STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION COMMISSION

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

APPLICATION OF THE NEW MEXICO OIL CONSERVATION DIVISION FOR REPEAL OF EXISTING RULE 50 CONCERNING PITS AND BELOW GRADE TANKS AND ADOPTION OF A NEW RULE GOVERNING PITS, BELOW GRADE TANKS, CLOSED LOOP SYSTEMS AND OTHER ALTERNATIVE METHODS TO THE FOREGOING, AND AMENDING OTHER RULES TO MAKE CONFORMING CHANGES; STATEWIDE

CASE NO. 14,015

ORIGINAL

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REPORTER'S TRANSCRIPT OF PROCEEDINGS

COMMISSION HEARING

BEFORE: MARK E. FESMIRE, CHAIRMAN
JAMI BAILEY, COMMISSIONER
WILLIAM OLSON, COMMISSIONER

Volume VI - November 9th, 2007

Santa Fe, New Mexico

This matter came on for hearing before the Oil Conservation Commission, MARK E. FESMIRE, Chairman, on Friday, November 9th, 2007, at Morgan Hall, State Land Office Building, 310 Old Santa Fe Trail, Santa Fe, New Mexico, Steven T. Brenner, Certified Court Reporter No. 7 for the State of New Mexico.

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(Continued...)

(Continued...)

DIVISION WITNESSES (Continued):



* * *

Wednesday, November 7th, 2007 (Volume IV)
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DIVISION WITNESSES (Continued):



(Continued...)

DIVISION WITNESSES (Continued):



* * *

(Continued...)

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CASE NO. 14,015



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Friday, November 9th, 2007 (Volume VI)
Commission Hearing
CASE NO. 14,015



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* * *

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* * *

# A P P E A R A N C E S

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* * *

ALSO PRESENT:

JOHN BARTLIT, PhD
DONALD A. NEEPER, PhD
New Mexico Citizens for Clean Air and Water

* * *

WHEREUPON, the following proceedings were had at 9:00 a.m.:

CHAIRMAN FESMIRE: Let's go back on the record.

This is a continuation of Case Number 14,015, the Application for rulemaking and to replace Rule 50.

Let the record also reflect that Commissioners Bailey, Olson and Fesmire are all present, we therefore have a quorum.

I believe -- "I believe". I know for sure that it's nine o'clock on Friday, November 9th, 2007.

I believe that we were still in the direct examination of Mr. Jones.

Is that correct, Mr. Brooks?

MR. BROOKS: That is correct, Mr. Chairman.

CHAIRMAN FESMIRE: Are you ready to begin -- I mean, to resume your questioning, so to speak, of Mr. Jones?

MR. BROOKS: I assume Mr. Jones is ready to resume his narrative.

CHAIRMAN FESMIRE: Okay.

MR. BROOKS: May it please the Commission?

CHAIRMAN FESMIRE: It will, sir.

BRAD JONES,

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

DIRECT EXAMINATION (Continued)

BY MR. BROOKS:

Q. Mr. Jones, would you continue?

A. Yes, I believe yesterday when we ended, we were discussing the proposal from the industry committee and Yates Petroleum Corporation, their proposal for a closure in place, as they call it.

CHAIRMAN FESMIRE: Mr. Jones, could you locate us on the first handout you gave and on your talking points?

THE WITNESS: This would be page 28 on the talking points. I believe it might be at the end of page 28. And of course we're also talking about the closure of temporary pits, and I'm discussing what industry -- the industry committee and Yates Petroleum Corporation has proposed.

Something I would like to point out on this recommendation. The proposal itself would require the operator to stabilize the pit contents, possibly test it, depending on groundwater issues, and then cover it with compacted material and re-vegetate. Their recommendation is based on that it's equivalent to deep-trench burial, which requires a new liner, testing beneath the pit, the existing pit that they have closed, and covering it with a geomembrane liner and putting four feet of soil on it.

The reason I would like to bring this up is because it is our contention that the closure in place would be one of the primary methods of closures pursued due to cost and not requiring testing underneath the pit.

Another thing I would like to clarify. Yesterday I made a statement about IPANM's recommendations. I misread their comments from October 22nd. I thought that they were recommending to just delete 19.15.17.13.B.(1), but their recommendation was to delete from B.(1) to G.(3), which is all the closure methods for all activities, with the exceptions of the time lines. And they were relying on the industry committee comments for proposed reasons. I'd just like to clarify that the industry committee has not recommended that those provisions be deleted. They have modified those and added additional language.

CHAIRMAN FESMIRE: Mr. Chairman, for clarification, then, I would -- in my comments I would withdraw the section deleting all those sections and just totally rely upon the industry comments --

CHAIRMAN FESMIRE: Weren't those Yates' --

MS. FOSTER: -- just for clarity of the record?

