today, if I could redo the analysis, I would not include those studies because I'm not looking at soil contamination in this, I'm looking at groundwater contamination.

Q. Mr. Wallace, have you been involved in any efforts to clean up contaminated groundwater?

A. Yes. Many efforts.

Q. Can you give us some idea of the range of costs that have been involved in those efforts?

A. There are seldom less than millions of dollars involved. Wells are very expensive, modeling design, logistics, soil removal, regulatory interface. I could go on and on. But the price is usually astronomical.

Q. Have you reviewed the changes to the proposed order that have been brought up here by the Southwest Research and Information Center?

A. Yes, I have.

Q. Do you support those changes?

A. Yes, I do.

Q. I don't believe you were present when Mr. Shuey testified yesterday, but he indicated, and he's indicated in one of his documents, where there was groundwater contamination, he assumed there was soil contamination. In your professional opinion, is that a valid assumption?

A. Yes.

Q. Now, you were here yesterday when Mr. Hicks testified, were you not?

A. Yes, I was.

Q. Do you regard his study as comparable to Mr. Olson's study?

A. I would suppose in scope, or in level of effort, yes, roughly comparable.

Q. Did they look at the same thing?

A. No, they didn't. Mr. Olson did not explicitly look at soil contamination and Mr. Hicks did not explicitly look at groundwater contamination. Therefore, they're apples and oranges.

As a matter of fact, there are other aspects of that that I can bring up. One of the purposes of Mr. Olson's study was to determine if, in fact, groundwater is getting contaminated from discharges into unlined pits, and he demonstrated that. He looked at groundwater and he found, yes, groundwater is getting contaminated.

Mr. Hicks, on the other hand, failed to rule out the possibility that groundwater is getting contaminated from unlined pits. He did not drill down to groundwater and show that groundwater was not contaminated. He just showed various levels of contaminants in soils and he did not show where that contamination ended.

Earlier in his testimony he mentioned that it is not uncommon to find higher levels of contaminant in the groundwater than you find in the soil. That is because in the soil, such

processes as volatilization, had a stronger effect, that once contaminant reaches the groundwater it is not subject to that type of influence as strongly.

But basically, to answer your question, they are not the same thing.

Q. Do you recall the deepest samples that Mr. Hicks said he took? Do you recall the depth?

A. I don't recall the exact depth of the samples he took. I do recall that he referred to some studies by industry that were and are unavailable to me at this point, that refer to free-phase hydrocarbons in water tables at various depths, and that he mentioned that it seemed that 35 feet was a magic number of sorts, and it was a deep enough depth to allow these natural remediation factors to eliminate sufficient quantities of contaminant so that the human health, the public and the environment are not impacted. I do recall that.

Q. Do you agree with that assertion?

A. No, I don't.

Q. Why not?

A. Well, for one thing, my modeling study showed that the remediation measures seemed

fairly nominal, that degradation and dispersion and other factors play a role and seem to be a minor role. Although I would have to do more studies to look at 35 feet of depth, I believe that 30 feet is probably not sufficient in many cases.

Also, and probably more important, is the fact that water tables fluctuate so highly in that area and I don't know when those depths were measured at the sites he referred to. However, the study he performed was done in March and early April, and that happens to be the time of year when water tables are at their lowest level, as cited by the New Mexico Bureau of Mines' studies on the Aztec quadrangle, for example. The highest level of water is in August, historically, when irrigation returns are high and rainfall is high, and other processes.

So, even if contamination is not found in the groundwater at 35 feet depth at one point in time, that water table could rise up to 20 feet in another point in time and redissolve contaminants from the soil and then bring them back down into the aquifer, actually creating a fairly horrendous problem, when it comes to

remediating such types of sites.

MR. MEIKLEJOHN: I don't have any further questions. We would move the admission of Exhibits SRIC-11, 12, 15 and 16.

CHAIRMAN LEMAY: Without objection, those exhibits will be admitted into the record.

[A recess was taken.]

CHAIRMAN LEMAY: Okay, we're back on the record.

MR. MEIKLEJOHN: Mr. Chairman, I have just a couple of follow-up questions.

CHAIRMAN LEMAY: That's fine. Sure.

EXAMINATION RESUMED

BY MR. MEIKLEJOHN:

Q. Mr. Wallace, there were two exhibits that dealt with the contaminant transport at certain time periods. Figure 11.1 and then Exhibit SRIC-16, one of which showed five parts per million at three meters, and one of which showed three-plus parts per million at something around 10 feet.

Those appear to be inconsistent. Is there a reason for that?

A. They're not inconsistent. I was looking at two different points in the model. In

Figure 11.1, I looked at a point below the pit along that five-part-per-million contour that was less than 10 feet below the pit. And as I mentioned earlier, the concentration increases the closer you go to the pit, and five parts per million is greater than 3.6 parts per million.

The other figure that I developed, I just wanted to go a little deeper because I realized in this figure I was a little under 10 feet, and I wanted to look a little deeper than 10 feet, so I looked at 10.5 feet, and the concentration dropped slightly, down to 3.6 parts per million. So there's no inconsistency. It probably would have been more helpful if I would have looked at a point similar to this point on the line.

Q. Is the data that you got at 10-and-a-half feet, was that data generated by your computer in the computer run of your modeling?

A. Yes. The data was taken from the same model as the data shown in 11.1.

Q. You listed, I believe, three different probabilities in your Exhibit SRIC-12. Could you tell us, please, on a scale of zero to 100, what

probability each of those represents?

A. Yes. They all represent zero.

Q. Thank you. You also indicated--you referred to two studies, a study made by Mr. Olson and a study made by Mr. Hicks. You said that one of them was representative, and it wasn't clear to me which one of those two you were referring to. Which were you referring to? Which is representative?

A. I'll have to rephrase that. It depends on the purpose of the study. I believe that Mr. Olson's study was representative of conditions that would be commonly encountered in the area that he looked at, for the purposes of which he conducted his study.

Q. And what was that purpose, as you understand it?

A. As I understand it, his purpose was to determine the likelihood of groundwater contamination from discharges into unlined pits. I believe that he's documented that appropriately, and I believe that his study was conducted appropriately.

I believe that although it's impossible for anyone to conduct a random-sample study

anywhere, I don't think the factors that were pointed out by Mr. Hicks yesterday were very strong indications that Mr. Olson's study wasn't random.

He cited the inability to drill down beyond a certain level and hit groundwater. The fact is that he was able to drill down fairly deep. In fact, at least as deep as the study that H^+GCL did, where they didn't hit groundwater. He was able to reach groundwater within the average depth that groundwater is found.

So the fact that he couldn't drill down more than 20 feet with a hand auger is irrelevant, because in many cases when he drilled down with an auger he found water. I think I've already shown that he looked at enough sites to demonstrate that that's likely. Maybe they'll find a way to argue with that, but I don't think that you can argue the fact that enough sites were sampled.

On the other hand, the H^+GCL study, I'm not certain of the point of that. I don't think that had the same purpose. It wasn't to document that pits don't contaminate groundwater, although

maybe it might have appeared that way. No groundwater was encountered. In fact, it did document that soil is contaminated by pits. He's only helped to document that soil gets contaminated by pits.

The burden of proof is quite a bit different, in my opinion, regarding these studies. There is an old phrase that's probably overdone, but absence of evidence is not evidence of absence. And I feel that Mr. Olson has found evidence of contamination. Mr. Hicks has not found evidence of high contamination, but just because he hasn't, doesn't mean it doesn't exist.

The reason I say that is, he's only looked at selected intervals within boreholes where he looked at the contamination. He didn't look at a continuous sample. As he has already shown, through his slides, there were levels where contamination was very, very high. It was black. And then there were areas where there was none. He did not sample continuously throughout every hole, and he didn't go down to the groundwater, even though the groundwater must have been only a few feet below, generally, in

most of those cases, I assume.

Therefore, I think that Olson's study was conducted effectively, and I concur with his conclusions. I don't concur with the conclusions that the study conducted by H^+GCL demonstrates in any way, that soil is not contaminated by discharges into unlined pits.

Q. Does that study, in your opinion, demonstrate that groundwater is not contaminated?

A. The study by H^+GCL?

Q. Yes.

A. No, it does not.

Q. Is it important, in your opinion, to include in such a study a characterization of the waste that is being discharged into the pit?

A. I'm sorry, can you repeat that?

Q. Is it important to look at the composition of the waste that is being discharged into the pit in the study like the studies conducted by Mr. Olson and Mr. Hicks?

A. I think it's very useful. It really depends on the purpose.

In the study by Mr. Olson, I think the most important thing was to look at the contaminant in the groundwater. By looking at

the contamination in the pit, you can make a reasonable assumption, initially, that it had to come from the pit generally. I've also done modeling to support that. It's helpful to know the contaminant discharge.

But what that tells you is--well, it's important, yes. I'll just say it is important. Because if you look at the contaminant in the soil underneath an unlined pit, it is dependent upon the concentration of the contaminant in the pit and the history of the loading rates. The pit may only be a week old.

If you look at the soil underneath a pit that's only a week old, it's not likely you're going to find contamination. If the pit is 20 years old, but it only discharged for a year 20 years ago, that's also important to know. It's very important, now that I think about it.

Q. Do you recall any indication by Mr. Hicks about whether he looked at the waste that was being disposed of in the pit?

A. All I was able to determine was that certain pits had discharges that were measured in barrels, and certain pits may or may not have had

discharges where he used the term "too small to measure." Whenever a pit had a discharge that was too small to measure, that meant that it was a discharge less than a barrel per day. A barrel today--I don't know the exact term in the oil industry, but I think it's something like 42 gallons.

I don't see how someone can fail to measure 42 gallons a day coming out of a discharge line. It couldn't be measured in fractions of a barrel. People all over the world measure all kinds of discharges much less than 42 gallons a day. So, we have no way of knowing whether or not any liquid was discharged into that pit or some quantity close to a barrel a day.

MR. MEIKLEJOHN: I have no further questions.

CHAIRMAN LEMAY: Thank you. Commissioner Bailey?

EXAMINATION

BY COMMISSIONER BAILEY:

Q. Just a couple of points of clarification. The opening paragraph of Exhibit 11 says that you assumed hydrogeologic parameters

characteristic of the vulnerable area. Is that the vulnerable area as presently defined, or does that also include the proposed additions to the vulnerable area?

A. To the best of my knowledge, it covers both areas. Both areas, to the best of my knowledge, are alluvial sediments that line drainage ways. I don't know--I don't have detailed information on the extended vulnerable area. I don't know how far the water table is in some of these dry washes, for example, but the general factors are the same: The discharge rates are probably representative, the mechanisms of attenuation, the hydraulic conductivities of the soil, the capillary pressures, and the other factors are probably representative.

And that's because the extended vulnerable area is a natural extension of the vulnerable area. All the sediments that have reached the vulnerable area, as a rule, came from farther upstream, which is where the extended vulnerable area generally is. So the conditions are, to the best of my knowledge, are very similar.

Q. Another point of clarification. The

value that you used for the saturated hydraulic conductivity, you gave reference to where it has been used before. Are these values typical of what type of material? Are they homogenous sands, or are they clay sands, or--

A. Well alluvial material, in general, they're typical of. I suppose it varies widely through alluvial material. To the best of my knowledge--well, the study that GCL did in the mid-80s, and the exhibit they provided at those hearings, they broke it up into, I believe, three categories.

They went up to 2,500 feet per day as a high range. That range would be typical of like a gravel aquifer, well-sorted gravel, where permeabilities are very high, or hydraulic conductivities; grading down to predominantly sands and some silts and some gravels, then the conductivity is dropped to around 25 to 250 feet per day. The greater the concentration of silts and clays, the lower the general hydraulic conductivity becomes.

COMMISSIONER BAILEY: Thank you. That's all I have.

CHAIRMAN LEMAY: Commissioner Weiss?

EXAMINATION

BY COMMISSIONER WEISS:

Q. We are faced with looking at output from computer models frequently here at this Commission--I don't know if you're aware of that--oil field reservoir simulation.

In those studies, they generally measure something, and the parameters are much fewer than 16. There are tremendous problems with nonuniqueness in that field. I should think they would be worse in your field, frankly.

A. They can be, if you don't pose the problem appropriately and if you don't have a good handle on the sensitivity of your model to the different parameters.

In lieu of the fact that I didn't have an extended period of time, I've been able to exploit the fact that in previous modeling studies I've had months and years to conduct sensitivity analysis and modeling simulations, many of which I've simulated just as many processes as I've done for this study. And I've been able to get a fairly good handle on how sensitive the model is.

Sensitivity analysis is what's

conducted when you, in many cases-- When you do a model and you want to find out how sensitive the model is to this factor, that factor, and this factor, you plug in various ranges of that factor and then you see what the model output gives. Then you plug in various ranges of the next factor and the next factor and the next factor.

I don't have that luxury today but, generally speaking, I could say that the model is very sensitive to your value of hydraulic conductivity. It's fairly sensitive to your value of dispersion. It's somewhat sensitive to porosity. It's sensitive to your hydraulic gradiant, to a moderate level.

I wasn't trying to conduct an all-encompassing study that showed every possible outcome of every different pit loading and soil type and biodegradation condition. I was simply looking at reasonable values for those parameters and trying to determine whether, given reasonable values, is it reasonable that groundwater can get contaminated.

And, when I selected those values, I did not know what the outcome of the model would

be. And the values that I selected were the values that you see. I did not have a preconceived strategy to definitely demonstrate, once and for all, that contaminants contaminate groundwater.

This is the first time I've ever worked for an environmental group. Most of my studies have been done on behalf of industry. So, I had to pose a question and answer it using reasonable numbers, and conduct an analysis that stood up. That's all I had the time or the resources to do.

Q. Do you think that this particular model could have matched the testimony we saw from Mr. Kilmer yesterday?

A. I wasn't present at--Mr. Kilmer?

Q. He found no organics 800 feet from the pits, after 30 years.

A. In the saturated zone?

Q. Yes.

A. I wasn't present at that testimony yesterday, so I would like to look at it. If he can justify his inputs to the model as much as I've justified mine--

Q. Well, he didn't use a model. Those were physical measurements.

A. Physical measurements. That's fine. I wasn't aware of those measurements. On the other hand, my model took into account the measurements I was aware of at the time, which include 30 parts per million of BTEX in groundwater below pits, as demonstrated by Mr. Olson.

My point was only, in that case, was to look at, "Can groundwater be contaminated from a pit?" And there is evidence of that, as well as modeling studies.

In my experience modeling aerial flow of contaminant transport through saturated zones, I would say that, yes, there must be several--there must be cases where, after 30 years, you won't find it a thousand feet away. But it depends on a number of factors: Are there confining layers? which way is the direction of the gradiant?

COMMISSIONER WEISS: Precisely. That's precisely the point. Thank you.

THE WITNESS: You're welcome.

EXAMINATION

BY CHAIRMAN LEMAY:

Q. I have just a couple of questions, Mr. Wallace. Your saturated hydraulic conductivity,

I guess we would call permeability? It's an interchangeably term, is it?

A. Not exactly, but it's sort of complicated; they're roughly the same.

Q. I'm a geologist, so that means I don't have the rigorous training in reservoir engineering.

A. Well, saturated hydraulic conductivity incorporates the permeability term. The permeability term is solely a function of the rock or the soil. The conductivity term takes into account fluid density, fluid viscosity and basically those factors. So, therefore, generally speaking, they're roughly the same.

If you're looking at the conductivity of oil or Benzene, it would be different than water. In any event, they're roughly the same.

Q. To try and get a feel for the measurement of this, you call it feet per day. Is that transferable to darcies in any way? Like 250 feet per day, would that be 90 darcies?

A. I could convert it. I can't convert it in front of you, but feet per day is not to be confused with, like, velocity, which also has the same units, of feet per day.

Q. We're not saying a contaminant would move at 250 feet per day through this computer model?

A. No. Absolutely not.

Q. That gets it to groundwater pretty quick?

A. Yeah. No, we're not saying that at all. In fact, we're saying, the way you determine velocities, conventionally--well, my model actually outputs velocities, and velocities fluctuate, depending on where you are in the model. But the average velocity for the saturated model was two feet per day, even through the hydraulic conductivity was 250 feet per day, and that's mainly because the gradiant--in Darcy's Law, it's the hydraulic conductivity times the gradiant, divided by porosity gives you velocity, and the gradiant is only 0.003 feet per day.

You multiply 250 by .003 and then divide by .35, then you get two feet per day, roughly.

Q. One other--

A. Oh, I'm sorry, I would like to clarify. I did a calculation. I looked at the

average velocity of groundwater flow through the unsaturated zone, representative outputs from the model, and I found that the average--well, the velocity near the pit was about three-tenths of a foot per day, and the velocity away from the pit was less, less than that--of groundwater, not of the plume.

Q. Some indication of how much less?

A. Down to an order or two of magnitude less. It was a transient model and the velocities change with time. I would say that if I had run the simulation long enough, then a steady state velocity of around three-tenths of a foot per day would have been reached, from the area from the pit down to the water table. And I think that's consistent with work done by Doug Earp in the last hearings.

Q. Just one other clarification on the model. As I understood your response to both Commissioner Bailey's and Commissioner Weiss' questions, that your model pertains to alluvium, per se, and not necessarily classified as vulnerable area/not vulnerable area? You're relating to this to, I guess, the reservoir qualities inherent in alluvium?

A. That's correct.

Q. So if we had bedrock or maybe compacted alluvium upstream, or some modification of what the vulnerable area alluvium has been--

A. Like shales?

Q. --the sensitivity model would show that would have a lot different characteristics, or not?

A. Yeah, it would. I would probably have to change a number of the parameters, such as the hydraulic conductivities and--

Q. Porosities?

A. Yes. However, I haven't looked at the bedrock characteristics where they're exposed. I don't know details. Speaking generally, the closer you get to the surface, the more weathered bedrock becomes, and the more--the greater the porosity.

As a result, many people frequently look at bedrock conditions in a similar manner that they look at alluvial conditions. But I can't say until I see some data.

Q. Okay. There were some questions yesterday that you weren't present for, but that particular reservoir, where the water was

contained, would be the Nacimiento formation, which--

A. Oh, the Lybrook study?

Q. Yes.

A. I did review that exhibit.

Q. Okay. You weren't here, but all that pertained to looking at basically the characteristics inherent in the Nacimiento formation, not alluvials.

A. I don't recall--I don't have it in front of me--I don't recall seeing any information on hydraulic conductivities of the bedrock. That would be very important to know.

I noticed some other things, like they showed extreme differences in water table measurements or depth to water over certain distance, but they didn't give the actual water table elevation, they just said the depth to water. I couldn't be sure whether or not they were measuring from the side of a hill and then they walked 70 feet down a hill. I don't know. I guess that came up, too.

I do think that it's very difficult to make a blanket assessment of the hydrogeology of an area, a blanket assessment, you know, without

doing some studies. I suppose I would like to see a demonstration on an individual basis, you know, if they were seeking a variance, and not a blanket-wide type of thing.

CHAIRMAN LEMAY: Thank you very much. That's all I have.

MR. MEIKLEJOHN: Thank you, Mr. Commissioners, Chairman. We don't have any further questions, but I would like to point out there were references that Mr. Wallace referred to that we have not provided; and there were also, I believe, some parameters, references for parameters that he mentioned. It seems to me it might be helpful for the record for us to provide those in an exhibit, and I would propose to do that when the hearing reconvenes.

CHAIRMAN LEMAY: That's fine. The record will remain open certainly until we get to the cross-examination stage. Please feel free to submit additional evidence to qualify at that time.

MR. MEIKLEJOHN: We have nothing further.

CHAIRMAN LEMAY: Before you all go, I would like to reemphasize that we will reconvene

at nine o'clock on the 21st, which is a Thursday, in May. If you need a transcript of either the complete hearing or a portion of the hearing, one witness's testimony, Carla, our court reporter, can provide that to you. See her after we dismiss today and she'll get you a copy of that.

MR. STOVALL: Mr. Chairman, I would point out that we announced at the last hearing that we would not make copies available through the Division of the transcript, that any copies will have to come through the reporter, because of the volume.

CHAIRMAN LEMAY: That's right. Is there anything else anybody has at this time? Any questions or statements? Any more direct testimony?

Then we are adjourned until the 21st.

(And the proceedings concluded at 11:10 a.m.)

CERTIFICATE OF REPORTER

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

I, Carla Diane Rodriguez, Certified Shorthand Reporter and Notary Public, HEREBY CERTIFY that the foregoing transcript of proceedings before the Oil Conservation Commission was reported by me; that I caused my notes to be transcribed under my personal supervision; 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 April 27, 1992.

Carla Diane Rodriguez

CARLA DIANE RODRIGUEZ, RPR
CSR No. 4

NEW MEXICO OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

CASE NO. 10436

IN THE MATTER OF:

The Application by the Oil Conservation Division for the expansion of the San Juan Basin "Vulnerable Area" which was established by OCC Order No. R-7940 in 1985.

BEFORE:

WILLIAM J. LeMAY, CHAIRMAN
WILLIAM WEISS, COMMISSIONER
JAMI BAILEY, COMMISSIONER

State Land Office Building
Morgan Hall
May 21, 1992

TRANSCRIPT OF PROCEEDINGS

VOLUME IV

REPORTED BY:

DEBBIE VESTAL
Certified Shorthand Reporter
for the State of New Mexico

ORIGINAL

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COMMISSION HEARING
SANTA FE, NEW MEXICO
MAY 21, 1992 -- 9:00 A.M.

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NEW MEXICO OIL CONSERVATION COMMISSION
COMMISSION HEARING
SANTA FE, NEW MEXICO
MAY 21, 1992 -- 9:00 A.M.

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CHAIRMAN LeMAY: We shall reconvene. This is the Oil Conservation Commission meeting. My name is Bill LeMay. With me I have Commissioners Jami Bailey, on my right, representing the Commissioner of Public Lands; on my left, Commissioner Bill Weiss.

We are here for the continuation of the hearing which is commonly referred to as the hearing on the vulnerable area, Case 10436, which is the application by the Oil Conservation Division for the expansion of the San Juan Basin vulnerable area which was established by OCC Order No. R-7940 in 1985.

Just for a brief review on that. We have had direct testimony by witnesses in this case. It was agreed by the Commission and counsel at the previous meeting that we would have all cross-examinations occur at one time. That's the reason why we're all here today, to conduct redirect and cross-examination.

There will be a time at the end, of course, for those of you who have not given testimony can read statements into the record. We'll leave the record open for a period of time for those of you that still want to submit

evidence in the case in the way of statements, letters, et cetera.

With that we shall continue. Mr. Stovall.

MR. STOVALL: Mr. Chairman, I don't know if there are other parties here who may wish to enter an appearance in addition to those who already have.

CHAIRMAN LeMAY: That's a good point. Also we need to swear in witnesses before you continue on that.

Are there any other appearances that will be made in this case today that have not already been on the record? Okay, that's fine.

For the purpose of swearing in, I guess, even though they were sworn in weeks ago, it would probably be better to swear them in again today. Those of you that were witnesses, please stand and raise your right hand.

[The witnesses were duly sworn.]

CHAIRMAN LeMAY: Mr. Stovall.

MR. STOVALL: Mr. Chairman, as you've explained, we've agreed that what we're going to do is present redirect testimony, which of course is limited to the scope of whatever was

originally presented by any of the parties, and then cross-examination.

I'd like to call Mr. Bill Olson for redirect examination. I would state that the record already reflects that Mr. Olson has been qualified and ask the Commission to again reconfirm his qualifications as a hydrogeologist.

CHAIRMAN LeMAY: He is so qualified.

WILLIAM OLSON

Having been duly sworn upon his oath, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. STOVALL:

Q. Mr. Olson, you've sat through the previous two days of testimony that we've heard in this case; is that correct?

A. Yes, it is.

Q. Going back now, we introduced sort of informally without you sponsoring Exhibit 14, which was the OCD, Division proposed rules for the expanded vulnerable area; is that correct?

A. Yes.

Q. And you have reviewed that, and that was in fact prepared by you, was it not?

A. Yes, it was prepared by me.

Q. Let's try to get the focus back on what we're trying to accomplish with this rule-making proceeding, what the Division's objective is and how it feels given the totality of what we've heard in the last couple of hearings.

Would you kind of explain what that rule really tries to accomplish and kind of focus on the real salient points that have been addressed by the parties?

A. Well, that was a draft order that was directed to us by the Commission to prepare. We prepared a first draft in the end of January, which we then used to hold meetings and discuss with various parties so that we could possibly try to work out any differences and come up with a reasonable approach for environmental protection in the basin.

We held some successive meetings after the first draft was put out under a memorandum by me. And then we issued a final draft order which we are proposing to present to the Commission, and that was OCD Exhibit 14.

Q. And is it correct to say that there has been industry and public input into that draft? It's not a consensus committee report, by any

means, but there has been input; is that not correct?

A. There's been input by various operators, we've had public meetings, and by the environmental groups.

Q. And it's addressed certain things that have been of concern to industry, variances -- the standard, to begin with, and then variances from the method of meeting the standard; is that correct?

A. Yes. The first draft essentially contained our recommendations as we presented them to the Commission at the January hearing. There were some modifications in the final draft which were a result of discussions at the meetings.

Q. Now, in making its recommendations to the Commission, and I would state that the Division may in fact make a revised submittal after the conclusions, contingent upon the Commission's approval and the other parties would have another opportunity.

But in making its recommendations at this point, has the Division looked at economic considerations and implementing these

regulations? Is that one of the factors that has been considered?

A. It has been considered in the time scheduling. We've allowed, based upon some of the concerns of industry over the time scheduling, we originally put in at the original hearing a recommendation for up to a one-year variance on the time scheduling.

On the subsequent final draft, we have modified that based on the concerns of BLM and some of the industry being able to carry it out in a timely matter that variances could be allowed for up to a two-year period on time scheduling.

Q. Now, one of the intents, as far as you're concerned, in implementing the variance would be that it would be an ongoing program of compliance, and not just coming up to the deadline and saying, "Woops, we didn't do it. Give us another couple of years"; is that correct?

A. That's correct.

Q. Mr. Van de Graaff testified and gave some economic figures as to the costs for compliance on a per-well basis. Did you have the

opportunity to review that?

A. Yes, I did.

Q. A lot of what he put in there had to do with the costs of reclaiming pits and back-filling or doing whatever to actually reclaim the pits once the tanks were put in; is that your recollection?

A. Yes.

Q. Do you think that's a valid consideration in this process? Is that something that is a significant economic burden imposed by this rule making?

A. It is. But there's also the economic impact upon the groundwater of any effect of contamination.

Q. I'll talk about that in a minute. But let me restate the question in a different way. The contention was that many wells will have to be abandoned because this cost will become significant and will make them uneconomical. What happens if those wells are abandoned?

A. If those wells are abandoned, they're going to have to go through the same closure procedures for those wells. I guess the economic consideration there is that the closure will have

to occur at the time of abandonment; whereas, under the proposed order, there is a scheduled phase-in for that.

And for closure of the pits, the companies are the ones that propose the schedule. There is no set schedule for closure of the pits.

Q. So, in other words, what we propose is a two-step thing: One is stop the discharges, future discharges; right?

A. That's correct.

Q. And then the second is a longer term phased-in thing of, okay, go back and do what is necessary in the individual pits?

A. That's correct.

Q. Now, you mentioned a minute ago the groundwater. You're saying there's an economic consideration of impact to groundwater; is that what you're saying?

A. Yes, there is. Groundwater is a resource of the state of New Mexico. And 90 percent of the residents in the state of New Mexico rely on groundwater for a drinking water source. So it's hard to put a price tag on the actual economic value of that groundwater if

someone is living in that area.

Q. An argument has been made and will be made that in a lot of these areas there's no beneficial use because there's nobody out there to use the groundwater. Is that an argument which you think would support exempting or not applying this rule to large, unpopulated areas of the San Juan Basin?

A. No, I do not. I think that all those waters that are under state statute are afforded protection. If someone seeks to move in there in the future and develop a well, whether for industrial or domestic purposes, they're allowed that right under state law.

Q. Touching on another economic consideration, I think we touched on it before, I just want to do it briefly again. Is this kind of an ounce of prevention is worth a pound of cure type of situation?

A. Yeah. The Division's whole idea is that we do know we have contamination of groundwater at similar types of sites in the river valleys and that we need to afford absolute protection in these areas unless it can be demonstrated that that protection is

unwarranted.

Q. What you're really saying is that we're affording absolute protection unless there's nothing to protect or nothing to protect from; is that correct?

A. That's correct.

Q. Now, would you agree that the data that the various parties have gathered is not comprehensive in terms of identifying the problem throughout the basin and throughout the areas?

A. I think some of the data presented has merit in terms of the variances. But I don't think it -- I think that the information is somewhat limited to provide blanket exemption.

Q. Even your own evidence, even your own testimony doesn't establish that there is groundwater to be protected throughout the entire basin and that putting produced fluids into pits necessarily contaminates that groundwater; is that correct?

A. That's correct.

Q. Throughout the basin?

A. Uh-huh.

Q. But is it fair to say that the approach that the Division is taking is let's create the

protection and then identify the areas that are not in need of this protection measure that is being required here?

A. That's correct. And that's similar to the approach that was taken in southeastern New Mexico under Order R-3221.

Q. Now, with respect to a lot of the testimony that was presented the last time, particularly by Four Corners Gas Producers and BCO, really was seeking an exemption for certain blanket types of, in one case, in the BCO case, an area; in the Four Corners Gas Producers' case, a type of well, a type of production, saying that this rule shouldn't apply to this area or this production.

I think you said just a moment ago that they have presented some valid evidence. Is it sufficient to grant an exemption on that broad a basis based on what they have presented here?

A. I think the information as presented is limited. There's a lot of information that could be provided also on discharge qualities in these areas, depth to groundwater, site specific type information.

Q. Site or area specific perhaps?

A. That's correct.

Q. Let's look just for the purpose of logic here, just to keep it on kind of a flow, let's take a look at the information presented by Four Corners Gas Producers, seeks to drill certain dry natural gas wells. And I'm not sure that I clearly understand the definition of how you would determine whether a particular well qualified. Do you understand that?

A. Not entirely. Part of the definition included that the well does not produce recoverable liquids at the well. That does not mean that it does not produce liquids, just that they are not produced in a quantity sufficient to warrant recovery.

Q. When you're talking about liquids, you're talking about hydrocarbon liquids that might have a market value but also contain contaminants; is that correct?

A. Water and/or hydrocarbons.

Q. So your concern then is that the definition is based upon the recovery and marketability rather than upon the impact, the potential groundwater impact; is that correct?

A. That's correct. I see some problems

with that definition as they proposed it.

Q. What about the specific evidence presented in support of their application, what are some of the limitations that you see with respect to that as a request for a blanket exemption?

A. I think there is some very valid information that's needed, such as discharge qualities. It's one of the most important things you want to look at in any type of discharge to the surface. And some of what we look at under discharge plan systems is quality of the waters that are being discharged.

There's other factors, such as depth to groundwater and other site specific or area specific information.

Q. Did their evidence show that in fact that there would be no contamination to groundwater within the proposed expanded vulnerable area?

A. No. They were concentrating on looking at soils related to these pits. And they did demonstrate they did have hydrocarbon contamination of soils at, I believe, nine out of ten sites that they looked at.

Q. And how many of those sites were actually within the proposed expanded vulnerable area?

A. Only two of the sites studied were in the proposed vulnerable area. And one of them did access groundwater at six feet. There was no record of any sampling of groundwater to see if there was any contamination of that groundwater from the disposal activities.

Q. So based upon the philosophy that you take a protective approach and then grant variances to protection where there's no demonstrated need for the measures to be taken, do you believe that you could make such a recommendation based upon what you've seen with respect to dry gas wells from the Four Corners Gas Producers' exhibit?

A. No. I don't think, based upon the information presented, we can allow such a blanket exemption. The blanket exemption we have under current R-7940 is one of the reasons we are here today, because the Division had to go out and perform a study to determine if these exemptions were posing a problem and they were.

And I think that kind of shows that the

blanket exemption approach really doesn't work quite well. We prefer to take it under a variance where we can consider a lot more factors.

Q. In other words, the information they presented is not invalid, but it could be better used in your opinion to apply for a variance and then study specifically where these wells are and what they contain and expand upon that; is that correct?

A. That's correct. The information they presented is what we looked for in any type of variance or considerations in looking at discharges for an area. It's valid information. I think we would want to look at a little bit more information to be able to form the basis of any variance, though.

Q. Would you anticipate that if any producer or group of producers were to come to the Division requesting a variance, similar to the exemption that the Four Corners Gas Producers is asking for, that the Division would work with the producer to define what information would be necessary to make such a variance approvable?

A. Yes. We've always worked with folks to

determine what information would be available, be required.

Q. And by doing so, then they would not be, hopefully, not taking a shot in the dark, but really would have some guidance from the Division to say this is what we need to see. And they could make their efforts productive and present you with some valid information; is that correct?

A. That's correct.

Q. Let's talk about -- BCO has taken a different approach with their request for an exemption. They've asked that, I think if the numbers are correct, something like a 324-square-mile area, nine townships, I believe, be exempted just based on the type of geologic conditions in the area?

A. That's correct.

Q. Again, do you have an opinion as to whether or not the evidence they've presented supports that type of exemption?

A. I don't believe the evidence they've presented supports that at all. We've been out looking at the area ourselves, and there's extensive alluvium throughout these valleys and extensive shallow groundwater within the systems

that they are proposing for a blanket exemption.

Q. Now, if I understand their proposal correctly, they're saying that really that this Lybrook area that they've defined and the township they've defined is a -- that there's no real alluvium; it's a badlands area; that there's -- the contaminants won't get to groundwater because there's no method for it to get there. Is that your understanding?

A. That was my understanding of their testimony.

Q. Now, you say you've actually gone out there subsequent to their presentation and looked at the same area that they've defined?

A. Yes, I have.

Q. Have you got a copy of their map? I think that might be more useful.

A. Would you like to tape it up on this?

Q. I think -- let's see which exhibit number it is, and perhaps people can --

A. I don't believe it's marked.

MR. PADILLA: It's not an exhibit. It's part of Exhibit 1.

MR. STOVALL: Oh, excuse me. Mr. Padilla advises me this map is part of Exhibit

1. I think we can just hold it up.

Q. (BY MR. STOVALL) And I just want you to tell me where you've gone and looked and done some sampling. I'll come over and hold it up, and you can kind of point to the areas where you've actually done some sampling.

A. We went around and we did some hand-augering in some arroyos, actually the systems up through here. We found shallow groundwater in the first two systems we looked at up here. In Johnson Canyon we found groundwater adjacent to the windmill they have marked here as a Nacimiento well, I believe, at a depth of 15 feet in the alluvium.

Similar situations were encountered here. We encountered groundwater at 20 feet in the alluvium here.

Q. That's in Rincon Largo; is that correct?

A. That's in Rincon Largo. Both these systems were essentially course, medium grain sands throughout the system with some clay, pretty extensive alluvial systems.

Up in Rock House Canyon we had looked at just off of the map right here. We put in a

hole there. We did not encounter groundwater, but we did encounter 24 feet of alluvial sediments in through this area.

We then circled back through this area and located a well, which is previously identified in a report by William Stone on the San Juan Basin groundwater resources. It's Hydrologic Report VI. And they've identified this well as being a perennial alluvial well with depth to groundwater at 73 feet.

I think the Commission should note that that is outside of the current area also, as we have already defined it.

CHAIRMAN LeMAY: "This well" meaning what well? Identify it on the map.

THE WITNESS: It's identified as Crow Lake Windmill. It doesn't show up well on the photocopy here, but it does show up on the USGS 7-1/2 minute quads. It's kind of faint on this map.

Q. (BY MR. STOVALL) Have you got a section and township? Can you identify that?

A. Yeah. That's in Township 24 North, Range 8 West, Section 15. And I believe it's in unit letter D.

Subsequently we came down looking at the Blanco Wash area. We did find this alluvial water at a depth of one foot in the wash area throughout here. We also found shallow hand-dug wells throughout here.

The farthest-west well, right here, we sampled. It had a pump jack on it that was used for cattle watering. And we sampled that, and it had total dissolved solids of 150 parts per million, which is better than a lot of Santa Fe city water we see here in terms of total dissolved solids.

This nest right here was actually two hand-dug wells in this area right here with a depth to groundwater of six feet.

Q. Now, let me clarify this. As we're looking at this particular exhibit, there's an explanation to the left, the first dot, and which wash is this we're looking at?

A. This is in Blanco Wash.

Q. Okay. The first dot is just in that blank area where the explanation block is; is that correct?

A. That's correct. But it is within the area that they are proposing, in 8 West, that

they are proposing for exemption.

Q. Okay. Good. I'm just trying to make sure that when we read a written transcript we know where we're talking about.

The second one is actually shown in the wash itself, in Blanco Wash itself, just about two inches to the right of that; is that correct?

A. That's correct. And depth to groundwater at that location is approximately six feet. We also located through published records, also by the Stone Hydrogeology of San Juan Basin Report, a shallow alluvial, perennial alluvial well with a depth of six feet in Escavada Wash in the south end of the area proposed for exemption.

Q. Again, that's shown just right on the southern portion about a half-inch above the boundary of the map; is that correct?

A. That's correct.

Q. Now, looking at that map, it appears to me that the heavy dark lines are in fact the proposed expanded vulnerable area; is that correct?

A. That's correct.

Q. Now, if I look at that map, it appears to me that a substantial portion of the area

itself, just in terms of square miles, is actually not even within the proposed expanded vulnerable area; is that correct?

A. That's correct.

Q. And is it your recollection that a fair portion of the evidence submitted by BCO's witnesses in fact came from outside the proposed expanded vulnerable area?

A. The bulk of the information submitted in all of the water quality sampling that they submitted was from areas outside the proposed vulnerable area.

Q. And that was the basis for saying that the entire area ought to be exempted from the applicability of the no-pit rule; is that correct?

A. That's correct.

Q. And yet you found within the areas that were actually in the proposed vulnerable area, you have found alluvium and in most cases groundwater at relatively shallow depths; is that correct?

A. There's groundwater throughout these systems, and there's extensive alluvium through every major system in this area.

Q. So again in terms of a conclusion with respect to granting a blanket exemption for an area of nine townships or over 300 square miles, what's your opinion?

A. I don't believe that's warranted based upon the information presented.

Q. And is it in fact even really necessary, considering that a large portion of that is not within the proposed vulnerable area anyway and would not be subject to the rules?

A. The bulk of this area is not vulnerable areas except for the canyon bottoms themselves. And the information presented was on areas outside the vulnerable areas.

Q. The part that's defined as vulnerable area has alluvium and has water, needs to be protected, and therefore some -- just township-range designation doesn't quite cut it in terms of an exemption; is that your opinion?

A. That's correct.

Q. The other side of the evidence we heard, of course, came from Southwest Research. I'd like to specifically just look for a moment. And again, addressing the utility of it, you were here and saw the presentation by Mr. Wallace with

respect to his modeling; is that correct?

A. Yes, I did.

Q. How useful is that to you in determining how prevalent or extensive contamination is or can be?

A. I think it's useful in that it shows that the contamination can occur. I think in terms of looking at the extent of contamination in some of the areas, it may or may not be valid based upon some of the assumptions in the model on looking at uniform flow through the saturated conditions.

Q. Now, is it correct, is my understanding correct that when you do a modeling of the nature that Mr. Wallace did, what you do is plug in some parameters, and then the computer calculates the results based upon those parameters. And then if you change a parameter, it changes the results? I think he testified to that, didn't he?

A. Yes, he did.

Q. Do you know or is it your recollection from his testimony whether there was any confirmation of whether the parameters used in that modeling in fact reflected the real world in the area out there?

A. As I understand from the testimony, they didn't do any actual fieldwork to corroborate their conclusions in the report. I think they were using them to try to corroborate information that the OCD presented that contamination is occurring.

Q. Would it be fair to say then that I think he talked about the range of influence or migration of contaminants of a thousand feet or more, that's likely to occur on a wide scale basis throughout the basin where there's contaminants put on the ground?

A. It can occur.

Q. Do you know if it would be a thousand feet away in every case?

A. I do not. I do not know that.

Q. Are the parameters which he used valid for a broad portion of the basin?

A. I think in some circumstances they would be. In some systems, possibly such as some of the systems we looked at with these nice uniform sands throughout some of the canyon systems.

In some areas, especially in the river systems in the San Juan, Animas, La Plata, things

are quite varied as to where you get sands, gravels. They're not uniform type systems and may not apply in those circumstances.

Q. In other words, the tool is limited in its utility; is that correct?

A. It's limited. I think it does show there is the potential for contamination from these sources.

Q. And that's the reason that the Division is proposing that protection be required until the non-need is demonstrated; is that correct?