CHAIRMAN FESMIRE: Weren't those Yates' comments?

MS. FOSTER: The industry committee, New Mexico industry.

CHAIRMAN FESMIRE: So you're changing your recommendation to delete to comply with Yates' request to delete all of them?

MS. FOSTER: No, my request was to delete all the paragraphs, but I made two conflicting statements. One was, delete all these paragraphs. And the second statement I made was, rely on all the industry comments. So I obviously was mistaken, and I will just rely on the industry committee comments, as opposed to making recommendations to delete those paragraphs. Okay?

CHAIRMAN FESMIRE: Okay, I don't want to pursue it. I'm still a little confused, though.

MS. FOSTER: Well, I'm just relying on the industry comments --

CHAIRMAN FESMIRE: But you're not -- are you representing Yates?

MS. FOSTER: No, I'm --

CHAIRMAN FESMIRE: Okay.

MS. FOSTER: -- representing IPANM.

CHAIRMAN FESMIRE: But isn't he talking about Yates' comments?

THE WITNESS: No, the industry --

CHAIRMAN FESMIRE: Okay, it was the industry --

MS. FOSTER: IPANM --

THE WITNESS: Yeah, the industry committee's --

CHAIRMAN FESMIRE: Okay.

THE WITNESS: -- comments for the proposed reasons for the deletions.

CHAIRMAN FESMIRE: The record will reflect that your comments are noted, and they will be --

MR. HISER: If it's helpful, the industry committee and Yates' comments are essentially identical.

THE WITNESS: Yes.

CHAIRMAN FESMIRE: That's what I was thinking. Okay, thank you.

THE WITNESS: Okay, I would like to continue on to the closure methods for permanent pits. There are just a few distinctions I would like to hit on this.

Under paragraph (1) the intent of the proposed language is to inform operators of their responsibilities. This would include the removal of liquids and basic sediment and waste from the permanent pits prior to implementation of the closure method and to provide instruction to the operator in order to prevent or reduce the risk of a release.

This is a separate requirement that is not required for temporary pits.

Also paragraph (2), the intent of the proposed language is to inform operators of the proper method of disposal for the liner system and it must be re-established for the closure.

So the rest of the requirements, such as paragraph (3), the testing beneath the pit, the determination of a release, which is paragraph (4), the application of allowing the conditions if there's not a release, allowing the backfilling and then application of the prescribed soil cover and re-vegetation under paragraph (5), these have been discussed in relationship -- they're the same requirements as those proposed for waste excavation and removal for temporary pits, and I would state that the intent for those reasons for the temporary pits apply for the permanent pits as well, and I would save some time for the Commission and other parties, if that's acceptable.

There are a couple of things I would like to comment on, though, in these, because there are some footnotes, and some of them are the same as the previous ones, and I believe that testing is footnote 36.

This was a recommendation to allow other methods, EPA-approved methods, and this was something that constituted a change throughout all of the testing parameters, especially for testing beneath the pit, so we did add some additional language stating that other EPA methods -- excuse me, that the Division approves. So this did constitute a change.

Footnote 37 was a support statement. I'd just like to point these out. So there was support for testing beneath a pit.

Under paragraph (5) there's another footnote, it's footnote 38, and I -- once again, this was -- the original language only had the implementation, there's references to the prescribed soil cover and re-vegetation standards. I think there's some confusion in not following the references to find out what those were referring to. But the soil cover and re-vegetation standards were not specified for any type -- they were just a general standard that the task force came up with, and it was never discussed that it would restrict it to any application when it was time for closure.

Subsection D, it says closure methods for closed-loop systems. As you can see, once again, these -- the methods are waste removal, we have on-site deep-trench burial and the alternative closure methods. These were all similar methods proposed under the temporary pit closure methods.

The only exception to this is that if you look under the waste removal section it doesn't include excavation. This is due to the fact that we're looking at drying pads, which would have dry contents on it, on the surface. And due to the nature of the waste, we would not be looking at these drying pads storing fluids, having a hydraulic head. So under this provision there's no additional testing beneath the drying pad. We think this is a pretty proactive approach to drilling that reduces a lot of risk, and it's dealing with solids and fluids. And so we have omitted that portion of that. We're not requiring the testing beneath the drying pad.

I would like to point out that Energen has recommended --

Q. (By Mr. Brooks) Okay, I believe Energen has withdrawn their comments pursuant to what we were talking about yesterday.

A. Okay. I would like, for the record, to state that the on-site deep-trench burial, the intention for that is -- and for the alternative closure methods, under the closed-loop system the intent that was expressed for temporary pits applies to these as well, instead of repeating those verbatim.