A. That's correct.

Q. Mr. Shuey also presented some testimony in support of shortened time frames for compliance. What's your opinion with respect to that, and was it supported by his testimony and the evidence?

A. I don't know that he offered any evidence actually supporting those shortened time schedules. On our end, we've looked at trying to balance all those approaches towards faster time schedules, longer time schedules, and try and come out with a reasonable approach that industry can comply with. And we feel we've done that.

Q. Let's say, for example, if he's

proposed a reduction of time, I think his was to a no variance or one-year variance, I don't remember, is there going to be a significant additional contamination if the OCD proposed time frames with the possible extensions under a variance plan were allowed in all cases even?

Would there be a significant additional contamination occur?

A. I don't think there would be significant additional contamination in that time frame of OCD's compared to Southwest Research's proposal.

Q. In other words, the benefit to be gained wouldn't necessarily justify the substantial burden that a short time frame could impose on industry; is that correct?

A. That's correct.

Q. And also proposed with respect to the granting of a variance language that says something to the effect that a variance will only be granted if it can be shown that there will be no contamination at any higher level than would occur if there had been a pit?

And I know he wasn't just talking about water contamination, he was referring to any sort

of contamination. Was that your understanding of that definition in the variance language?

A. Yes, it was.

Q. Again, is that practical from a real world considering you've got to balance industry and benefits gained from the industry practices, operations, and the benefit to be gained to the environmental protection?

A. I don't know that that would be a significant environmental benefit. Even under the Water Quality Control Act, Water Quality Control Commission regulations, contamination is allow up to standards so you are allowed some degree of low level contamination but not above health based standards.

Q. Are we going through a balancing process of trying to say we've got an industry out here that contributes to our society and to our state's economy, and we've got an environment which is extremely valuable and which we treasure here in New Mexico. And we've got to bring them together and protect that environment, but allow that industry to continue to function?

A. That's correct. And we work to balance all interests to provide protection for the

environment and still allow a mechanism for compliance by industry.

Q. Is there anything else you would like to add to your testimony?

A. I don't think so.

Q. I would like to hand you one thing. It's marked Exhibit 15. Have you distributed a copy of this?

A. No, I haven't.

Q. Would you just describe briefly what Exhibit 15 is?

A. Exhibit 15 is a listing of the shallow alluvial groundwater in the Lybrook area. And this refers to the red circles I had shown on the map presented by BCO that lists the locations, the surface water systems, the locations of where we found groundwater, and depth to groundwater at those locations and the sources of that information.

Q. And that's the information that you've already testified to and pointed out on the map; correct? This is just a tabulation?

A. This is a tabulation of that testimony.

MR. STOVALL: Mr. Chairman, I'd offer

Exhibit 15 into evidence. And I have no further questions for Mr. Olson.

CHAIRMAN LeMAY: Without objection Exhibit 15 will be admitted into the record. I think we'll just go from the top here.

Mr. Roberts?

MR. STOVALL: One thing. If any of the parties -- I didn't go to the back rows -- I do have the exhibits up here.

MR. MEIKLEJOHN: I just want a copy of the--

CHAIRMAN LeMAY: I have you at the end, Mr. Meiklejohn. Is that all right as far as the system of cross-examination?

MR. MEIKLEJOHN: That's fine. I'm just trying to get a copy of the exhibit.

CHAIRMAN LeMAY: Fine.

Mr. Roberts, your witness.

CROSS-EXAMINATION

BY MR. ROBERTS:

Q. Mr. Olson, is it your recommendation or is it your testimony and your recommendation that a group of producers could come to the Commission or to the Division requesting a variance as opposed to coming on a company-by-company basis?

A. I think it could be done on an area-wide basis, which could include a variety of companies, if the information is to be used by all.

Q. So joint efforts wouldn't necessarily be precluded?

A. No, it wouldn't.

Q. Now, you talked about the proposed order of the OCD, the one that I think has been introduced as Exhibit No. 14, OCD Exhibit No. 14.

Now, just as a point of clarity, that order does not include all of the points of interest to industry or environmental groups, does it?

A. No, it does not.

Q. Did you attend the 1985 vulnerable area hearing?

A. I was not employed with the OCD at that time.

Q. So you did not attend it?

A. I did not. I read the transcripts from the hearings when I was first employed by the Division.

Q. Okay. Is it not true then from a

reading of the transcript of that hearing, is it not true that much of the testimony there dealt with how the mechanisms of attenuation would retard or eliminate contaminants that introduced into a saturated zone into the groundwater?

A. Yes. I believe we disproved that with our study. That was the argument used for the current exemptions in the vulnerable area.

Q. Okay. But at that time there was much testimony presented regarding mechanisms of attenuation based on the assumption and maybe even the reality that contaminants were being introduced into groundwater?

A. I don't remember any specific testimony quantifying attenuation mechanisms, but there was discussion of potential types of attenuation mechanisms.

Q. Are you familiar with the Water Quality Control Commission regulations for groundwater?

A. Yes, I am.

Q. Is it not true to say that those regulations do permit contamination of groundwater within certain restricted distances from the source of contamination?

A. They do not permit contamination above

standards.

Q. What is the point of compliance under the WQCC regulations? It's not the point of discharge, is it? Is it not the edge of the property, of the discharger?

A. Well, it's contamination of the waters of New Mexico. If you can prove that it will not leave your property, you are allowed to, under the current regulation under state law, to contaminate groundwater.

I think the point is that it's difficult to and I don't know of anyone that ever has proven that their water will not migrate off their property.

Q. It's possible that it could be proven, though?

A. It has been done in circumstances of containment, uh-huh, of contamination.

Q. How do you reconcile the WQCC regulations which would permit contamination of groundwater within the confines of the property owned by the discharger with what you refer to as the statutory charge to protect freshwater sources?

A. I think one of the differences is that

the leaseholders do not own the groundwater underlying their property. A lot of times that is just a lease; it is not their property that they are on. A bulk of it is BLM lands actually, federal properties.

Q. Would you agree that that's probably a legal question, a legal issue?

A. What? That you can contaminate groundwaters if it doesn't leave your property?

Q. Well, I asked you to reconcile what you referred to as the statutory discharge, statutory obligation to protect freshwater sources versus what the WQCC regulations permit in terms of contamination.

A. I don't know if that's relevant because we operate under this. And this proposal is under the Oil & Gas Act regulations, which have absolute protection for contamination of groundwater. There is no provision in the Oil & Gas Act that I know of that allows for contamination of groundwater.

Q. Now, if you say that contamination can occur as much as a thousand feet away from a source, do you know of any such incident of contamination from produced water sources?

A. We have one incidence of up to approximately 500 feet in the Flora Vista water supply well.

Q. Do you know of any incidences of contamination from sources a thousand feet away from a freshwater well or spring?

A. Not to my direct knowledge.

MR. ROBERTS: That's all the questions I have.

CHAIRMAN LeMAY: Thank you, Mr. Roberts.

Mr. Padilla?

MR. PADILLA: I got caught.

MR. STOVALL: That's a sign, Ernie.

CROSS-EXAMINATION

BY MR. PADILLA:

Q. Mr. Olson, in the wells that you sampled that are identified in Exhibit 15 in the Lybrook area, did you sample any of those wells for BTEX contamination?

A. We were not looking at BTEX contamination. We were looking at the assertion that there was no alluvium in these areas. As a by-product, we found groundwater.

Q. You have no information then that there

is any contamination or BTEX contamination in any of these water sources?

A. No, I do not.

Q. Looking at Exhibit 15, can you tell me whether any of those water sources are ephemeral?

A. They are all ephemeral systems from my determination visiting the site.

Q. How about the one, the Crow Canyon one, would that be considered ephemeral also?

A. That could be considered ephemeral. There was no water flowing in any of the systems when we were visiting them.

Q. Would that be completed in the alluvium, as you call it, or would it be in the Nacimiento?

A. That was a record from the, as I said, from the Stone report on hydrogeology and water resources of the San Juan Basin. And it was listed from their investigation as a perennial alluvial well from a depth to groundwater of 73 feet.

Q. Did you go to this well?

A. We visited the well site, uh-huh.

Q. Did you sample the water from the well?

A. We did not.

Q. Did you measure the water level?
A. We did not.
Q. You took this, you made this survey three days ago; is that correct?
A. That's correct.
Q. And had it rained out there before you went there?
A. It rained after we were there, while we were there.
Q. The one well on the Blanco Wash that you show as being within one foot, would that be from recent precipitation?
A. I would expect it's most likely from that, from runoff, all events. I think the important thing to note is that the water adjacent, directly adjacent to there, we looked at the hand-dug well.

I think you'll see on the Exhibit 15, I believe it's the fourth listing, Blanco Wash at 14 feet. That was approximately 100 yards away on a bank, so you're probably looking at a losing ephemeral system.

Q. Do you know whether these are year-round sources of water?
A. I do not know that. I don't have

direct knowledge of that. But the fact that one of those has a pump jack on it and appears to be used on a regular basis for stock water, I would assume it has water on a year-round basis.

Q. But you don't know whether it's used on a year-round basis?

A. No, I do not.

Q. You have no independent knowledge? I'm not trying to quarrel with you one way or the other.

A. No, I do not know that.

Q. Was the entire alluvium or this, as you saw it here, was that saturated with freshwater, all of the alluvium that you looked at?

A. The ones that we looked at were saturated.

Q. How far away from the source was it saturated?

A. We didn't look to see that. That wasn't the purpose of the investigation. The purpose was just to look and see if there was groundwater in these systems.

Q. But you don't know whether it's extensive or whether it's a limited source of water?

A. In Blanco Wash I'd say it's most likely extensive since some of the hand-dug wells are at distances from the wash itself.

Q. What is the water level on those hand-dug wells?

A. One was six foot and one was fourteen feet.

Q. Do you have any history of the water source independent as to how long these water sources last out there in the alluvium?

A. I do not.

Q. You also mentioned that you were essentially patterning after Order R-3221, as you enunciated, for southeast New Mexico. Are you familiar with the Red Bed exemptions that have been granted in southeast New Mexico, I believe in Eddy County and even through Lea County?

A. Yes, I am.

Q. Would that type of Red Bed exemption apply for the Lybrook area due to the shale and the type of geologic condition that has been -- or that has been testified to by the witnesses for BCO?

A. No, it would not.

Q. Why not?

A. Looking at 3221 exempted areas with the Red Beds, those are largely areas of Red Bed highs. And if you're looking at the Lybrook area, there's a cut, canyon, arroyo systems which are filled with extensive alluvium. And I think, as we've shown, they have groundwater in there, which is a protected quality.

Q. From the standpoint of maybe an extensive area, isn't shale more dense than clay?

A. Shale more dense than clay?

Q. Yes.

A. Sure.

Q. And the Red Beds in southeast New Mexico are red clay; is that correct?

A. Correct.

Q. And the Red Beds in southeast New Mexico are not as thick as the Nacimiento formation; correct?

A. Actually they may be on the same order of thickness in places.

MR. PADILLA: I believe that's all the questions I have, Mr. LeMay.

CHAIRMAN LeMAY: Thank you, Mr. Padilla.

Mr. Kellahin?

CROSS-EXAMINATION

BY MR. KELLAHIN:

Q. Good morning, Mr. Olson.

A. Good morning.

Q. Do you have a copy of the Division proposed order and a copy of your report that you submitted in the earlier portion of this case?

A. I think so. Yes, I do.

Q. It's the report authored by you. And I forgot the exhibit number for the hearing, but it's Open File Report H-89-9.

A. That's correct. It's Exhibit No. 6.

Q. Let me ask you some questions about the draft order so that I can understand some of the concepts that the Division is proposing.

The sequence or the phasing in of compliance in the various areas, you contrasted with Mr. Stovall while ago a range of times and discussed with him the OCD recommendation in terms of a shortened period of time that Southwest Research had proposed.

Could we specifically look at certain categories that there is a difference in timing between the Division and Southwest Research? For example, I believe it's paragraph 1-C, is it?

A. You're referring to the expanded areas?

Q. Well, I believe it's Rule 3-B(2). The Division has proposed a two-year phasing in for the elimination of pits within that category?

A. That's correct.

Q. And Southwest Research has proposed 18 months?

A. [Nodded.]

Q. What was your response to Mr. Stovall about the difference within that time frame?

A. I don't think there's a very significant difference in that time frame.

Q. At what range of additional months either subtracted to -- or subtracted from or added to the two-year period becomes an important difference for you?

A. I'm not really sure at that point. I would say we're trying to put in and trying to eliminate discharges as quick as possible and in as timely a manner as possible. And I think that's what we proposed.

Q. In talking about a range, is an additional year's period of time within a range of reason?

A. I think so. And I think that falls within the potential variances that we've allowed for scheduled areas.

Q. Is there an additional number of years in any particular category that if we add on to the Division's proposed timing becomes so large a period of time that you are uncomfortable with the potential risk of contamination?

A. Well, technically from the way the regulations are, if we know that we have contamination occurring, it should not immediately, but that's just not realistic.

Q. I understand. But in terms of phasing in the different categories, I guess the area that you're most concerned on is the one that you've studied in your report which is that shallow groundwater incident of potential contamination in the original vulnerable area, isn't it?

A. That's correct because there are population centers in that area.

Q. I don't understand the concept of variance. When we look at the proposed rule on the variance, describe for me what variance is supposed to mean. Is this a variance as to a

geographic area, or can it be an application for a variance as to type of discharge or well involved or type of pit?

Help me understand. Is there any limitation on the kinds of variances that can be requested under this proposed order?

A. I think it's pretty clear under Rule 7 the way the proposed variances read; that the variances can be for two items: one, for the time schedules that would apply for areas, and the other for the discharge prohibition. It applies directly just to those two items.

Q. Are there any other types of possible variances that are being excluded by this proposed rule?

A. Not that I know of.

Q. Okay. Let me ask you about your report, sir.

A. Uh-huh.

Q. I read through your report recently, and I was trying to understand your perspective, the objective, the methodology, and exactly how you worked through your study. And let me help you go through, as I understood what you have done, and tell me if I'm correct or not.

In reading through the report, I got to about page 15 and you're beginning to describe and discuss for the reader the original vulnerable area order, and you identify it. And in terms of shorthand, we're dealing with an area of the three major rivers in the San Juan Basin, being the San Juan, Animas, and La Plata.

And we're dealing in an area that is 100 vertical feet above the surface of those waters, I believe.

A. That's correct.

Q. Within the context of that rule, then, you go on and describe what that rule was supposed to do on page 17. And you focus in on one component of that order, which is it grants an exemption for low volume discharges where the depth to groundwater is ten feet or less.

The low volume discharge being less than five barrels of produced water a day?

A. That's correct.

Q. On page 19 then you say the purpose of the study was to determine if the depth criteria used in that order provides adequate protection of natural groundwater from the dissolved organic load in produced water.

Again, within the original vulnerable area, you're focusing on the exemption criteria that was used to justify the low volume discharges when you were in close proximity to groundwater?

A. That's correct.

Q. On page 20 then you described for us the objectives of your field study. You say the objective of the site selection process was to locate unlined produced water pits receiving discharges of less than five barrels per day in the San Juan Basin shallow groundwater areas.

All right?

A. [Nodded.]

Q. You then selected 13 sites. Are all 13 sites selected in the original vulnerable area?

A. No, they are not. I believe there's a couple of those that are in the proposed expanded area.

Q. Okay. I want to go through your appendix, and we will look at all 13 sites and you can help me find which are in and outside of the original vulnerable area. I did not have an index within your report to show me exactly where those were. So if you'll help me go through

that, we'll do that in a minute.

How many of the sites are outside the original vulnerable area?

A. I believe there are three. The third one may be right on the border. I'm not exactly sure without looking at the maps.

Q. All right. On page 23 then you describe for us some of the limitations you had to deal with in the field because you were using a hand-auger drilled monitoring well process?

A. That's correct.

Q. Right?

A. Uh-huh.

Q. And that of the 13 sites that you studied, you were only able to utilize that methodology to access groundwater when it was at, say, 25 feet or less?

A. That's correct.

Q. Okay. Let's go to the appendix, if you will, in which we'll talk about the 13 sites, Mr. Olson. I think it starts on page 53 of the report, the Abrams L No. 1 is the first one.

So that I understand the BTEX criteria, help me make the translation. You're dealing in parts per billion, are you not?

A. These are in parts per billion, that's correct.

Q. And if we apply a contaminant standard using the Water Quality Control Commission standards, the benzene standard is what? ten parts per billion?

A. Ten parts per billion.

Q. And the toluene standard is 75 parts per billion?

A. That's correct -- it's 750 parts per billion.

Q. Sorry. I missed a zero. 750 parts per billion?

A. Yes.

Q. The ethyl benzene, is that also 750 parts per billion?

A. I believe it's approximately 620. I'm not exactly sure.

Q. I thought that was the xylene standard.

A. I think ethyl benzene and xylene are approximately the same.

Q. Okay. 620 apiece for the last two?

A. Correct.

Q. All right. When we look at the

spreadsheet for the Abrams L No. 1, the items that are reported on the tabulation is a discharge rate in barrels?

A. That's correct.

Q. For each of those sites, do you have an analysis of the discharge water?

A. We did not -- we were not able to get it for every site because sometimes we could not get a separator discharge or any water out of the separator. We went around with operators to have them trip the separators for us. That was one of them that they tripped it and we didn't get any water out of it.

Q. So when we look at the tabulation of data, the volume measured is a measured volume by you?

A. It is not a measured volume by us. It was compiled from the pit registration forms which were submitted by industry, which was their estimation of the discharge volume.

Q. The other parameter I have on the spreadsheet is the depth to groundwater, the next entry on this spreadsheet, at 16 feet?

A. Yes.

Q. Okay. When we look at the

down-gradient monitor wells, "ND" means not detected?

A. Means not detected.

Q. You tested for and could not detect the presence of those contaminants?

A. That's correct. Two of them were off-gradient and one was up-gradient.

Q. Of the monitoring hole wells, it appears that only benzene and the No. 4 monitor well exceeds the Water Quality Control benzene standard?

A. That's correct.

Q. Okay. When we look at the next one for the Drew Sullivan Com. "B" 1, this one is okay, isn't it?

A. The groundwater around that location was -- had nondetectable levels of BTEX.

Q. When I say okay, I'm going to refer to in terms of exceeding the Water Quality Control standards so I don't confuse you.

A. You're referring just to BTEX?

Q. Just to the BTEX. The purpose of the study, as I understood it, was to focus on those volatile organic components. And I want to look at those four, those four items.

A. We were also looking at chlorides, but that was an ancillary part of the investigation.

Q. All right, sir. So the second well on page 54, that one is okay. On page 55, the Gallegos Canyon Unit "F" 162, that one exceeds the standard?

A. Well exceeds standards.

Q. Okay. The next one, the Gallegos Canyon Unit 153 does not exceed the standards. That one is okay?

A. The 153 E did exceed the standards in two of the down-gradient holes for benzene. Well above standards.

Q. I'm sorry. Okay. I was looking at the last four monitor holes, none of which detected, but there are two down-gradient holes that did exceed the standard?

A. Right. Some of the holes are in various locations. Some may be off-gradient from the pit locations since the hydraulic gradient wasn't known at the time when the wells were put in.

Q. Do you have diagrams or schematics that show the site plan of each of these sites to understand how they're oriented in the field?

A. Yes, I do. I produced them for -- Dugan requested those, and I supplied those to them.

Q. Okay. They have been made available to one of the operators?

A. They've been made available to industry at request.

Q. Page 57, the Gerk "B" 1M, this one is okay?

A. It was nondetectable levels of BTEX, correct.

Q. And then we get to 58, the Grambling "A" No. 3-A, this one busts the standard, doesn't it?

A. Correct.

Q. Let's look at this one for a minute. Do you happen to have the description of where these two are located, the one on page 57 and the one on page 58?

A. I can mentally picture where those locations are at. The Gert "B" No. 1-M is along the San Juan River Valley just downstream from the confluence of Canyon Largo.

Q. Okay. And then the Grambling "A" 3-A is about two miles to the northeast of the first

well?

A. I believe it's a few miles -- it's up Largo Canyon. I don't know the exact mileage. It is a considerable distance from the Gert "B" No. 1-M, though.

Q. My information is that the Gert "B" No. 1-M well is located in Unit M of Section 19 of 29-9?

A. I don't have that information right in front of me right here.

Q. Okay. When we look at the Gert "B," it's got a separator discharge of .26 and a depth to groundwater of 15 feet. It doesn't exceed the standard. You look to the next well and find a similar volume of discharge with the same depth to groundwater, and it does exceed the standard.

Within this portion of the vulnerable area with these two wells in the proximity they are to each other, what variable is occurring within this area that will cause that to happen, where you see contamination in one well and not in the area?

A. Well, it could be biodegradation mechanisms. Also it could be that there was floating product found in the Grambling "A" No.

3-A wells. It destroyed our monitor wells.

Q. You say it could be. Did you test to find out why there's a difference in results between two wells in which the two components that are listed on the spreadsheet are the same yet get different results?

A. I don't think I understand.

Q. You say it could be a lot of things. Did you make any determination as a scientist as to what it actually is that explains the difference?

A. Oh, I expect it's the presence of floating product under the Grambling "A" No. 3-A.

Q. When we go to 59, page 59, the Heath Gas Com. "C" No. 1, that one is okay, isn't it?

A. That was the "G" No. 1. We were only able to put in two holes at that location. There was a lot of gravel there, and we weren't able to complete other down-gradient wells.

Q. The Marquis Eaton "A" 1-E on page 60, this one is okay, isn't it?

A. It's okay with the exception of chloride in hole No. 2, which is well above the up-gradient levels and is above WQCC standards.

Q. I understand. We were examining the BTEX.

A. Okay.

Q. 61, the Riddle FL "S" 3-A, this one is okay, isn't it?

A. With the exception of what's listed as up-gradient hole 2. And that was up-gradient from the produced water pit but was down-gradient from the tank drain dehy pit. I kind of listed it in error as an up-gradient hole 2.

It's up-gradient of the separator and the main produced water pit. But it's directly down-gradient of the tank drain and dehy pit, which did have benzene above WQCC standards.

Q. Okay. As you move down-gradient to holes 3, 4, and 5 --

A. They were clean --

Q. Okay.

A. -- for BTEX, with the exception again with the chloride on hole No. 5, which is at 1295.

Q. Okay. Then on 62, the Sullivan Frame "A" 1-E, this one is okay, isn't it?

A. Again with the exception of chloride on hole No. 2, down-gradient hole No. 2.

Q. Again we're looking at the BTEX, if you will. Page 63, the Tapp Com. 5, this one is okay, isn't it, for BTEX?

A. It's showing trace delves of BTEX, but it does not exceed standards.

Q. And then the Valdez "A" 1 on 64, this one exceeds the standards?

A. That's correct.

Q. And then the Valdez "A" 1-E on 65, that one looks like it exceeds the standards, doesn't it?

A. That's correct.

Q. Okay. When we look at those wells that exceed the standard in the monitoring wells, it appears to me, and correct me if I'm wrong, the depth to groundwater is less than 20 feet for those sites that cross the standard?

A. I believe that's a general statement. There was BTEX detected in up to 31 feet, but it did not exceed standards for that location.

Q. Okay. I'm also correct in understanding that from your report that if we have a distance of 20 feet or more to groundwater that the BTEX standards established by the Water Quality Control Commission are not exceeded?

A. In this study I guess that could be a conclusion.

Q. Apart from the volume of discharge in the depth to groundwater, what other geohydraulic factors did you investigate at these sites?

A. I guess I don't understand your question.

Q. Are we dealing with everything else being similar within the 13 sites with the exception of the volume of discharge in depth to groundwater?

A. There was some dissimilarity in that some systems had a little bit more clay, some had a little more gravel, et cetera, a little variable lithology.

Q. Did you detect as a geohydrologist any component or characteristics of the site that would allow you to categorize or separate one site from another?

A. No, I did not because we have some sites that had heavy clays that did have -- such as the, I believe, the Valdez "A" 1-E, which had heavy contamination of groundwater at 240 times the standards where we had a heavy clay. And some sites had sandy systems that also had

contamination at depth of up to 20 feet.

Q. When we take the results of this information and apply it back now to the original vulnerable area order, we can find examples then -- what? do we have six? I've lost track. Are there six examples?

A. I believe there's seven that exceed standards, I believe.

Q. Seven exceed standards where depth to groundwater is 20 feet or less?

A. That's correct.

Q. So we now know that there is some risk in small volume discharges using the five-barrel-a-day ten-foot criteria?

A. I see no reason that there's not contamination occurring at greater depth from those. It's just that we were not able to do that in our study.

Q. Exactly so. And as a scientist, that's what we have from your study?

A. That's correct.

MR. KELLAHIN: Thank you, Mr. Chairman.

CHAIRMAN LeMAY: Thank you, Mr. Kellahin.

Mr. Meiklejohn?

CROSS-EXAMINATION

BY MR. MEIKLEJOHN:

Q. Mr. Olson, can dry gas wells produce waste water?

A. Yes, they can.

Q. Can they produce more than one barrel of waste water per day?

A. I don't have a knowledge of what the average discharges on the dry gas wells are for those.

Q. Do you know what the composition of the waste water produced by such wells is?

A. We have, I believe, some information in our files as to discharges from PC wells.

Q. But you don't know it?

A. I don't know it off the top of my head.

Q. If there is contamination, BTEX contamination in soil beneath the pit and there is groundwater below that soil, is it possible for the level of BTEX contamination in the groundwater to be higher than the level of contamination in the intervening soil?

A. It's possible.

Q. Are you familiar with the recommendation that Southwest Research & Information Center made concerning public notice and participation by members of the public in variance proceedings?

A. I remember the testimony.

Q. Does the Oil Conservation Division object to including the public in variance proceedings?

A. I would think for an individual site itself, I don't know that we need to go to public notice on individual sites. But any other type of area-wide or large-scale basis, I don't see any reason not to afford it to public hearing.

Q. Is it your position that with regard to the individual sites that if the site is owned by someone other than the operator, that the owner of the site should have notice of the application for a variance?

A. I believe they should have knowledge of what's going on with their property.

Q. Would it also be your position that owners of land adjacent to the property on which the site is located should have information about what is going on on that property?

A. If it has potential to affect their property, yeah, I expect it should.

Q. You were asked in earlier questioning about situations in which contamination has occurred more than a thousand feet away from the source of contamination; do you recall that?

A. Yes.

Q. Are you familiar with the Lee Acres site?

A. Yes, I am.

Q. Does that site include BTEX contamination of groundwater?

A. There is BTEX contamination of groundwater from the refinery site, but I think I was answering it in the question from production sites. From the refinery site, we have contamination going -- I don't know what the exact distance is, but it is a considerable distance from the refinery. We've seen other refinery sites also.

Q. Is it more than a thousand feet?

A. Yes.

Q. Did you look at the parameters that were used by Mr. Wallace in the design of his model?

A. I didn't go into depth. I reviewed it through when he was presenting his testimony.

Q. On the basis of your knowledge of the San Juan Basin, were the parameters that he used reasonable?

A. I believe they were.

Q. You discussed an effort to draw a balance between the need to protect the environment and the need to accommodate the interests of industry. Is that balance mandated by the Oil & Gas Act?

A. No, it is not.

Q. Does the Oil & Gas Act require the Division to protect not just groundwater but the environment more generally?

A. The 1989 amendments provide for protection of the environment in addition to groundwaters. I think it's groundwater, human health, and the environment.

Q. Is the soil in which produced water pits located part of the environment?

A. It is.

Q. Do the Water Quality Control Commission standards apply to produced water?

A. No, they do not. The Oil & Gas Act

applies to produced water discharges, not the Water Quality Act.

Q. Does BTEX -- I'm sorry. I didn't mean to cut you off. Did you finish your answer?

A. Yes.

Q. Does BTEX occur naturally in the groundwater in the San Juan Basin?

A. No, it does not.

Q. You discussed also the need to accommodate the interests of industry with respect to the compliance schedules. And you were asked specifically about the difference between the compliance schedules that the Oil Conservation Division has recommended and the compliance schedule that Southwest Research & Information Center has recommended. Do you recall that?

A. Yes.

Q. Does the Division have any specific information indicating what the cost to industry would be of using the compliance schedule recommended by Southwest Research as opposed to the compliance schedule recommended by the Division?

A. No, we do not.

MR. MEIKLEJOHN: I don't have any further questions.

CHAIRMAN LeMAY: Thank you, Mr. Meiklejohn.

Mr. Kendrick, I'm not excluding you. Did you wish cross-examination of any of the witnesses?

MR. KENDRICK: No, I do not.

CHAIRMAN LeMAY: If you do, just jump right in.

Commissioner Bailey?

COMMISSIONER BAILEY: No questions.

CHAIRMAN LeMAY: Commissioner Weiss?

COMMISSIONER WEISS: No questions.

CHAIRMAN LeMAY: I have two.

EXAMINATION

BY CHAIRMAN LeMAY:

Q. Mr. Olson, if you were to define a dry gas well, how would you define it?

A. I would maybe, possibly list it as a well at which no liquid hydrocarbons were produced and not recovered. I think I would --

Q. In which no liquid hydrocarbons were produced?

A. Which I think would have to include

some water fraction also.

Q. That's what I was wondering. Assuming there was a discharge of water slightly with the dry gas well, would that also apply to a hydrocarbon -- to a BTEX content in the water discharge?

A. The controlling factor is going to be what the quality of that discharge water is. If it's not in contact with a liquid hydrocarbon, like a free-phase product, then it's not going to have appreciable BTEX in it.

Q. Okay. One other question on the hydraulic gradient. I was confused?

A. At one point you said there was no measurement of the hydraulic gradient. And another time I caught the inference that the hydraulic gradient at least was the gradient of stream flow in the river valley. Is that correct, or is there a variance from stream flow to hydraulic gradients in river valleys?

A. This is referring to the study?

Q. To the study but also, I think, to the area that BCO looked at. I was confused as to hydraulic gradient, I guess. Can you predict hydraulic gradient in stream valleys?

A. Yeah. Largely it will be sub-parallel to the channel itself. You also get some effects in the ephemeral systems from recharge events where you'll see a wave front as you get a flowing surface volume.

In a losing stream, you essentially get a wave front that will move out away from it and flatten out at some point. That's from a recharge event, such as, when the stream is flowing.

So you will get some side component, but the largest component is down the length of the channel.

Q. So when you were talking about up-gradient, down-gradient, you were generally referring to the gradient as defined by the stream flow in the valley on your study?

A. In our study we actually surveyed in the well locations. We did not know what the hydraulic gradient was at the time we did the location.

We assumed in the San Juan River Valley, for instance, that the gradient was sub-parallel towards the river in those areas, largely due to a lot of the irrigation up along

the sides of the valleys.

And we placed then on the larger wells according to where we assumed the gradient was. When we installed the monitor wells, we then surveyed in the locations, and we took depth-to-water locations. And so we were able to have the information to produce water table gradient maps.

I did produce those at the request of industry. And they support -- that's where the map, the table listing shows down-gradient, up-gradient. It's based upon that information.

Q. Well, I guess my question then, is it your assumption then that -- or the assumption that the water gradient was some parallel function of the river valley, was that borne out by your water table measurements when they're surveyed in?

A. Most of the time it was. There was some localized circumstances due to irrigation where it might have been a little bit more directly towards the river.

CHAIRMAN LeMAY: That's all the questions I have.

Are there additional questions of the

witness?

MR. STOVALL: I've just got a couple of redirect.

FURTHER EXAMINATION

BY MR. STOVALL:

Q. To address the notice question quickly, Mr. Meiklejohn, in answer to his answer, I think you said you thought the property owner ought to get notice probably; is that correct?

A. That's correct.

Q. And he talked about adjacent property owners. Would there be, like, a distance that you would recommend from adjacent property owners within so many feet or so many yards or so many miles, whatever, that would include, say, a radius around an area to be affected by a variance if there is such notice?

A. I think that would be a good way to do it. I can't think of an exact distance that would apply. We do use under commercial facilities, which are large-scale facilities, a half-a-mile. But I don't know that that would be, you know, applicable in this circumstance if you're looking at a small volume point source discharge.

Q. It's a similar number that's used in the UIC program, is it not?

A. That's correct.

Q. Another question quickly on the balance question. In response to Mr. Meiklejohn, you said you didn't know in the statute of a charge to balance the interests. Are you familiar with the requirement of the OCC and OCD to prevent waste of oil and gas?

A. Yes.

Q. And also protect freshwater and regulate discharges to protect human health and the environment?

A. Yes.

Q. Does that sound like it might be a balance?

A. That could be interpreted to be a balance between the producing interest and the interests to protect groundwater.

Q. One of the questions of Mr. Padilla and Mr. Kellahin reflected about whether you had found contamination. And essentially you were saying that it didn't appear that there wasn't contamination every place you found water; is that correct?

A. That's correct.
Q. Do we want to wait until there's contamination in the water before we protect it?
A. No. Just looking at the costs of any clean up involved, the benefits of protection far outweigh any allowance or any -- allowing groundwater contamination to occur, I guess, since we know it is occurring at some sites.
Q. That's exactly what we're trying to do?
A. That's correct.
Q. Is chloride a contaminate?
A. Yes, it is.
MR. STOVALL: I have no further questions.
CHAIRMAN LeMAY: Additional questions of the witness?
Mr. Padilla?
MR. PADILLA: I guess I have to ask another question, Mr. Chairman.

FURTHER EXAMINATION

BY MR. PADILLA:
Q. Mr. Olson, you were just asked by Mr. Stovall whether chloride was a contaminant. Did you find any chloride contamination in the Lybrook area in your most recent travels there?

A. That was not the purpose. We did not look at chloride contamination. We just looked for the presence of groundwater and alluvium in those systems.

Q. No evidence of any chloride contamination, as far as you know, in the Lybrook area?

A. Not that I know of. We haven't looked, though.

Q. You don't have any information now about chloride contamination?

A. No.

Q. And you don't have any information about BTEX contamination in the Lybrook area?

A. No.

MR. PADILLA: Thank you.

CHAIRMAN LeMAY: Thank you, Mr. Padilla.

Any questions of the witness? He may be excused.

Let's take about a ten-minute break.

[A recess was taken.]

CHAIRMAN LeMAY: If you'll sit down, we'll continue.

Mr. Stovall, do you have anything

further?

MR. STOVALL: No. I think I've sufficiently covered the topic for gratification.

CHAIRMAN LeMAY: Thank you. We shall then continue with Mr. Roberts.

MR. ROBERTS: I'd recall Mr. Hicks.

Mr. Chairman, before we begin with the questioning of Mr. Hicks, I'd point out that I have placed before you a series of rebuttal and redirect exhibits that would be later tendered into the record by Four Corners Gas Producers Association.

CHAIRMAN LeMAY: Four Corners Gas Producers Exhibit 7, 8 --

MR. ROBERTS: 7, 8, 9, 10, 11, 12, and 13. Those have been distributed.

MR. MEIKLEJOHN: Mr. Chairman, I'm not certain, given that these haven't actually been tendered whether this is the appropriate time, but we object to the admission of these exhibits. I haven't had a chance to go over them all in detail. We got them just before the hearing this morning. And my understanding is that they weren't available before then.

I certainly expect if Mr. Roberts had

had them before, then he would have provided them to us. We have not had an opportunity to go over these and analyze them in any sort of detail. We are not prepared to ask for continuance of this matter for the purpose of doing that. We think that would be inappropriate.

We suggest either that they not be admitted because they have not been subject to analysis by other parties or that if they are admitted, then they be given the limited weight because of that because no other parties have had an opportunity to analyze and to ask detailed questions on cross-examination about them.

CHAIRMAN LeMAY: Okay. Mr. Roberts, do you have a response?

MR. ROBERTS: Yes. Mr. Chairman, the direction we had received is that we should present our case primarily through rebuttal and not through cross-examination. We think it's certainly reasonable to have developed rebuttal testimony, and that testimony is represented by the exhibits.

It seems to me that if the exhibits are not permitted to be used at this hearing, then Mr. Meiklejohn could object to every question I

ask of my witness on rebuttal and theoretically we don't have an opportunity to present our case. I think it's the nature of the process that's been employed here.

We have certainly had some time to prepare for rebuttal, and we have taken that opportunity to do so. But as far as I'm concerned, it was part of the process.

It seems to me that the rebuttal goes, insofar as it pertains to Mr. Wallace's testimony, it goes to the model he submitted. An expert who submits a model ought to be able to address questions or address comments regarding that model and shouldn't need an extended period of time to do it.

I would agree that getting those exhibits today may put a burden on them in terms of interpretation of what we have in the way of testimony. But again I think that's part of the process.

CHAIRMAN LeMAY: I'm sorry. Mr. Meiklejohn?

MR. MEIKLEJOHN: I'd simply like to point out that the modeling we're talking about is a fairly complicated process. And it's not

accurate, I think, to indicate that an expert who completes a model, does a modeling study, can necessarily respond on the spot to other calculations that have been done theoretically on the basis of that model or to determine what is and is not valid in that model.

Running those calculations on a hand calculator or in one's head is not always possible.

CHAIRMAN LeMAY: Well, the model isn't necessarily the item of the discussion here. It's used for comparison purposes, I think.

As I understand it, you're not objecting at this point because there's been no motion by counsel to submit these exhibits into the record. They'll be part of the testimony.

And at that point, may I suggest you reserve that judgment on whether you want to object to the submission when counsel makes the motion, and we'll be conscious of the fact that you at this point aren't too pleased with the way this is being done.

I might mention, in the past our Commission hearings have never -- I won't say never. Generally speaking we submit exhibits at

the time of testimony, and at that time is the only time that people get a chance to look at the exhibits.

So by doing this we're not breaking precedent with normal Commission-Division procedures. Occasionally, like in this case, we have asked that the exhibits be available prior to hearing, but that does not mean that we've done this all the time.

Many times in our hearing process, we do get the exhibits at the very time testimony is taken and there's been no chance to study it ahead of time. I just point out that because you may not be familiar with some of our policies.

MR. STOVALL: Mr. Chairman, if I might add something.

CHAIRMAN LeMAY: Mr. Stovall.

MR. STOVALL: I would make a recommendation that perhaps what we do is have Mr. Roberts present his case. Perhaps if we do it under the threat of no lunch until he finishes, he will do it in an expeditious manner.

And then we can take a lunch break, and that will give all the parties an opportunity to

review these exhibits and come back and have a chance to see if there's really anything that needs to be cross-examined or gone through.

CHAIRMAN LeMAY: Any other comments?

MR. ROBERTS: Mr. Chairman, just let me say that I think it was proper and fair when we came here before the April 9 hearing, that all parties would exchange exhibits. That gives all parties an idea of where each of the other parties is headed.

But I guess I just don't necessarily think that is a valid point in terms of one party presenting cross-examination or rebuttal testimony.

So although these exhibits were not in form to be submitted until actually late last night, I guess I would quibble a little bit with Mr. Meiklejohn about whether they should have been provided had they been available.

And we were given no direction as to the provision of these exhibits.

CHAIRMAN LeMAY: Okay. We'll reserve judgment.

Yes, sir, Mr. Padilla.

MR. PADILLA: Mr. Chairman, I would

have to concur with Mr. --

MR. ROBERTS: Roberts.

MR. PADILLA: -- Roberts. Memory goes first.

MR. ROBERTS: We're good friends.

MR. PADILLA: Because we're going to have essentially the same problem, although not as extensive. We are planning, but it was by way of rebuttal that we were going to submit the information.

CHAIRMAN LeMAY: We've already had one exhibit submitted into the record without objection, so we'll delay that decision until after we hear the testimony.

MR. MEIKLEJOHN: That will be fine.

CHAIRMAN LeMAY: You may continue, Mr. Roberts.

EXAMINATION

BY MR. ROBERTS:

Q. Mr. Hicks, going back to the recent testimony today of Mr. Olson, he raised questions about the definition of dry natural gas wells. And he expressed some concerns about the broad application of that definition.

Do you have any response that you would

like to make to those concerns?

A. Yes. I thought I had read into the record a proposed definition of a dry natural gas well previously. But I'd certainly like, if I hadn't, I want to do it now, and if I had, will refresh everybody's memory.

How we've elected to define a dry natural gas well, it has three characteristics. A dry natural gas well is a natural gas production well which produces less than one barrel of oil or natural gas condensate for every one million cubic feet of produced natural gas.

Two, it will produce less than one barrel of water per day. And that goes directly to the point which was brought up earlier according to our definition. As stated in here, if any natural gas well, no matter what its origin, produces more than one barrel of water a day, it cannot be considered a dry natural gas well.

And, three, the third part of the definition of a dry natural gas well is a well at which liquid hydrocarbons are not recovered. And so those are the three-part definition: one dealing with the oil and gas ratio; one dealing

with the production of water; and one dealing with the fact that there is not liquid hydrocarbons recovered at the site.

Q. Can you review for the Commissioners how that definition came into being? In other words, why do we have the three-part definition?

A. Well, first of all, we wanted to make it practical with respect to the oil and gas ratio, that would give us an indication of how much oil was being produced relative to natural gas. And you can determine that based on your records right in the office.

Secondly, we believe that the higher the ratio of oil to natural gas, the more chance that there is for volatile organic constituents to be dissolved in the produced water at higher concentrations when there is enough oil or condensate produced by a well that will be recovered at the site.

And so we didn't want to merely have the oil to gas ratio be the defining factor because we could have a very high producing well that would produce large quantities of hydrocarbons, liquid hydrocarbons.

So the further limitation on that was

the equipment on site that would allow for the recovery of liquid hydrocarbons.

And lastly, there may be wells, such as coal seam wells, for example, which would fit the definition but would produce large quantities of produced water. And clearly that was a category of well that we did not want to include in this kind of a very restrictive but very applicable definition to a large variety of wells or a large number of wells in the San Juan Basin.

Q. Mr. Olson observed that free hydrocarbons could be a problem. How does the definition that you proposed for a dry natural gas well deal with that problem?

A. The free hydrocarbons being in a produced water pit or in a discharge to an area where there may be a threat to groundwater is indeed a problem and fully recognized by Mr. Olson and also recognized by the Four Corners Gas Producers Association in developing this definition. That's what we are trying to avoid.

We believe that this classification of wells, as we have created this restrictive definition, would preclude the discharge of liquid-phase hydrocarbons into the pits. And

indeed when we have studied and looked at the wells that we have, we don't see this discharge of free-phase hydrocarbons into the pits.

And that's part of the reason we wanted to create that definition, because we fully believe that the problem raised by Mr. Olson of free-phase hydrocarbon discharge into pits does cause the kind of contamination that everybody should be concerned about.

Q. Now, Mr. Olson also noted that eight out of ten of the wells you tested in your dry natural gas well study for Four Corners Gas Producers Association were located outside the boundaries of the proposed expanded vulnerable area.

Why did you test wells outside the boundaries of the proposed expanded vulnerable area?

A. Well, we defined -- at the last hearing we might remember that we defined the criteria that we utilized in the site selection process. The wells that fit this particular criteria, the definition is certainly part of the criteria.

We had to ensure that we could get access to these sites. We wanted to ensure that

there was an earthen pit at these sites. There was no point in going to a dry natural gas well that happened to have a fiberglass or a steel tank to perform our testing. And we had to make certain they were operational at the time.

And in order to do that and in order to minimize the cost of the study where we would not have to be driving literally hours between sites, we elected to select wells that were in a specific geographic area which shared the characteristics with the proposed expanded vulnerable area.

And that is the criteria that we used, and that's why some of the wells were indeed located outside of the existing vulnerable area.

Q. How do you justify the proposed exclusion for dry natural gas wells within the boundaries of the proposed expanded vulnerable area when 80 percent of the wells that you've tested are not located in that area?

A. Well, first, two of the wells were located within the proposed vulnerable area. And that particular data from those wells certainly can't be challenged by any means in terms of its location.

Second, the remaining eight wells, they are located relatively close to this boundary of the vulnerable area. And we want to show a little bit more about -- there's nothing real magic about this boundary. It's selected on hydrogeologic means, but there's nothing magic about it.

Third, the soil sampling at the ten locations that we looked at indicated that the soils were indeed very similar between the vulnerable area and the area outside the proposed expanded vulnerable area.

You know, it's my opinion that the depth and the levels of contamination or hydrocarbons, I should say, shown in our testing program is representative of what I would expect to find at dry natural gas well sites within the proposed expanded vulnerable area.

Additionally, since the April 9 hearing, I collected some additional data from two natural gas wells, dry natural gas wells, which were located within the existing vulnerable area. And I did some groundwater sampling to test to see whether indeed groundwater had been affected in any way at these two locations. And

we'll discuss that a little bit more.

But the interesting thing or what I want to emphasize is that it doesn't matter where the dry natural gas well is. It's the nature of the discharge from dry natural gas wells that is important. We don't believe that soil type or other issues have a significant bearing on the process of evaluating the threat of dry natural gas wells.

Q. Mr. Hicks, now refer to what has been marked as Four Corners Gas Producers Association Exhibit No. 7, and would you identify it and describe its contents.

A. This is directly from the Soil Conservation Service survey. And I brought some copies of that survey, one for the Commission and one for the Division. Section 1 shows the Soil Conservation Service soils maps.

And I'd like to bring that public information forward because these particular maps in Section 1 are developed off of area photographic base maps, and it's difficult to see in this particular photocopy.

These documents are free, available from the Soil Conservation Service. Anybody can

go down and pick them up from the county. And it is public information. It's been around for quite a number of years.

Moving through this particular exhibit, you'll notice that we have a soils map which has many different classifications or identified soil associations. And we've mapped the well sites that we looked at that are within the vulnerable area. We can see this Bengal "B" 6 and Nassau 5-R on this first page, clearly within the vulnerable and in the same general area.

As we turn the page, you can see the limit of the vulnerable area. And Dugan Western Federal No. 6 is near the boundary of the vulnerable area. And we can see what soil type it's on, and we can be comparing those to the soil types that are within the vulnerable area.

The Dugan Claude Smith No. 1 is located maybe in, maybe out of the vulnerable area. Clearly it's very close to the line. We've mapped it as being just outside the vulnerable area. Probably need a surveyor to find out whether it's actually in or out.

The next page shows again the limit of the vulnerable area and the Dugan Redfern No. 2.

Its soil association is "FX." Sometimes these are a little bit difficult to see, but I do have that shown in Section 2.

The Wiedemer is shown with respect to the limits of the vulnerable area to show where these things are. The Dugan Designated Hitter No. 1, the limit of the vulnerable area can't be shown on this particular map because it is off the scale. But you would see in our original exhibit where the Dugan Designated Hitter exists relatively to the vulnerable area.

Red Mac, again the soils map, we can't map the limit of the vulnerable area. However, in our initial exhibit it does show the limit of the vulnerable area with respect to the location of the Red Mac No. 2. The same is true with the Giant Mandana State No. 2.

And so these maps, again, are publicly available information from the Soil Conservation Service. And you can corroborate the soil, the mapping, and the soil types are the same. They're direct copies from the Soil Conservation Service.

Now, what I've done in Section 2 is I've just outlined for everybody's convenience

the soil types as to which wells lie where. And the names of the soil types then are shown on the next page so that you can identify exactly what "DS" would mean. For example, "DS" is the Doak Sheppard Shiprock Association.

One can then compare, knowing the type of soil that it's in, we can turn to Section 3, and there are certain engineering descriptions of each one of the soil types. And again you can look at the soil types within the vulnerable area as well, and we can compare the engineering characteristics, which are shown in table 13.

The important things you might want to take a look at is the percentage passing, the sieve number, liquid limit plasticity. These may be important in terms of deriving or inferring some hydrogeological properties.

Additionally, the infiltration characteristics are shown in table 14. This indeed I've reproduced the entire table 13 of all of the Soil Conservation Service document.

Table 14 shows the permeability, inches per hour, which is really infiltration. They used this parameter to determine its acceptability for soil septic lines, some

chemical properties as well.

And so the point of this exhibit here is to allow the Commission and allow the Division and allow anybody who is interested to compare the soil associations of the locations of the wells that we've tested with the soil associations with the wells that are within the vulnerable area.

And I think that everybody will find, as I have found, that the basic engineering properties are the same of the soils' associations within the vulnerable area. I'd like to show one slide here for the purposes of showing what this vulnerable area boundary is meaning.

This clearly shows -- there we go. Now it clearly shows. We have a boundary of the vulnerable area crossing soil types, soil associations. This is a boundary based on the distance above the channel.

These soil horizons are based on a lot of different characteristics including slope. The difference between SD and SC, for example, right across here with respect to the its engineering properties, you can't tell them apart

with respect to the hydrogeologic characteristics.

Indeed you'll see that this crosses SD and comes into another soil association, crosses in RA. And we have a wide variety of soil associations that are in the vulnerable area and across the vulnerable area.

When you look at SM up here, for example, and compare the characteristics of the SM, which is a Shiprock, I believe, soil association, you'll find out that it compares very favorably with what exists down in the vulnerable area.

Additionally, you would notice that one of those wells that was mapped as an FX series that exists within the vulnerable area here is FX down in here. And indeed we see it outside the vulnerable area as well.

So the point of this particular slide is to show that indeed we have got a boundary that crosses the soil horizons, the soil associations, and the soils that we're dealing with here, the depths of which are greater than several feet in many instances, as you'll see from the table, show that we have a similar

environment with respect to soils. And, of course, soils is something that we were very concerned with in this study.

Q. The soil samples taken at the ten dry natural gas well sites showed contamination at one site, I believe. I believe, however, that you did not provide any direct evidence of the presence or absence of groundwater contamination at any of these sites.

How can you state with any level assurance that groundwater has not been contaminated at these sites?

A. Well, at one site and here we have a discrepancy. And I think at one site we did find the presence of BTEX constituents in the soil exceeding what we would call recommended levels, recommended levels when you look at underground storage tank remedial action procedures or when you look at the proposed closure guidelines presented by the Oil Conservation Division. We found one site where these levels were exceeded.

The empirical evidence that has been developed at underground storage tank sites in New Mexico and elsewhere demonstrate to my satisfaction that where the soil hydrocarbon

concentration is below 100 ppm that this particular concentration, total petroleum hydrocarbons, does not pose a threat to groundwater quality.

This is why these regulations and policies permit leaving these particular soils in place when it's less than 100 ppm. I believe that is why the NMOCD has also adopted a 100 ppm value as a part of their definition for contaminated soil.

And I think that I might want to just talk a little bit about what contamination means. But we'll get to that in a little bit.

Q. Mr. Hicks, in direct testimony I believe Mr. Wallace said that your dry natural gas well study documented soil contamination at the sites or at sites outside the expanded vulnerable area.

Do you agree with this characterization of the results of your study?

A. No. The study shows that no soil contamination was found in nine out of the ten wells tested. In my opinion, if we were able to drill a little bit deeper at the Claude Smith No. 1 well, we would have found the limit of what I

would define as hydrocarbon contamination at that site.

Q. Is this just a matter of semantics?

A. I believe it is in that the soils at most dry natural gas wells have some associated hydrocarbons with them. The hydrocarbons are there, but these concentrations are below any established action levels.

In my definition these soils are not contaminated, per se. We can use the same example of chloride. Chloride exists in the natural environment. We see it in groundwater. We also see chloride levels that are below action limits or below standards.

Where chloride is present in groundwater, we don't call it contaminated. When chloride is present at levels above action limits, above standards, we generally indicated that the soil, or in this case the groundwater that we're talking about, is contaminated if we can identify a source.

And so I think that the relationship between standards and action levels needs to be fully considered when you start using the term "contamination."

Q. Is your definition of contamination consistent with the environmental regulations currently in place?

A. Yes, I believe it is.

Q. In further direct testimony Mr. Wallace implied that your study was incomplete because you didn't sample and test groundwater. And he further stated his assumption that groundwater must be relatively close in those cases.

What was the purpose of your study?

A. As indicated before, we wanted to find out if this particular classification of gas well could cause contamination at all, and if so, to what depth in the soil horizon would contamination be observed.

Q. To accomplish that purpose, was it necessary to sample and test groundwater?

A. In my opinion, no.

Q. Do you have an opinion as to the depth to groundwater at the locations of the ten dry natural gas wells you included in your study?

A. Yes. The depth to groundwater at these locations would probably be anywhere between seven feet, six feet below land surface and one hundred feet below land surface.

And I would imagine that where we took these samples the average depth to groundwater would probably be between thirty-five and fifty feet.

Q. What is the basis for your estimate of the depth to groundwater at these locations?

A. I've had a lot of experience in the San Juan Basin, and I've drilled a lot of monitor in sites throughout the area.

Q. Mr. Hicks, would you refer to what's been marked as Four Corners Gas Producers' Exhibit No. 8 and identify it?

A. Yes. This is the results of the study that I discussed a little bit earlier where we sampled groundwater at two sites. And I want to make it clear to the individuals that we used two sampling type techniques.

If you turn to the maps, you'll see that the Likins B-1 well is very close to the San Juan River. It's the first map. It's in the lowland area, and it's clearly within the existing vulnerable area.

In the next well, the next page, we sampled Bengal B-6, which is in the proposed expanded vulnerable area. And it's up on the

side of the arroyo.

In the Likins B-1 well, the pit, the produced water percolation pit was an evaporation pit, produced water pit, was excavated into groundwater.

Actually the water that existed in the pit was a surface expression of groundwater. So the discharge from this particular dry natural gas well went from the unit, the equipment on the site, directly into a surface expression of groundwater in the pit.

And the Likins B-1, then, we sampled the pit, and we found no detection of any of the volatile organic hydrocarbons of interest.

At the Bengal B-6 well, which is one of the wells that we unexpectedly hit groundwater at seven feet. It was not our intent to select wells where we would encounter groundwater.

One of the points of our study was to determine the effect of soils in remediating the discharges prior to its hitting groundwater. And so this was something that we didn't expect, and we really didn't -- kind of interfered with our work in some way. But we did hit groundwater.

The groundwater that was intercepted in

the construction of the boring at Bengal B-6 is in no way related to the groundwater that is in existence in the adjacent wash, which I believe is the Gallegos Canyon.

The water that we intercepted at Bengal B-6 is probably coming from the Navajo irrigation project adjacent to this site. But nevertheless it did represent infiltrated groundwater, water that was in the ground moving across the site.

And we elected to determine whether the discharges from this well could have impacted this water, which clearly would not have volatile hydrocarbons associated with it.

And we find that toluene was shown as -- that should actually be in micrograms per liter. It is indeed parts per billion in both of these cases. So that we see toluene from Bengal B-6 at 1.4 parts per billion, well below the action limits standards for groundwater quality in the state.

This clearly shows that we've got -- indeed we found higher levels of contamination, I should say hydrocarbons -- I'm slipping up now -- higher levels of hydrocarbons in the soils above this groundwater. And we find that groundwater

indeed did show some hydrocarbons, but they were below standards.

And indeed at this particular site we have a certain level of corroboration that groundwater is not impacted by this discharge from dry natural gas wells. The same being true with Likins where we have a direct discharge from the equipment into groundwater. We do not see any contamination from this particular type of discharge.

Q. Why did you take these samples?

A. Basically we wanted to address the concerns of Mr. Wallace and maybe concerns that others may have concerning the lack of groundwater data.

Q. Was the sampling testing protocol consistent with the guidelines followed generally in the industry?

A. Yes. We followed the protocol that was acceptable and quality assurance and cleaning, decontamination was consistent.

Q. Have you fully, to your own satisfaction, stated the conclusions that you have drawn from the results of this sampling and testing program?

A. I think that these data do show that our earlier conclusions based on soils analyses are further supported and that groundwater is not impacted by these kinds of discharges from dry natural gas wells.

Q. How do the results of the dry natural gas well sampling and testing program relate to the proposal that you have submitted on behalf of Four Corners Gas Producers Association for an exclusion of dry natural gas wells from the operation of the order?

A. Well, there's no evidence that these wells, dry natural gas wells cause groundwater contamination. In fact, it seems like the available evidence that we've been able to collect indicates that these types of wells do not cause groundwater contamination.

In addition, the available evidence indicates that these wells do not cause soil contamination which could constitute a threat to groundwater. And in my opinion these wells, this classification of wells should clearly be eliminated from the inclusion in this order.

Q. I want you to direct your attention once again to your ten dry gas wells study.

Those results indicate soil contamination at one site at a depth of 4.8 feet.

Now, if groundwater at that site had been found at a depth of approximately 4.8 feet, would you have expected it to be contaminated?

A. If there was groundwater in existence in contact with this particular soil at 4.8 feet, it is possible that the groundwater would be contaminated.

However, it is my opinion that at this particular site the groundwater is at a depth much greater than 50 feet and was not in any way endangered. And I think that's an important point to bring forward.

Q. Well, if it is possible that contamination above standards might occur, then how do you justify the request for an exclusion for all dry natural gas wells located in the proposed expanded vulnerable area?

A. In my opinion, the depth to groundwater in the vast majority of the proposed expanded vulnerable area is much greater than five feet. As I testified earlier, we did have up-hole contamination.

We do see at this particular site, we

see a lessening of the hydrocarbons in the soil samples as they were extracted. We also hit auger refusal. We could not get any deeper because of the bedrock conditions and low permeability shales that we intercepted at this site. We were in sands. We were not able to get any deeper.

So combining the fact that the proposed expanded vulnerable area generally has a depth to groundwater of greater than five feet and the fact that only one of these ten wells that we studied showed any level of soil contamination that would be of concern at any depth clearly reduces the possibility or the probability of groundwater contamination at these sites.

The interesting thing about the Claude Smith well is that we did have, as I indicated, bedrock conditions. And we have very low permeabilities in a precluded deeper sampling due to the consolidation of the rock.

I believe that the material was trapped within this particular low permeability area and would not migrate any distance at all. And this particular site, while it may have contamination, in my definition, the low permeability would

preclude it from moving from the site even if groundwater were at 4.8 feet.

Q. Why do you not ask for an exclusion for dry natural gas wells located within the boundaries of the existing vulnerable area?

A. As I testified earlier, in my opinion that kind of a total exclusion may be justified. However, there is a large population base in the existing vulnerable area, and the risk to human health is greater there.

It is the position of the Four Corners Gas Producers Association that all environmental regulations should be applied based on the consideration of the probability of contamination and the risk to human health and the environment.

And in that spirit the Association requests an exclusion only for the dry natural gas wells located in these lower risk areas where the human health issue provides a much lower risk.

Q. Mr. Hicks, I want to try to give the Commissioners a feel for the magnitude of the proposed exclusion. Do you have an estimate of the number of dry natural gas wells that fit your

definition that would be located within the boundaries of the proposed vulnerable area?

A. Yes, and it's quite a bit larger than I originally thought it was going to be. We looked at the NMOCD Exhibit No. 7, which lists the potentially impacted wells by this order submitted at the January 16 hearing. And according to this exhibit, there were 7,250 wells that may be impacted by this order.

Of this number, 7,250, approximately 2,150 of these wells are producing from the Chacra. Excuse me, that's not right. But I think in the Fruitland Sandstone there's 69; and in the Pictured Cliffs, there's 1805; and in the Chacra, there's 276, which brings me a total of 2,150 wells which are producing from formations which would be considered dry natural gas well formations.

So looking at the percentage, the wells that could potentially satisfy our definition for dry natural gas wells are 30 percent of the total number that may be impacted by this order.

And I believe that this percentage of 30 percent is applicable throughout the expanded vulnerable area. We're only asking for an

exclusion within the expanded vulnerable area, not the existing vulnerable area.

But looking at the percentages, it's my opinion that 30 percent of the wells within the expanded vulnerable area will be classified as dry natural gas wells according to our definition.

Q. The order that has been proposed by the Oil Conservation Division contains language that would permit industry to submit applications for variances.

Why does Four Corners Gas Producers Association propose an exclusion for dry natural gas wells rather than simply applying for a variance?

A. In my understanding of the variance procedure, we have a rather burdensome process that we would have to go through considering the evidence that we brought forward here.

We believe that for my clients alone the NMOCD may have to rule on a variance request for dry natural gas wells from 30 companies for sites that are throughout the proposed vulnerable area.

This is going to generate quite a lot

of paper and require a lot of manpower on the part of industry, but also on the part of NMOCD to process these applications.

In my opinion, this is a dilution of the resources, especially when we have presented what I believe is convincing evidence that dry natural gas wells to do not create a threat to human health and the environment.

And at this moment in time we have all the parties present to create -- to examine the evidence and create a process of an exemption for these dry natural gas wells. And I believe it would save a lot of time and a lot of burden.

Q. Mr. Hicks, at this point I'd like to move to another line of questioning. At the April 9 hearing, one of the Commissioners asked about the relationship of hydraulic conductivity to permeability.

And I'd like to have for the record a clear correlation of hydraulic conductivity to permeability. Could you tell us what that relationship is?

A. Well, simply put, the permeability is a formation characteristic. The unit of which is used by petroleum engineers is generally darcys

or millidarcys. And hydraulic conductivity is essentially permeability but modified to account for the viscosity and density of the fluid that's throwing through it.

Rather than making a separate calculation to the effect of these factors, we use the term "hydraulic conductivity." Different factors are used for hydraulic conductivity. We can use gallons per day per square foot or feet per day.

Conductivity as measured is approximately two-and-a-half times the permeability in darcys for common shallow aquifers.

Since the viscosity and density of water are variables and dependent upon temperature, conductivity in feet per day can be shown as a function of the aquifer's permeability and the water temperature.

This relation is shown in our next exhibit, Exhibits 9 and 10, which are bound together. They show the mathematical relationships that exist between darcys and the commonly used units of hydraulic conductivity.

The purpose of this exhibit, both of

these Exhibits 9 and 10, is to provide the Commission, who generally works with darcys, the relationship between some of the terms that we're using here.

Graphically we are showing how the temperature has an effect on the ratio of hydraulic conductivity and permeability with respect to the hydraulic conductivity in darcys and some of calculations that we did to show this temperature relationship.

The viscosity versus temperature graph shows why we see this impact. Data tables of viscosity and specific gravity and some information presented and fluid flow through reservoirs.

And on page 1 of Exhibit 10, which is a straight line graph showing the maximum transport distance in 20 years, where we're talking about permeability in darcys, we'll talk about this in a little bit.

But again this is helping to show how transport distance in looking at permeability with respect to darcys is going to relate to the hydraulic conductivity values that we've been talking about earlier.

Q. Is it accurate then to say, if you know, the soil permeability you can calculate the conductivity and from that estimate the maximum transport distance with time?

A. Yeah. Knowing the permeability and the other characteristics that are necessary, you can calculate the maximum transport distance with time.

Q. Is it also accurate to say that the maximum transport distance is a function of aquifer velocity, which is a function of permeability?

A. Yes, plus the other factors of attenuation. But velocity is a key factor parameter in determining the transport distance of any contaminant or species of concern.

Q. Would it also be fair to say that there are many parts of the proposed expanded vulnerable area in which the potential aquifer would be of low permeability?

A. Absolutely.

Q. Now, one such area was described by BCO at the April 9 hearing. In your opinion, is it likely that there are other similar areas?

A. Yes. I believe that we would find many

areas within the San Juan Basin by looking at geologic maps where the existing or the proposed expanded vulnerable area would have low permeability units.

Q. Now, you previously referred to Four Corners Gas Producers Association Exhibit No. 10, which I think is a graph depicting maximum transport distance. I take it that you've done work with respect to maximum transport distance for various ranges of permeability?

A. Yes.

Q. Now, what --

A. This work that we did is summarized in page 1 and subsequent pages as well. And it shows the maximum transport distance at the end of 20 years. And we've plotted that versus the permeability in darcys to, again, give the Commission a feeling for what we're dealing with with respect to darcys and transport distances.

For this particular example, we wanted to use the same hydraulic conductivity that we had been using in this hearing of .003 in the model. And we can plot then that the unit of 250 feet per day of hydraulic conductivity is about a value of 100 darcys permeability value.

So you can plot, just using the simple equation that is shown on this graph here, where after 20 years of transport where a molecule of water may exist after 20 years of transport under these conditions. And you'll see that it's about at 16,500 feet.

And the interesting thing about how you read this graph is that the permeability in darcys on the left-hand side, where we have .01, .1, and 1, you can pick your permeability. And you move over to the right, when you intersect the line, you move up and you can find the transport distance.

On the right-hand axis of this same graph, you'll see that we have 1, 10, and 100. And for those particular units of permeability, you move to the left over to your line, and you move down to find out what your transport distances are.

And again I want to emphasize that the point of this particular exhibit is just to give the Commission a feeling for transport distances with respect to how darcys relate to the equations that we've been using.

Q. Now, using your example, does that mean

that the contaminant concentration will be 30 parts per million at the maximum distance?

A. Absolutely not. All of the attenuation mechanisms which we've discussed, such as volatilization and biodegradation and dilution, will work to reduce the concentration at the leading edges of any contaminant plume.

This is just the greatest distance that a molecule can travel based on this equation.

Q. At the April 9 hearing BCO testified that their pits were in areas where the formations were quite shaley. What permeability range would you think shaley formations would exhibit?

A. A millidarcy, couple of millidarcies, maybe even less than one millidarcy.

Q. Let's take an example of 100 millidarcies. That would be the equivalent of one-tenth of a darcy, would it not?

A. Yes.

Q. Assuming the same porosity and hydraulic gradient value as was used in the Southwest Research Information Center model, which I think was .003, what would be the maximum transport distance in 20 years for water flowing

through an aquifer having permeability of one-tenth of a darcy referring to your maximum transport distance graph?

A. Okay. Using one-tenth of a darcy, which is on the left-hand scale, move over to where you intersect the line and move up, and I believe we're somewhere between 13 and 17 feet of transport distance using that particular example of one-tenth of a darcy. And that's after 20 years of transport.

Q. Are you implying that contamination, if it occurs, will only travel a maximum of 17 feet in all cases?

A. No. No. There are certainly documented cases where aquifer permeabilities are much higher than one-tenth of a darcy.

Additionally, in low permeability areas the sheer volume of the discharge would displace the water in the water bearing zone such that it could move greater than 17 feet. This is what the second graph shows.

This is, again, it's to give the Commission an idea of what may happen in very low permeability areas, extremely low permeability areas in this particular case, where we were to

inject, for example, as we see in the left-hand column, one barrel of water per day.

In 20 years you can find -- you can move over to the 20-year plot that we have here, and we can see that indeed the average radius would be about 30 feet. And this is simply by using -- I believe the calculations are behind it.

It's just merely that the discharge will fill the pore space in the rock or in the unit and displace the water that's in it. The sheer volume will cause the transport of fluids greater than 17 feet in this particular case.

And again I just want to say that the purpose of this is to show not only the relationship of hydraulic conductivity in darcys, but in very low permeability areas, the transport distance is going to be minimal.

Q. Earlier you testified that some parts of the proposed expanded vulnerable area would have potential aquifers that would be of low permeability. And I believe you identified the BCO area as one of those areas.

Mr. Olson's study showed that wells with small volumes of discharge produced water

could carry volatile hydrocarbons into the groundwater.

And although I'm not indicating that we accept SRIC Exhibit No. 11 as accurately stating the facts, if one accepts Mr. Olson's study and the SRIC exhibit, there is an implication that contamination from small volume water produced water pits can cover large areas.

Is it not true that the only way this can occur if it does in any circumstance is in an area of high permeability?

A. Yes, I believe that's true. If the permeability is low, then the affected area, if any, is going to be small.

Q. Now, SRIC's Exhibit No. 11 depicts the results of the modeling run by Mr. Wallace. Are you familiar with that exhibit and the results?

A. Yes, I am. It's the SUTRA model. And if properly calibrated, it can rigorously and accurately simulate the natural transport and remediation processes.

Q. What do you mean by the phrase that you used, "if properly calibrated"?

A. Well, a simulation model is just a group of equations that theoretically can

calculate the effect of natural processes. It can predict what may occur.

Each equation that is used in the model has a number of input parameters. In addition, each one of these input parameters may have a wide range of possible values that may represent different conditions that would exist in the field.

With so many variables that exist in models, it's important and imperative that the modeling results be compared to actual field data to provide any level of confidence of the model's particular accuracy.

In other words, the model must be history matched before it can be used to predict what will actually happen.

Q. Did SRIC do this with the SUTRA model in your opinion?

A. Not to my knowledge. I did not see any evidence of a history match.

Q. What is your opinion of the input parameters used by Mr. Wallace in the SUTRA model?

A. Well, I agree with Mr. Olson, that most of the parameters that were used by SRIC are

within the range that are possible in the field in the San Juan Basin. However, many of these values, in my opinion, were on the conservative end of the scale for each one of those variables.

And when we combine this conservative approach, we maximized the projected contaminant transport distances. For instance, the hydraulic conductivity of 250 feet per day is representative of a well-sorted coarse sand which would be found perhaps in some areas of the immediate river bottoms where Mr. Olson indicated that might be the case and perhaps in some coarse-grain well-sorted areas in the proposed expanded vulnerable area. But it clearly is not the average or the -- what we might call typical.

The conductivity would drop by orders of magnitude when you get into poorly-sorted fine-grain sand. And much of these particular kinds of sediments may be found in some of the ephemeral washes of the proposed expanded vulnerable area where claystones and shales provide much of the sediments that feed into these particular alluvial courses and we get a

poorly-sorted unit.

Q. What types of hydrogeologic conditions exist within the existing and the proposed expanded vulnerable areas?

A. Well, various aquifer conditions exist. As I indicated earlier, you're likely to find well-sorted coarse sand in portions of the immediate river bottoms. And you're likely to find poorly-sorted fine-grain sand in many portions of the ephemeral washes. And it's common to find that the soils are primarily clays in much of this area.

Q. Now, getting back to the SRIC SUTRA model, in your opinion, are there other examples where the input parameters used by SRIC were overly conservative?

A. Well, I think that the loading value of 2.5 barrels per day is representative for a number of situations in the San Juan Basin. But it is pretty high for the average conventional gas well.

You should note that most of the coal wells which produce large volumes of produced water have been completed recently. And they all use tanks to contain this produced water instead

of unlined pits; whereas, the unlined pit wells are generally less than 2-1/2 barrels per day.

And another, in my opinion, conservative assumption in the SUTRA model used by SRIC is the 30-foot thick aquifer zone to portray the area which I believe that they were modeling, which was the existing vulnerable area, the major area, major river areas.

In these river valleys, I believe that where the conductivity is representative of 250 feet per day, that the aquifer thickness might be significantly greater, perhaps as much as 100 feet thick.

And when you utilize that much of an aquifer thickness, you're going to create significantly more dilution from your discharges.

Q. Is it your testimony then that the SRIC model is not representative of the typical field conditions that you would expect to find existing in the existing vulnerable area and the proposed expanded vulnerable area?

A. I think that there may be a few isolated situations, which perhaps by accident the model actually does create a history match;

however, it certainly doesn't represent the majority of the pits in the existing or the proposed expanded vulnerable area.

And I'm not prepared to say that there is any area where the model would represent actual conditions. There may be one or two. I can't -- I don't know.

Q. Would you agree, however, that by running the saturated model SRIC was trying to show that once an aquifer is contaminated that that contamination may travel great distances?

A. That was the inference that I got that that was indeed the purpose for running the saturated model.

Q. Now, I'd ask you to refer to what's been marked as Four Corners Gas Producers Association Exhibit No. 11. Figure 11.2, which is attached to that Exhibit No. 11, indicates that after five years the contaminant was present in concentrations of .15 parts per million at a distance of 1,000 feet from the source and in concentrations of 1.5 parts per million at a distance of approximately 600 feet from the source.

Now, I want you to assume that figure

11.2 represents typical field conditions. Based on that assumption, what other realities would you expect to see in the field?

A. Well, the graph that we're talking about in our Exhibit 11 is the -- we see it here with some other calculations on it, but this is a reproduction, if you will, it is -- why don't we show it.

This is how the SRIC model would look reproduced here, and we'll talk a little bit more about this exhibit. But indeed this is about 1,000 or 1,500 feet from down here in the bottom to the top where we've got 1.5 ppm. We did modify it slightly, and I'll get into that in just a little bit, why we did a slight modification to it.

But to answer your question, I don't believe that this representation of a plume represents typical field conditions at all. If I were to assume that it did, that this 1500-foot worth of transport, that that was actual, in my opinion we would see numerous cases of freshwater wells and springs that have been contaminated, grossly contaminated by BTEX constituents.

Q. Do you have an estimate of the number

of unlined pits located in existing and proposed expanded vulnerable areas that have received discharges of produced water for periods in excess of five years?

A. I don't know the exact number, but I think it would be safe to say that there's several hundred, if not thousands, of such wells that have received produced water into unlined pits for a period exceeding five years.

Q. Do you have an estimate of the number of freshwater wells or springs that exist in these areas?

A. Again I don't know. But I've traversed the area quite a bit, and in my opinion there are perhaps hundreds of wells and springs within the existing vulnerable area.

Q. Do you have any knowledge of the number of freshwater wells and springs that have been contaminated from produced water sources?

A. I personally know of only one well that has been contaminated by the discharge of produced water into unlined pits at a well site.

Q. Would you or could you describe the documented facts or summarize the documented facts with respect to that one case?

A. The one case that I'm aware of is indeed the case that we've talked about for quite a number of years at Flora Vista, the Manana gas well, where it's my understanding that there was quite an upset with respect to the dehydrator unit, which was receiving free-phase hydrocarbons from the oil-water separator at the site, and that this particular dehydrator unit discharged free-phase hydrocarbons into the associated pit.

Q. Is it likely that there are other cases of produced water contamination of freshwater wells or springs of which you have no knowledge?

A. Well, I honestly do not believe that it is very probable. And the reason I say this is it's -- the user of water from a freshwater well or spring typically will report benzene, toluene, ethyl benzene types of contamination if it exists.

The principal reason for that is that the odor and the taste associated with volatile hydrocarbons, your nose and your mouth are very sensitive to that. And we've seen that anybody that is used to drinking good quality water, when they come in contact with one which has been contaminated by volatile hydrocarbons, they know

it.

And we see this empirically from the underground storage work that has been done over the past ten years where individuals have clearly reported problems associated with volatile hydrocarbons in their wells and have been traced back to underground storage tanks.

This particular kind of contaminant does lend itself to detection by, I'll use a 25-cent word, organoleptic detection methods, meaning your nose or your mouth.

Q. In your opinion is the documentation of produced water contamination at this one site, freshwater well or spring, is that consistent with the assertion that what we're seeing in the SRIC model represents typical field conditions?

A. No. Again, if the SRIC model, saturated model, is representative of typical field conditions, I would expect to see a lot more documented cases of water, freshwater wells and springs, associated with produced water at well sites.

Q. Refer back now to Exhibit No. 11 again, and this is Four Corners Gas Producers Association Exhibit No. 11. And that exhibit

indicates approximate underground water flow velocity of two feet per day. I'm sorry. I'm going to refer you to SRIC Exhibit No. 11, which indicates this flow velocity of two feet per day.

Now, Mr. Wallace stated that this rate is consistent with other published work on groundwater flow in alluvial systems in the area. And in fact he stated that GCL looked at velocities higher than this. And he indicated that two feet per day was a conservative input parameter.

In your opinion is groundwater flow rate of two feet per day what you would expect to find throughout the existing and the proposed expanded vulnerable area?

A. It may be conservative by certain people's definition, but in my opinion it does not represent the conditions which would be observed in many -- the majority of the areas of the proposed existing vulnerable area or the proposed expanded vulnerable area.

I believe that it would probably match conditions where we find very coarsed-grained cobbles, alluvium in the Animas River and some

coarsed-grained sediments in the San Juan and other major rivers within the vulnerable area.

The rate of flow at two feet per day may be observed in restricted areas of the expanded vulnerable area where we have a steep hydraulic gradient.

Q. How far could groundwater flow in 20 years at a flow velocity of two feet per day?

A. 14,600 feet.

Q. Now, if the hydraulic conductivity value was one-tenth of the value used by SRIC in its model, what would be the maximum down-gradient transport distance?

A. The maximum distance for a water molecule that is not attenuated would be 1,460 feet.

Q. So we can calculate that further, and if the hydraulic conductivity is one one-hundredth of that used by SRIC, then we would assume a flow distance of 146 feet, I would assume?

A. That's correct, for a water molecule that's not attenuated.

Q. Are there aquifer conditions in the existing or proposed expanded vulnerable areas

that would have conductivities several orders of magnitude less than what was used by SRIC in the model?

A. In my opinion, yes.

Q. In addition to hydraulic conductivity, Mr. Wallace mentioned in SRIC Exhibit No. 11 that dispersion and diffusion would affect the movement of volatile hydrocarbons dissolved in produced water.

I believe Mr. Wallace testified that the effects of dispersion and diffusion were factored into the SRIC model. I think he also indicated the model takes into account dilution resulting from underground flow.

What is your opinion with respect to the manner in which Mr. Wallace has dealt with these forces of diffusion and dilution in his model?

A. The movement of water affects the rate of diffusion such that volatile organic hydrocarbons, which are introduced at the top of the model, would in time and with distance, would reach the bottom of the aquifer through dispersion and chemical diffusion and other transport mechanisms.

The model, the saturated model assumes that if an aquifer -- or if a contaminant from a pit is -- the way I understand it, and I need to preface that, the way I understand how it works is if a contaminant from a pit is introduced at the top of the aquifer, it would diffuse and a water well that would be located adjacent to the pit and drilled into and completed in the bottom of the aquifer would show this evidence of contamination and because in this particular instance, I believe it's just a two-dimensional model. We're only dealing with one particular layer here.

Diffusion and dispersion are forces that try to equalize the concentration throughout an area. And they're greatly influenced by underground flow. If dispersion and diffusion were to take place in the model, as it is indicated, as it spreads out and moves down-gradient, then certainly dilution, and it's my understanding that dilution would also be recognized by this same model, so all of these forces would be utilized by the model to determine certain concentrations at certain distances away from the source.

And my understanding of that led me to believe that there's some inconsistencies within the figure 11.2 of SRIC.

Q. What is that inconsistency?

A. Well, we found in looking at that, we looked at a material balance problem, which is shown in our Exhibit 11 on the first page and is shown up here on the screen.

Moving through this, this shows some calculations that were done where we show the total barrels of contaminant in the SRIC model area to be 2.3 barrels at the end of five years.

Let's waltz through this a little bit. I'll show you how we did this calculation. We'll start down here at the bottom and move that up all the way.

What we did is we took a look at this particular zone of the SRIC model, which identifies the 15 ppm range, and we took a planimeter to it and found that the area associated with this area within this 15 ppm has an area of 13,000 square feet.

Now, the average ppm within this zone, we know that it's higher than 15 ppm here and at 15 ppm here. And we used, as the next page

shows, we used a logarithmic decline.

And we calculated-- estimated, if you will, that the average concentration within this area based on a logarithmic decline, which I believe would be 30 here, 15 here, we come up with 19.9 ppm as the average concentration of total BTEX components within this area.

So by knowing the area and the thickness -- there we go. Thank you. -- by knowing the area and the thickness of the aquifer, the porosity of the aquifer gives us the total volume of fluid that is impacted or that we're dealing with here, we multiply times the concentration in parts per million, we divide by the 5.6, which is the conversion between cubic feet and barrels.

And by utilizing that equation, we come up with a volume of total BTEX components within this zone of 4.8 -- I'm sorry, .48 barrels. We did the same thing for here. And we came up with a volume of BTEX components in this particular area of 1.46.

We did then the same thing for this area, and you can see that we did account through the subtraction, I mean the area throughout

here. We did not -- this equation, this calculation here subtracted out this mass, and we came up with .36.

And the original SRIC model showed, if I can go down -- give me the top of the model. The original model showed that we had some kind of a front moving across here. And we felt that it would be not logical to assume that all of this area out here was contaminated to an area of .15 ppm.

So we drew the plume back to conform with the plume geometries that were shown in the earlier -- or I should say in these higher concentration levels so that we wouldn't be counting molecules out here that may not exist.

And so when we calculated this, we came up with a total volume, which is shown on the bottom, that was through this mapping process of 2.3 barrels of total BTEX components.

And yet the source that we're dealing with here, it's our understanding that the source that we were dealing with in this model, this saturated, unsaturated model, the point that we were trying to make is to determine what happens at a discharge of 2.5 barrels per day. That was

what we understood that this model was supposed to be telling us.

And so we multiplied 2.5 barrels per day times 365 days a year times 5 years times the concentration that was given us in the model that was purported as discharge of 30 parts per million, and we came up with .14 barrels per day, or total barrels over that 5 years.

So we saw 16 times more total BTEX in the simulation run based on the concentrations than could have been put in there from the source that we were allegedly modeling. So I have a little problem with that.

This particular calculation of ours does not consider that 1 percent of the plume per day will be lost through biodegradation and volatilization. And so we're clearly -- the discrepancy here is rather significant when you consider that.

And so I believe that even with this high conductivity model, there's -- it doesn't match. It's grossly exaggerated the extent of the contaminant transport given the situation that we were supposed to be modeling.