Subsection E, this is the closure method for below-grade tanks.

There are some special considerations for this under paragraph (1). The intent of the proposed language is to inform operators of their responsibilities of the removal of all liquids and sludge from below-grade tanks prior to the implementation of the closure method, and it provides instruction to the operators in order to prevent or reduce the risk of a release.

There also provisions in this for paragraph (2) that are somewhat unique as well. The intent of this proposed provision is to encourage and allow operators to recycle, re-use or reclaim the below-grade tank if possible. So they have an option that that tank doesn't have to become a waste item.

Paragraph (3), the proposed provision provides instructions to inform operators to what extent equipment should be addressed for closure where below-grade tanks are utilized.

Once again, paragraph (4) is the testing beneath the below-grade tank.

Paragraph (5) is addressing -- for the determination of a release and addressing that release.

Paragraph (6) is the backfilling and the prescribed cover and re-vegetation standards, which have been discussed, under temporary pits. I would like to state for the record that the intent discussed for temporary pits are the same intent for these items listed here.

Subsection F, on-site closure methods.

The intent of this provision is to establish specific general requirements for on-site closure and to identify an approvable method that may not require exception.

Under general provisions, paragraph (1), the intent of this provision is to identify to the applicant or operator the general provisions for on-site closure method.

The reason that we have this separate and don't identify a specific method -- and I'd just like to clarify this up front -- is that under the exceptions for alternative closure methods -- and these would apply to temporary pits and closed-loop systems -- they may request some alternative that requires on-site closure. So these general provisions that are listed under paragraph (1) would apply to that exception.

Subparagraph (1), the intent of the 100-mile-radius provision is to reduce the cumulative effect of multiple burials of drilling waste and properly manage waste when a viable option for disposal is within distance of a disposal facility that is capable of accepting such waste. Generators of hazardous and solid waste are required to properly dispose of their waste, especially if a viable option is available. The intent of this provision is based upon the same concept, proper waste management.

I believe Mr. von Gonten covered this as well.

Certain parties such as the industry committee and Yates Petroleum Corporation have requested -- or recommended that this provision be omitted from the rule.

Subparagraph (b), the intent to establish the siting criteria for on-site closure methods is based upon the permanence and duration of the application of the closure. The siting criteria provide an additional level of protection over time. Siting criteria are the same as those for the construction of a temporary pit or below-grade tank. The conceptual idea is that an operator should not bury or leave waste material in a location that a temporary pit cannot be constructed, operated or permitted.

Subparagraph (c). This provision is proposed to protect OCD from approving activity that may contradict an agreement between the operator and the surface owner. During the task force meeting -- meetings, representatives from industry clearly expressed their unwillingness to share any information regarding the agreements with the surface owner under the Surface Owner Protection Act. In order for OCD to protect itself from legal ramifications from surface owners, written consent must be provided for OCD to approve on-site closure.

Q. Now Mr. Jones, just to clarify -- you've already testified to this, but this provision applies to any on-site closure method, not just to deep-trench burial?

A. That is true. We also, under the exceptions, there are exceptions -- sections of the regulations that are not open to exceptions, and we have identified this as one of the provisions that you cannot get an exception to.

Q. Now Mr. Jones, are you aware that the Surface Owner Protection Act requires the oil and gas operator to restore -- to substantially restore the surface?

A. I haven't read it in that detail, but my understanding is that there is a certain obligation.

Q. Okay, continue.

A. Certain parties such as the industry committee and Yates Petroleum Corporation have requested that this provision be replaced by language that would only require the operator to notify the surface owner of a temporary and, if applicable, the on-site closure or deep-trench burial. Even though their proposed language is not clear, it would suggest that some type of demonstration of notice would be provided. Such a change would provide OCD with -- it should say, would not provide OCD with the proper -- appropriate information to determine if approval would contradict the agreement between industry and the surface owner.

Subparagraph (d). The intent of the proposed language is to instruct applicant and operators of the additional provisions that apply only if on-site deep-trench burial is pursued.

This provision here is to direct -- pretty much to direct operators, if they're pursuing the deep-trench burial, where they need to go to complete that task.

Subparagraph (e). Once again, this is a testing beneath the existing -- of course here it says drying pad and temporary pit. This is one of the provisions that we have recommended language change, a proposed change, and I believe that was submitted on Wednesday.

It was not our intent, as you can tell from the other recommendations, for closed-loop systems with drying pads to include testing beneath that, due to the nature of the -- removing the liquids and having a drier solid on the pad. So at this time we would like to request that the portion that states, Drying pad associated with a closed-loop system or, be removed from this provision.