Q. In your opinion is there other evidence

of inconsistency in figure 11.2 of the SRIC Exhibit No. 11 insofar as it deals with and illustrates these forces of dispersion, diffusion, and dilution?

A. Yeah. We looked at this, and we scratched our heads wondering exactly how this could exist. And we did figure out some things, and then we were provided with the new exhibit. And it helped us clarify some things a little bit more about how this model worked.

And it appears to me, and I think that it was confirmed in the information that was supplied by SRIC, that the model, the model cell or the node, which exists underneath the produced water pit, must have been held at a constant concentration of 30 ppm.

Given this constant concentration of 30 ppm, the water, the flow of water was then permitted to flow through this constant concentration and pick up contamination. And we created a plume down-gradient from that. That's my understanding.

And indeed I believe that this recent revision to the SRIC Exhibit 11 did confirm our hunch. And I'm sure Mr. Wallace will tell us a

little bit more about it.

Now, I have not run the SUTRA simulation. I did not do it. But I can say that a plume similar to 11.2 would probably be generated utilizing this 30 ppm constant concentration. I'm not disputing the model. The model works.

People in my organization have used SUTRA, and they utilize it presently. I don't have any question about the model. But I do have a problem with this particular method of holding this zone constant.

And when I say -- when I talk about this holding particular node or this unit constant, the way I understand it, it's holding the entire 30-foot-thick zone, the node underneath this particular discharge point is constant at 30 ppm.

I believe that this is -- this holding it constant at 30 ppm is based on the information that was presented by Mr. Olson where he showed that those concentrations do exist. But those concentrations exist in the upper portion of the aquifer, not throughout this entire, in this case, 30-foot-thick zone.

I think that underground storage tank sites and other sites of the release of hydrocarbons demonstrate that hydrocarbons are concentrated in the upper portion of the aquifer, and it does take a little while for it to spread vertically and laterally.

Assuming that the aquifer is a 30-foot-thick zone of contamination does not agree with what is existing in the field. This diffusion and mixing do not work instaneously.

They are not an instant process whereby a discharge of a produced water pit which would hit the top of the aquifer would diffuse and mix throughout the entire thickness, and therefore you see discrepancies by using Mr. Olson's data of 30 ppm as the concentration for the entire aquifer.

Q. Mr. Hicks, I believe you have a visual experiment here that would help illustrate the rate of diffusion in an aquifer. Could you very quickly describe this experiment and what it shows?

A. This is a, what? sixth grade science experiment here, showing diffusion. What we did is we got potassium permanganate dye, and when

the hearing began, we put a capsule of potassium permanganate in here and dropped a screen on top of it so that it would not float so that we could understand just how chemical diffusion would operate in an area where there is no impediment.

And indeed we see a coloration of the entire water column. We saw that actually within one hour. So we see that chemical diffusion, for example, in this kind of static environment would happen very quickly when there's nothing to impede its flow.

This particular experiment here, we filled -- we put some potassium permanganate in the bottom and put sand on the top of it, just fine-grained sand material, frac sand, as a matter of fact, well-sorted. But it is -- it's not clay. It's fine-grained frac sand.

And we poured the water in two weeks ago. And over a course of six days, we've seen this particular front, which you can see right up in here if you look close, over a period of six days, it's moved two inches.

And so when we have this porous media, diffusion works quite a bit slower. When we add -- now this is a static environment. This does

not represent -- I don't mean to represent this as being something that we would see in the field.

What I'm trying to represent is that chemical diffusion, for example, as one portion of the equation that is utilized in the model moves very slow.

I would assume that Mr. Wallace would testify that the sensitivity of the model to chemical diffusion is low. It is not sensitive to chemical diffusion.

Q. You indicated that it was your assumption that in the SRIC model that Mr. Wallace maintained that a constant concentration of 30 parts per million over the depth of the aquifer.

Now, in order to maintain that constant concentration beneath the pit, what would actually be required in the field?

A. Well, in the last page of our exhibit here, I have a little graphic. The way I understand -- again, I am making an assumption here that this is what's happening.

What we have is a zone that's 30-feet thick. And the way I understand it from the

revised revision is that the node underneath the produced water pit would be 150 feet wide.

I understand that it was discussing a 150-foot-by-150-foot grid that was at 30 parts per million. I'm not certain if I got that right. We'll find out later if I did.

But if we have a 150-foot zone that is perpendicular to groundwater flow and we have freshwater coming in, we know that the produced water is 30 parts per million.

So in order to created a constant concentration of 30 parts per million, we have to make sure that the produced water that is coming into this particular node that is held constant at 30 parts per million, that this water coming in displaces the water that's coming through.

And again what I'm -- these are the questions that I have about what's going on in this model. So I just -- we just calculated what the flow rate would be to try to get a feeling for exactly how much water would have to be input to displace this water so there wouldn't be any dilution and we could maintain this 30 parts per million.

So we found that in order to do that

for 150 feet, this model may be simulating a discharge of produced water of 600 barrels per day. And I believe that a discharge of 600 barrels a day of produced water would probably create a plume similar to what we're discussing here.

Now, before we got the revision of the SRIC Exhibit 11, we believed that the node below the produced water pit would probably be, you know, 12 by 12 because that was the size of the pit that was utilized earlier.

So we performed this same calculation that we see here for an area that is 30-foot-thick-by-12-feet, again to find out what we would have to do in the field to maintain that 30 parts per million.

And we came up with a 48-barrel-per-day discharge rate into the produced water pit in order to maintain this constant concentration.

And again I would not be surprised if 48 barrels per day put into a produced water pit under the conditions of the SUTRA model would probably create that saturated plume that was demonstrated.

Q. Mr. Hicks, are there other simple ways

to calibrate a model in addition to those which you've already discussed?

A. Yes. We can look at the history matches, and we can look at actual field conditions and what exists in the field and compare those to what the model is predicting and then make certain adjustments to the model.

I lost my place here. This simple calculation that we've performed here was just a check that was used to determine if the graphical results which were represented were actually representative of the field conditions. And looking at it, it looks like we're off by an order of magnitude or more.

Q. What other evidence have you developed concerning the calibration accuracy and applicability of the model which is the basis for the SRIC Exhibit No. 11?

A. That is the history matching that we show here as Exhibit 12.

Q. Okay. Please summarize your thoughts concerning SRIC's model and review the conclusions made based on your simple calculations.

A. All right. Let's go through this

exhibit that we have here. In Section 1 we show where these wells are. They're located within the existing vulnerable area generally. And these particular wells are wells that we have data on.

And I will say that the first location, which is the Riddle site, an investigation was done and submitted to NMOCD in 1988, so it's public record.

I admit that we looked for that public record in the OCD files, and we couldn't find it. But we did find a transmission letter from our company on behalf of Tenneco in submitting this and for Riddle then.

So that the record is complete, because I do not believe that Southwest Research & Information Center or others may have had the same advantage that we had because it was not in the OCD records when we looked. It is now. We did have the transmission letter to Commissioner Bailey, as a matter of fact so -- I don't know what you did with it, but anyway it is in the public record.

I'll give you the ones for Valdez "A" 1, which we also have a transmission letter

that indicates it was submitted to the Division. Amoco "GCU" 153-E. There's some available information, and I'll go through that. There is not a report on Amoco "GCU" 153-E.

Thomas No. 1, which is a Mobil site that is in a public record in the possession of NMOCD and the Valdez "A" 1-E also is a report that is in the public record for a site that we did for Tenneco.

These were the sites that have complete groundwater investigations or what I can consider complete. There's more wells around. I mean, Mr. Olson did several sites himself.

But we did not have a capture, if you will. We did not have the edge of the plume defined in any of the sites that we had. This is all of them that we could find.

The chemical data, again we're putting it into the public record now for that which is not in there presently, are here. These were all done pursuant to EPA techniques, protocol in the field. We sampled, H^{+}GCL -- or GCL at that time, sampled all of these wells at the dates that are indicated by the sample number. I can vouch for the accuracy of those sampling results and the

methods that were used.

And here's what we came up with. Let's twist this on the side, can we? For Riddle "FLS" 3-A, here we have superimposed the model of SRIC over the actual field data.

And we have here -- I've put it all in terms of parts per billion. So please make a mental note that previously we were talking about parts per million. I've translated it into parts per billion so that we can correlate it with the standards and correlate it with the results that we have.

We have a line of 150 ppb, SRIC model. 1-15/1000 -- I'm sorry. That's 15/100. This is 15/1000 parts per billion is the line here. And again keep in mind this is for 2.5 barrel per day discharge. "FLS" No. 3 is considerably less. Typical case.

But let's compare with what we see as a typical case with that which is the model, and we see a very small plume associated with the Riddle site.

This is from data -- these wells were installed after Mr. Olson did his work. And at the first sampling event at Riddle, we found the

same results that Mr. Olson found.

The up-gradient well showed levels of contamination which were of concern. When we developed the wells more and we did the second sampling of that, we found the levels -- we found higher levels down-gradient from the contaminant -- what we call the contaminant source, which was a produced water pit.

So we used a second set of data because we felt it was more representative, showed more of a worst-case scenario. And indeed we find a little bit of a plume indeed around here further corroborating what Mr. Olson has said.

He said that these small discharges can cause a problem with respect to the contaminated groundwater, further stating the fact that this is why Four Corners Gas Producers Association is saying that within the existing vulnerable area discharges should be eliminated, all discharges. And we don't have a big concern over this particular issue because indeed we're corroborating what is said.

The next site --

Q. Mr. Hicks, before you go on, let's see, I believe we show a 10 ppb line on the SRIC --

okay, right there on that exhibit. Where would that be on the SRIC figure 11.2?

A. Okay. We've got, let's see, 50, 150, 15, 10, out here.

Q. That would be the 10 ppb line?

A. Yeah. Maybe somewhere out here.

Q. Okay. Continue on.

A. We don't have anything about the construction of the wells for "GCU" 153-E. They were in when we got there. Amoco doesn't have the information. They were just installed. There's well completion diagrams in the last section for some of these sites, the ones that were available.

But we've taken the samples from these wells. We know that they're shallow wells. They may be completed more similar to how Mr. Olson completed his wells. They may be completed with 10 feet of screen.

But the important thing here is, again, this is where the former pit was. And here we have another present produced water pit. We've got a number of wells where the gradient is clearly defined. We have a zone of contamination that is greater than 10 ppb total benzene, total

BTEX.

Now, when I draw this line of 10 ppb, this doesn't necessarily mean things are above standards; it just means total BTEX. But it certainly would represent an area that would be of concern to the Commission and to the audience and certainly to ourselves. And so we've identified this here.

Again we show an area that is in the San Juan River Valley where we have very limited areas of concern. And I will use the word "contamination," but an impact of concern.

The next slide is showing much the same story for Valdez "A" 1. And again I want to emphasize these are discharges of less than two-and-a-half barrels per day.

These are the areas that have been reported to the OCD as problems areas, if you will. These are the areas that were located on Olson's report as having contamination and that have been re-examined by the industry to determine the extent of the contamination.

Again, a zone of concern. This time we're seeing it get a little bit bigger in this case in Valdez. It's up near Bloomfield. It's

on the San Juan River. Higher concentrations, again confirming what Bill Olson has found, but certainly far less than the model.

I find this one to be particularly interesting at the Mobil site. Here we have a produced water site. And here we have a line leak of free-phase hydrocarbons several years old. The plume has only moved so far.

High levels, 69 parts per million. High levels. Very -- we want to be concerned here. We have probably there's a free-phase floating hydrocarbon plume associated with this particular one.

At this site, again that I think is typical of the San Juan River Valley, there's a lot of irrigation around this site. The other sites that we showed were not in areas of heavy irrigation.

In this site we do have, in my opinion, a limitation of this plume because of the heavy irrigation and the input of oxygenated nutrient-rich water, which happens throughout the basin throughout the vulnerable areas.

This particular site does not have significant irrigation, but it's interesting to

show again that under the worst-case scenarios of the leakage of free-phase hydrocarbons from a condensate tank, the plume at 10 ppb here compared with the plume of 10 ppb by the model out here. And I think that that's what we want to show with that particular case.

And the last one is from the Valdez "A" 1-E. An older site, it has some history to it. It would be good for the Division and good for the Commission perhaps to spend some time later going through how the history was developed on these particular wells.

This is the contaminant source that no longer exists here. These are the complete data sets of a couple of months ago. And it shows the length of the plume of, what? 350 feet.

Again we have areas of concern in here. This exceeds standards. It confirms once again that these areas in the existing vulnerable area demand protection and confirms what Mr. Olson had been doing with his report.

But again what we're trying to point out here is that the differences between 10 ppb really in the field from a typical area, typical production, granted less than 2.5 ppb, and that

which is purported to be representative in the model.

And what we're -- we bring this up because we want to ensure that the Commission understands the severity of the problems that are really out there.

Q. Mr. Hicks, with this data you've illustrated on these graphs available to you on April 9, did you have the data that you have represented here on April 9?

A. Not all of it, no. Some of the public information data were clearly 1988 that we had. But some of the data is indeed prior to the 9th.

Q. Okay. Now, as a point of clarity, Exhibit No. 12, Section 2, contains data in tabular form. And it refers to dry gas well water disposal sites. That is not accurate, is it?

A. That's what you call a typographical error.

Q. Do you want to, for the record, label that appropriately?

A. It should just read, "Chemical Data of Groundwater at Selected Gas Well Water Disposal Pits." So if you cross out the word "dry,"

you'll have it as it should be because none of these were dry gas wells.

Q. Do you have any other observations to make about the Four Corners Gas Producers Association Exhibit No. 12?

A. Probably. Well, the SRIC model, in my opinion, represents an unrealistic worst-case scenario where we have a high water loading situation in the heart of a river valley an alluvium of high conductivity.

The transport distances, which were projected by the model, were not adjusted to conform with reality, the reality of what exists in the field.

In addition, I believe that the SRIC figures attached to the Exhibit 11 exaggerate the problem even beyond that of a worst-case scenario. Therefore, I don't believe it's representative of the existing proposed expanded vulnerable area.

The evidence that we've presented shows that conditions exist within the vulnerable area that will limit the contaminant transport if it does in fact ever reach an aquifer.

Again, the Four Corners Gas Producers

Association recognizes the potential for problems in high risk areas and it supports the need to address these situations. But the Four Corners Gas Producers Association maintains that those problems are limited in number and scope.

And, therefore, the Four Corners Gas Producers Association believes that any order issued in this case should not only allow for variances on a well-by-well basis, but also variances on an area-wide basis or a variance based on the type of well that exists.

In addition, we believe that the extension of time required for the elimination of discharges is indeed warranted in these lower risk areas, the proposed expanded vulnerable area, which represents a lower risk to human health and the time factor -- that extension of time is fully defensible and warranted.

And certainly we should be given the opportunity to identify additional areas where variances are justified.

Q. In response to a question asked by Commissioner Bailey on April 9, Mr. Wallace testified that the parameters that he used in his model would fit the existing vulnerable area and,

to the best of his knowledge, the proposed expanded vulnerable area. Do you agree?

A. No. For all the reasons I've discussed, I don't agree that it is representative.

MR. ROBERTS: Mr. Chairman, we probably have about 20 minutes of questioning left.

CHAIRMAN LeMAY: Let's go. We're going to stay here until we finish this witness.

MR. ROBERTS: Okay.

Q. (BY MR. ROBERTS) At the April 9 hearing, Mr. Shuey testified that the 24 sites listed in SRIC Exhibit No. 2 are the only sites listed because they are the only sites for which there is documentation in the public records.

Now, why are the wells listed in SRIC Exhibit No. 2 the only wells documented in the public record?

A. If you take a look at that particular exhibit, you'll see that 15 of those well sites are Amoco-Tenneco wells and 4 of them are Meridian-El Paso Gas Company wells.

And I've spoken with the representatives from those companies, and there are a lot more wells, well sites that they've

taken a look at beyond these 24. And there are no problems that exist at these other well sites.

The companies -- these companies have closed many of these produced water pits and have not identified problems. And thus, as a result of the lack of any problems associated with these sites, they haven't notified the Division of problems in soil or groundwater contamination.

Q. Has it been the historic practice not to notify the OCD every time a pit is closed?

A. That's my understanding. And we certainly support the order in the notification of pit closures. We don't have any problem with that. We believe that from now on, all pit closures should be -- the OCD should be notified of that.

Q. So that comment is limited to future closures?

A. That's correct.

Q. Now, if the Four Corners Gas Producers Association supports the provision in the Oil Conservation Division's proposed order regarding notification of all future pit closures, then why doesn't it feel it is necessary to document the

closure of pits previously closed?

A. Well, there's a number of reasons to deal with this issue of the previously closed pits. It's my understanding there's some legal constraints on this retroactive application of the rules. But I only want to address the practical and technical reasons.

And, first, if problems were noted on a pit closure, they were generally brought to the attention of the Oil Conservation Division. And so in my opinion there's very few cases out there where we've got nondocumentation of pits that have been closed where significant contamination which may impact groundwater would exist.

Secondly, we know that there are natural processes which are in effect that will limit the extent of contamination, biodegradation, and volatilization over time. So if the source is cut off, we know that those processes will act to limit any problems associated with these sites.

Finally, it's not been industry practice to keep records of these routine closures; therefore, the OCD may be asking for information that doesn't even exist.

Q. I want to ask you to clarify that a bit. If most pits don't have a problem, why does the Four Corners Gas Producers Association support notification on all future pits, not just the ones with problems?

A. Well, I think what we want to do is we want to build a real statistical, valid database where we can tell on all pit closures which cause problems and which don't so we can get a feeling for what the percentages are. And that way we'll have some data that we may be able to propose some additional modifications to the rules as these data are developed.

Q. What is your opinion with respect to the statistical analysis made by Mr. Wallace? And I believe that analysis is represented by his Exhibit No. 12, and it's based on SRIC Exhibit No. 2.

A. Well, I think the statistical methodology is fine, but using the sites that are listed in No. 2, SRIC Exhibit No. 2, to represent the entire population of wells in the San Juan Basin is off-base.

We've indicated that these wells all had problems with them or they were part of Mr.

Olson's study, which were in the existing area. And many, indeed six or seven of those, I believe, had problems associated with them and needed to be brought to the attention of the OCD.

So we've got a database here of 24 sites which represent problem areas. And to use that as a sample of a population and then to make a representation that it is -- that by performing statistics on that particular sample that you can predict what's going to happen with the entire population, it's similar to going down to the Police Department and looking at arrest records and then determining where there have been convictions and who's a criminal based on arrest records. And then saying, okay, 70 percent of the people who have arrest records are criminals; therefore, the entire population are criminals.

I don't think that the population within this room are 70 percent criminals. And I think that that's where the problem exists, is in the sample of the population that was utilized.

Q. At the April 9 hearing Mr. Shuey testified that in his opinion produced water should not be disposed into unlined pits, and he

asserted that industry recommends that practice. And in support of that assertion, he cited two passages from an API environmental guidance document that pertains to on-shore solid waste management in exploration and production operations.

Have you reviewed Mr. Shuey's testimony, and are you familiar with the API document I've just identified?

A. Yes, I'm familiar with it.

Q. What is your reaction to Mr. Shuey's testimony on that matter?

A. I believe that Mr. Shuey took the cited passages out of context. The pertinent parts of the text of this document are presented in our Exhibit 13. Again, Exhibit 13 is simply a reproduction of a publically available document.

Both of the passages that are cited by Mr. Shuey are contained in the API document as subparts to another subpart entitled, "Production Pits." We've got the entire Section 5.2, "Production Pits," here.

On page 55 of this document, as you can see, it will read, the pertinent part would read: "Unlined on-site pits used for the

disposal of waste should be restricted to areas where soil conditions, hydrogeological factors, and rainfall prevent significant soil or groundwater contamination. The following guidelines should be used for various on-site production pits."

The API document then goes on to discus specific on-site production pits from which Mr. Shuey has extracted the passages that he cited in his testimony. A reading of these passages in context reflects that the API document recommends the produced water pits should be lined in those areas where soil conditions or hydrological factors and rainfall do not permit significant soil or groundwater contamination.

I think that when you read the entire thing, you'll see that that is the case.

Q. At the hearing on April 9, you testified regarding the establishment of wellhead protection areas. During his testimony Mr. Shuey expressed some concern that your proposals don't afford the same protection to private individual water wells as they afford to water wells serving a larger segment of the population.

Do you care to address that concern of

Mr Shuey?

A. Yes. Certainly I did not mean to imply, by any stretch of the imagination, that one person's well is any less important than a municipal supply well because it's equally important to that person.

But municipal supply wells that produce water at 250 gpm create a much larger cone of depression or a capture zone, if you will, for contaminants than a private well, which may produce less than 2,000 gallons per day.

Thus the risk of an impact to a municipal well is much greater than the risk associated with a private well where water may be drawn in from a private well in a captured radius of maybe only 100 feet.

Q. What is your opinion with respect to the SRIC position that areas within a radius of 1,000 feet from freshwater wells and springs should be designated as wellhead protection areas?

A. Well, SRIC has submitted no credible evidence to support this position. I think the model may have been used to support that position, but I can't see that it can be used --

I just don't understand how it can be used now.

In addition, I think that that position is in contrast with existing regulations in the Safe Drinking Water Act -- or, I'm sorry, the public water supply regulations.

Q. SRIC has also proposed a 12-, 18-, 24-month discharge elimination schedule. In your opinion is that a reasonable proposal for the elimination of discharges of produced water into unlined pits in the existing and proposed expanded vulnerable areas?

A. Four Corners Gas Producers Association believes that a one-year period for the elimination of produced water into unlined pits in the existing vulnerable area is reasonable subject to the opportunity to obtain a variance from the requirement for the discharge elimination. An 18- to 24-month time frame for the proposed expanded vulnerable area is not reasonable.

Again, SRIC has submitted no credible evidence to support its position in that respect. The SRIC model, again, I don't understand how it can be applied in this particular area. I believe it was introduced to

support the shortening of the time frame for the elimination of discharges.

But the evidence submitted by Four Corners Gas Producers Association, on the other hand, shows that the contaminant movement in groundwater is relatively slow and that the mechanisms of attenuation are indeed operating to retard the movement of the contaminant of concern or maybe even to eliminate them altogether.

The field evidence shows very limited hazard to human health or the environment from long-term disposal to unlined pits in the proposed expanded vulnerable area.

In addition, the short time frames proposed by SRIC will virtually ensure numerous requests for the extensions of time to comply, which in turn will create a significant administrative burden to NMOCD.

I believe that they can use their resources, you know, better in protecting the environment where it really needs to be protected.

Q. From the testimony that was given by the SRIC witnesses on April 9, I think I'm surmising that it's their position that variances

ought to be granted and considered only on a site-specific basis, a well-by-well basis.

What is your opinion with respect to that position?

A. Well, if that's the position, and that's how I read it too, and perhaps I'm wrong and it can be clarified. But I believe it would be extremely unreasonable. The administrative burden on the OCD would be enormous. And the evidence that's been submitted in this case certainly does not support a position of a well-by-well, area-by-area variance -- well-by-well, that is.

It clearly is demonstrating everything that has been put forward that the conditions exist on an area-wide basis which would preclude contamination or degradation of groundwater in an area or by a particular classification of wells.

Clearly the NMOCD should have the opportunity to grant variances on an area-wide basis or, if necessary, for a class of wells.

Q. SRIC, I think, has also proposed that a variance be granted only if it can be demonstrated by the applicant that the use of an unlined pit affords the same level of protection

to soils and groundwater as would be afforded by the use of tanks or lined pits.

What is your opinion of this proposal?

A. Well, in my opinion unlined pits will seldom create the same level of protection as do tanks or lined pits. But we also know that getting into your car and going to work does not afford the same level of protection as staying in bed. People generally choose to take the small risk of traveling to work to realize the benefit of work, while others might stay in bed.

The variance procedure as proposed by OCD permits experts in the field to determine the level of protection which is warranted at given sites. At some sites the OCD will determine the risk of discharge to unlined pits are too great and that tankage or lined pits are required.

At other sites the NMOCD may determine the discharge to unlined pits affords the necessary level of protection to human health and the environment and they will grant a variance. Such a procedure is fully consistent with all state and environmental regulations that I know of.

Q. Mr. Shuey also discussed in his

testimony the SRIC perspective on notice and hearing for variance applications. What is the position of Four Corners Gas Producers Association with respect to that issue?

A. Four Corners Gas Producers Association believes that notice by publication should be given by the Oil Conservation Division upon receipt of an application for a variance. The owner of the land upon which the activity is taking place should receive actual notice of the application from the applicant.

The Director of the OCD should be empowered to act administratively on a variance application if no objection is received to it within 20 days after the date of publication of notice or the date actual notice is mailed to an owner entitled to that notice.

On the other hand, the Director of the OCD should also be empowered to set an application for hearing on its own motion.

Objections, if they are to be considered, must be made by an individual who is -- an individual or an entity which has a proprietary interest in the lands upon which the activity is taking place and be accompanied by

some scientific or technical data specific to the lands which would support a claim that the proprietary interest will be harmed or injured if the application is granted.

Upon receipt of an objection that meets these criteria, the Director may but shall not be required to set the application for the hearing. This procedure for notice and hearing would be consistent with that as is routinely done under the WQCC regulations.

It's the position of the Four Corners Gas Producers Association that this procedure would adequately address the interests of those who have legitimate concerns regarding the impact on the environment of the regulated activity.

At the same time this procedure provides industry with some protection against any kind of nuisance objection which would create a hearing that may be unwarranted.

Q. Southwest Research Information Center has proposed that for pits closed prior to the effective date of an order entered in this case and after January 1, 1987, the operator should be required to submit reports of that activity for review and retroactive approval. The proposal

would also subject these pits to closure guidelines that have not yet been adopted.

What opinion do you have of this proposal?

A. Well, we've addressed this issue a little bit already, but we'll go a little bit further. The Commission Order R-7940 created what we've been referring to as the existing vulnerable area. That order set forth requirements that would govern certain operations of oil and gas producers in the existing vulnerable area.

That order also provided certain exemptions from the operation of the order. To that extent any activity was governed by the provisions of Order 7940, then it is appropriate that compliance be required.

It is important to note, however, that the scope of Order 7940 is limited to the existing vulnerable area. As of today we have no order or rule in effect that governs the disposal of produced water into unlined pits or the closure of such pits in what has been referred to as the proposed expanded vulnerable area. If such activities are regulated, then it will be by

virtue of the new order, ruled, entered in this case.

It is, therefore, the position of the Four Corners Gas Producers Association that it would be improper for the OCD to attempt to retroactively regulate, pursuant to a new order and rule, activities which have not been previously prohibited by Order R-7940.

In addition, there are practical matters that would be addressed with respect to this issue. First, there's been no evidence submitted that pit closures in the proposed expanded vulnerable area have caused problems to groundwater, human health, or the environment.

Even where groundwater contamination has been documented in the existing vulnerable area, the evidence submitted in this case indicates that the transport distances are minimal.

In addition, the evidence indicates that natural processes do remediate soils and groundwater indicate when the source of contaminant is removed.

Finally, if adopted by the Oil Conservation Commission, the proposal of SRIC

would create a significant administrative burden to the agency.

Q. Were Four Corners Gas Producers Association Exhibit Nos. 7 through 13 either prepared by you or at your direction and under your supervision?

A. 13 was publically available information. I extracted it and bound it myself. The remainder of these exhibits were indeed prepared by me or under my supervision. Excuse me. The soil properties of dry gas wells, our Exhibit No. 7, is publically available information which I extracted from the soil survey and put into a form that was readable to the Commission.

MR. ROBERTS: I move the admission of these exhibits.

CHAIRMAN LeMAY: Are there any objections to the admission of these exhibits?

MR. MEIKLEJOHN: Mr. Chairman, we object to the admission of Exhibits 12 and 11 on the grounds that I indicated earlier. We have not been provided with these in sufficient time to analyze them and to respond to them adequately.

The other documents that Mr. Hicks has pointed out, we do not object to. A couple of them are publically available information. One of them was in a document that we referred to, and we don't have any objection to that.

If the Commission is inclined to admit the documents, we request that the Commission give them limited weight given the inability of the other parties to prepare a response to them.

CHAIRMAN LeMAY: Fine. We'll take that one under advisement, and after lunch we'll rule on what exhibits will be admitted.

MR. MEIKLEJOHN: Thank you.

CHAIRMAN LeMAY: And at this point let's take a break. Before we take a break for lunch, I need to say a few things. Those of you who have not been involved in the rule-making process, recognize that historically we have never made rules and regulations based on theoretical models or computer models.

And generally where you have the issues, I think we can get closer to good rule-making procedure if we truly address the issues and not a lot of theoretical calculations, because those things can be argued for hours,

days, weeks, and basically years because of the variability of what goes into this model.

So I say that because I hope we can get to the issues and spend more time on the issues and not a lot of time defending theoretical calculations or inputs to models.

I think they are useful in principle, but as far as being a definitive item that we would set regulations on, recognize historically we've never done that.

Let's take a break for lunch and come back at 1:30 for some cross-examination.

[The lunch recess was taken.]

CHAIRMAN LeMAY: We've decided to admit all exhibits into the record but certainly weigh 11 and 12 lightly. Double reason for that, not only because of the objection, but because of my comments, it does concern computer modeling and we weigh computer modeling lightly.

Mr. Roberts, you may continue.

MR. ROBERTS: I have no other questions.

CHAIRMAN LeMAY: Okay. Let me run down the list.

Mr. Padilla?

MR. PADILLA: I don't have any questions.

CHAIRMAN LeMAY: Mr. Kellahin?

MR. KELLAHIN: No questions, Mr. Chairman.

CHAIRMAN LeMAY: Mr. Kendrick is not here. Okay. Mr. Meiklejohn?

EXAMINATION

BY MR. MEIKLEJOHN:

Q. Mr. Hicks, you mentioned a couple of times in your testimony the importance of the fluid that is being disposed of in the pit that's of concern. Would you agree that that is important, isn't it, the nature of the fluid?

A. The nature of the fluid that's disposed -- in the broadest sense, that's true.

Q. Did you test or determine in any of the pits that you looked at, did you test the characteristics of the fluid that was being disposed of in those pits?

A. Oh, we're talking about the dry gas wells?

Q. Yes.

A. Excuse me. Rewind that tape. No, we did not test the fluid that was discharged.

Q. All right. Thank you. Is chloride found naturally in the soil in the San Juan Basin?

A. Chloride?

Q. Yes.

A. Yes, it is.

Q. Is BTEX found naturally in that soil?

A. In the soils?

Q. Yes.

A. In areas of natural oil seeps or where there may be natural release of the underground hydrocarbons, you would call it natural in that it was not -- it was not introduced by man.

Is it naturally occurring as a form of soil formation? No, it is not.

Q. Okay. You've discussed in your direct testimony the Likins. Is that how you pronounce it, L-i-k-i-n-s?

A. L-i-k-i-n-s, correct.

Q. I think you said that that pit was actually in groundwater; is that correct?

A. Yes. The groundwater was so shallow that digging the pit actually exposed the groundwater surface.

Q. How deep a pit is that?

A. Two, three feet.

Q. Do you know if that pit is still active at this point?

A. Yes, I believe it is active. Yes, that's why we sampled it.

Q. And I think you indicated that you were not able to detect any BTEX in the water in that pit; is that right?

A. That's true.

Q. Would you attribute that in part to dilution of the disposed fluid by the groundwater in the pit?

A. My guess is that that's probably the -- well, there's probably several mechanisms that may be equal. Dilution clearly is a very large factor in why we would see low values of benzene.

The discharge from the well itself is very small, so it may be -- the residence time in this exposed pit may cause even volatilization and biodegradation as well. But clearly those mechanisms of dilution and biodegradation and volatilization probably all combine to create lack of detection.

Q. With regard to the SUTRA model that

you've discussed, have you personally run that model?

A. I have never personally run that model.

Q. Did you do the analysis that is reflected in -- I don't remember what the exhibit number is. Is it 13? You presented an exhibit that analyzes --

A. The dilution?

Q. -- the model that Mr. Wallace presented. Did you personally do the calculations?

A. This one?

Q. Yes, that's correct.

A. This, for the record, is our Exhibit 11. I did not personally do these. It was done under my direction.

Q. All right. You also discussed notice --

A. Except -- excuse me, let me clarify this. This last page, I personally did that one, the last page.

Q. Okay. You also discussed the issue of notice in the case of a variance --

A. Yes.

Q. -- an application for a variance. Would you tell me again, please, who you suggested should get notice and who should provide that notice?

A. The Oil Conservation Division should provide notice through publication to all individuals that are affected, publication in a newspaper that is local to that area, as well as the applicant for the variance should notify the landholder.

And this was -- I want to make sure that we're clear. We're talking about the notification for a variance; correct?

Q. Yes, that's correct. That was my question.

Is notice by publication in a newspaper a realistic method of getting notice to people in your opinion?

A. It is what is commonly used. And people that are interested in legal aspects and environmental aspects typically are aware that there will be notices in publications.

That is the method that the State Engineer utilizes for water issues. That's the method that the New Mexico Environment Department

uses for discharge plans and other applications. That's the method under the WQCC regulations the Oil Conservation Division uses for their discharge plans, which are environmental issues.

So I think it's very reasonable.

Q. Are you familiar with the notice provisions that are required when applications are filed for location of solid waste facilities?

A. No.

Q. Is the soil beneath a produced water pit part of the environment?

A. Yes, it is.

MR. MEIKLEJOHN: Thank you very much. No further questions.

CHAIRMAN LeMAY: Commissioner Bailey?

MR. STOVALL: Excuse me, Mr. Chairman.

CHAIRMAN LeMAY: I'm sorry, Mr. Stovall, I have you at the end of my list here.

MR. STOVALL: I hope I'm not to take personal offense at that.

CHAIRMAN LeMAY: Nothing personal implied, sir.

EXAMINATION

BY MR. STOVALL:

Q. I want to make sure I got one thing

straight. You talked about the soil didn't matter; is that correct? Did I hear that correctly at the beginning of your testimony this morning?

A. Well, they certainly matter to the farmers and everybody else. But what I'm saying is that with respect to the dry gas well exemption that we are proposing, we believe that it is the nature of the discharge from the dry natural gas wells that there is something about the nature of the discharge that creates a very low to minimal to no threat to the environment.

And when this discharge is applied to low permeability soils or high permeability soils, it doesn't seem to make that much of a difference that there still is no significant degradation and in some cases zero degradation.

Q. But I understand that you said when you talked in response to Mr. Meiklejohn that you haven't actually looked at the discharge, so we don't have any information for the Commission about what that discharge is made up of?

A. We're assuming that the discharge from dry gas wells --

Q. No, I didn't ask what you're assuming.

I'm asking, did you look at it? Do you have any information?

A. We have no chemical analyses of the discharges from dry natural gas wells.

Q. Okay. You've used some wells which were part of Mr. Olson's study. Looking at the Valdez "A" 1-E, and you showed some contamination that was in excess of WQCC standards at the well site in the groundwater at the well site or pit site; is that correct?

A. Yes. You could see that in the chemical analysis tables. And I want to make sure that we're clear that the 10 ppb line that we drew is for total BTEX. But you are correct, there is contamination at that site. There is an impact that is above standards.

Q. Are you aware that under current regulations in the law right now that that discharge is in violation of the law?

A. Well, the discharge now goes to a tank, and it's been going to a tank for a period of time.

Q. Excuse me. I'm sorry. Let me rephrase that. The contaminant is in violation of the law, under current law?

A. I don't know whether I can answer that or not, whether I'd be qualified to answer whether or not that contamination per se is against the law.

Q. Okay. Well, you're not a lawyer. And I was just asking if you were aware. I assume the purpose of the exhibits that you show, particularly with relation -- I think it was 12, I believe, with your plumes?

A. Yes.

Q. -- and your actual length, was you were showing this transport mechanism, the movement mechanism?

A. That's correct.

Q. And in terms of advising your client, if I tell you as a lawyer, that the actual contamination at the site is a violation of the law and could subject the operator to penalties and clean-up requirements, does that change your opinion as to the recommendation to exempt wells by a certain type without other considerations of where it is, depth to groundwater and taking a closer look at it?

A. If I don't -- okay. We're going to try and answer, and if I don't get it right, I'm sure

you'll rephrase the question.

If I believe that a classification of wells or any well, if I believe that there's going to be a discharge that will result in a situation which puts my client in violation of regulations and subject to fines, I will not make that recommendation.

If I believe that there is a situation where the discharge will not cause a violation of any regulations or standards and create a violation of law and be subject to fines, if I don't think that will happen, I will make the recommendation to the client to make the discharge.

Q. A lot of your testimony focused on the fact of the movement of a contaminant and it going away. And a lot of the sites you've looked at, you've essentially shown that there is a contamination at the site.

A. Uh-huh.

Q. And some of those are the dry gas wells, I believe. Perhaps I'm incorrect on that?

A. Yes, you are incorrect. All of those --

Q. Thank you.

A. -- groundwater plumes were from gas wells which would not qualify as dry gas wells under our definition.

Q. They did qualify as low volume liquid producers under the 1985 exemption?

A. Yes, they did.

Q. Have you done any clean-up work on a site, such as the Valdez, or any groundwater contamination clean-up work as an engineer?

A. Oh, yeah.

Q. What's the cost of a clean-up? Do you have any idea of the range of costs?

A. Well, would you like to talk about the costs associated with some of those wells that were shown here?

Q. Sure.

A. I've done a little work than that.

Q. That would be fine.

A. For the Mobil Thomas No. 1, which is a site that was located, which we showed, we believe that that entire site can be remediated for probably less than $20,000.

The contamination, which is above standards, is very small. It is not moving at a high rate. We have -- we feel fairly confident

that $20,000 will create a remediation at that site which will be approvable by the Division.

In fact, there's a proposal in the Division, to the Division, to that effect as of day before yesterday.

Q. Roughly $20,000, you're saying?

A. That's correct.

Q. That's a fairly small clean-up; is that correct?

A. That's a fairly small clean-up. But it also would be typical of all of those sites that I show. These are not our superfund sites. These contamination cases associated with these particular wells that were shown as exhibits will be small dollar volume -- small dollar clean-ups.

Q. What would be the effect if they were in fact a water supply that somebody was using? Would that change that cost figure at all?

A. If it was -- yes, it would. It would probably in my opinion double, triple -- double or triple those costs at a minimum. And depending on the kind of well and the relationship between the operator and the affected party will play a very large role.

The technical considerations almost

become dwarfed by the political considerations when you get into those kind of situations.

Q. Have you done any what you would call large-scale clean-ups?

A. Yes.

Q. Can you describe roughly the cost and the type of contamination that you're dealing with?

A. Well, we've talked a little bit about the Lee Acres landfill and the refinery associated with that. We performed the entire investigation, designed the remediation, and installed the remediation program for the Bloomfield refinery owned by Giant Industries.

And that particular situation where there was a considerable difference in the loading, if you will, between the produced water pit and the refinery, but that refinery remediation was on the order of somewhere between half-a-million and three-quarters of a million dollars after all is said and done.

Q. Can you conclude from this that prevention is in fact cheaper than remediation, correction, and clean-up?

A. No.

Q. You can't conclude that?
A. No, I can't conclude that.
Q. How come?
A. Because we're dealing with a statistical base here. And for one given refinery site, at that particular site your statement is true, prevention is significantly less expensive than any kind of remediation.

However, when you begin to look at a large number of sites, a large number, let's say, more than 100, where the dollars associated with prevention may be $5- to $10,000, if it's $10,000 for 100 sites, then what we're dealing with, if my math is correct, would be close to a million dollars.

And then if you compare that with the statistics of certain problems existing and the mathematics of $20,000 per site for a produced water site, the statistics may change considerably.

If we believe then that -- and I'm not advocating this; I'm answering your question.
Q. Yeah, I'm listening. I hear you in that context.
A. It may be -- since you're asking an

economic question, I'm giving you an economic answer. It might be economically advantageous to say we will deal with problems as they occur.

And because we believe that the economics indicate that there's going to be 5 percent of your wells out of 100 will cause problems, and so 5 times $10,000 is $50,000, or $100,000 worth of remediation may be required. And yet the prevention is going to cost me a million for these wells.

So from an economic standpoint, I cannot say that prevention is cheaper than remediation for this kind of a program.

For refineries, for large industrial facilities, for different kinds of discharges that may have a much larger volume, clearly you're correct. Clearly that prevention is less expensive.

But this case, I'd have to look at it a little bit more carefully, but I can't make that statement.

Q. Your clients are mostly independent, small- to medium-sized independents, in the San Juan Basin; is that correct?

A. That's true. For this case, that's

true. If you're talking about my clients in general --

Q. I'm talking about Four Corners Producers --

A. For this case, that is true.

Q. -- in this case. You would still recommend that risk, for a smaller independent to undertake the risk of having to do a clean-up, which minimum cost would be in the $20,000 range, rather than try to prevent? I want to go into another line of questioning here.

A. Yes. I don't know if I would make the recommendation. But what I would do is present the two alternatives. One is a straight cost of prevention, and that can be calculated by determining the tank and the disposal price and everything else. That can be calculated.

The other is a statistical analysis or a gut-feeling professional analysis of how many sites would be contaminated to a degree where you would have to take action and what that normal action would be.

And then I would present that and say you have two choices here: This is your fixed cost, and you know you're going to be safe with

this. Here is a professional opinion as to what the costs will be to take care of things as they come up.

And the independent may say, I've got 50 wells. I want to get out of the business. I've got my children to think about. I don't know what's going on. I'm going to go with the tanks.

Somebody else may say, I'm going to manage this more effectively. I'm going to handle things as I go along. I've got too many wells and I will take a different approach. So that is how I would present it.

Q. The different approach being a --

A. Handle things, handle problems as they occur and look for problems as they occur, but do not take the prevention aspect of tankage or lining.

Q. So you're suggesting that on an area-wide basis, you'd rather run the statistical odds. And that, of course, does not take into account the impact on the person or persons whose water supply could be affected; is that correct?

A. What I'm saying is that I would present those two options, and I would present what the

economics are.

Now, if you're shifting from economics back into the impact on to people, we have to consider a different line of questions here, because realistically when we have a well that is located, for example, within the existing vulnerable area where there is a much higher risk to individuals and public health, I recommend, and indeed the Four Corners Gas Producers Association affirms, that there should not be discharges in this area except subject to specific variances.

And so clearly that risk to human health in a populated area is understood and recognized by the Four Corners Gas Producers Association. And that is why they are consistent with OCD's proposed rule of no discharge in the existing vulnerable area.

Q. Now, looking at the statistical side of it, you've assumed, what, a 5 percent risk? Is that the number?

A. I've given that as an example.

Q. As an example, okay.

A. I don't know exactly what the statistics would be.

Q. The fact is we really don't have enough population of wells tested to determine that at this point; would you agree with that, to get a good statistical analysis and not random sampling to give you a good statistical analysis; or would you disagree with that?

A. I don't know if I can agree or disagree with that at the present time. If you look at the dry natural gas wells, for example, and we concentrate on soil contamination only, I believe that we may have enough of a database, and I have not run the statistics to prove or disprove it, but there are statistical methods that you can use on small sample sizes to determine whether or not the results indeed prove or disprove a specific hypothesis.

I haven't done that testing, that hypothesis testing procedure under statistics. And so I can't tell you whether or not there's an adequate database out there for dry natural gas wells.

However, I believe that there is enough of a database out there, statistics aside, presented by Mr. Olson, the graphs and charts that we presented, that would say that within the

existing vulnerable area the proof is there; let's eliminate the discharges.

Q. Just real quickly, you heard Mr. Wallace at the last hearing on his statistical probability analysis, that there was a fairly high number of contaminations. Do you remember that discussion?

A. Yes, I certainly do.

Q. Just briefly comment on his methodology. Is it a valid method, as you can see?

A. The method that he used, the calculations that he did were valid. However, the statistics generally take a sample of a population to determine the characteristics of the entire population.

The population in this case would be the wells in the San Juan Basin, which -- what's our number? 7120? or something like that?

Q. Something like that.

A. Something like 7,000 wells would be the population. Mr. Wallace took a sample of 24 sites, or 20 sites, somewhere in there, which were purported to represent the entire population.

And he did the statistics on that population and found indeed that there was a high degree of contamination observed in that population.

I maintain that that population of 20-odd wells represents problem sites that have been identified, and I believe his statistical analysis is correct, that 70 percent there, plus or minus 70 percent of the cases which are identified as problem contaminated cases, will have impact to groundwater.

But in no way does that sample of 20 represent the entire population of 7,000.

Q. I assume you heard Mr. Olson in his testimony that you can basically take one of two approaches: That is to require protection until it can be demonstrated that it's not needed and to not require protection unless it's demonstrated that it's needed. Did you understand that differently?

A. Yes, I heard that.

Q. And he's recommending the former approach, to protect until the demonstration is there; that it's not needed?

A. And I think that's consistent with the

variance procedures that have been developed and that the Four Corners Gas Producers Association agree with. Clearly in our minds there has been a demonstration that category of wells -- that there is a category of wells, however, that we believe make a demonstration that there is not a threat to human health and the environment, and data has been presented for that.

And, in my mind, when there is a reasonable potential that contamination can occur, I concur with Mr. Olson's philosophy. When there is not a reasonable probability that human health and the environment will be impacted, I have to believe that more evidence should be presented before we take that approach.

And in this particular case of the dry gas wells, at least in my opinion, I believe that the evidence indicates that there is not a threat.

And so I guess in that particular case I would take the other approach, more of a wait and see attitude, and perhaps more data collection may be necessary.

Q. Is your statistical population of ten,

given your same sort of analysis and switching philosophies, is it an adequate sampling to apply to 2,000 wells, to make that recommendation for 2,000 wells?

A. Again what I would like to do is to take a look at how the -- and I haven't done it, and I probably should have, now that I think about it, is perform the statistics to make a determination if the results of these ten wells would be adequate to say that additional sampling is not necessary, the small sample statistical methodology.

I haven't done it. I only know that it exists. And it probably should be taken a look at to ensure that the results would be representative of the entire population.

Q. If this exemption is built into the order, do you have any concept of -- and assume that the Division would take the position that they would then have to (A) determine that the wells had the proper within-the-volume tolerances, as specified in your definition, and (B) to make sure that your presumptions were correct, which would require a sampling, do you have any concept of the burden that might place

on the Division?

A. I don't know how the Division would work it. In my opinion there would be a requirement of the -- on industry to submit, as they already do, the discharge of produced water.

And if that produced water, for example, is less than one barrel a day and meets its other requirements --

Q. Let me interrupt you right there real quick. How is that measured by industry currently? Do you know how that's determined?

A. You know, there's many ways to do that. And some people look at it and guess. Other people put a 55-barrel drum underneath and measure it. I mean, there's a lot of different ways, and we get lots of different answers: Everything from too small to measure, which means somebody is looking at it and says, "Too small to measure," to putting a calibrated instrument or a drum or a bucket underneath it and coming back the next day and seeing what happens.

But what I'm saying is this, in terms of the burden you talked about, clearly we talked about violations as well earlier and violations

of regulations. If an individual reported that a dry natural gas well produces less than one barrel of produced water a day and that wasn't so, that person would be violating the regulations and probably subject to penalties or some kind of enforcement action by the agency.

And so I think that is the stick that is in place for NMOCD to utilize in ensuring that these standards are being met -- is the penalty, standards that exist currently.

So I don't know what kind of a burden that would actually place on NMOCD.

Q. Well, let's assume that is the case, that is the penalty mechanism that would work. The Division then would have to, over whatever period of time it determined, investigate each of those wells and determine that what was being reported was actually accurate; is that correct, or do some sort of sampling?

A. Something would have to be done. Yeah, that's true.

Q. Could you accept that that burden might be just as difficult on the Division with a different set of consequences given our purpose of protecting freshwater as dealing with the

various situations?

A. If you tell me or your staff tells me it's so, I will believe it because you all are the ones that are going to be doing it.

Q. Could what you are seeking for your clients and what your clients would like to have, to have these gas wells be exempt -- I know you've said some reasons why not to go through a variance process -- but could it not be done with a variance?

A. Well, to tell you the truth, that's the question I still came in here with this morning. And if I'm hearing the Division correctly, that (A) a group of producers can come forward with a variance petition, which is what I thought I heard earlier and was the case and I would appreciate it if the Commission would permit some clarification of that from the Division sometime in the near future, one, a group of producers could come in under a single variance; two, a demonstration could be made for a large variety of wells spread out over the basin; three, that site specific information would not necessarily be required.

If it can be demonstrated that it's the

nature of the discharge that is creating the lack of threat to groundwater and public health and the environment and it is not the nature of site specific soils or depth to groundwater or those other issues, if those arguments can be carried forward in a variance procedure and these same arguments that we're developing right here could be put forward in a variance procedure, that would probably be much more acceptable to me.

My issue in terms of, and I think I made it clear earlier, that my main issues between a variance procedure and an exemption is that we have many of the same people that are -- this kind of a variance procedure, for example, if we were to take dry natural gas wells from the exemption and move them into a variance, my guess is, because of the large variety of the wells across the entire basin, that we'll be in this hearing room again with these same people, with the same evidence hearing it one more time.

And in putting forth this evidence that the Division was comfortable with the evidence and the Commission was comfortable with the evidence, I say let's get it done now. And it's more of expediency that I'm talking about right

now as to why to go for an exemption rather than a variance.

But if you're telling me or if I'm hearing correctly that the same procedure could be used and we can get to where we need to be through a variance, I don't have a big problem with that. I do not have a big problem with that.

My opinion is that if we can make that decision now, we should make it.

Q. Let me respond to that. I'm sure Mr. Kellahin will appreciate my narrative comment, because it is a rule-making, I think the Division's position and Mr. Olson testified to is that the variance procedures that you describe -- I'd probably modify the thing about basin-wide, but covering an area of certainly greater than a single site specific is how the Division conceives operating that.

And I can say to the Commission that I'm not satisfied that the -- and I don't think Mr. Olson is satisfied and has testified as such -- that we've fully addressed that issue.

I would also anticipate that the evidence which you have presented would not be

for naught because it could be used in the establishment of that variance process. Does that give you a little comfort?

A. Probably more so to my clients than to me, but clearly, yes.

Q. Would you be more comfortable if I said that, in the process of a variance, we talked about a risk analysis between the cost of clean-up and the cost of installing tanks and used the $5- to $10,000 number for installing tanks or pit liners? I think it's probably a little high.

But if we told you that we could come in and look at degrees of protection based on these conditions in the area or site or type of well that that would reduce the cost of protection, would you be more inclined to tell your clients to come up with a plan or help your clients come up with a plan?

A. Again we're back to an economic argument.

Q. Back to economics.

A. The economic argument would change. For example, if -- let's use that 100 wells again. For the sake of argument, we'll use our 5

percent problem issue and we'll use $20,000 as being the typical remediation. We're talking about $100,000 worth of remediation, okay?

If you're telling me that in this particular area, these 100 wells, it would only cost $750 to create a level of protection that would be satisfactory to the OCD, clearly the economics indicate let's create that level of protection because the economics say protection in this case is clearly more cost-effective; that is, protection and prevention is clearly more cost-effective than dealing with problems as they come up in terms of remediation.

Q. Now, understanding of course when we're throwing numbers out here, most of those are kind out of the air --

A. Absolutely out of the air.

Q. -- in terms of percentages and everything else. That same thing works if we can take, say, your 5 percent risk number and reduce it to 3 percent. By spending a little more you can again get some more cost benefit?

A. Absolutely. Or if my 5 percent number is off and it's 15 percent, then indeed the cost of remediation becomes three-fold what I

originally said, would be $300,000. And certainly the cost of prevention is adjusted accordingly as well.

But to make a blanket statement, the point I'm trying to make, is to make a blanket statement that prevention is less costly than remediation is not true in these cases -- it may not be true in these cases and probably, and I think clearly, is not true for the dry natural gas wells.

Q. Economically based only?

A. That's correct.

Q. And you are -- one final thing. You're aware we're here today because an exemption was built into the original vulnerable area order. I think you had some part in that, if I'm not mistaken?

A. Yes. I'm probably more aware than anybody.

Q. And therefore I assume you can understand the Division's concern about building another exemption which could result in this happening again in a few years?

A. Well, by the same token, in fairness to the Commission's decision of five years ago and

in fairness to the work that Mr. Olson has done and industry has done, I think that we have created a significantly better rule than has been proposed even by the Division.

And I also look at what has occurred over these five years since that first rule. And I don't hear of any contaminated domestic wells, any contaminated springs, any contaminated municipal wells, any degradation of groundwater that I wasn't even aware of that isn't being addressed.

And so what I'm saying is that that exemption allowed us to examine things very carefully and come up with a better rule and yet, in my opinion of the evidence that I see, human health and the environment was not impacted by that wait of five years.

And I am not suggesting that the Commission should wait five years to deal with, you know, questions about dry natural gas wells. But what I am saying is that an exemption for dry natural gas wells may create less burden on the Division, less burden on industry, and we can still examine it as we move through the process.

MR. STOVALL: Well, I'm not sure I

accept your conclusion about less burden on the Commission, but I appreciate it. And I have no further questions.

CHAIRMAN LeMAY: Thank you, Mr. Stovall.

Commissioner Bailey?

COMMISSIONER BAILEY: I have no questions.

CHAIRMAN LeMAY: Commissioner Weiss?

COMMISSIONER WEISS: No questions.

CHAIRMAN LeMAY: I just have one.

EXAMINATION

BY CHAIRMAN LeMAY:

Q. Would it be helpful in the process of dealing with the variances and exceptions for the Commission to outline some guidelines by which it would grant variances?

A. I think clearly that should be done for industry and for the public interest groups to know what kind of rules we will all be playing for. There is -- everybody fears the unknown. And I think that part of the testimony that both sides have been presenting here represents some of that fear.

CHAIRMAN LeMAY: Thank you.

Additional questions of the witness?

MR. ROBERTS: I have two or three on redirect.

CHAIRMAN LeMAY: Please, Mr. Roberts.

FURTHER EXAMINATION

BY MR. ROBERTS:

Q. Mr. Hicks, you have testified that you had not tested the fluid that was discharged or that is discharged at the ten dry gas well sites that was a part of your study program. Why did you not test the discharge fluid?

A. We were making the assumption that the discharge from dry natural gas wells would be something similar, on the same order of magnitude, as the discharge from other natural gas wells, maybe half as much total volatile organics, maybe a quarter as much, but on the same order of magnitude.

So we felt that the discharge of volume was going to be very important from these wells. And there may be some increased quality, but it really didn't matter that much to us.

We were most interested in what the impact was to the soils, the impact was -- and what we could infer from that to the impact of

the environment. So we were looking at the end product, if you will.

Q. What relationship in BTEX concentrations in soil and BTEX concentrations in the discharge fluid would you expect to find at those ten dry gas well sites?

A. I think that the discharge would be considerably higher than the observed BTEX in the soil.

Q. BTEX concentrations in the discharge fluids would be higher than the observed concentrations in the soil?

A. That's correct.

Q. Mr. Meiklejohn asked you if in your opinion soil beneath a pit is a part of the environment, and you said yes. I think he was trying to go to the definition of what soil contamination is.

Would you care to expand on your answer to his question in terms of what spot soil contamination is?

A. My definition of soil contamination is where the contaminants of concern exceed regulatory limits or recommended guidelines, established limits which would indicate that

there's a threat to human health and the environment.

And I might also say that in the same manner the soils in septic tank leach field areas are also part of the environment, and yet contaminants from septic tanks are allowed to discharge onto soils and they remediate themselves. It's part of a treatment unit.

And so, I mean, that too is an area where it is very common that we allow natural remediation to take place from a discharge which would not meet drinking water standards.

And so, yes, that soil too is part of the environment.

Q. Now, an exclusion for dry natural gas wells is an extremely important issue to Four Corners Gas Producers Association, is it not?

A. Yes, it is.

Q. And does the evidence in your opinion presented to date in this case support that exclusion?

A. The evidence that has been presented supports an exclusion.

Q. In your opinion has there been any credible evidence presented in this case in

opposition to that exclusion?

A. I haven't seen any.

MR. ROBERTS: Thank you.

CHAIRMAN LeMAY: Thank you, Mr. Roberts.

Additional questions of the witness? If not, he may be excused. Thank you, Mr. Hicks.

Looking at my schedule here, next I have Mr. Kellahin, actually, according to the schedule we worked first time around. I think Mr. Van de Graaff was your witness.

MR. KELLAHIN: Is that your pleasure, Mr. Chairman?

CHAIRMAN LeMAY: Yes. That's fine.

MR. KELLAHIN: Mr. Chairman, we've brought Mr. Van de Graaff back today to respond to questions that the Commission or any participating party might have of him.

I just have a few questions to give him an opportunity to supplement his earlier testimony, if I may.

CHAIRMAN LeMAY: Please.

DARWIN VAN de GRAAFF

Having been duly sworn upon his oath, was examined and testified as follows:

EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Van de Graaff, let me direct your attention to the concept, as you see it from your perspective, of the variance question. We've spent part of the day talking about the variances.

Would you and your association support in this order the allowance of variances for those situations where there is relatively low risk to the environment?

A. Yes, we would. I believe we would have to consider, however, that what technically might be required to achieve or receive a variance could conceivably cost more than actual compliance.

So if there were restrictions or regulations that imposed greater cost to apply and receive a variance, then it would be counterproductive. But certainly we believe that low risk areas should receive a variance.

Q. Your study involved tabulation of data

from certain of your members with regards to the cost effect that your industry would experience with regards to compliance with the proposed order. And one of those cost factors was the cost for a pit closure.

Regardless of whether or not the order is adopted or exactly what process is undertaken for compliance, ultimately at some point in time there is going to be the expense of pit closure, is there not?

A. That would be right assuming, of course, that the flexibility of the variances that might be applied would preclude that.

Q. Do you have any additional comments or response to the fact that we have discussed in this hearing the cost component for pit closures is going to be there at some point in time regardless of whether this order is adopted or not?

A. The point I was trying to make then and I would restate now simply is that while a cost exists, there is a difference in extended cost over a greater period of time which can be anticipated and better absorbed particularly by smaller operators.

And then, secondly, we feel that the cost requirement would be a burden or certainly a detriment to any expanded or development, new development, and it would affect new horizons, infill, fully development of the field if that development carried with it the added cost imposed by such regulations.

We feel that because of that detriment or deterrent possibly reserves would be left in the ground.

Q. Do you have any comments with regards to the sequence or the timing, the phasing in of compliance in certain areas insofar as it applies to the ultimate cost of pit closure?

A. In terms of the timing, we reviewed that earlier. I believe we endorsed those recommendations made by the Four Corners group. I'd be glad to restate those, if you wish. I have them here, I believe.

I assume you're talking about the current vulnerable areas with 200-foot schedule -- am I answering the right question?

Q. Yes, sir. Your association does support then the proposed time sequences that the Four Corners group has recommended?

A. That is correct. One year, three years, three years, five years.

MR. KELLAHIN: Thank you, Mr. Chairman.

CHAIRMAN LeMAY: Thank you.

Questions, Mr. Roberts?

MR. ROBERTS: No questions.

CHAIRMAN LeMAY: Mr. Padilla?

MR. PADILLA: I have no questions.

CHAIRMAN LeMAY: Mr. Meiklejohn?

MR. MEIKLEJOHN: No questions.

CHAIRMAN LeMAY: Mr. Stovall?

MR. STOVALL: Couple of quick ones.

EXAMINATION

BY MR. STOVALL:

Q. I want to make sure what your understanding is with respect to the OCD proposal as it stands with respect to pit closure as distinguished from elimination of discharges.

Is it your understanding that the timetables -- in the OCD case it's one, two, three years -- apply only to the elimination of discharges and do not apply to the actual closure of existing pits into which discharges would no longer be made?

A. That's the way it's written on the

paper here, sir, and that's the way I understood it.

Q. And that the actual time for pit closure could be spread out over a much longer period of time pursuant to a plan submitted by the operator to the Division?

A. That's correct.

Q. And I understand then that what your association is recommending, these longer time frames, as you just read, the one-, three-, three, five-year time frames, you are aware that the Division has taken the approach that we'd rather start with the short time frames and then consider variances in terms of extending those times, again, based upon a plan and a phased compliance by the operator for the elimination of discharges?

A. I'm aware that's the recommendation you've made. And without trying to be flippant, I assume you're aware that we offered this as an alternative.

Q. I am aware of that.

A. Thank you.

MR. STOVALL: I just wanted to make sure that your alternative was to what we really

said. I have no further questions.

CHAIRMAN LeMAY: Thank you, Mr. Stovall.

Commissioner Bailey?

COMMISSIONER BAILEY: No questions.

CHAIRMAN LeMAY: Commissioner Weiss?

COMMISSIONER WEISS: No questions.

CHAIRMAN LeMAY: I only have one --

THE WITNESS: I would have been disappointed, sir.

CHAIRMAN LeMAY: -- only for your comment.

EXAMINATION

BY CHAIRMAN LeMAY:

Q. We were all at the BLM meeting in Albuquerque, and of course one of the subjects there was pit closure. Do you have any comments concerning integration of OCD regulations and orders and those that might be required by the BLM?

A. Obviously we would like to operate in a responsible manner with as few regulations as possible. Is that general enough?

Q. Yes. I'm sorry.

A. I was going to say we're very sensitive

about what we believe to be the cost-effectiveness of regulation. As you recall also, sir, that was a major topic at that convention.

I suspect that our interpretation of cost-effectiveness and high-risk, low-risk would be areas where we would have some disagreement. But we believe that we have to be sensitive to that. And as we look at these regulations, we would make the same argument. And the BLM and OCD should certainly be coordinated as far as we're concerned.

CHAIRMAN LeMAY: Thank you. That's all the questions I have.

Any other questions of the witness? If not, he may be excused. Thank you, Mr. Van de Graaff.

Mr. Kellahin, do you have another witness?

MR. KELLAHIN: Yes, sir. Mr. Chairman, we're recalling Mr. Tom O'Keefe. Mr. O'Keefe is with Williams Field Services Company.

TOM O'KEEFE

Having been duly sworn upon his oath, was examined and testified as follows:

EXAMINATION

BY MR. KELLAHIN:

Q. Mr. O'Keefe, let me supplement with you your testimony at the last hearing with regards to a couple of topics. I'd like you to share with us and summarize one aspect of your prior involvement before the Commission, and that had to do with the Low Volume Gas Measurement Committee sponsored by the Oil Conservation Division. Were you a member of that group?

A. Yes, I was.

Q. You were one of the industry representatives that participated in that effort?

A. Yes, I was.

Q. What's the general time frame of the activity of that committee?

A. The committee was convened in, I believe, it was October of 1989 and concluded its work in the fall of 1991.

Q. What was the goal of that committee?

A. It was to examine and recommend methods by which low volume wells which would otherwise be uneconomic to continue to produce -- could continue to be produced by changing whatever regulatory restraints that were in place that

made sense to change given the nature of those wells.

Q. As a result of that committee effort, were changes made at the Oil Conservation Division, procedures concerning the measurement of low volume gas wells?

A. The OCD and the BLM modified their rules concerning measurement of low volume wells to permit more economic means of determining volume on those wells to fall within a certain category in terms of their producibility.

Q. Can you describe for us briefly the criteria for a low volume gas well that is eligible for the economic savings realized from the new measurement standards that are applied to those categories of wells?

A. There are two criteria. The first is for wells that can produce no more than 15 Mcf per day. The means of measuring the volume or determining the volume of those wells was modified so that orifice meters or similar instruments did not have to be used. The volumes could be estimated based on production history and on knowledge of when the well was actually turned on.

The other category of wells are those that produce less than 100 Mcf per day. And the requirement for meter calibrations was relaxed from a quarterly basis to a semiannual basis.

Q. Have there been estimates of the effect of that order with regards to the numbers of producing wells and the ultimate hydrocarbons that will be produced now under the new procedure that would otherwise have been lost?

A. When the rules were modified, the Director of the BLM for New Mexico included the statement with the modification. And I'm reading this from the NMOGA newsletter, where Mr. Woodard, who is the Director of BLM, stated that approximately 1850 federal and Indian wells would -- well, I'm not quoting. I'm sorry. I began to paraphrase.

I'll quote, "The new rules will prevent approximately 1850 federal and Indian wells from being abandoned in the San Juan Basin." Then he went on to say, "There will be an overall increase in recoverable reserves, and these wells will produce 4.7 billion cubic feet per year, enough gas to heat more than 30,100 homes."

Q. Do you have an opinion, sir, as to

what, if any, impact the proposed expansion of the vulnerable area order that the Commission has under consideration today will have on the prior order that we've just described for the low volume measurement?

A. In my opinion there will be a significant impact. For one thing, many of the wells that are in the proposed expanded vulnerable area are the same wells that are dealt with in the low volume category with the modified rules.

And in arriving at these modified rules, a savings per well was estimated by -- well, by me as one person, but also by other members of the committee, to amount to perhaps a thousand dollars per year as opposed to the cost to install lined pits or tanks, which will be in the neighborhood of $3,500 to $5,000 per unit, which incidentally is not a cost pulled out of the air. That's a cost that's been experienced by the industry already. And that's a good, valid cost estimate, in that range.

So we've saved a thousand dollars per well per year to try to keep these low marginal wells producing and not wasting the resource.

But, on the other hand, we'll need to spend up to $5,000 one time and then the ongoing operating and maintenance cost that's entailed by having to operate with a tank rather than using earthen pits.

And those wells will be far less economic under the proposed rule than they are now with the relaxed measurement rules.

Q. The Division proposed order deals with pit closures. Have you reviewed that order, proposed order in terms of the various kinds of pits that will be affected by the proposed pit closure procedure set forth in this order?

A. Well, as I understand the pit closure, that's separate from the order and will be dealt with in a different, I guess, rule making. I'm not sure I'm following you.

Q. With regards to discharges in unlined pits, the discharge into the unlined pits applies to all pits, as you understand it. Is there any reason in your mind to distinguish or separate or categorize the kinds of pits that will no longer receive discharges?

A. I think there's good reason, and going beyond that, even considering the cost, a typical

well, as I think I mentioned in my earlier testimony, doesn't have just one pit.

It will have typically one pit, but it will also typically include a pit for the dehydrator, could have a pit for the tank so that the tank bottoms can be pulled, and it could have a compressor pit.

That's four pits. And each one of those could cost $5,000 to put a tank in. So that's $20,000 per site. That, of course, is a worst-case. And there are opportunities to share pits. Sometimes those work and sometimes those don't.

But probably typically there would be two pits per site, and so the cost per site would be $10,000 on the high end or $7,000 on the low end to install a tank or a lined pit, times 7,000, more than 7,000 wells in the proposed expanded vulnerable area. If I can do this in my head, that's $70 million.

Some of that money will be spent anyway certainly, and people are putting -- companies are putting tanks in. But not all of that money needs to be spent, and the requirement to spend that money will certainly result in abandonment

prematurely in my opinion of a resource.

In terms of the nature of the discharge, the discharge of fluids from a production unit is different from the fluids that are discharged from a dehydrator pit. And I think consideration should be given to that fact.

When a separator or a production unit serves the wellhead and downstream of that there is a dehydrator, in all likelihood the volume of fluid will be far less from the dehydrator than it is from the production unit.

And as a result, the pit that's used by the dehydrator is considerably different in its impact on the environment and on water and human health and all the other things we need to be concerned about.

Q. Is there a way to categorize or to rate in some priority the kinds of pits that put the environment at greatest risk?

A. Those pits that do not collect oily waste, liquid hydrocarbons, to me seem more benign than otherwise. And those pits that collect very little liquid at all, and in the ideal world in the case of a dehydrator, the

liquid that's discharged is condensed water. It would be drinkable if the container were food quality, I suppose.

Now, the ideal world doesn't exist out there, we know that, but it's possible to get close to that. And frequently that is the case, that all the dehydrator puts out is condensed water. And only during upset conditions if the upstream equipment doesn't work does the dehydrator, the separator section of the dehydrator, come into place and discharge typically small volumes of fluid.

So to me there's at least two basic categories of risk in the disposal of fluids in an earthen pit.

Q. Do you have a recommendation for the Commission with regard to what types or categories of pits in the expanded vulnerable area might be exempted or excluded from this order?

A. From a pipeline perspective, I would suggest that a pit that serves a piece of equipment such as a dehydrator which is downstream of a primary separation unit should be exempt from the proposed rules regarding the

expanded vulnerable area.

Q. Anything else for your testimony?

A. One thing I've thought of just over this day, regarding the phasing in of the rule and considering the San Juan Basin and the climate and the roads, one year, two years, three years may seem fairly long, but in fact the construction period in the large part of the basin is really constrained by the weather and by road conditions.

And typically from sometime in November until sometime in April, construction is very difficult. When it's accomplished, it's expensive. It is oftentimes accomplished at the expense to some degree of the environment.

There are rules that prohibit construction in sensitive wildlife areas. And certainly we don't want to have a negative impact on that part of our environment.

So when we talk about three years or five years, we're probably really talking about half of that time in terms of available construction period in which that work can be accomplished.

And if we really are going to install

thousands of tanks, that's a major undertaking and I don't think can be accomplished in such a brief period of time and in a manner that is either economic or otherwise sensible.

MR. KELLAHIN: Thank you, Mr. Chairman.

CHAIRMAN LeMAY: Thank you, Mr. Kellahin.

Mr. Roberts, any questions?

MR. ROBERTS: No, I have no questions.

CHAIRMAN LeMAY: Mr. Padilla?

MR. PADILLA: I have none.

CHAIRMAN LeMAY: Mr. Stovall?

MR. STOVALL: Just one. I'm not even going to go to the mike to do this.

EXAMINATION

BY MR. STOVALL:

Q. Are you aware of the Flora Vista community water well contamination? Have you ever heard of that situation?

A. I have heard of it. I don't know details about it, but certainly I've heard about it.

Q. If I were to tell you, and I will tell you as a matter of Division knowledge, that that

was caused by a dehydrator pit, would that change your opinion about exempting dehydrator pits exclusively?

A. We're talking about the proposed expanded vulnerable area. If I understand correctly, the Flora Vista location is in the existing vulnerable area. I think we would be irresponsible as a company to know that we have a dehydrator pit where we can contaminate groundwater, and we would not do that.

If in the proposed vulnerable area, 50 feet above groundwater, discharging two quarts of water a day to me simply can't be a problem. And if there is an upset for a brief period of time where barrels of water per day, as I say, a brief period of time occur, in my mind, and I'm not the expert in hydrogeology or geohydrology, but I don't see that as a risk to groundwater or other parts of the environment.

Q. Could that be addressed by a variance?

A. I like the variance concept if it can be applied on a broad basis. When I think about the 460 wells that we have in the expanded vulnerable area proposed and the fact that we just went through a variance procedure with bird

nets on 1400 locations out of the 2700 that I have, that I submitted more than a year ago in which I had not received any action on, then I question being able to deal on a well-by-well basis with variances.

The burden on us, the burden on the OCD, keeping track of where we are in the process to me is unnecessarily cumbersome. And to the extent that there are geologic similarities, population similarities that make sense for wider areas to be dealt with on a variance, then that's much more palatable.

MR. STOVALL: No further questions.

CHAIRMAN LeMAY: Mr. Meiklejohn?

MR. MEIKLEJOHN: No questions.

CHAIRMAN LeMAY: Commissioner Bailey?

COMMISSIONER BAILEY: No questions.

CHAIRMAN LeMAY: Commissioner Weiss?

COMMISSIONER WEISS: No questions.

CHAIRMAN LeMAY: I have a question.

THE WITNESS: Is it about pipeline rates?

CHAIRMAN LeMAY: Gathering rates. Economic wells and gathering rates.

EXAMINATION

BY CHAIRMAN LeMAY:

Q. Now, Mr. O'Keefe, I was wondering, and I'm just exploring one possible avenue, in your experience with, say, the equipment downhole, downstream from the well, are there testing procedures that you know of, whether yearly or monthly, that could be used rather than maybe pits or something to guarantee the integrity of that equipment so that you would significantly reduce the possibility of discharge?

A. There are techniques, there are maintenance techniques that help ensure the reliability of the equipment. They vary from company to company. We have annual inspections and maintenance on our dehydrators as well, which is formal. We schedule that and we mark it off as it's done.

And then every time we have an operator at the well, part of that person's responsibility is to be sure the equipment is working. As long as that is done, then upsets should be very few.

We control the dehydrator. The upstream equipment is controlled by the leaseholder, the operator. And, as I say, their methods differ. But good maintenance will help

to ensure solid reliability and reduces costs too over the long-run, so it generally only makes good sense to do it regardless.

Q. Can you kind of see where I'm coming from? If there was some -- I'll call it guarantee -- but there was significantly reduced risk of equipment failure that would cause discharges, whether that might be a possibility, used as an exemption to the no-pit requirement, if that could be worked out with the District Supervisor, we'll say, or there was such a program in place.

My question is: Are there programs like that? You mentioned you have had them with your company, and have they proven successful in eliminating or at least significantly reducing discharges?

A. They've proven successful in providing reliable equipment operation. The dehydrator, when it operates properly, will discharge fluids into a pit if the separator receives fluids because we don't want that intermingled with the gas stream and then causing downstream operating problems.

So in fact when the dehydrator is not

functioning properly, the reverse occurs; it doesn't discharge.

I want to be forthright with you. The upstream equipment needs to operate properly and discharge when it should and not stick closed and thereby cause a carryover into the downstream equipment.

And producers have operations similar to ours to be sure that their equipment functions properly. We have contracts. All of them in the San Juan Basin with my company between us and the producers provide that the producer will prevent free liquids from going to our equipment.

And we can probably do, I hope, cooperatively a better job of enforcing that. But the contract is in place to make that happen.

CHAIRMAN LeMAY: Thank you.

Mr. Kellahin, anything additional?

MR. KELLAHIN: No, sir.

CHAIRMAN LeMAY: Additional questions of the witness? If not, he may be excused. Thank you, Mr. O'Keefe.

Let's take a 15-minute break. And when we come back, Mr. Padilla.

[A recess was taken.]

CHAIRMAN LeMAY: We shall continue.

Mr. Padilla.

MR. PADILLA: May it please the Commission, at this time I'd like to recall Mr. Kilmer to testify as part of our case for rebuttal and to the testimony of everyone else that has gone before us.

CHAIRMAN LeMAY: Please continue.

CLAY KILMER

Having been duly sworn upon his oath, was examined and testified as follows:

EXAMINATION

BY MR. PADILLA:

Q. Mr. Kilmer, since April 9, since the last hearing or the last segment of this hearing, have you conducted new studies in the Lybrook area to further enlighten yourself as to the type of discharges and the type of -- where to make further recommendations as to whether BCO ought to recommend to the Commission promulgation of the proposed rule or similar alternative or exemption?

A. Yes, sir, we have.

Q. Why have you conducted those studies?

A. Basically we felt that more information would be useful to help evaluate the validity of some of the modeling that's been performed by the Southwest Research & Information Center, and additionally, to just further enlighten the Commission as to conditions near Lybrook.

Q. Did you feel that, as a result of the SUTRA modeling, that you had to have actual data in order to present to the Commission because of the recommendations that were made due to the SUTRA modeling?

A. Yes, sir. We felt that site specific information in and around Lybrook would be worthwhile information to have.

Q. In particular what kind of things did you look at when you did your studies? And I'd also like for you to describe to the Commission what studies you conducted and how you went about doing it in a general way.

A. Well, basically we did some water quality analysis. We evaluated the quality of water that was discharged at a pit that we considered to be representative as a commingled discharged from five different wells.

And additionally, we installed a

shallow monitoring well near this pit to evaluate the degradation of BTEX components as they moved through the subsurface from this pit.

In addition to that work, we did some permeability type testing of sediments from several different locations to try to establish a realistic vertical hydraulic conductivity for the Nacimiento Formation.

Q. Now, you just now stated that you were trying to find out what the conductivity for water in the Nacimiento Formation was. Why did you limit yourself to the Nacimiento?

A. Well, we felt that the Nacimiento Formation was the location or was the formation upon which the discharge points that BCO operates are located within the vulnerable areas in and around Lybrook.

Q. Mr. Kilmer, let me ask you, this morning Mr. Olson talked about finding alluvium in the vulnerable area. But he also said that in general you did not stick to the vulnerable area.

I'd like to ask you now why you in your field reconnaissance and in your studies now why you didn't really stick to that, to the

vulnerable area, or the proposed vulnerable area.

A. I believe Mr. Olson alluded to some water quality data that we collected from wells that were completed in the Nacimiento Formation that did not happen to be within the vulnerable area.

And the dictates of our study were to attempt to go out and identify groundwater contamination arising from BCO discharges. And those locations were and others happened to be ones that we considered to be the most vulnerable and the most likely to exhibit contamination.

Q. So you looked for the worst possible situations in your field reconnaissance; is that fair to say?

A. Yes, sir.

Q. Now, let's go on and have you tell us about the studies that you actually did. You mentioned that you did some conductivity testing and you also did some water analysis from the B battery; is that correct?

A. Yes, sir, that's correct.

Q. You didn't mention the B battery. But where is the B battery located?

A. The B battery is located down here in the southern portion of our location map. It is approximately in the northwest corner of Section 34, Township 23 North, Range 7 West.

Q. Mr. Kilmer, why did you choose this particular site to test water?

A. This particular discharge point accommodates the discharge from five different wells, and that is the largest number of commingled wells that are discharging water to a given point.

So we felt that the water quality that we got from that point would be most representative of a number of wells on BCO leases.

Q. Did you do any background investigation as to whether or not the type of discharge at this site would be representative of discharge at other BCO sites?

A. Only by way of comparison of the gravity of crude oil that's being produced on BCO leases. And, generally speaking, there's not a great deal of variation between the gravity of crudes that are produced on wells all across BCO leases near Lybrook.

Q. Mr. Kilmer, how much of a discharge, how much is BCO discharging on a daily basis in the B battery?

A. The B battery, I believe, is one-and-a-half barrels per day.

Q. And is this representative of their type of discharges on other sites?

A. It's, I would estimate it would be an average. There are probably some lower, and I know that there are a couple higher.

Q. What kind of discharge, what information did you get as a result of the water tests that would be BTEX contamination?

A. Well, as I said, we sampled that discharge point in the pit itself. And I might add that the sample was collected immediately after a couple of the oil-water separators were tripped such that we were dealing with -- at least part of the water in the pit was freshly discharged.

And we took the samples and had them analyzed for benzene, toluene, ethyl benzene, and xylene. And the laboratory result of that sample was that the total BTEX concentration was 102 micrograms per liter.

Q. Now, going back to the conductivity tests, describe those in a general way if you would, please.

A. We did a couple of different kinds of conductivity tests. At three locations we performed a simple percolation test; whereby a posthole-like excavation is excavated and then water is introduced into the hole and an attempt is made to maintain a constant head of water in the bottom of the hole and water level subsidence measurements are maintained for a period of approximately two days to determine the vertical subsidence rate in the perc test hole.

The other type of test that we did at two different locations was a test in which -- I might add that on several of these pits, we considered these to be good candidates to test for water level subsidence because, being situated on the shaley deposits in the Nacimiento Formation, discharge water tends to stay in these pits for long periods of time.

And we maintained water level measurements in two different pits for a period of two days to arrive at estimates or index estimates of vertical hydraulic conductivity for

those sediments.

Q. Mr. Kilmer, would you go up to the map and show where you conducted these tests, please.

A. Yes. We conducted one test, which was a percolation type test, at the disposal point at the G-2 well in the northeast of Section 2, Township 22 North, Range 8 West.

Additionally, we performed a percolation test at the B battery where we took the water quality data. Again that's in Section 34, Township 23 North, Range 7 West.

We also did a test at the I battery location, which is in the southeast of Section 33, Township 23 North, Range 7 West. We also performed -- that, incidentally, was a percolation type test and not a pit subsidence rate test.

At the J-1 pit located in the northeast of Section 16, 23 North, Range 7 West, we performed a pit subsidence, water level subsidence type test.

And additionally, we did one up here at the Smith 2 location, which I believe is in the northwest of Section 18, Township 24 North, and

Range 7 West. So we conducted a total of five tests.

Q. What kind of results did you obtain from these tests, Mr. Kilmer?

A. Based on these tests we achieved an average vertical hydraulic conductivity rate of .012 feet per day.

Q. Is that low or high or what kind of a standard is that?

A. That's a fairly low value. It would be on the high end for shaley type deposits.

Q. Mr. Kilmer, did you prepare any exhibits to show the relationship of water migration into the subsurface as a result of your tests?

A. Yes, sir, I did.

Q. I'd like for you to refer to what we have marked as Exhibit No. 4 and have you identify what that is and what it contains.

A. Exhibit No. 4 is entitled, "Biodegradation and Vertical Migration Rates in Lybrook, New Mexico," and basically contains two elements: a biodegradation rate, as depicted by the lower plot down here, and a vertical water migration rate, as depicted by the upper plot,

the upper plot being a diamond and the lower plot being the dots.

Q. Let me direct your attention to the scale on the left-hand side first and have you tell the Commission what that scale means and how you arrived at that type of a scale.

A. Okay. The scale on the left-hand side is the BTEX concentration in micrograms per liter. And that scale goes from zero to 125. And we arrived at that spread based on the water quality that we observed at the B battery disposal point being 102 micrograms per liter.

And we wanted to track the biodegradation of that water from 102 micrograms per liter down to near zero.

Q. Did SRIC use a similar type of exhibit on April 9?

A. In terms of the BTEX concentrations for the SUTRA modeling, yes, they referred to an initial BTEX concentration, yes, sir.

Q. And what was that spread in that model?

A. The initial BTEX concentration on the SUTRA model, unsaturated portion of that model as generated by SRIC, was characterized by an initial concentration of 30,000 micrograms per

liter.

Q. Where would 102 micrograms per liter fit on a scale of zero to 30,000?

A. Well, if that scale read zero to 30,000, the 102 micrograms per liter would be the bottom 1/3 of 1 percent of that vertical distance. So basically all the data points would just be stacked along the bottom.

Q. Would it be a flat line along the bottom probably?

A. Basically, yes, sir.

Q. Okay. Let's move on to the bottom scale. Tell the Commission what that is.

A. Okay. The bottom scale depicts the elapsed times and days beginning at zero and going out to 300. This would be the elapsed time since the injection of a volume of water into the surface water discharge would get.

Q. Okay. What does the scale on the right-hand side of the graph show?

A. Okay. The scale on the right-hand side indicates the depth of water penetration in feet below land surface. And that scale goes from zero at the top of the scale to 50 at the bottom.

Q. Now, let's go to the first plot that you have -- well, which plot do you want to go to first?

A. Well, we can look at the lower plot, being the biodegradation rate. And assuming that you have a biodegradation rate of .95 percent per day and your beginning concentration was 102 micrograms per liter, it would take approximately 300 days to achieve a total BTEX concentration of five micrograms per liter.

Q. And why five micrograms per liter?

A. Five micrograms per liter is the drinking water standard for benzene.

Q. How about the other fuel contaminants?

A. Well, in earlier testimony, I believe, it's been established that the toluene, ethyl benzene, and xylene components, drinking water standards for those are in the hundreds. I believe toluene is 750; ethyl benzene is 620; and I think total xylenes are 750.

Q. Assuming there was no benzene in the BTEX component, I suppose that you would reach a safe standard a lot faster; is that correct?

A. Well, if there were no benzene in the originally discharged water at 102 micrograms per

liter, and that would represent the total concentration of toluene, ethyl benzene, and xylene, you would have water that would meet drinking water standards initially, at the outset.

Q. Okay, Mr. Kilmer, well, before I get to the next question, where did you get that .95 percent per day?

A. That .95 percent per day was presented in the chain study, which was referenced by Mr. Wallace, I believe, and used in his model, SUTRA model.

Q. Now, let's look at the entire -- well, let's go to the other plot that you have at the top and have you tell the Commission how you read that in terms of the entire graph.

A. Okay. Basically the upper plot depicts, based on the vertical hydraulic conductivity of .012 feet per day, which we determined with our permeability testing, and assumed porosity of 20 percent and a gradient of 1, this would be the rate of vertical fluid migration below a pit.

Q. Okay. Looking at the entire graph, what does the entire graph demonstrate?

A. Basically what the graph demonstrates is that, assuming you had a discharge of 102 micrograms per liter total BTEX and you waited for that to fully degrade down to 5 micrograms per liter, the water under these hydraulic conditions would have penetrated between 17 and 18 feet from land surface.

Q. And so at 18 feet you would effectively have clean water; is that what you're saying?

A. Yes, sir.

Q. Uncontaminated water?

A. Right.

Q. Let's look at the other component there, the vertical conductivity. Please discuss with the Commission how you arrived at that number.

A. Well, basically the testing that we did, we feel, depicts more in line with the horizontal hydraulic conductivity than the vertical.

Q. Why is that?

A. Water that's introduced into a pit flows basically in two directions. It flows horizontally and vertically. And in shaley type deposits, the vertical hydraulic conductivity is

on the order of -- it's either -- it's from one to three orders of magnitude less than the horizontal hydraulic conductivity.

In other words, in a horizontal direction a shaley deposit will transmit water much more readily than in a vertical direction.

Q. So in effect are you saying you're spreading the water out?

A. Right. This number, the .012 feet per day, is approximately 1/10 the numbers that we derived from our testing. That's a very conservative number. Probably the more realistic number would be 1/100, but we were wanting to be conservative.

Q. What does the published data show for a shaley type environment? Is this on exhibit 5?

A. This would be Exhibit 5, yes.

Q. Okay.

A. This is from an accepted groundwater reference text entitled, William Walton, "Groundwater Pumping Test Design and Analysis." And basically this gives representative vertical hydraulic conductivities for various types of aquitar or type sediments, first entry being sand, gravel, and clay and then a permutation of

that clay, sand, and gravel. And the last two entries, shale and clay.

The numbers in the middle column represent the vertical hydraulic conductivity in the units, gallons per day per square foot. The right-hand column is more in line with -- has the same units that we presented in the previous illustration such that the sand, gravel, and clay would have a range of vertical hydraulic conductivity from .013 feet per day to .13.

And then if you move all the way down to a consolidated shale, the vertical hydraulic conductivity is on the order of 1.3 times 10 to the minus 7 up to 1.3 times 10 to the minus 4.

So basically the .012 that we generated for those deposits would be typical -- on the testing that we did -- would be typical of what is described here as clay, sand, and gravel deposits.

So basically the numbers that we came up with were somewhat pessimistic in terms of -- the conductivity that we got was a little bit greater than published sources say it should be.

Q. Do you have any explanation as to why you wound up with a higher figure?

A. Yes, sir. I believe that the testing that we performed was on weather sediments. All our tests were at or near land surface. I believe that these hydraulic conductivites presented in the table here are representative of unweathered in situ deposits that you find at depth.

Q. At what depth would you encountered unweathered shale?

A. It would depend on the deposit and the climate of where you're doing your study. But generally speaking, if you could get down ten feet or more, you would probably find more representative of unweathered type materials.

Q. How far did you get down with your experiment?

A. Well, the tests that we performed on the disposal points were basically right at land surface. And the tests that we did with the percolation test method, we made excavations of between three and four feet for those.

Q. Could you have gone down further? Well, let me ask you, how did you make those holes?

A. We used a posthole digger.

Q. And is that as far as you could go?
A. That's about as far as we could reach with our posthole diggers.
Q. Now, does your figure take into consideration, as far as pits is concerned, any type of evaporation process?
A. No, sir, it does not.
Q. Does that also push that number up slightly higher?
A. It could account for some of the discrepancy that we see, absolutely. If you have a certain amount of evaporation, that's going to be water that under our calculations was accounted for as water that infiltrated rather than having evaporated.

So it would appear to make the vertical hydraulic conductivity greater by not allowing for evaporation.

Q. Beyond ten feet from the surface, would you expect to encounter shale conductivity as illustrated on this table?
A. Yes, sir. I would expect unweathered deposits of the Nacimiento Formation to fall somewhere between row 2 and row 3 on hydraulic conductivity. Basically row 3, that's 7 times 10

to the minus fifth to 1.3 times 10 to the minus third -- would be the range that I would expect.

Q. In your graph you've chosen to use the same, your actual data; is that correct?

A. Yes, sir, that's correct.

Q. And that gives you a more conservative figure or a higher figure, as you indicate?

A. Right. It indicates that the rate of vertical fluid movement out of one of these pits is greater.

Q. Let's go back to Exhibit No. 4, Mr. Kilmer. And I'd like for you to go to the right -- bottom right side, the bottom corner of the graph, right-side corner.

At what point would you estimate that you no longer have any contamination of water?

A. At the point at which your total BTEX concentration drops below five micrograms per liter, technically you don't have contamination. There's no legal contamination remaining.

Q. Okay. But let's go to what depth, let's say, on that chart would you estimate that you would get down to zero BTEX?

A. According to this estimate, it would probably be more appropriate to look at the

amount of vertical movement from land surface to determine how long it takes to get to five micrograms per liter.

In other words, you move from 102 micrograms per liter down to 5 micrograms per liter in the time it takes the fluid to move 18 feet. And without carrying that calculation out any further, I would estimate somewhere between 20 and 30 feet you would have no contamination left.

Q. Does the type of discharge as -- well, let's take the 1.5 barrels per day discharge from B battery, would that have any effect one way or the other on your estimate?

A. Not particularly, no.

Q. How about the 2.5 barrels? I think that's the greatest that BCO is discharging out there, if I recall correctly.

A. As long as you didn't wind up having a discharge rate that resulted in appreciable height of water being developed in the discharge pit, I think this is probably representative.

Q. So what's your answer? Is there any difference between 1.5 barrels and 2.5 barrels?

A. Not realistically, no, sir.

Q. So pit loading has no significance on this one unless you put the ocean in there?

A. Well, unless you put enough water in there to change the gradient, then basically you could increase the rate of flow. But in terms of vertical direction, we've assumed a gradient of 1, which is a pretty high gradient.

Q. Why did you use 1? And before you answer that, also answer why you chose the porosity at 20 percent.

A. The porosity I assumed at 20 percent. It's probably on the low end for sediments that could be occurring at the surface. As you get down further at depth, it may be more representative.

The gradient of 1, again, was an assumed gradient, which was purposely intended to generate a fairly pessimistic result.

Q. When you said a gradient of 1, what do you mean? You go down 1 foot, and then you go another foot to the side; is that --

A. Basically a gradient is in the saturated groundwater table. The gradient is defined as the number of feet, or whatever unit you want to use, of rise divided by the number of

feet of run, such that the gradient of 1 is equivalent to groundwater table slope of 45 degrees.

Q. And is that type of gradient realistic for discharge into the Nacimiento?

A. I think it's probably fairly representative.

Q. Okay. Do you have anything further on this exhibit, Mr. Kilmer?

A. No, sir.

Q. Let's go on to Exhibit No. 6 and have you identify that for the Commission, please.

A. Okay. Exhibit No. 6 is a cross-section of the B battery disposal location where we took our water quality data. And --

Q. What's on the left-hand scale?

A. The left-hand part of the scale is basically a vertical scale that's defined as an arbitrary distance above some point. This, by the way, was not surveyed in and is based on estimates which I have made and my attempt to accurately represent land slope and location of berms and the location of saturated water and so forth.

Q. Okay. Does the top line represent the

terrain?

A. Yes, sir. The top solid line would represent land surface. And you can see that there's a berm here and a berm here, and the discharge pit location would be in between.

Q. And what's the dashed line?

A. The dashed line within the pit area represents standing water level in the pit. And in the subsurface proximal to the pit represents what I estimate to be the saturated sediments below this pit.

One thing I'd like to point out is that I put question marks to indicate that we don't have any firm data to suggest that this is actually native groundwater or that this is what you might call a groundwater mound which has accumulated below this pit.

What's more likely in my view is that it is perched saturation within the Nacimiento Formation such that if you drill a hole through this saturated zone, you'd encounter dry sediments somewhere below it before you hit the perennial standing water table surface.

Q. And what's the perennial standing water surface? Is that the Ojo Alamo?

A. It would probably not be in the Ojo Alamo, but would be at some depth in the Nacimiento Formation, probably comparable to what we measured in our water level measurements for the two Nacimiento wells that we canvassed within the vicinity of Lybrook.

Q. And what's that depth?

A. The shallowest one we measured was 129 feet.

Q. Okay. You said 129 or 175?

A. I believe it's 129.

Q. You have a monitor well out there?

A. Yes. In our poking around at this location, we noticed that there were some evaporative salts on this slope down, and this is a pretty steep slope, downhill from the pit. And since we had our posthold diggers out, we thought, well, why we don't we go ahead and dig a hole and see if we encounter saturated sediments.

And, sure enough, we hit saturated sediments at approximately three feet. So we elected to install a temporary monitor well at that location and to collect our water sample.

Q. What did your water sample show?

A. Basically the water sample analysis indicated that the result was 36 micrograms per liter total BTEX.

Q. Mr. Kilmer, how does this compare with the information that you showed on Exhibit No. 4?

A. Happily, it compares fairly well. One of the things it points out is that our estimate as a gradient is not too far from wrong. It probably is something less than 1 there, but certainly somewhere in the neighborhood of 1.

Additionally, we take this data and we start off at 102 micrograms per liter, and we move approximately, what? 8 feet through the sediments vertically, and we wind up with 36 micrograms per liter.

Q. Have you changed Exhibit 4 to reflect this information?

A. Yes. We've annotated Exhibit 4 to basically show how this relationship cracks up with our empirically-derived field observations.

And what we did was just drew a couple lines on to indicate if you find the amount of time that it takes to go from 102 micrograms per liter total BTEX down to 36 micrograms per liter, it's on the order of 120 days.

If you take that line, that time line, and figure out at what depth the water is likely to have penetrated during that period of time, you find that it's between 6 and 7 feet from the land surface.

And I'd like to add that this entire illustration was constructed before we had the water quality data back on sampling that we performed at the B battery pit. So we haven't gone back and changed any of these parameters to try to make them agree better with what we found out.

Like I say, it's a happy situation when you can do some of this calculating and have the real world coming somewhere close to agreeing with what you predicted.

Q. So essentially the information on Exhibit 7, which is this exhibit that you're showing now, and Exhibit No. 6 is virtually identical; is that correct?

A. Yes. They're in virtual agreement.

Q. And you had no -- the results of those tests had no relation with each other? The testing had no relation with each other?

A. Like I said, when we constructed figure

4 and the unannotated version of Exhibit 7, we didn't have the water quality data. So we weren't really sure how that would hash out.

Q. What does all this information tell us, Mr. Kilmer?

A. Well, what it tells me is that for the type of discharges that BCO is making on BCO leases, it's unlikely that legal levels of BTEX contamination can be transmitted much below 18 to 20 feet below land surface.

Q. How about any type of contamination?

A. If you go back --

Q. Talking about zero contamination at this point.

A. Exhibit 6 indicates that in a distance of 8 vertical feet, we took the BTEX contaminants from 102 micrograms per liter down to 36. And I believe that's approximately a 65 percent reduction.

If you look at that as a linear relationship, which I don't think is unwarranted, it's highly unlikely that the contaminants would proceed below 20 feet from land surface.

Q. Can you reach a conclusion as to whether BCO operations are contaminating any

freshwater sources in the Lybrook area or at least in the area where BCO is operating and discharging?

A. Yes, sir, I can.

Q. What is that?

A. My conclusion is that groundwater contamination resulting from BCO discharging is not occurring.

Q. Do you have an opinion as to whether, assuming that this type of discharge continues, whether any contamination could occur in the future?

A. Yes, sir, I do.

Q. What is that opinion?

A. That opinion is that extended similar discharges will not have any greater penetration effects.

Q. Do you have any information to indicate that the discharges that BCO is discharging out there will increase in the future?

A. No. And, as we alluded to on the April 9 testimony, it's our view that BCO's production is on the decline in the Lybrook area, and it's only reasonable to assume that the discharge volume will decrease with time.

Q. Mr. Kilmer, let's look at Exhibit No. 8 if you would, please. Tell the Commission what this is.

A. Exhibit No. 8 is a dual induction log from the State J-2 well, which is located in Section 16 of Township 23 North and Range 7 West. And this log depicts the resistivities of sediments penetrated by this well down to a depth of 1700 feet.

Q. Now, why are you bringing this up to the Commission, Mr. Kilmer?

A. I believe that there was some skepticism as to the validity of the cross-section that we presented in terms of the accuracy of the depiction of the Ojo Alamo sandstone at depth.

And it took a little bit of looking around, but we were able to find an electric log that has a response to the Ojo Alamo Sandstone. And we felt that it would be enlightening to go ahead and present the information and show at least what the depth of the Ojo Alamo Sandstone is at this location, which doesn't coincide exactly with the location of our cross-section that was presented.

Q. Would this be a type log --
A. Yes, sir.
Q. -- for the Nacimiento?
A. Right.
Q. Or at least to show the thickness of the Nacimiento?
A. Yes, sir, that's correct.
Q. Okay. What exactly does this log show?
A. Well, the way we've interpreted this log is that the Ojo Alamo Sandstone comes in at a depth of approximately 1520 feet and has a thickness of approximately 150 feet.
Q. Now, in your cross-section you generally indicated that through your line of cross-section you had what kind of a thickness for the Nacimiento?
A. I think we had the thickness of the Nacimiento at 1200 feet.
Q. And this shows a thickness of the Nacimiento at what? 1500 feet?
A. 1520 feet, yes, sir.
Q. So what conclusion do you draw from this log --
A. Well, from a groundwater protection standpoint, we were arguing that the Nacimiento

is quite thick in the area, and it lends weight to our argument that groundwater protection of the Ojo Alamo Aquifer is well afforded by the Nacimiento Formation.

Q. Mr. Kilmer, this morning Mr. Olson indicated that he'd been out in the Lybrook area, and he said that he found some alluvium contrary to your statement and your report that there was no alluvium.

Can you -- or well let me ask this this way. Do you have an explanation as to why you made the statement that you did in your study as far as alluvium is concerned?

A. Our study basically took us through BCO production up in the neighborhood of Duffer's Point and down through the Escrito, Lybrook, and Alamito Fields, which basically is the center portion of the map indicated. And this is figure 1 from Exhibit 1 presented earlier.

In our field reconnaissance through those areas, we did not see appreciable accumulations of alluvium in the vulnerable areas.

Q. You state as a pretty absolute statement that there's no alluvium in the Lybrook

area. Do you mean that in an absolute way?

A. No. That was just a general statement that was intended to refer to the proposed extended vulnerable area as affects BCO's production in this area.

Q. Now, in drawing the boundaries for the Lybrook area, how did you go about doing that, mapping the Lybrook area?

A. Basically we wanted to depict an area that included all of BCO's production from north to south and east to west. And the boundary of this illustration circumscribes BCO's production basically.

Q. Now, in the pits that you studied and the discharge areas where BCO discharges water, are you fairly certain that there are no discharges into the alluvium if there's any alluvium in that particular area?

A. Yes, sir, I am.

Q. And it's your testimony and your opinion that the discharges are directly onto the Nacimiento?

A. Yes, sir, that's correct.

Q. Then you found no evidence to indicate that any type of discharge would be into any

alluvium that may be out there?

A. Not that we know of, no, sir.

Q. Do you disagree with Mr. Olson that he found alluvium out there?

A. No, sir, we don't. The areas that Mr. Olson indicated, and we haven't had probably an adequate opportunity to compare notes on this since it we were just presented with the information this morning, but we don't necessarily have any quarrel with Mr. Olson's assertions that he found alluvium in some of the areas that he checked. No, sir.

Q. What was your reaction to the testing, water testing, that Mr. Olson made out there on the one well that had, I believe, 150 parts per million of salt solids?

A. I'm not too certain that Mr. Olson did any testing. I believe he was referring to published data on a well that he indicated in the area. But basically it would be a very high quality water. In the neighborhood of 100 milligrams per liter tds, no doubt.

Q. Doesn't that indicate to you that there's no pollution or contamination in that area?

A. It could be a very good indication of that in that the discharge water, aside from the organic compound component. If you look at the tds, the discharge water would be much greater than 100 milligrams per liter.

And on that rationale you would expect that if there had been contamination, you would see some manifestation in the inorganic aspects of it.

Q. How about the locations that Mr. Olson found alluvium? Do you have any comment with regard to that insofar as whether there's any production around that?

A. Again, we haven't had a very good opportunity to evaluate the information that was presented. But the areas that he indicated on the map were not close to areas in which BCO has production.

Q. Now, going again to your field reconnaissance, isn't it true that you look after what you have considered to be the worst sources of contamination, if there were any, in this area?

A. Yes, there is. We discussed in the earlier proceedings, we were looking for

manifestations of contamination in and around San Jose Springs because we considered that the San Jose Formation was more susceptible to contamination than the Nacimiento Formation in the intervening canyons.

Q. Does that indicate to you that perhaps the proposed regulation is not directed in the appropriate way in terms of simply identifying the vulnerable area as opposed to identifying sources of discharge?

A. Absolutely. And we alluded to this a little bit earlier, that we felt that the most vulnerable areas, at least in and around the vicinity of Lybrook, were the topographic salients rather than the topographic lows in which the proposed extended vulnerable areas reside.

Q. Now, have you had any experience in dealing with alluvium in the San Juan Basin?

A. Yes, sir, we have.

Q. And have you made any studies for anyone in connection with what type of water you would encounter in an alluvium?

A. Yes, sir, we have.

Q. Tell us about your studies in an

alluvium as far as in the San Juan Basin.

A. Geohydrology Associates back in 1979 and 1980 conducted an investigation of alluvium, valley fill deposits, in the vicinity of the Pittsburg and Midway Coal Mining leases, approximately eight miles southeast of Window Rock and ten miles northwest of Gallup.

And in that investigation we drilled numerous monitor wells through the alluvium and into the underlying bedrock to establish the quantity of groundwater that might be present in the alluvium.

As the objective of the study, PNM Coal was going to have to acquire and retire some water rights associated with strip-mining in the area. And our goal was to quantify the amount of water that was present in the alluvium in that area.

Q. Where is this area again? It's eight miles south of Window Rock, you said?

A. It's basically right between Window Rock and Gallup. It's northwest of Gallup and southeast of Window Rock.

Q. Did you find alluvium in that site?

A. Yes, sir, we did.

Q. And did you find that type of alluvium in the Lybrook area?

A. No, sir, we did not. In the study for PNM Coal, we identified fairly thick accumulations of alluvium, at least in some of the downstream areas of the channels that we were checking where there was a fairly deep dissection. And I think we measured up to 48 to 50 feet of accumulation of alluvium in that area.

The only alluvium that we may have seen in the vicinity of Lybrook associated with our field reconnaissance for BCO were very thin veneers of alluvium laterally discontinuous and basically not mappable on a geologic map.

Q. Did you find any published information on alluvium in the Lybrook area --

A. Yes, sir, we did.

Q. Where did you find that?

A. It's published, but it's no longer in print, a series of geologic maps that were constructed by the New Mexico State Highway Department's geology section.

They were attempting to identify aggregate deposits for possible utilization for

highway building projects, I assume. And the Lybrook area is depicted in those maps, yes, sir.

Q. Did you believe that the deposits shown in that information were significant to change your opinion as to whether there was any alluvium in the Lybrook area?

A. No, sir, we did not. Basically there is a disagreement between the alluvium that is mapped on the State Highway Department's geologic maps and the vulnerable areas as depicted in the Lybrook area.

Basically each of these stream channels, these ephemeral stream channels, the vulnerable area extensions go well beyond those areas which are depicted as having accumulations of alluvium on the State Highway Department's geologic maps.

Q. Mr. Kilmer, going back to the McKinley County study that you made, I'd like for you to refer to Exhibit No. 9 and tell us what that is.

A. First of all, I'd like to orient the Commission to where the study was conducted and what it amounted to. Again, this is halfway between Window Rock and Gallup. And the yellow area depicted on this --

Q. Mr. Kilmer is that on a USGS quadrangle?

A. Yes, sir. That's a USGS seven-and-a-half-minute quadrangle.

Q. What's the name of that quadrangle?

A. Oh boy, it's the Sampson Lake, New Mexico quadrangle. This area is approximately in Township 16 North and Range 20 West.

Q. Assuming that there would be the type of deposit of alluvium in Lybrook as shown in the McKinley County or on that quadrangle, I take it the yellow is the alluvium; is that correct?

A. Yes, sir. The yellow is alluvium as depicted by the same series of maps, the State Highway Department maps.

Q. And what are the black circles in series there?

A. Okay. Each of these black dots depicts the monitor well that was drilled through the alluvium into the underlying bedrock and completed as a permanent monitoring well.

You see that we drilled three transects on the main drainage of Defiance Draw. And then we drilled two transects across a couple of tributaries.

Q. What information did you gather from this study?

A. Let me go through these overheads a minute, and I'll show you what we got. First of all, I'd like to say that all these wells that we drilled, which were drilled in December of 1979, were all dry at the time we drilled them. They all penetrated completely through the alluvium and were cased so that we could afford a permanent monitoring point.

This cross-section here depicts the results of the drilling across Defiance Draw Transect 1, which is the downstream transect. And on each of these cross-sections, the view will be in the upstream direction such that, for example, Well "D" 1-A would be the left-hand well as you're looking upstream and so forth.

Basically this is Transect 1, the downstream transect, and it identifies approximately between 50 and 60 feet of alluvium in Well "D" 1-D, which is approximately the axis of the arroyo, which was filled with the alluvium at this location.

Q. It's deeper in the center; is that what that shows?

A. Yes, sir. The underlying formation in this case is the Menefee Formation, which at most of these locations was either shale or siltstone. We did encounter some sandstones within the Menefee Formation in these borings. But for the most part, it was shaley-type deposits.

And additionally, the soil borings indicated that the alluvium was fairly fine-grained material that had -- would have a low vertical hydraulic conductivity.

Q. How low?

A. We'll present some more data, and I'll show you.

Q. You're now on the second page of Exhibit 9, I take it?

A. Right. And this is Transect 2, which again is the middle transect on Defiance Draw. It depicts land surface on the top curve and the alluvium and bedrock interface below.

Again, all these wells drilled in November of 1979 were dry.

Q. You're on the third page of Exhibit 9?

A. Yes, sir.

Q. Transect 3?

A. This is Transect No. 3, which is the upstream location, located right here. Again, you're looking upstream.

Q. When you say "located right here," where is "right here"?

A. That's in Section 17 of Township 16 North, Range 20 West. I'd like to point out that we did encounter saturation in Well "D" 3-D td'd at 45 feet approximately four months after the well was drilled in March of 1980.

Again, when we first drilled the well, it was dry. And after an inordinate amount of precipitation, it just so happened that that winter was an El Nino winter, which I don't know if any of you folks follow the weather or not --

Q. What's "El Nino"? What does that mean?

A. El Nino is a climatic event which occurs approximately once every seven years in which inordinate amounts of wintertime precipitation fall in this part of the United States.

Q. Okay.

A. Incidentally, this is an El Nino year, or this winter has been an El Nino winter.

Okay. This is Defiance Draw Tributary

1 Transect, which is located in Section 11, Township 16 North, Range 20 West.

Q. Point to that again. You were standing right in front of that.

A. [Witness complied.]

Q. Okay.

A. This transect again didn't encounter any water when we drilled the wells, and we never found water during our approximately monthly observation throughout the period of record out there that we observed, which was approximately eight months.

Okay. This is the transect for Tributary 2, Defiance Draw, which is located in Section 2 of Township 16 North and Range 20 West.

Q. That's the uppermost transect?

A. Yes, sir, that's the northernmost transect. Again, when we drilled these wells, we didn't encounter any groundwater, although after copious amounts of winter precipitation, we were able to detect water in three of these wells.

And I'd like to present a hydrograph to show the water level responses in these three wells. Basically we had found water in Well

"DT" 2-A, "DT" 2-B, and "DT" 2-C. The hygrographs look something like this.

Q. What's a hydrograph, Mr. Kilmer?

A. A hydrograph is a graph depicting the elevation of water within a well over a period of time. We made a series of water level measurements. Initially, again as we drilled these holes, they were all dry.

In March of 1980 we detected approximately four-and-a-half feet of saturation in Well "DT" 2-A. In Well "DT" 2-B, we detected approximately one foot of water.

Q. How do you measure that four-and-a-half feet? Where do you get that measurement?

A. Well, we took the measurement. We measured the water level from the top of the casing, the well casing, and we get a depth of water.

And having an estimate of the elevation of the top of the well casing and the depth to the water, you subtract the depth to water from the elevation of the well casing. And these would depict the elevation of the water levels that we measured.

Q. Do you measure the amount of water you

encountered on the bottom scale? Is that how you read that graph?

A. The bottom scale would be a date scale, and those represent the 12 months for the year 1980. In other words, January would be 1 and December would be 12.

So basically what we encountered in all three of these wells is what I would call ephemeral water. In other words, it was not there in December of 1979 when we drilled the wells. And by October of the following year, it was gone.

So it's a, what you would define as ephemeral groundwater.

Q. Does that mean it's a temporary source of water?

A. I don't think you can characterize it under any circumstances as a source of water because the chances that you would find it are slim. We just happened to luck out to find this during an El Nino year.

And this is probably typical of what you would see, small amounts of saturation when there are large amounts of precipitation. And when that source is cut off, the saturation goes

away.

Q. What happens to this water? Does it migrate down to the Menefee, or where does this water go?

A. Some of goes into the Menefee, and probably a greater portion of it is lost to evapotranspiration.

Q. What's evapotranspiration?

A. Evapotranspiration is the combined effects of evaporation from soil and transpiration by plants. The plant roots take up the moisture out of the subsurface and transmit it to the atmosphere and through the leaves.

Q. Do you have anything further on these?

A. Yes. I'd like just to give you an idea of the effects of El Nino. This is National Weather Service precipitation data that was collected at the Gallup, so-called Federal Aviation Administration station between the years 1973 and 1987.

And we have taken the sum of December, January, and February's precipitation measurements for the years indicated such that if you were looking at this data point here, this would be representative of December 1973, January

and February of 1974. And this .2 would be the combined precipitation in inches for those three months.

And the reason we selected the winter months is because that is the time during the year when the greatest amount of recharge is taking place.

Actual precipitation -- the greatest amount of precipitation occurs during the summer squall months when there are storms that move through and release large amounts of water. But unfortunately during the summer, evapotranspiration rates are extremely high, and most of that water is lost before it has a chance to recharge.

During the winter months evapotranspiration rates are low. And so this is the period of the year when recharge to groundwater is taking place.

And basically what this graph shows is that there's quite a jump in the amount of precipitation that occurs beginning in December 1979, or more accurately for the months of December of 79, January and February of 80.

And this is synchronous with the time

period when we were out making -- doing the soil boring and making the water level points.

Q. Mr. Kilmer, what relation does this have to the Lybrook area, all this information you've shown to us here on Exhibit 9?

A. The relationship that it has is, of course, that this has been an El Nino year, and we don't consider it surprising that there might be small, thin saturations of ephemeral water that would occur at the bottom of some alluvium.

Q. In terms of contamination the Oil Conservation Division has a duty to protect freshwaters. What effect would BCO's operations have on discharging assuming there is alluvium in the Lybrook area --

A. Again --

Q. -- In this particular water source?

A. Those types of water sources being ephemeral would be lost and would only be temporary -- would only be in place on a temporary basis and therefore would not be impacted. They would not be sources of water that would be impacted by discharges on BCO's leases.

Q. Mr. Kilmer, would the climatic

conditions be similar to the McKinley County study and the one in the Lybrook area?

A. I think the rainfall characteristics for both of these locations are very similar, within one or two inches per year of the total. And I expect the peaks and lows in the rate of precipitation to be very similar for the two locations. I know that the evapotranspiration rates are very similar for those two areas as well.

Q. Mr. Kilmer, it's not your testimony here today, is it, that these type of water sources are not important and therefore no regard should be taken to protect this type of water source; is that correct?

A. No, I would not maintain that. But I would be quick to point out that the logistical problems and practical problems of trying to define a resource, assuming you could call it a resource and I would debate that because it's not there very long, but for the sake of argument if you could call it a resource, you'd have a very difficult time trying to delineate it, find out where it was, and take steps to protect it.

Q. Now, going back to the December 9

hearing, Mr. Kilmer, Commissioner LeMay asked you about the State Engineer standards. And I think you left the impression, at least the implication, that possibly water having a high amount of dissolved solids should not be taken care of as much as a good water source that would be potable.

I think you were making the distinction between potable and unpotable water at the time. Would you like to clarify your answer to Commissioner LeMay with regard to what you answered in terms of potable and nonpotable, at least for human consumption?

A. Well, I think your statutory mandate is very clear. It says if the TDS concentration is below 10,000 milligrams per liter, then you're bound to protect it.

I think the point that I was trying to make was that from an evaluator's or a regulator's standpoint, if you have a limited number of man-hours of time and resources that you can devote to the protection of groundwater resources, certainly you should focus your efforts on the more pristine sources of water.

Q. But that does not mean that you should

contaminate other sources up to the State Engineer's standard of definition of what freshwater is?

A. No, sir.

Q. Mr. Kilmer, do you believe there are other areas in the San Juan Basin that would be similar to the Lybrook area in terms of the kind of geologic condition and the type of discharge that BCO is conducting in that area?

A. Yes. I feel that there are extensive areas in the San Juan Basin that would be very analogous to the conditions that we find at Lybrook.

Q. And would these areas be potential candidates for variances to be issued by the Commission?

A. Absolutely.

Q. Now, what is your recommendation to the Commission as far as the Lybrook area is concerned insofar as exemption, variance, or exclusion is concerned?

A. We will maintain that we feel that there is certainly inadequate technical justification to the assertion that groundwater contamination is occurring as a result of BCO

activities near Lybrook. And our recommendation would be that the BCO properties be exempted.

Q. In other words, what you're saying is that the level of protection afforded by a lined pit in this area is not necessary?

A. That's correct.

Q. Now, considering the testimony by Mr. Olson this morning as to the depths of groundwater as shown by OCD Exhibit No. 15, and I'll hand this to you, do you have any change in your opinion as to whether or not BCO operations are contaminating groundwater by virtue of its discharges considering the depth to groundwater as shown on that exhibit?

A. No, sir, I do not.

Q. And why not?

A. I believe that it's highly likely that some of the soil borings that Mr. Olson performed indeed encountered ephemeral water, which may or may not be there some weeks or months in the future, likely would not be during the next several years.

Further, a couple of wells that were quoted, I believe there were a couple of dug wells in Blanco Wash that were referred to and a

dug well down in Escarvada Wash, all of which are some distance from BCO producing properties and therefore although it's -- and we will admit that it's demonstrated there are perennial saturations in shallow alluvium some distance away, we still don't have any direct evidence to show that groundwater is at risk near BCO production around Lybrook.

Q. You're saying there's a considerable amount of separation from there to the actual production, the actual discharges, I take it?

A. Right. I believe that's correct. Again, I'd like to stress that we haven't had an ample opportunity to go over the data that Mr. Olson presented, but based on areas that he indicated on the map earlier in his testimony, yes, I would make that assertion.

Q. Considering the location and the nature of the discharge and the conductivity in the Nacimiento, is there any likelihood in the foreseeable future that there will be any contamination to these freshwater sources that Mr. Olson identified in his testimony this morning?

A. Not in my view. Could I -- I think we

overlooked a point in the presentation of the alluvium data. Could we present that now?

Q. Sure.

A. We did some hydraulic testing of the wells that were completed in the alluvium during the short period of time that there was saturation.

Well "D" 3-D, we did a slug test on, and we obtained a hydraulic conductivity of .016 feet per day. I'd like to stress that that is a horizontal hydraulic conductivity. And it's likely that the vertical hydraulic conductivity in this type of sediment would be at least one order of magnitude lower and maybe more.

This compared very favorably with the vertical hydraulic conductivities that we obtained in our testing of the Nacimiento. And basically what this tells us is that the alluvium, at least in this location, is not highly transmissive and, from a groundwater protection standpoint, would afford a level of protection on a equal footing with that which is afforded by the Nacimiento where we tested it.

We did one other test at the Tributary 2 transect. And while this doesn't have a

hydraulic conductivity determination, it does have a transmissivity determination.

If you assume that there was 2 feet of saturation, this transmissivity value would yield a hydraulic conductivity of .15 feet per day. And basically if you move that one order of magnitude over, that would .015 feet per day.

So in both these locations we got very tight sediments. Basically when we conducted these slug tests, we did it using bailed volumes of water. We would come to the location and set up to make rapid water level measurements and instantaneously remove a known volume of water from the well and watch the water level recovery.

And if you check the data that was generated, you'll see that it took actually hours in one case and more than one day in another case for the water level to completely return to pre-impacted conditions. Thank you.

Q. Mr. Olson -- I'm sorry. My mind is going again. Mr. Kilmer, do you have anything further to add to your testimony?

A. No, sir.

MR. PADILLA: Pass the witness, Mr.

Chairman.

CHAIRMAN LeMAY: Do you want to move the exhibits in the record?

MR. PADILLA: Move the admission of Exhibits 4 through 9.

CHAIRMAN LeMAY: Are there objections? If not, Exhibits 4 through 9 will be admitted into evidence.

Mr. Roberts?

MR. ROBERTS: I have no questions.

CHAIRMAN LeMAY: Mr. Kellahin?

MR. KELLAHIN: Pass.

CHAIRMAN LeMAY: Mr. Meiklejohn?

MR. MEIKLEJOHN: May I just have a moment?

CHAIRMAN LeMAY: Sure. We'll go to Mr. Stovall.

MR. STOVALL: Sure. I'll be glad to do that. I'm not sure exactly where we went the last hour-and-a-half, but I've got a couple questions I'd like to go through.

EXAMINATION

BY MR. STOVALL:

Q. First, tell me what alluvium is in your mind, Mr. Kilmer.

A. Alluvium is weathered and transported material from its parent source that has been moved a minimum distance and redeposited in another location.

Q. Would you mind going to the map and showing me, if you know, where the Highway Department alluvial deposits were located on the BCO map.

A. Basically the alluvial deposits are located in the centers and at a lesser distance upstream than these channels in practically every case.

The proposed expanded vulnerable areas in general across this area, which is basically a surface water divide, greatly exceed the areas mapped as alluvium by the State Highway Department such that, for instance, in Alamito Wash is a particularly strong example of where the Highway Department mapped the alluvium from the very thin stream no further than up to, I believe, this confluence between Alamito Wash and Escarvada Wash.

And from BCO's perspective, the impact is substantial. I think they had something like 12 discharge locations that are inscribed within

the proposed extended vulnerable areas which the Highway Department indicates there's no alluvium there and that has denuded the Nacimiento Formation.

By the same token, if you move up Blanco Wash, I believe the Highway Department map indicates alluvium goes not much further than the Rio Arriba County line such that the expanded vulnerable area goes approximately four or five miles past the area that has been mapped as alluvium by the State Highway Department.

Q. That's all the questions I have as far as the map.

Now, you understand that when the Division mapped the vulnerable area and defined it, it didn't do an individual investigation of each wash, each arroyo, each basic drainage, but it used a standard criteria across the basin?

A. Yes, sir, I do.

Q. Also, when the Highway Department was mapping for alluvium and looking for alluvium, you said they were looking for it for road construction material; is that correct?

A. That's correct.

Q. So that would probably be mapped in

terms of ground material which could both have the coarseness and the volumes that would make it economically practicable to get it out and use it for highway purposes; is that correct?

A. No, sir, that's not correct. They subdivided the alluvium into several different types of deposits. Obviously they mapped the deposits. It looked as if they might be attractive to use for roadbed type material.

But the alluvium, as they mapped it, includes a rigorous definition of all alluvium which, as I said before, is material that's been transported and deposited elsewhere.

Q. Now, you talked about the water being fairly high quality. That water is protectable, isn't it? I mean that is what we're trying to protect is water, for example, the well Mr. Olson talked about?

A. Assuming that you can find it, identify it, and delineate it, yes, it would be.

Q. Now, you've stated that at this time there's no BCO discharges into the alluvium area or areas where Mr. Olson was and states that he found water.

Can you state with absolute certainty

that there will never be production there or wells drilled or discharges into that area?

A. I'm not sure which area you're referring to.

Q. Well, I'm talking about the areas you were talking about, the ones where you stated, I believe, if I heard you correctly, that when Olson identified the areas where he found alluvium and water, that that was not areas where BCO had production and discharges.

A. That's correct.

Q. Can you guarantee the Division and the public that there will never be production and discharges in that area?

A. I don't know what the status of BCO's leases are.

Q. I'm not talking about BCO. I'm talking production.

A. No, sir, I cannot.

Q. Okay. You understand that what we're trying to do is protect and set a standard of conduct for future operations; primarily the goal is elimination of discharges?

A. Yes, sir.

Q. Now, you had your map of the area down

by Window Rock, just for clarification, you talked about as being Range 20 West. That is not NMPM, is it, New Mexico Prime Meridian?

A. That's New Mexico Prime Meridian, I believe, yes, sir.

Q. Is that correct? Okay. I just wanted to make sure. I was thinking that was further west than that.

And you're suggesting that based upon an analysis done what? 50, 75 miles away, that the Commission ought to exempt from protective regulation a 324-square mile area in Lybrook?

A. Basically we introduced the material that was generated near Window Rock as a mechanism of enlightenment for all the parties involved so that more informed decisions could be made concerning the relationship of the extended vulnerable area and any alluvial deposits that those may delineate and the presence or absence of a shallow vulnerable groundwater source.

Q. Wouldn't that better be handled by a variance where you could actually look at the area particularly given the fact that some groundwater has been found in alluvial washes in the area?

Wouldn't the variance approach to do a more careful analysis in the Lybrook area be a more appropriate way to determine what protection is needed?

A. Well, I've heard a lot of testimony today about variances. And my personal opinion is that variances are often set up in a way that, as a practical matter, makes it extremely difficult and expensive to obtain the variance.

And so you would have to identify more specifically what type of variance mechanism you're referring to before I could comment on that.

Q. Well, you've suggested here, for example, I think I heard you say towards the end of your testimony that the conditions which you found in -- well, let me back up. Let me ask one question first.

You've indicated that you felt the more vulnerable areas, from a standpoint of potential harm to groundwater, were actually on the mesa tops?

A. Yes, sir, that's correct.

Q. It sounds to me like perhaps we ought to redefine the vulnerable area to go to a

broader basis and include some of those areas where there is an even greater threat to groundwater; is that what you're recommending?

A. My recommendation is that a rigorous attempt be made to identify known resources of shallow vulnerable groundwater before an onerous and costly proposal is initiated.

Q. How would you propose to do that?

A. It takes a lot of work. The United States Geological Survey have been in the business for quite some time of generating volumes of groundwater data. There's a lot of it available. More needs to be obtained.

Q. Given the fact that we want to protect and prevent contamination, some of which has been described as very good water, is there a better way to do that than to go through a variance process and say, "Okay, we think there's a possibility there's water out here. Now, you who are in control and who have something to lose out here are going to demonstrate to us that there isn't"?

Can we accomplish the same result in a different way?

A. Well, I can only think of an analogy,

is that if there's a rumor that you have mice in your house, do you recommend burning down the house as a protective measure to rid yourself of the mice?

Q. Well, that's an excellent analogy. I know we've been here too long now.

Let me move on to something else. You've indicated that there are other areas in this thing, other areas out there that are similar in character to this?

A. Yes, sir.

Q. Is that correct?

A. Sure.

Q. And what I've heard you say is grant an exemption to the area that's operated by BCO, but in the same conditions take everybody else and put them in a variance process. Is that what I understand you to say, is grant an exemption based upon the operator?

A. No. I'm saying that the extended vulnerable areas should not be projected into areas where there is not vulnerability to groundwater contamination. It just so happens we went out and studied BCO because that's our job.

My assertion is that there are many

other areas likely to be located in the San Juan Basin in which the operators that are in those same areas are going to fall through the cracks.

MR. STOVALL: Mr. Kilmer, I'm afraid I'm led to the conclusion that you're requesting that we not protect water that you've demonstrated is clean until we've proved that you contaminated it. And I suspect that that may go against the focus of the regulation.

I have no further questions.

CHAIRMAN LeMAY: Mr. Meiklejohn?

EXAMINATION

BY MR. MEIKLEJOHN:

Q. Mr. Kilmer, you heard Mr. Olson testify this morning about some work that he did just recently in the Rincon Largo area; is that right?

A. Yes, sir, that's correct.

Q. Do you recall that? And could you locate for us on the map, please, where he indicated that he found alluvium and found groundwater?

A. Not with certainty. I have not located those points on the map. I can point to the same places where it appeared to me that he pointed, but we had not plotted those points on the map.

Q. Okay. Does BCO have producing wells in the -- is it a wash? Is Rincon Largo a wash or a canyon or a draw?

A. A canyon.

Q. Canyon. Does BCO have production wells in that canyon?

A. I believe they do, yes, sir.

Q. Do you recall how many there are?

A. No, sir, I don't.

Q. Could you go to the map and take a look at it and tell us approximately how many there are?

A. I see three discharge points in Rincon Largo Canyon.

Q. Well, on the copy of the map that I have, I count about five or six.

A. The map that you have is a photocopy that doesn't -- it only indicates the locations of wells.

Q. I see.

A. This map is annotated and indicates locations of not only the wells, but the ones at which their discharge points are highlighted. So basically it would be the wells that have pink highlight around them.

Q. I see. That doesn't show on the map, on this black and white copy?

A. No, sir.

Q. There is also a water well in that canyon, isn't there?

A. Yes, sir, there is.

Q. There are a couple of Rincon Largo -- I'm sorry, BCO wells fairly close to that water well. Are those production points? Are those discharge points?

A. Those are production points and not discharge points.

Q. I see. Is it your testimony that that area of that canyon has no alluvium in it; whereas, the area that was investigated by Mr. Olson does have alluvium in it?

A. Not being certain where Mr. Olson's study was conducted, I wouldn't want to make that contrast. But our investigation of that area didn't indicate appreciable thicknesses of alluvium, no, sir.

Q. What do you mean by "appreciable thicknesses of alluvium"?

A. Any more than a veneer of less than ten feet.

Q. Is it your understanding that Mr. Olson testified that he found groundwater, I believe he said, at a depth of 20 feet?

A. I believe Mr. Olson indicated that he found saturated sediments at a depth of 20 feet.

Q. Is it your testimony that there are not saturated sediments elsewhere in that canyon?

A. Not having specific, intimate knowledge of the hydrogeology of that canyon, I couldn't say that there wasn't, no, sir.

Q. Do you know whose water well that is?

A. No, sir, I don't.

Q. Are you familiar with any efforts to test the water in that well? Do you know what the results of any such tests would be?

A. I believe we made an attempt to collect a water sample from that well in our original reconnaissance. And at that time we were unable to gain access because of impassable roads.

Q. Did you make an effort to find out who owns the well?

A. No, sir, I didn't.

Q. That canyon is within the area that you are asserting should be exempted in the order adopted by the Commission; is that right?

A. Portions of that canyon, yes, sir.

Q. Are you familiar with the hydrogeology of all the portions of that canyon which you are asserting should be exempted?

A. Only to the extent that I've compared the extent of alluvium that's been mapped by the State Highway Department and what I observed in the field.

Q. I'm sorry. Would you repeat that, please?

A. I'm familiar with that portion of the canyon that is in the very upstream portion of the canyon, the headwaters, if you will, of that canyon.

Q. And approximately what portion or percentage of the canyon is that?

A. I don't know how far downstream that canyon goes off the map, so I wouldn't want to put a percentage on it. But probably not a very great portion of it. Just the upstream portion, the portion near BCO's production up there.

Q. All right. Thank you. You testified at the hearing in April that there wasn't any alluvium in the areas that you were asserting should be exempted from the proposed vulnerable

area; is that right?

A. If we did, it may have been in error. We meant to testify that we did not see alluvium in the expanded vulnerable areas in the vicinity of BCO production where we did our field reconnaissance.

Q. In one of the exhibits that you've submitted, I believe it's BCO Exhibit 6, do you have that? That's the cross-section of the B battery disposal location?

A. Yes, sir, I do have that. That shows a disposal pit and below it groundwater; is that right?

A. It shows a disposal pit and below it, saturated sediments.

Q. Is it your position that that's not groundwater?

A. Yes, sir. Not native, naturally occurring groundwater.

Q. What is it?

A. It is perched water that goes -- proceeds for an unknown distance vertically below that discharge point.

Q. What's the source of that perched water?

A. The source of that water is the disposal pit.

Q. And you do not know whether that perched water connects with any groundwater?

A. Not with absolute certainty, but we're fairly confident that it does not.

Q. What's the total extent of that perched water? How far does that perched water go?

A. It would be difficult to make a very informed judgment of that without taking into account the likely rate of loss of water to evapotranspiration and the likely depth of penetration and the rate disposal of water into that pit.

Q. And the total, as shown on that exhibit, the total BTEX content in that perched water is 36 micrograms per liter?

A. At the point where we measured it at that monitor well, that's correct.

Q. That exceeds the Water Quality Control Commission standards, doesn't it?

A. Yes, for drinking water it does.

Q. Are you aware of -- you discussed earlier in your testimony contamination of perched water, or I think you said ephemeral

water supplies.

Is there anything in the Water Quality Control Commission standards or the Oil & Gas Act that exempts such water supplies from protection?

A. Not to my knowledge, not specifically.

Q. Are the disposal pits that BCO has constructed not located in alluvium?

A. The ones that we have looked at have been located on the Nacimiento Formation. We have not visited every disposal point.

Q. How are those pits excavated?

A. They're basically, a certain amount of soil is removed from the pit and stacked into a berm which surrounds the pit.

Q. Does the fact that you're excavating in the Nacimiento Formation present any particular difficulty in excavating the pit?

A. I can't testify as to how much trouble they may have had digging those pits. I can tell you that when you start hitting relatively unweathered Nacimiento Formation in a dense shale with a pair of posthole diggers, it will jar out your false teeth.

Q. I'm sorry to hear that. You've not been involved in actually setting up any of those

pits?

A. No, sir.

Q. How deep is the monitor well that's shown in BCO Exhibit 6?

A. It's approximately three-and-a-half feet deep.

Q. Are there any other monitor wells surrounding that particular disposal location?

A. No, sir.

MR. MEIKLEJOHN: I have no further questions.

CHAIRMAN LeMAY: Thank you, Mr. Meiklejohn.

Commissioner Bailey?

COMMISSIONER BAILEY: No.

CHAIRMAN LeMAY: Commissioner Weiss?

EXAMINATION

BY COMMISSIONER WEISS:

Q. How long has that pit and battery been in use?

A. I'm not certain. I haven't researched the age of it. But based on the condition of barbed wire fences and so forth, I would estimate it's been there at least ten years.

COMMISSIONER WEISS: No more

questions. Thank you.

CHAIRMAN LeMAY: One short one.

EXAMINATION

BY CHAIRMAN LeMAY:

Q. Your reference to mice, is that in any way refering to three blind mice or in any way referencing the current City Commission?

A. No, sir, it's not.

CHAIRMAN LeMAY: Any other questions of the witness?

MR. PADILLA: A couple of questions on redirect, Mr. Chairman.

CHAIRMAN LeMAY: Fine.

FURTHER EXAMINATION

BY MR. PADILLA:

Q. Mr. Kilmer, Mr. Meiklejohn asked you some questions on the canyon over to the right, I'm not sure which one. I think it's the Rincon Canyon; is that the one?

A. Yes, sir, the Rincon Largo Canyon.

Q. And you stated that there were three discharge points in that canyon, three BCO discharge points?

A. Yes, sir, that's correct.

Q. Are those discharge points located on

the Nacimiento?

A. I have not personally visited those three discharge points, so I couldn't say with certainty.

Q. Are you reasonably certain that they are completed in the Nacimiento?

A. Yes, sir, reasonably.

Q. Based on your field reconnaissance?

A. Yes. As I say, I haven't visited all those locations, but I know in the header of that canyon the extended vulnerable area exceeds the limits of alluvium, yes, sir.

Q. With regard to the cross-section, the cross-section in the B battery as shown on Exhibit 6, Mr. Meiklejohn asked you whether there was any freshwater right below the discharge point. And I'm not sure what your answer was. Was your answer no?

A. Our answer is that the water that we measured in the monitor well and the water that's depicted on this diagram is the water that's a result of discharge at that pit. And we don't have any evidence to suggest that that is continuous with protectable fresh groundwater sources beneath.

Q. Do you know whether there are any freshwater sources in the Nacimiento in this area?

A. Field reconnaissance and file and literature search indicate that there are not.

Q. Mr. Kilmer, how would you characterize that area right below the discharge point on Exhibit 6?

A. It's basically a Nacimiento Formation. It's a shaley deposit, very dense. One of the reasons we were able to discover saturation of water on that steep slope is the fact that it's so tight that the water from that pit is moving laterally probably more than it is vertically.

What alerted us to the presence of shallow water there was the salts, evaporative salts, that had accumulated on the slope downhill from that pit.

Q. In terms of saturation, what kind of saturation do you find underneath the discharge point?

A. Saturated sediments.

Q. And it would be clayish, or what would that look like if you were able to take a sample of that?

A. Well, it's basically interbedded layers of fine-grained sands, silts, and clays. If you broke a piece of it out of the ground and looked at it, it would form lenticular chips in your hand. And it basically separates along horizontal plains of weakness where accumulations of clay are present.

Q. Would it be wet because of discharge?

A. Yes, it would be.

Q. And what would be the -- how would it feel? Like clay?

A. It would feel very greasy.

Q. And is it your opinion there's no freshwater underlying this pit?

A. It's my opinion that there is very likely a notable distance of separation between sources of freshwater beneath this pit and the water that is depicted in Exhibit 6.

Q. Looking at the other exhibit that you've had showing the vertical penetration of water in this area and given your knowledge of depth to groundwater in the Nacimiento, where would you expect or what would you expect to be the notable difference in saturation from the discharge and encountering the freshwater source

in the Nacimiento?

A. I would anticipate and, you know, this is all speculation on my part, and you can give it whatever credibility you'd like to. My guess is that --

Q. I hope you have more of an opinion. You're an expert, Mr. Kilmer?

A. Well, based on my experience with perched water saturations and sediments of these types, I would anticipate that you're going to find, beneath the B battery pit, you'll probably find water that -- saturated sediments that proceed no deeper than 50 feet below land surface.

And below that you have completely dry sediments down to a point of probably between 1- and 200 feet where freshwater would be encountered, native saturated sediments would be encountered within the Nacimiento Formation.

Q. And when you say "freshwater," it would be freshwater in the nature of the kind of water that you testified about April 9 from the testing that you made of the Nacimiento; is that correct?

A. Yes, sir, that's correct.

Q. And that kind of freshwater is

different than the water that you've encountered in the Ojo Alamo Sandstone?

A. Quite different, yes, sir.

MR. PADILLA: I have nothing further, Mr. Chairman.

CHAIRMAN LeMAY: Thank you, Mr. Padilla.

Any more questions of the witness? If not, he may be excused.

And we'll take a ten-minute break, and we'll come back and wind things up.

[A recess was taken.]

CHAIRMAN LeMAY: We shall continue.

We'll continue now with Mr. Meiklejohn.

MR. MEIKLEJOHN: Thank you, Mr. Chairman. First witness is Michael Wallace.

MICHAEL WALLACE

Having been duly sworn upon his oath, was examined and testified as follows:

EXAMINATION

BY MEIKLEJOHN:

Q. Mr. Wallace, you were present this morning when there was testimony by Mr. Hicks about the modeling that you did in connection with this proceeding, weren't you?

A. Yes, I was.

Q. Could you tell me what the purpose was for which you did the modeling that you performed for Southwest Research & Information Center in this matter?

A. Yes. I had a two-fold purpose. Olson's study had found that groundwater had been contaminated by discharges, small quantity discharges into unlined pits. I merely attempted to determine if this was other evidence that supported this or not.

And in addition to that or to do that I conducted some modeling studies. One of the reasons I did that is, and I know some of the versions expressed regarding modeling today, to me a model is just a means to test your conceptions about the system that you're looking at.

And it had been, as I mentioned the last time at the hearings, much attention had been -- or much speculation had been brought up regarding factors such as biodegradation and other attenuation mechanisms, but no hard work had been done, fieldwork or theoretical, to try to clarify what exactly these processes -- how

they operated and how they were affected.

So I merely used the model to test some conceptions. It wasn't my intention to do an extensive modeling effort looking at every possible scenario of the system.

Q. Is it your assertion that the model that you conducted would be applicable in all situations, for example, a situation in which you had a discharge pit located in solid bedrock, would the model apply there?

A. No, it wouldn't.

Q. Would it apply in a situation where you had fractured bedrock?

A. No, it wouldn't there either. But there are circumstances in which it might. It would depend on the degree of fracturing, the possibility of maybe using a porous medium approach, which SUTRA is, to define a fractured flow problem. And SUTRA isn't designed to do that, and I wouldn't attempt to use SUTRA to do that in such a hypothetical case that I dealt with.

However, fractured rock simulation, just on the face of it, seems to offer conduits for migration of contaminants that would still

have been of concern whether or not it can be modeled with SUTRA.

Q. You actually conducted two modeling studies; is that right?

A. Yes.

Q. Could you tell us briefly, go over again for us, what those were and what the differences were?

A. Yes. The first modeling study was, as I said earlier, was conducted to just test some conceptions about unsaturated flow or flow from pits into the groundwater through an unsaturated zone.

And looking at data that was available in the literature and general understanding of the area there, this model took what I thought were the representative values and tested some of these hypotheses. The other model -- and that was my primary purpose, by the way, in the work that I did for SRIC.

The other model didn't have such an important focus on my part. The saturated zone modeling study was merely to carry out that thought somewhat, see how far contaminants might move through groundwater once they were -- once

groundwater was contaminated. And I also attempted to use representative values.

Nonetheless, it wasn't my primary focus, and I think we'll get into that later, about how it stands.

Q. Now, have you seen the Exhibit No. 11 introduced this morning by Mr. Hicks, the Four Corners Gas Producers Association Exhibit No. 11?

A. Yes. I think that's the one that looks at my modeling study.

Q. Can you tell us which of the two studies it refers to, that it's directed to?

A. It's directed at my second study, the study of the saturated zone contaminant transport.

Q. Since the hearing in April, have you done anything to corroborate or validate the result of your modeling studies?

A. Yes, I have.

Q. What have you done?

A. I did a number of things. I checked the mass balance of the models. And my version of the mass balance is it's going -- I'm going to try to not get into much detail with it. It's not exactly what Mr. Hicks was referring to

earlier. But I did check the mass balance, and it was very good.

I checked whether or not my model was yielding spurious results. For example, if the model showed that contaminant anywhere was greater than the source concentration, that would be considered an indication that the model was giving bogus answers.

Or if the model showed things like oscillations or lack of conversions, I would have noted that. And I checked all of those issues regarding model conversions, and I found that they were extremely suitable for the study.

There was no oscillations, for example, at all. And there were no spurious results. That doesn't mean that I calibrated the model. It just means that I checked to make sure that the model gave reasonable results given the input values.

Q. There was some discussion this morning about the values that you used in the model. Did you use what you regard as representative values?

A. Yes. I regard them as representative. I didn't always use values that minimized -- that would lead to, for example, the minimization of

plume distance traveling.

And, on the other hand, I didn't always use values that maximized the distance that a plume would travel. I tried to use numbers that fell within ranges of data that I saw.

One of the reasons for that was that I had limited time. I could only make one modeling run for each case. So that's why I chose those values.

Q. Are the sources for those values spelled out in the revised and expanded parameters table for Exhibit SRIC 11?

A. Yes, they are.

Q. Specifically regarding the testimony given by Mr. Hicks, did he correctly interpret the constant source of contaminants that you used in the second model, the saturated flow model?

A. Yeah, he did. But I could have saved him the trouble of going to all that work. I wish he would have just given me a call and asked me, and I would have provided him that information.

Q. Would you explain that?

A. Yeah. The model results prints out concentration at every nodal point in the grid.

And clearly, I wasn't very clear about how I assigned that source concentration to begin with.

But in my original testimony I meant to imply that I assigned a constant source of 30 parts per million over an area of 150 feet by 150 feet.

And I never meant to imply that that necessarily represented -- well, I never explicitly modeled a constant flux of contaminants being pumped into the aquifer. It was just a square in the model that had concentrations at 30 parts per million and water was moving through it.

Q. Where did you come up with the figure of 30 parts per million?

A. From the work that Olson did, his field study.

Q. Was Mr. Hick's interpretation that that means a disposal rate of, I think he said, 601 barrels per day into the pit; was that correct?

A. No, absolutely not.

Q. Why not?

A. Well, it would take me a little bit to go into that, but apparently I failed to explain

what a two-dimensional model means. The two-dimensional model that I conducted does not recognize any flow in the third dimension.

It is basically -- you can give the model any thickness you like. And, for example, I could have assigned a thickness of 300 feet. I would have gotten the same results of concentration distribution. Or I could have assigned a thickness of 3 feet or 3 millionths of a foot. It would have no difference on the concentration distribution of the plume.

It's sort of an artifact of the way modeling is used or the way two-dimensional models are used to simulate contaminant transport. That's basically the reason that you can't multiply by thickness to compute the volume. It's a meaningless exercise.

Q. Why did you assign any thickness at all?

A. Because the model requires the input of a thickness to run.

Q. Would thickness be relevant under certain conditions?

A. No. Under the conditions that I modeled, thickness is not relevant. There are

many parameters that I have to put into the model to get it to run because it's a general purpose model.

And it is not just solely designed to simulate contaminant transport under the conditions that I simulated. For example, thickness is important in other cases. If I were modeling the effects of pumping somewhere, the transient phenomena of the hydraulic stresses applied to the model, then thicknesses are very important.

But I used a steady-state model. The flow rate, the velocity rate was constant throughout the model. There are no stresses to the model, and therefore the assignment of a thickness is really irrelevant. Nonetheless it requires it, so I put in the value that seemed to be representative for the area.

Q. Do you feel that your saturated flow model overestimated the potential for migration of BTEX transport through aquifers?

A. It's possible. I only looked at one case. And based on some of the evidence that was presented this morning, I'm quite prepared to admit, as more and more evidence like that comes

out, it makes my simulation less and less likely regarding saturated flow.

Nonetheless, I try to use representative values. And I didn't go out of my way to try and maximize the movement of the plume growth. In fact, I thought that I was using some parameters that actually gave industry the benefit of the doubt by minimizing plume movement.

I used biodegradation rates that were highest reported in the literature. I used retardation coefficients. Actually, just for example, I could have assumed that there was one stringer of sand surrounded by impermeable clay zones.

There was quite a bit of discussion here about low permeability units. That's a two-edge sword. Sometimes low permeability units can help actually confine flow to these conduit pathways where they actually move much farther than they would normally if the entire unit was just merely high permeability. I didn't look at examples like that. I tried to keep it simple.

And, in addition to that, I'm rather curious that so much attention was focused on

that model. To me it seems somewhat irrelevant, given my knowledge of the regulations, that they're designed to protect groundwater from contamination.

They don't really go into any detail about where contaminants go once they're in the groundwater. And that in fact is the reason that I spent so much time focusing on the unsaturated zone modeling study.

Q. Were any of the questions that Mr. Hicks raised about the saturated flow model bring into question the unsaturated flow model?

A. No. I was curious about that too. And now I understand they ganged up on me: One guy looked at the saturated and one at the unsaturated. Maybe that's not true.

But, no, he did not have any comments regarding the unsaturated model.

Q. Is it your professional opinion that particularly the unsaturated flow model substantiates the field results that were obtained by Mr. Olson indicating that discharge pits can contaminate groundwater?

A. Yes. And in fact I regard Olson's study as, somewhat loosely termed, as a form of

historical calibration of my model since Olson's study shows contaminants reaching groundwater from small quantity discharges into unlined pits. That's exactly what my model showed.

And to me, from my point of view, that represents a form of calibration.

Q. Mr. Hicks also expressed some questions about the statistical analysis or calculations that you did. Did you hear his testimony on that point?

A. Yes, I did.

Q. Do you agree with his conclusions about your statistical analysis?

A. No, I don't.

Q. Could you explain why?

A. Yes. I gather that he misunderstood the nature of my calculations. Originally, and I'm going to just review it very quickly just to make sure that no one else misunderstood, originally I had heard that it had been, for example, it had been said that not a large enough sample of pits had been looked at to justify this ruling that you're considering.

And I took the opposite approach. I made assumptions, well, what is enough pits to

look at? That was sort of the basis of my study. And I made assumptions about the number of pits that had actually contaminated groundwater.

And then I worked backwards in these calculations to find out what the probability would be that 60 percent of these 21 pits that were studied show contamination given the fact that certain numbers of pits really were contaminated.

And I looked at given the fact that only 7 pits were contaminated, given the fact that only 100 pits, given the fact that 1,000 pits were contaminated, and then I reverse calculated those probabilities.

And in every case I came up with very low probabilities that 7 pits out of 21, or something like 7 out of 15 would have been found to be contaminated, which led me to come up with a conclusion that much more pits than just 15 have been contaminated.

Q. Do you mean the pits have been contaminated or --

A. I'm sorry. The groundwater. It's getting late and I haven't had my dinner, and my

blood sugar is low, something like that.

There's something else he brought up that kind of concerned me. He compared my study to looking at a sample of people with arrest records and people without and then coming up with the conclusion that -- I didn't really follow it exactly -- but I thought he came up with the conclusion that everyone with an arrest record is a criminal.

There's different types of arrests. You can be arrested for jaywalking. You can be arrested for murdering somebody. I don't think that that analogy is applicable to my study. I only looked to see whether or not groundwater was contaminated or whether it wasn't. I made no inferences on the degree of contamination.

Q. When you testified in April, did you indicate to the Commission the factor that you used for the biodegradation rate?

A. Yes, I did.

Q. Do you recall what that rate was?

A. Yes. Well, it was equivalent to .95 percent per day. But the actual number was in percent per second, which was negative 1.09 times 10 to the minus 7.

Q. Was your testimony on that point accurate or had you actually used a different --

A. I actually used a different number, and that was another mistake on my part. I actually used a number that was ten times less than that.

Q. And did you subsequently run the model again to determine what difference that made in the output?

A. Yes, I did. Because I had more time to look at it while I was checking conversions and mass balance and for errors, that was one of the things I checked. I reran it. I found no significant difference at all. I think there was a difference after 44 days of 2/10 of a foot in the position of that 5 parts per million contour line.

Nonetheless, I went ahead since I had the time and ran the simulation a little bit further. The simulation went on to a year. I just arbitrarily cut it off at a year.

And by that time my simulation showed, and I'm prepared to provide anyone who asks details of that, it shows that at that depth of 10 feet below the pit, the concentration had risen to about -- I don't have the diagram in

front of me.

I think it was about 15 -- oh, here it is. Yeah, a little over 10 feet depth. It rose to 15 parts per million. And the 5 parts per million contour had dropped down more than 20 feet. And, well, I don't have much to add to that.

MR. MEIKLEJOHN: Thank you, Mr. Wallace. I have no further questions.

CHAIRMAN LeMAY: Thank you, Mr. Meiklejohn.

Mr. Roberts?

MR. ROBERTS: May we have a minute or two to discuss whether there is a need for cross-examination?

CHAIRMAN LeMAY: Yes.

Mr. Padilla?

EXAMINATION

BY MR. PADILLA:

Q. Mr. Wallace, you didn't do any testing at all in connection with any of the testimony or evidence that you presented to the Commission; is that correct?

A. No. I mean, that's correct. I only looked at other people's tests.

Q. You took no independent -- or you made no independent field studies or anything of that nature in order to input into the information that you had?

A. No.

Q. I believe that you testified in April that you used values from literature and from testimony at previous hearings, at the hearings in the mid-80s that were held on this issue.

Now, as far as the literature is concerned, you looked at literature that's published and this general information, geologic information, things of that nature; correct?

A. Yes.

Q. As far as the hearings in the mid-1980s, is it fair to say that those hearings concerned the San Juan River and Animas River Basins only?

A. My study of those proceedings wasn't deep enough for me to firmly answer that yes or no. I believe that the vulnerable area at that time, it's smaller than the vulnerable area now and it was in those counties. But I just can't answer that.

Q. What information then did you take from

the 1980 hearings?

A. I think that was spelled out in my expanded reference parameters. I tried to be fairly comprehensive in the information that I got from those areas. But I'd go into it, if you like.

Q. Well, let me just try to cut through all the -- basically the information would not apply to the Lybrook areas shown on this map; is that correct?

A. I don't know if that's true.

Q. You have no way of telling me whether you used any information on the Lybrook area or that would be applicable to the Lybrook area?

A. None of the studies that I looked at specifically addressed this Lybrook area.

Q. Okay.

A. But it did address the San Juan Basin. And I believe the Lybrook area is in the San Juan Basin.

Q. By analogy you're saying the characteristics all over the San Juan Basin are identical?

A. No, absolutely not. I'm well aware that there is a high degree of variability from

one location to the next. For example, I've already admitted, for example, that my model wouldn't be applicable for rock. I was simulating flow through alluvium.

Q. Would your model be applicable to the Lybrook area?

A. I would say that if the alluvium in the Lybrook area -- and there seems to be quite a bit of controversy regarding the nature of the alluvium in the Lybrook area -- if it fits the properties that I've outlined here, then my model would be applicable.

Q. Do you know whether the alluvium in the San Juan Basin or the Lybrook area, as has been testified to by Mr. Olson, has the same type of water saturation that the alluvium in the San Juan River would have?

A. I don't know that, but I wouldn't rule it out.

Q. Are you saying by that response that you have the same amount of water volumes, as far as you're concerned, in the alluvium in the Lybrook area that you had in the San Juan River Basin?

A. I find it difficult to make any

determinations about relative quantities of water in alluvium in the Lybrook since so little seems to be known about it.

Q. You don't have really any independent knowledge about the Lybrook area, do you, Mr. Wallace?

A. No, I don't. My knowledge is based on what I've heard today and last month.

Q. Mr. Wallace, in SRC 11 you relied on certain references and in particular one by E. R. Brown and W. J. Stone, and it's entitled, "Hydrogeology of the Aztec Quadrangle, San Juan County."

Do you know where the Aztec quadrangle is?

A. Yeah. Generally it's an area that covers a certain amount of space north of the San Juan River, I believe.

Q. Is that basically part of the San Juan and Animas River Basins?

A. Yes.

Q. And the Aztec quadrangle is limited only to San Juan County, not Rio Arriba County?

A. Right.

Q. Right. Do you know where the Duncan

Oil Field is?

A. I don't recall.

Q. You cited a reference by Eisman dealing with the Duncan Oil Field of New Mexico. Do you know who that is in SRIC 11?

A. Oh, yes. I cited that. I forgot where I actually refer to the data from that study. I'm somewhat familiar with that.

Q. Is that in the San Juan Basin?

A. I'm not certain.

Q. Okay.

A. I do believe that it is in similar terrain that's close, if it's not in the San Juan Basin, it's close.

Q. Somewhere in New Mexico, I take it?

A. It's closer than somewhere in New Mexico.

Q. Mr. Wallace, I'm not sure in relation to what exhibit you were referring to here, but you testified in April that you had fluctuating water levels and depths.

Was that in relation -- do you recall whether that was in relation to shallow groundwater as found in the San Juan River channel?

A. I think that that generalization applied to all of the alluvial aquifer systems in the San Juan Basin, not just the San Juan River channel.

Q. When you talk about -- you stated above that, you said, "Although I would have to do more studies to look at 35 feet of depth, I believe that 30 feet is probably not sufficient in many cases."

To be fair, you really -- I take it you were dealing with the water levels at 30, 35 feet; correct?

A. I think what I was referring to then, if I understand what you're saying, is that was regarding a statement by Mr. Hicks that 30 feet of unsaturated material would be enough to allow contaminants from a pit to get remediated naturally. Therefore if the water table was any lower than 30 feet, it would never receive any contamination.

Q. Given Mr. Olson's -- or Mr. Kilmer's testimony, he stated that by the time you get beyond 20 feet, 20 to 30 feet, you're not going to have any contamination, and that's in accord with what you just now said; is that correct?

A. Mr. Olson's?

Q. Mr. Kilmer. You were here when Mr. Kilmer testified this afternoon?

A. Yes.

Q. And his study in the B battery indicated that -- or that by the time that water got beyond 20 feet, certainly beyond 30 feet, that you would have no BTEX contamination.

And what you've just said now is that when you get beyond 30 feet, probably chances are you're not going to have any more contamination. So it seems like you agreed with him. Would you agree with what I'm saying?

A. No. I think I understand. All I did before was paraphrase what Mr. Hicks said. Later on in my testimony I disagreed with that. I said I don't think that 30 feet is necessarily deep enough to prevent contamination of groundwater.

And, in fact, as I just pointed out earlier in my direct by Mr. Meiklejohn, when I ran my study longer, for a year, I showed 5 parts per million of benzene going down 20 feet.

Unfortunately my model was only 20 feet deep, so I couldn't run it any deeper than that. Of course, 5 parts per million of benzene is

significantly higher than the New Mexico Water Quality Control Commission standards for benzene.

Q. Let me ask the question this way. You were here this afternoon when Mr. Kilmer testified about the penetration of water beyond 18 feet and going into 20 to 30 feet. He also stated that probably beyond 30 feet you would have no further contamination.

Would you agree with that statement?

A. No. No I wouldn't.

Q. Why not?

A. For a number of reasons. I don't agree -- I don't believe that those types of assumptions can be made given the study that he performed. He drilled one well; then he took one sample. And I don't believe he was able to effectively demonstrate that he was sampling from a perched zone or a saturated zone or some zone that was somewhere in between that.

As a result, I don't agree with his initial assumptions regarding the processes that are occurring. What I saw was that he drilled into saturated sediments. In my book I call that groundwater when sediments are saturated. And they were contaminated.

On the other hand, I would say that conceptually his loading rates were much lower than the loading rates that I used. And his permeabilities actually were not lower than the permeabilities I used.

If it really was rock that was unfractured and the loading rates were really that low and it wasn't an aquifer that he was sampling from, then I would concur with his conclusion that the contamination is not a problem. I'm not convinced that's the case there.

Q. Did you hear him respond to a question by Mr. Meiklejohn that indicated that the area underneath that discharge site was saturated from produced water and not freshwater?

A. Yeah, I heard him give that opinion.

Q. And based upon what you said, if it was not water saturated with freshwater to begin with, I take it that you concur with Mr. Kilmer's analysis?

A. I don't necessarily concur with his analysis, but I would concur with his final conclusion about the threat to groundwater. If that's not groundwater, then there's no threat.

Q. I have one question on your statistics, and everybody seems to be intrigued by your statistical analysis. I'm going to try something else because I don't understand this notion of population.

I'm going to assume that this entire area here, this blackboard, is the San Juan Basin. Rio Arriba County is somewhere in here, and San Juan County is here, and McKinley is down right here, and Sandoval is probably right in here. And I'm not sure, but I think that's more or less the way it is.

You take a quarter here, and let's call this quarter the San Juan River System and the Animas System. San Juan River and Animas, let's called that. As I understand, there are 7,000 wells in the whole San Juan Basin, and that is really your population; correct --

A. Yes.

Q. -- for your study. Now, if you have a number of wells here, and my understanding of your statistical analysis is that all the wells where there was contamination were within this San Juan-Animas River Corridor; is that correct?

A. I don't know if that's correct. The

number I took, I believe, covered the vulnerable and the extended vulnerable area.

Q. You don't have any recollection of where --

MR. STOVALL: Mr. Chairman, I've got to object.

CHAIRMAN LeMAY: Where are you going with all this, Mr. Padilla?

MR. STOVALL: He said he doesn't know what the details are. He's told him a number of times that it's a very generalized thing. I don't know how many times and different ways I need to hear it.

CHAIRMAN LeMAY: Are you trying to get something out of this witness that he hasn't even testified from initially?

MR. PADILLA: No. I'm trying to figure out what his population is. And I take it that his population comes from the corridor, as I've tried to demonstrate it here.

MR. STOVALL: Mr. Chairman, it's in his exhibit. Mr. Padilla can look at Mr. Wallace's exhibits and find out what he's used for details. I don't think we need to spend a long time on this.

CHAIRMAN LeMAY: Where are you going with this? This is rule-making. This is something where we're trying to discredit witnesses. What's your point?

MR. PADILLA: The point is, Your Honor -- Mr. Chairman, that the population that he sampled is in the San Juan River Corridor and not here in Rio Arriba County.

I guess maybe, as long as we have that objection and as long as my point is on the record, I guess I could sit down at this point.

CHAIRMAN LeMAY: Well, no. I'm just trying to figure out where you're going. It seems like we're asking questions here, and I have no idea where you're going.

Why don't you state where you're going and ask the witness if he can either agree or disagree with whatever you're trying to say.

MR. PADILLA: I thought I was going that way, Mr. Chairman. The nature of the objection seems to me that I should read the exhibit. I don't understand the testimony with regard to the statistics.

I'm simply trying to find out if his statistical analysis is based on data that he

took from the San Juan River Basin and the Animas River Basin as opposed to the entire San Juan Basin.

What I'm trying to get at is that the extension or the extension to wells located up here in Rio Arriba County have no -- are in a different population than in the wells in this corridor.

CHAIRMAN LeMAY: Well, I thought you made the point -- correct me if I'm wrong -- initially when you asked about the Lybrook area. I thought that was the purpose of your questions as to his detailed knowledge in the Lybrook area.

MR. PADILLA: Well, let me just leave it at this, Mr. Chairman, if he doesn't know where he took his data from, I'm satisfied with that answer.

CHAIRMAN LeMAY: Where did you get your data? You may answer the question.

THE WITNESS: I think Chris Shuey later -- I mean, he's the one that compiled the data on the number of production sites that are relevant to the vulnerable area. So my understanding is there are 6800 production sites that might be affected by this ruling. That's

where I got the data. I didn't go and study every detail about where every site was.

In addition to that, I think the point you're trying to make is that the area along that band representing the San Juan River probably has no relation, physical relation, whatsoever to the Lybrook area. But I think through your testimony you've tried to make that clear. I think that there's quite a bit of controversy regarding whether or not you're right.

I also think I focused on flow through alluvial systems, alluvial soils. I didn't look at flow through rock. I think I made that clear.

CHAIRMAN LeMAY: I thought so too.

THE WITNESS: Okay. And I thought that the vulnerable area and the extended vulnerable area is designed to look at groundwater flow systems and alluvial systems. So I don't know what else I could say about it.

CHAIRMAN LeMAY: Where are we there, Mr. Padilla? Is there confusion with that testimony and what he's trying to say?

MR. PADILLA: In terms of his statistical analysis, if Mr. Wallace is willing to say that his statistical analysis also has the

same impurity with regard to not using any data from Lybrook to make that statistical analysis, I would be satisfied with that.

CHAIRMAN LeMAY: I thought he said that. I also thought he said his model was to verify Mr. Olson's sampling of wells' discharges in alluvium. I thought we were talking about alluvium.

MR. PADILLA: I understand that, but, Mr. Chairman, I'm talking about his statistical analysis where he says that so many sites in the San Juan River Basin are contaminated; therefore, by analogy he takes up the entire San Juan Basin and says all the wells in Rio Arriba or all over the San Juan Basin, a certain percentage -- a great percentage of that are also subjects of contamination.

CHAIRMAN LeMAY: I didn't hear that.

Did you say that?

THE WITNESS: No. I don't recall saying that.

MR. PADILLA: Perhaps I misunderstand his statistical analysis. And I'm simply trying to clarify that.

CHAIRMAN LeMAY: I didn't hear that.

Did you hear that, Commissioner Weiss?

COMMISSIONER WEISS: That's what this is all about.

CHAIRMAN LeMAY: Well, maybe you have a question. Go ahead. Is there anything else?

Q. (BY MR. PADILLA) In your random sampling that you used to say that a certain percentage of the wells in the San Juan Basin were contaminated freshwater sources, where did you obtain that random sampling?

MR. STOVALL: I object. I don't believe that characterizes the witness' testimony accurately. I don't believe he used his statistical analysis and random sampling or his statistical method to say there are "X" contaminated wells.

CHAIRMAN LeMAY: I didn't hear that either.

MR. STOVALL: I think he used his statistical sampling to say this is not the entire group -- or statistically analyzed, the group that was sampled is not the entire group of contaminated wells.

I don't think he predicted the number of wells. And the question is misleading and

therefore can't be answered.

CHAIRMAN LeMAY: Let's get to the heart. Is that what you're saying?

THE WITNESS: No, not at all.

CHAIRMAN LeMAY: Good. Does that satisfy you?

MR. PADILLA: I'm satisfied.

CHAIRMAN LeMAY: Good. Fine. Do you have any more questions, Mr. Padilla?

MR. PADILLA: I have no more questions.

CHAIRMAN LeMAY: Let's be direct. Let's just ask the witness if that's what he said or he meant rather than -- I mean, I think it's helpful to the Commission if we hear a direct question. It's a rule-making procedure. When we're trying to characterize the witness' testimony in different ways, I get confused.

MR. PADILLA: Well, Mr. Chairman, I'm sorry for taking up the Commission's time with this line of questioning, but I got to the point where he was qualified as a statistical expert. He made a considerable amount of -- a lot of his testimony dealt with extrapolation across the San Juan Basin.

CHAIRMAN LeMAY: I understand that.

I'm just trying to say, ask him a direct question and he'll tell you and then we'll all know. I couldn't follow your line of reasoning. One question would have answered it. That's fine. We're trying to get to the heart of the matter.

Did his answer satisfy you?

MR. PADILLA: Yes, Mr. Chairman.

CHAIRMAN LeMAY: Thank you.

Mr. Kellahin, do you have any questions?

EXAMINATION

BY MR. KELLAHIN:

Q. A point of clarification, Mr. Wallace, with regards to the unsaturated model, I recognize the parameters that you've selected and the diagram that shows the limitations as to depth of the model.

Did you attempt to take your data and calibrate or adjust your parameters to match any specific site that Mr. Olson documented in his study for the unsaturated model?

A. No. I only did one simulation at the last round of testimony.

Q. And that's what I thought I had heard. I wanted to make sure that I had not misheard

that information.

A. Yes.

Q. In applying your discipline and methodologies to groundwater potential contamination, do you in fact take reservoir simulation models like this and try to history match the performance of field data for a given source of contamination?

A. Well, I think quite a bit of a attention has been focused on this calibration issue. And in my experience I have quite commonly done modeling simulations without calibrating.

Usually on the behalf of industry, I would perform simulations that consider worst-case scenarios. And one of the reasons for that is the lack of data.

Q. I understand.

A. And basically I don't think it's fair to imply that meaningful results can't be obtained from models due to lack of calibration. Sometimes calibration is not an issue.

Q. When you calibrate a model to a given example of field data, how many variables or parameters are you dealing with?

A. Well, it depends on the field site you're calibrating your model to. It could range from, to the best of my knowledge, oh, anywhere from 5 to 20.

Q. In the saturated model example, again, we had time for one run. The length of that run was the five-year time parameter and you didn't run it in any other lengths of time for the saturated model?

A. No, I didn't.

MR. KELLAHIN: Thanks.

CHAIRMAN LeMAY: Thank you, Mr. Kellahin.

Mr. Roberts?

MR. ROBERTS: Yes. We do have two or three questions.

EXAMINATION

BY MR. ROBERTS:

Q. Mr. Wallace, have you ever participated in actual field studies regarding produced water pits?

A. Well, let's think about that. No, I haven't.

Q. Now, would it be possible to modify the input parameters in such a way that the

unsaturated model that you ran would predict that contamination would not occur if groundwater is, say, less than 50 feet deep?

A. I'm sorry. Could you repeat that?

Q. Sure. Could you modify the input parameters in such a way that the unsaturated model that you have run would predict that there would be no contamination of groundwaters less than 50 feet?

For instance, could you modify the value for hydraulic conductivity or the loading factor value in such a way that the model would predict that there would be no groundwater contamination, say, at depths less than 50 feet?

A. At this moment I can't answer that question because I'd have to do the model runs to try and see if that would be the case. And I truly don't know whether or not I could make that case.

There might, you know, for example, I might be forced to use hydraulic conductivity values that aren't applicable to that area in order to make that case, or I might not be.

Q. Do you have an opinion as to whether those kinds of conditions might or might not

exist in the areas which are the subject of this case?

A. Well, I'm really open-minded about it. I think that I would like to see a case-by-case basis. Like I said before, this model was just to look at the data and see if it seems to support the evidence as brought forth by Mr. Olson.

Q. If it could be shown that those conditions exist, would it be your opinion that variances would be appropriate?

A. Are you referring to, like, a case-by-case basis or a broad generalization?

Q. I'm talking about an area-wide basis where it could be shown that the condition existed over an area.

A. I would find that hard to believe, and I certainly wouldn't support that conclusion. And, once again, my model, I don't make that claim with my model.

I'm not saying that because my model shows that contamination reached groundwater and because Bill Olson's study showed groundwater contamination, I'm not claiming that that means that every single pit in the vulnerable area is

contaminating groundwater.

Q. I understand that, but I take it your answer is that you would find it almost inconceivable or hard to believe, at any rate, that there would be conditions of the type we've talked about over an area-wide basis where the conclusion could be drawn that groundwater would not be susceptible to contamination?

A. Well, as has been stated by other people who have testified here, the geologic systems that we've been looking at are highly heterogenous. They vary widely from one location to another. One person says an area is alluvium. One person says it's bedrock. One person says it's sand; it's clay.

If somehow a case could be made that, yes, in every single case that we're talking about the soil is impervious to contaminant transport and groundwater flow and the discharges are infinitesimal and the depth to groundwater is exceedingly great, if you could persuasively make that argument, then I would concur.

But I don't feel that that argument has been persuasively made at these hearings.

MR. ROBERTS: Thank you, Mr. Chairman.

CHAIRMAN LeMAY: Thank you.

Mr. Stovall?

EXAMINATION

BY MR. STOVALL:

Q. Well, the only models that I really understand are the ones I used to make as a kid, so I won't touch that.

Just one question. What I've understand you've said, just to clear up what Mr. Padilla said, you've said you've taken information Mr. Shuey has provided you, plugged it in, and said where these conditions exist, where these results may happen, and that could be applicable anywhere these conditions exist here; is that correct?

A. Can I paraphrase that or rephrase that?

Q. Sure.

A. You tell me if you think that's what I said.

Q. Okay. That's fair enough.

A. Let's go back and say what my understanding is that this vulnerable area has been defined for groundwater and alluvial systems. And alluvium is alluvium. It has some

ranges. There's some variability in it. And it has some other properties. But as a rule, it's not rock. And it's more permeable than rock is.

Therefore, I was looking at -- the assumption was 6800 wells are going to be impacted. You could say that I'm making the assumption that they're all in alluvium. I'm not making a geographical distinction between different parts of northern New Mexico or northwestern New Mexico.

I'm just looking at, well, the number of that I was given of wells that are going to be impacted by this order, and the assumption was that they're all in alluvium. I don't know if that can be argued that that's not valid. Maybe there is a bimodal distinction.

Q. Let me just stop you here. What you're really saying is that it's not a site-specific thing and you would have difficulty applying it to a specific region such as Lybrook and saying this is Lybrook?

A. I'm sorry?

Q. You would have difficulty taking what you did and saying this is Lybrook, or this is --

A. Well, at this point I would, but if

someone showed me an area in Lybrook where there was a pit in an alluvial system --

Q. I understand that. That's not the part I'm concerned about. Could you do the same thing and take an area down here, say, take a wash down in McKinley County and move it 75 miles and say this ought to be applied for 300 square miles of area and say that it's at all like this area over here in McKinley County scientifically, just as a scientific factor?

A. Once again, if that wash area --

Q. Would it apply to 324 square miles, or would it apply to washes that are similar to those? Would the analogy be between similar washes?

A. Yes. I think the analogy is between similar washes. It's not between, you know -- as a result, perhaps you could expand the definition of pits that have contaminated groundwater. You could look at alluvial systems, for that matter, all over the state perhaps, because I was concerned with alluvial systems.

Maybe you could look all over the country or all over the world. I don't know where you draw the line.

MR. STOVALL: That's all. I got all the information I needed.

CHAIRMAN LeMAY: Thank you, Mr. Stovall.

Commissioner Bailey?

COMMISSIONER BAILEY: No questions.

CHAIRMAN LeMAY: Commissioner Weiss?

COMMISSIONER WEISS: Yes.

EXAMINATION

BY COMMISSIONER WEISS:

Q. When you make the determinations, statistical determinations based on probability, are the results relevant if the samples are not randomly generated?

A. No, they're not.

Q. Were the samples randomly generated, these 20 wells?

A. I don't know the answer to that question. I believe they were.

Q. What was the technique used to select the pits, the random -- how were the random pits determined, the randomness of this determination?

A. I would say they were -- you know, they were in the vulnerable area. They were small quantity discharge pits, as I understand it.

Q. Let me put this a different way. If you're going to design an experiment and you're going to try and run fewer tests, you don't want to run 7,000, you don't even want to run 7, how do you go about picking out the 7 samples that you're going to base your runs on?

A. You would randomly -- you would have to somehow randomly generate them --

Q. Yes.

A. -- as you asked me earlier.

Q. So you understand what I'm saying?

A. Yes. Yes, I do. Maybe I should help clarify why I believe it's a random sample, because a lot of talk has been made of that. I guess I didn't make a very good point last time around.

But the vulnerable area is the area of concern. And, as I understand it, 6800 wells in that vulnerable area, all of them are located, to the best of my knowledge, in alluvium with shallow groundwater. That was the point of defining a vulnerable area.

To me, then, I would assume that you should be able to go to any pit at random and dig down and either you will or you won't find

contamination in the groundwater. I believe that one of the limitations that Mr. Olson had was that he was hand-augering and he could only go down a certain depth. So he was kind of limited to pits where he could only go down to a certain depth.

But, fortuitously, I would say that the groundwater averages at that certain depth anyway. So that wasn't a limitation of his approach to looking for contamination.

Now, on the other hand -- well, I don't really know. See, one of the things about the pits that I don't know is how many pits are producing 1 barrel a day or how many pits are producing 2.5 barrels a day or 5 barrels a day or a 1/10 of a barrel per day. And what I see here is many people trying to make a distinction now between 1 barrel per day and everything else.

And, as I understand it, back in 1985 the distinction was already made, 5 barrels per day, and everything else. So what I see is this line continually being drawn farther and farther back regarding the amount of produced waters that are generated.

I don't know if that's relevant, but I

think that there are a number of different ways you can look at pits. And you can always split hairs on the issue. But overall if you're just looking at it, there are these pits and they're in alluvium. And some of them are producing quantities of produced water that appear to be contaminating groundwater that has been found.

I don't think Olson knew ahead of time that when he went to a certain pit it was going to be contaminated. Maybe he suspected; maybe he didn't. I think that's a question that he should be asked.

COMMISSIONER WEISS: Yes, I think you're right. Can I ask him?

CHAIRMAN LeMAY: Sure. Did you use a random number generation type approach to sampling the pits you sampled?

MR. OLSON: No. Essentially we went over to well over 200 sites in an attempt to hand-auger holes at over 200 sites throughout the current vulnerable area. Out of those we only found those 13 that we could access with the available equipment.

But they were random; they weren't preselected sites. They were random sites

selected that were accessible with the groundwater out of the entire 200 -- over 200 sites that we had looked at.

COMMISSIONER WEISS: I don't think that's a random number. I don't think the experiment was designed with random numbers in mind is what I think you said.

MR. OLSON: Well, I think what we originally looked at is trying to attempt to get 10 percent of the pits in the area. Our goal was to get 20 sites. We couldn't get 20 sites we could access with the available equipment.

But we didn't actually go out with an idea of looking at, say, okay this pit looks dirty; we'll do this one. Actually, the bulk of the pits we looked at, with the exception of, I think two, all looked clean. There was weeds growing in them. They were relatively clean-looking pits.

We actually had more problems looking at -- we looked at a production pit that was relatively clean. We had a blown-down pit off the other side of the path. And we were kind of concerned about, well, here we're looking at the clean one; obviously there are dirty pits on

site.

MR. STOVALL: Commissioner Weiss, do you mind if I ask a follow-up question to clarify?

Mr. Olson, was it your intent to go out and do a statistical analysis by which a randomly generated, pick a number out of a hat, or a computer-generated number type thing, so that you would have a true random sample for polling purposes? Was that the purpose of your effort?

MR. OLSON: No, it wasn't. It was to just look and see if we had contamination at exempt pits.

COMMISSIONER WEISS: Thank you. That answered my question. That's the only two questions I had.

THE WITNESS: Okay.

CHAIRMAN LeMAY: I don't have any.

Any redirect?

MR. MEIKLEJOHN: Yes, couple of questions.

FURTHER EXAMINATION

BY MR. MEIKLEJOHN:

Q. Mr. Wallace, have you been involved in field investigations or projects dealing with

groundwater that's been contaminated by volatile organic compounds?

A. Yes, I have. A fair number.

Q. What sorts of projects?

A. As I stated in my original testimony, I've worked on seven commonly called superfund sites. Among those, I don't remember exactly how many of them involved BTEX-like chemicals, but probably a good four or five of them did, including one in Denver. A shallow water table with free product floating on it where I did some field investigations.

Another one in northern Colorado with benzene, toluene, and xylene moving through the system. I did field modeling work there. I've worked on a number of other areas with hazardous chemicals which contaminated groundwater in which I've done the sampling, field investigations, and other appropriate work.

Q. There's been a number of questions about the applicability of your model, your modeling work in various different areas. If the model applies to alluvium in the San Juan River Basin, would it also apply to similar alluvium in the Animas River Basin, in the Largo Wash in the

Lybrook area?

A. Yes.

Q. Is it your understanding that the law of the state of New Mexico protects groundwater that is perched water?

A. To the best of my recollection, I don't think there is any distinction made between perched water or other type of groundwater. I think the main distinctions that are made are total of dissolved solid contents.

MR. MEIKLEJOHN: All right. Thank you.

I have no further questions of Mr. Wallace.

CHAIRMAN LeMAY: Additional questions of the witness?

COMMISSIONER WEISS: Just for your own personal interest, I think you ought to check the equation again. I believe there's a typo in it.

THE WITNESS: Which equation?

COMMISSIONER WEISS: That's the hypergeometric distribution.

THE WITNESS: A typo?

COMMISSIONER WEISS: Uh-huh.

THE WITNESS: Oh, you're right. The

denominator of the lower?

COMMISSIONER WEISS: Precisely.

THE WITNESS: Thank you. That should have been (N-M)!, which means factorial.

COMMISSIONER WEISS: Yes.

THE WITNESS: Thank you.

CHAIRMAN LeMAY: Thank you. You may be excused.

THE WITNESS: Thanks.

CHAIRMAN LeMAY: Who says our Commissioners aren't watching the exhibits?

MR. MEIKLEJOHN: Our next witness is Christopher Shuey.

CHRISTOPHER SHUEY

Having been duly sworn upon his oath, was examined and testified as follows:

EXAMINATION

BY MR. MEIKLEJOHN:

Q. Mr. Shuey, you've been here throughout the day today; is that right?

A. Yes, sir.

Q. And you've heard the testimony concerning whether particular contamination of groundwater is or is not a problem; is that right?

A. That's correct.

Q. What is the 100 parts per million standard that's been mentioned in connection with the state of New Mexico's underground storage tank regulations?

A. That's a remediation requirement for soils that are contaminated by leakage from underground storage tanks, which most often is either gasoline, diesel fuels, or some sort of liquid hydrocarbon product.

Q. Does the existence of that standard mean that it is legal in New Mexico to contaminate either soil or groundwater to that level?

A. Absolutely not.

Q. At the hearing in April, were you asked by the Commission to determine where the sites that were listed in an exhibit that you presented at that time are located relative to the vulnerable area?

A. That's correct.

Q. And have you done that?

A. Yes, I have.

Q. Is that a 24-item list that's titled, "Locations of Unlined Pit Sites Listed in

Exhibit SRIC 2 Relative to the Existing Expanded Vulnerable Area"?

A. Yes, sir.

Q. Where did you obtain the information for that?

A. First of all, I prepared this in response to a question, I think, that Commissioner Bailey had. And I obtained information about the locations of these 24 sites relative to the existing and expanded vulnerable area from a number of sources which are listed on the document.

There was a printout of current and expanded vulnerable area sections, subsection units, under township and ranges that the OCD staff had prepared last August, which has now been updated and is complete. I had that available.

I have in the past looked at the vulnerable area maps that are on file. I talked on a couple of occasions with Mr. Olson to verify if my reading of the maps were consistent with his.

And then back in 1984, in preparation for the first vulnerable area hearing, I served

on the Short-Term Produced Water Study Committee, and there was various mapping exercises. And Union Texas Petroleum Corporation generated a map, a general map, of the vulnerable area shaded. And it allowed you to look at sections that are approximately 3/8 of an inch square.

And so I was able to use those four sources of information to figure out which sites on that list of 24 are in the existing area, which are in the expanded area, and which are outside the area.

Q. Now -- I'm sorry. Go ahead.

A. Essentially two of them fell outside the area, six of them fell within the expanded vulnerable area. One is marginal. As I think Mr. Hicks pointed out this morning, sometimes you, when you're looking at maps, even the detail of a seven-and-a-half minute quad map, you'd almost have to survey the site to see exactly where it is.

And then the rest, that amounts to 16 others are in the existing vulnerable area.

Q. Is that exhibit accurate?

A. To the best of my knowledge. And it was prepared by me.

MR. MEIKLEJOHN: Mr. Chairman, I move the admission of Exhibit SRIC 17.

CHAIRMAN LeMAY: Without objection SRIC 17 will be admitted into the record.

MR. MEIKLEJOHN: Thank you.

Q. (BY MR. MEIKLEJOHN) Mr. Wallace testified this afternoon, Mr. Shuey, about the flow of contaminants in a permeable layer that is surrounded by relatively impermeable layers. You may have used the term "preferential flow."

Are you aware of any situations in San Juan Basin in which such flow has occurred?

A. Yes. As I understand the situation at the Mary Wheeler, Manana-Mary Wheeler site, the so-called Flora Vista contamination site, that it just so happened that that dehy pit had received an upset of produced fluids throughout the separator -- was unfortunately overlaying over an ancestral, an old ancestral channel of the Animas River, which would have provided or could have provided a preferential flow pattern.

Q. Do you know how far the contamination from the site in that situation has gone, has traveled?

A. There were two public water supply

wells. It's been testified by various people that one of them was contaminated and that that was located approximately 500 to 600 feet down-gradient from the pit, and I think that's accurate.

There's another one that was located in the same area, I believe, a slight distance farther away that, as I remember, and I stand to be corrected if my memory of that file of information which is fairly large is incorrect, but as I remember, there were some pump tests that were done to determine flows and other geologic aquifer parameters. And in the process of that happening, a second well had developed some contaminants.

And so really there's two municipal -- or not municipal, but public water supply wells that were affected at that site.

Q. Are you aware of any situations in which the contaminant has traveled more than 1,000 feet from the source in the San Juan Basin?

A. Yes. Well, in terms of the pollutant, the target pollutant that we're all concerned about, produced water, there was discussion by

Mr. Hicks and others about the Lee Acres site.

As I stated earlier last month, I have been on the site of the landfill and the lagoon. I, in fact, helped the OCD staff take samples from the lagoon in January of 1985.

Now, the lagoon being unlined, I included it on my list. It is, as many of you know, much larger than the standard oil field produced water disposal pit; nonetheless, it is an unlined excavation in an alluvial river valley.

There's been file cabinets full of information and data generated on the Lee Acres site. And I think the consensus amongst regulators is that a plume of contaminants emanated from the lagoon characterized by a variety of pollutants, including volatile organic compounds and chlorides, and there was some BTEX associated with the produced waters that were disposed in that lagoon.

It was established clearly that produced waters had some from off-site federal leases to that pit. There were -- the closest private domestic well in Lee Acres is about a quarter-of-a-mile roughly down-gradient. And

that well owned by the Reynolds was contaminated with the same substances and contaminants that were found in the landfill lagoon in the plume emanating from the lagoon.

There are other private wells in the Lee Acres subdivision that had been detected as being contaminated. Of course, all those people are now on a community water supply. But at the time that this incident occurred, subsequent investigations found at least a half-dozen private water wells contaminated.

I would have to go back into the files and dig very deeply. I do not remember that the Reynolds well was the only one contaminated with pollutants that were consistent with the landfill plume. I can't tell you from my memory exactly how many however. But clearly that was a situation in which the contaminants well exceeded 1,000 feet.

And I don't know that they've ever really found the downward, down-gradient edge of the plume. As I understood, the last analysis, that was more than a half-mile from the source.

Q. With regard to the Lybrook area, Mr. Kilmer testified about certain sites that BCO has

in, I believe, it's the Rincon Largo Canyon. Can you, using the map that I believe is now on the back of the blackboard --

A. It disappeared.

Q. -- can you show us where you understand Mr. Olson to have investigated the soil in that canyon and where the BCO discharge ports are?

A. I assumed that Mr. Olson correctly noted on his exhibit, OCD 15, the correct location of where he did some excavations. I believe that that is denoted as 24-7-24, and that would be at this -- somewhere in this point.

Q. Pardon me. Could you stand on the other side of the map so that the Commissioners can see what you're pointing to?

A. The map may fall, so I'll try to hold it here. I'm pointing to an area on the map that is identified as Rincon Largo. I am pointing to the section that is Section 24. And I believe that OCD Exhibit 15 denotes the unit letter as G.

There are 16 units in a section. It starts in the northeast corner with A and then goes snake-wise. And so that would put G somewhere in the -- in the southwest of the

northeast, with a little help from Mr. Chavez.

So Mr. Olson found alluvium and groundwater at 20 feet in Largo -- Rincon Largo within or approximately a mile from the nearest discharge point of a BCO well.

Now, I did not know until I heard the testimony of Mr. Kilmer that certain of these BCO wells in Rincon Largo have, I assume, produced water discharges. Those, he testified, are indicated on this map in pink. And so that's -- that may even be less than a mile from the nearest BCO discharge point.

There are three BCO discharge points clearly within the Rincon Largo and another one semi at the edge of it, perhaps even two that are semi at the edge of it. It's very hard to tell on this map.

Q. Given what Mr. Olson found, are you aware of any reason to believe that there is no alluvium in the area where those discharge points are located?

A. No. I think that Mr. Olson established there is alluvium at that point. And it would be very hard for me to believe that it's not throughout that canyon. So I think that that is

an area that deserves protection as has been denoted in the expanded vulnerable area maps.

Q. Is it Southwest Research & Information Center's position that notice should be given of applications for variance not only to the owner of the property where the discharge site is located, but also to owners of adjacent properties?

A. Yes, sir.

Q. Is it your view that publication, notice by publication in a newspaper of general circulation is an adequate means to accomplish that?

A. It is not, and let me tell you why. Unless there is a what we call notice in fact, that is an actual notice given to the landowner or adjacent landowners, let's face it, most people don't read the legal ads.

As I understand the solid waste regulations, solid waste management regulations in the state of New Mexico, there are a variety of different mechanisms for ensuring notice, one of which is a requirement for something a little bit more elaborate than a legal ad in the back of the paper, like a small display ad.

OCD's commercial disposal facility regulations require actual notification of contiguous landowners and I believe occupants, and that's an important thing to note.

Often, as many of us have in our life, rented property, rented homes, we have an interest in being informed when facilities are proposed for our neighborhood. And it seems that the interests of people in those neighborhoods would be well served by notice in fact and notice that goes beyond publication in a newspaper of general circulation in the legal ads.

Q. In a proceeding concerning a variance, should the burden be on the person seeking the variance, or should the burden be on the person resisting the application for a variance?

A. As we have testified, the burden clearly needs to be on those who seek the variance. Essentially what they are coming in and asking for is an exemption from a rule that everybody else has to comply with.

We have stated that those kinds of variances and exemptions can be granted based on a site specific demonstration, and we stick to that. I see no reason to place the burden on

people who are potentially affected by the proposal.

I am also not convinced that so-called nuisance protests are -- they are certainly not everyday occurrences. I can't remember, you know, one that recalls that and, as long as I've been involved in this business, generally people who file objections are concerned. And they have property values in mind. They have health and welfare of their families in mind.

I think that we give short shrift to those concerns if we label them nuisance protests.

Q. Are you familiar with the Duncan Oil Field?

A. Yes, I am.

Q. What's the basis for your knowledge of that field?

A. I participated in the site specific investigation of leakage from an unlined pit in that area in 1985 and was a coauthor of the paper that is referenced in Mr. Wallace's reference list of SRIC Exhibit 11. And I'm familiar with the results of that.

Q. Where is that pit -- that field

located?

A. It is near the San Juan River near what we call the Hogback, which is approximately seven miles east of Shiprock, New Mexico. It is in the existing vulnerable area.

Q. Do you know what county it's in?

A. It is in San Juan County, New Mexico, and it is on the Navajo Indian Reservation.

MR. MEIKLEJOHN: I have no further questions. I'm sorry. Do you wish to add something?

A. We missed a couple points.

Q. I guess I did have another question.

A. There's a couple of other things that I can say about SRIC, what I think has been marked as 17, the list of the contamination sites, which exist in the expanded area.

It was much to my surprise to find that the Lee Acres landfill site is outside of the expanded vulnerable area. It is clearly within alluvial drainage. That drainage proceeds northward from that area of the landfill site several miles.

There are certainly not only oil and gas properties and activities north of that site,

but human inhabitation. And so I would suggest that the expanded vulnerable area be expanded or a special protection area be created to be added to the expanded vulnerable area to include Township 29, Range 12 West, Section 22 and the portions of that unnamed arroyo which meet the definition of the vulnerable area.

And I wanted to one last time make very clear that we use the Water Quality Control Commission numerical standards as gauges of contamination. They are not applicable to produced water. And that is clearly spelled out in both the Water Quality Act and, I believe, the Oil & Gas Act and the Water Quality Control Commission regulations.

The introduction of benzene, toluene, ethyl benzene, xylenes into groundwater in any amount is contamination. It does not occur naturally. Those substances do not occur naturally in alluvial materials unless they are put there by human activity.

And so we can argue over whether it's legal contamination or not, but it is still groundwater contamination.

Q. Is the introduction of those substances

into soil contamination of the environment?

A. Yes, I believe they are.

That's all I have, Mr. Meiklejohn.

MR. MEIKLEJOHN: Thank you. No further questions.

CHAIRMAN LeMAY: Thank you.

Mr. Roberts?

EXAMINATION

BY MR. ROBERTS:

Q. Mr. Shuey, I just want to ask one question regarding the -- goes to the accuracy of your Exhibit No. 17. I believe you testified that the Lee Acres landfill is outside the existing and proposed expanded vulnerable areas; is that the way to read that?

A. That's as much as we can figure out, yes, as I can figure out in review of this material and consultation with Mr. Olson.

Q. Our research -- when I say "our," Four Corners Gas Producers Association, research indicates that that's a 40-acre tract that's partially within the existing vulnerable area.

Would you have any reason to think that that research is inaccurate? And again I'm not trying to set you up in any way; I'm just trying

to make sure that this exhibit is accurate in terms of all the information.

A. Well, I wouldn't prepare something, Mr. Roberts, with the belief that it was inaccurate, let's put it this way.

Q. I didn't accuse you of that.

A. I guess what we're asking for is that unnamed arroyo, that drainage be made part of the vulnerable area.

I would grant you that in -- a section is a very large -- 640 acres. Maybe not all that section would be in the expanded vulnerable area. I'm trying to get at where the shallow groundwater is which is the intent of the vulnerable area.

Q. Was it your testimony that adjacent landowners receive actual notice of applications for variance?

A. Yes.

Q. How would you define an adjacent landowner?

A. I believe I also said occupant too. And by adjacent, next to the proposed operation. One can talk about affected individuals or interests. I think that's probably, arguably,

too broad.

It seems to me that it's fairly simple to identify based on land status maps and research into plats and other kinds of mechanisms, including going and knocking on somebody's door or visiting them in their field or whatever they're doing, to provide actual notice.

That can be in the form of a letter. It can be in the form of a copy of the application. There's a variety of ways of seeing that that gets done.

Q. Let's assume that the adjacent landowner is one mile away from the activity which is the subject of the application for variance. In your opinion would that adjacent landowner be entitled to actual notice of that activity?

A. Uh-huh.

Q. That would be 5,000 feet away. Do you have any technical or scientific data that would support your position that that landowner at that distance away from the activity should be notified by actual notice?

A. You asked me a hypothetical question,

and I gave you the general answer to a hypothetical question. I think that, you know, different circumstances prevail obviously. I would rather have the rule require actual notice of adjacent landowners or occupants rather than not under the assumption that somebody may be adjacent but five miles away.

And the reason is that that person's property, that business, a variety of interests may be affected other than his or her health or water supply. And it is not always -- it's not true in all cases that when somebody lives, physically situated or lives a great distance, their property may be contiguous to the facility that is being -- that the request for variance is being asked for.

Q. Well, is it your opinion -- is your opinion based on your personal belief that those people have a general interest in what's going on -- proximity suggests that they have a general interest in what's going on? Or do you actually have some scientific or technical data that would support your position?

A. I have both personal views on it, and I have experience. I've worked with people who

live adjacent to facilities. And if something happened at one of those facilities, whether they are three feet away or three miles away, they want to know what's going on.

I've worked with people in the Lee Acres area. I've worked with people in the Animas River Valley. It's, you know, based on experience. And I suspect that if your interests were so affected you would feel the same way too.

Q. Are you telling me that you don't have any scientific and technical data to support your opinion?

A. I'm saying to you --

Q. I'm trying to just get an answer to my question.

A. I'm saying to you, Mr. Roberts, I don't think it's a scientific question; it's a policy question.

MR. ROBERTS: Thank you.

Thank you, Mr. Chairman.

CHAIRMAN LeMAY: Thank you, Mr. Roberts. Mr. Padilla?

EXAMINATION

BY MR. PADILLA:

Q. Mr. Shuey, on SRIC Exhibit 7, your

location No. 10 is the Lee Acres landfill; correct?

A. I'm sorry, Mr. Padilla, are you referring to 17?

Q. 17.

A. I'm sorry. Now, ask your question again.

Q. Site No. 10 is the Lee Acres landfill; right?

A. Yes, sir.

Q. And you testified that that is sort of extraordinary because it's a large size of contamination; is that fair?

A. I think it's accurate to say that the contamination does not extend over 640 acres in the section, no. I believe that I clarified, in response to Mr. Roberts' question, that what we're trying to get after is the unnamed wash or arroyo in which the landfill is located.

And so absent a unit letter, I recommended the entire section, and I'd be happy to provide the unit letters of the coordinates of the specific area as to what we're requesting once I look at the detailed maps.

Q. Is there a large lagoon out there? Is

that a pretty big lake, or what is that?

A. There were a couple of, I think there were three actually, lagoons at one point. And at the time of the time of the problems in 1985, there was one in operation, I believe. They have all been drained and backfilled.

Q. How about, is there any similarity in terms of the kind of discharge in the Lee Acres landfill compared to any of the other sites in your list of 24?

A. As I noted earlier, Mr. Padilla, the lagoon is significantly larger in area. I would have to look at the documentation to give you exact square feet. But, as I remember from being there a couple of times, you know, 60 to 70 feet on one side, about similar to that on another side.

But the similarities to these other pit locations is that this was an earthen pit. It had no liner. And it was receiving waste that included production fluids.

And the time that I was there helping the OCD take samples, there were a variety of things floating on the fluids: paraffin, dead horse heads, obvious septage. There were opened

and unopened bags of caustic soda sitting on the side, the bank of the lagoon. And there were piles of what I think anyone familiar with the oil field will call drilling mud.

Q. Mr. Shuey, I had Mr. Kilmer identify on BCO Exhibit 3 the three sites, disposal sites, that discharge into the Rincon Canyon.

The three sites identified by Mr. Kilmer while you were testifying were the Lybrook -- well, the first one is the Lybrook site, which takes water from the Lybrook 2, No. 4, No. 6-22 well. And discharge, daily discharge is .1 barrel per day.

The other site is on the B 5-23 well, and there's no water discharge from that well. And the third site is on the Federal 2-26 No. 1, and there's a .9 barrel per day discharge from that well.

Would you agree with me that there is a considerable difference between the totality of the three sites in the Rincon Canyon and the Lee Acres landfill?

A. Yes there is a difference.

Q. A big difference; right?

A. You mean in terms of discharge?

Q. Yes, sir.

A. I see what you're getting at, but it's a little bit apples and oranges. Unless I'm wrong in interpreting --

Q. Well, it is apples and oranges.

A. Let me see if I can clarify and understand. I interpret your exhibit, BCO Exhibit 3 and those volumes to be measured discharges from a separator?

Q. Probably.

A. And the lagoon received bulk loading from trucks.

Q. All kinds of stuff?

A. Right, that's correct.

Q. And actually you can't really compare both of these sites?

A. No. I guess in your terms, no, you can't. But I did not make a comparison between the Lee Acres landfill site and the three BCO discharge points that you're referring to.

Q. But you were saying that because the Lee Acres site was an alluvium and the three BCO disposal sites were also in alluvium; therefore, you had the same degree of care associated with both essentially?

A. I didn't say that, Mr. Padilla.

MR. MEIKLEJOHN: That was not Mr. Shuey's testimony. I object to that.

Q. (BY MR. PADILLA) Well, the same measure of protection should be taken as to both?

CHAIRMAN LeMAY: Objection noted. What did you state, Mr. Shuey, if you want to repeat?

THE WITNESS: I believe I went to the BCO map and I pointed out that within Rincon Largo, where previous testimony had suggested -- had indicated that there was alluvium and that it had groundwater in it of 20 feet, that within a mile of that site was a discharge point.

And I believe that Mr. Kilmer had testified that to his knowledge there were no BCO discharge points that affected alluvial groundwater and they may -- whether the totality of discharges is .3 barrels a day or not.

I also testified that the reason to confer protection on the area where the Lee Acres landfill is because there is shallow groundwater. It is an alluvial system.

Q. (BY MR. PADILLA) So is it apples and oranges between the Lee Acres site and the three sites on --

A. In terms of discharge volumes, yes. In terms of the protection of the geologic regime in which both are found, no.

Q. How about in terms of separation from a known water source and assuming that there is water 20 feet, as Mr. Olson indicated, a mile away or approximately a mile away?

A. And not separation from the water source?

Q. The distance from the discharge point to the water source.

A. Well, I make the assumption, based on Mr. Olson's testimony, that there is shallow groundwater in the alluvium in Rincon Largo. I don't believe I've heard testimony from BCO to say that there's not at your discharge points.

So given that, that alluvium deserves protection.

Q. And you're not saying either that there's discharge into the alluvium either, are you? You don't have any information to say that BCO is discharging into the alluvium; correct?

A. The only information I have is what is on your Exhibit 3, which indicates that there is -- there are, quote, unquote, "discharges."

They are small quantity discharges, yes.

Q. That's all the information you have?

A. That's correct, sir.

Q. Now, you testified as to burden of proof for variance. Shouldn't the burden of proof for rule-making be on the applicant for the rule?

A. Well, I think --

MR. STOVALL: I object. Mr. Shuey is not a lawyer. He's not qualified to testify as to rule-making standards and burden of proof standards.

CHAIRMAN LeMAY: I'm going to overrule the objection in the sense he's issuing some policy statements, I think, which he's certainly free to answer Mr. Padilla's question on policy statements.

I'm not sure where you're getting, but go ahead.

THE WITNESS: I believe your question was: Should the burden of proof be on the applicant? And I think that --

MR. MEIKLEJOHN: Excuse me for just a moment, Mr. Chairman. Let me clarify one thing. Mr. Shuey testified about the burden of proof in

a proceeding for a variance. The question was about burden of proof in a proceeding for a rule-making.

THE COURT: I think that's a significant difference. Is your question directed to him on a variance or rule-making?

CHAIRMAN LeMAY: All right. He can answer it on rule-making.

THE WITNESS: I think clearly it's on the applicant. I think that the Oil Conservation Division has accepted that and is the proponent of the rules that are before us today.

MR. PADILLA: I have no further questions.

CHAIRMAN LeMAY: Good. Thank you.

Mr. Kellahin?

MR. KELLAHIN: I'll pass, Mr. Chairman.

CHAIRMAN LeMAY: Thank you.

Mr. Stovall?

MR. STOVALL: I think I'll pass too.

CHAIRMAN LeMAY: Commissioner Bailey?

COMMISSIONER BAILEY: Pass.

COMMISSIONER WEISS: No questions.

CHAIRMAN LeMAY: You're getting off easy.

EXAMINATION

BY CHAIRMAN LeMAY:

Q. Given the fact of the nature you do have natural seepage of oil and gas that could leak into alluvium, would you consider that naturally occurring?

A. Yes, to the extent that they are there.

Q. Two: Do you happen to know, on the two examples that you gave, being Lee Acres and mainly the separator in -- it's so late.

MR. STOVALL: Flora Vista.

Q. (BY CHAIRMAN LeMAY) Flora Vista. Thank you. -- the depth of the water in Flora Vista?

A. Eight to nine feet, I believe.

Q. Would you accept the same level in that area as the river was?

A. Plus or minus a few feet, yes, probably.

Q. It was out there. I mean, you could see the river and you could see the fill-up in the area. It was the level of the river. I'm not sure whether that's the case in Lee Acres water wells or not.

Isn't it less than 50 feet to water in

those wells that were contaminated in Lee Acres?

A. I remember some total depths, but the depth to groundwater, as I remember, around the lagoons is about 35 feet. And I think that that's similar down in the subdivision.

Q. Would that be close to the level of water absolute in the river, you think, given the topography of the area?

A. I don't know that I can make that conclusion. I just don't know.

CHAIRMAN LeMAY: That's all I have.

Additional questions of the witness?

MR. MEIKLEJOHN: We have no further witnesses to present.

CHAIRMAN LeMAY: Thank you. Do you have any redirect?

MR. MEIKLEJOHN: No.

CHAIRMAN LeMAY: If not, he may be excused.

Are there any statements to be made or anything further in the case?

MR. GREGORY: Just a statement.

CHAIRMAN LeMAY: Please identify yourself.

MR. GREGORY: Steve Gregory with Unocal

Corporation.

MR. STOVALL: Mr. Gregory, to help the court reporter out, since she's been at this for about eight out of ten hours, why don't you come up to the mike.

MR. ROBERTS: Mr. Chairman.

CHAIRMAN LeMAY: Yes.

MR. ROBERTS: One other item before you do that, would you give us a time frame for the submission of these --

CHAIRMAN LeMAY: Yes. When we get through, we'll discuss that briefly.

Mr. Gregory, please step up here and give your statement.

MR. GREGORY: I am the environmental coordinator for Unocal Corporation in Farmington, and I wanted to make two points: Number one, to correct a statement that was made in the April meeting.

There was a statement made by one of the witnesses that Unocal had -- it was one of the operators, major operators in the basin that had gone ahead and started lining pits on their own.

I think that's probably taken from

applications to the OCD for drip pits that we were reactivating. And so I just want to correct that. We really are not going out and lining pits because we feel there's a danger to groundwater.

Now, that doesn't mean in the existing vulnerable area we certainly realize that when you start having groundwater depths, 10 foot, 15 foot, we eliminated those pits years ago.

Our concern now is when we look at the -- I didn't bring the map with me, but when you look at the map of our wells, we looked at your proposed expanded vulnerable areas, and we marked all of our wells within those areas. We came up with in the San Juan Basin about 88 wells that fell within the expanded area.

We went back and looked more closely at those wells, and we discovered that 77 of those wells were on the top of Ensenada Mesa. And I don't know how familiar you are with that area, but Ensenada Mesa is about 1,000 vertical feet above the San Juan River and 800 vertical feet above Canyon Largo.

And so I guess what we're trying to say is that when it goes to requesting a variance, it

looks like we're going to be requesting a variance on about 80 percent of our wells that fall within this proposed vulnerable area.

And that variance will be based on our own knowledge of groundwater depths, which average greater than 100 feet, and that's to damp sand.

What we have are -- we took -- I'm not sure how familiar you are with cathodic protection wells. But we drill wells offsetting some of our locations in order to protect casing on our producing wells. And we went back over data for our cathodic protection wells that we drilled in 1990 in that same vulnerable area.

What we found was that looking at the drillers' logs, they keep just handwritten records as they drill those wells, driller logs indicate that they found in most cases damp sand around 170 feet. The shallowest damp sand was 60 feet.

And so the bottom line is I just want to express we feel there's a concern if we have to ask for a variance on 80 percent of our wells that fall within that area, then perhaps there's been a mistake in outlining the area.

Now, maybe that only applies to Ensenada Mesa, but we feel there is -- in fact, it was just pointed out Lee Acres apparently didn't fall within the area. So we have an area that obviously should have been and the tops of mesas, and I have no idea how they fell in it.

Maybe the outline of the area that's on the maps needs to be looked at much more closely before a rule is made.

CHAIRMAN LeMAY: Thank you very much.

Additional statements in the case?

Do you have anything more to say, Commissioner Weiss?

COMMISSIONER WEISS: No.

CHAIRMAN LeMAY: Commissioner Bailey?

COMMISSIONER BAILEY: No.

CHAIRMAN LeMAY: We shall take the case under advisement. You mentioned the time frame. Can you do it in two weeks? If I give you two months, you'll take two months. Three weeks?

MR. MEIKLEJOHN: We would prefer three weeks.

MR. MEIKLEJOHN: Following the preparation of the transcript.

MR. ROBERTS: There's an agreement

between industry and environmental groups.

CHAIRMAN LeMAY: That's rare.

I need to ask the court reporter: How long will it take for the transcript?

THE REPORTER: Two weeks.

CHAIRMAN LeMAY: Two weeks. You can do it in a month; right? Then two weeks after the transcript.

MR. MEIKLEJOHN: Very well.

CHAIRMAN LeMAY: We'll leave the record open one month for comment and take the case under advisement.

Thank you, everyone, for the late hours. I appreciate your patience and contribution.

[And the proceedings were concluded at the approximate hour of 7:00 p.m.]

CERTIFICATE OF REPORTER

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

I, Debbie Vestal, Certified Shorthand Reporter and Notary Public, HEREBY CERTIFY that the foregoing transcript of proceedings before the Oil Conservation Commission was reported by me; that I caused my notes to be transcribed under my personal supervision; 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 June 3, 1992.

Debbie Vestal

DEBBIE VESTAL, RPR
NEW MEXICO CSR NO. 3