As for the intent of this purpose, it is the same intent that we have, testing beneath the pit -- in this case, temporary pit -- that would apply to on-site closure that we have addressed for temporary pits under waste removal and excavation.

We do have some footnotes here, and these footnotes are the same as the ones that have been submitted for other sections, which would include an option or some language for other methods, EPA methods. This constituted a change for this provision, so we do have language that states, other EPA method that the Division approves. This constituted a change from a recommendation from the task force member, and I believe footnote 40 is another support statement for testing underneath.

Subparagraph (f) is a determination if there's a release or not, the backfilling and the installation of the -- or construction of the prescribed soil cover and the re-vegetation of the site, those references.

Much like the ones I've been -- that have similar language, we'd like to state for the temporary pit recommendations for intent. They would apply here as well, instead of allowing the -- me reiterating those. But the intent should -- is the same as those for temporary pits.

Subparagraph (g), this is -- if a release is determined, the operator shall comply with part 16 and -- or Rule 16 and Rule 19. Once again --

CHAIRMAN FESMIRE: Rule 16?

THE WITNESS: Or, I'm sorry, 116, I apologize. Rule 116 and Rule 19. These are the same provisions that are listed under a temporary pit.

I would like to state that our intent is the same that was expressed for temporary pits.

Paragraph (2) --

MS. FOSTER: Mr. Chairman, I'm just reviewing through Mr. Jones' very voluminous notes here, and I'm noting that under section (f) there's quite a few things that he missed, specifically the footnotes that were addressed by the task force on consensus issues and nonconsensus issues. And I understand that we're trying to get this as quickly as possible, but I think this information is quite important for us to review. And if you'd like, I can do it on my cross-examination, but I just -- since we're here --

CHAIRMAN FESMIRE: I think he indicated in his prelude -- weeks ago or so, when we first started -- that he would be not covering everything in his notes, and he asked that the only things that he covered be attributed to his testimony. Is that your understanding?

MR. BROOKS: Yes, Mr. Chairman, I don't believe that the furnishing of notes that the witness used to testify from obligates the witness to say everything that's in his notes. Now if it's otherwise admissible, they can go into it on cross-examination.

CHAIRMAN FESMIRE: Okay, I think that pretty accurately states the law, doesn't it, Ms. Foster?

MS. FOSTER: Well, I wasn't quite sure why they were giving us his notes, but since he has given us the notes and they are quite voluminous, and up until this point he has been addressing all the footnotes, and -- it would appear from his notes or material that he is referring to that there are quite a few footnotes that refer to the material that he has just skipped.

Again, if you would like me to address it in cross-examination, I'd be more than happy to.

CHAIRMAN FESMIRE: I think surely you can address the footnotes in cross-examination.

As for his notes, I think he clearly stated as a condition of giving notes to the other participants that, you know, he would be using only part of them.

Mr. Jones, why don't you continue?

THE WITNESS: Yes. If I can, I'd also like to clarify, at the beginning I explained the color-code of the presentation, which would indicate what was consensus or nonconsensus. I would hope that the color-code would speak for itself. Anything in black was new language proposed by OCD or existing language that came from either the guidelines or the current rule. So I was hoping that some of that presentation, I wouldn't have to identify that, it speaks for itself.

Paragraph (2), on-site deep-trench burial. There's a footnote that relates to this. I would like to state for the record that originally the option for on-site deep-trench burial was an approved -- well, I wouldn't say approved method, it was a method under exceptions for closure.

In our original draft when we -- that we provided to the task force, under exceptions we have on-site deep-trench burial, and we had alternative closure methods. And upon comments that we received from multiple parties, we decided to integrate this method into the rule and out of the exception provision. So I would like to make that clarification. And we did take that comment into consideration and create a change.

Subparagraph (a), the intent of the proposed language is to remind applicant and operators that the provisions under paragraph (1) of this subsection, which would be subsection F, or on-site closure, all of those provisions must be satisfied or demonstrated if deep-trench burial is pursued.

Subparagraph (b), the operator -- or, I'm sorry, the intent of this provision is to prevent the development of unpermitted surface waste management facilities.

This provision specifically states that you must use a separate on-site deep-trench closure for each closure associated with a drying pad or closed-loop systems. We have been approached multiple times asking if people can consolidate multiple closures into one thing. We believe that constitutes a surface waste management facility, either be it a centralized facility, which is defined under part 36. If parties are paying each other, if there's multiple parties and they're not associated with each other, it could be a commercial facility.

There are provisions for that, but once you start bringing in waste to one location and consolidating that waste, that falls up under part 36.

And so we want to make sure that this does not occur and that we don't have a lot of unpermitted surface waste management facilities out there, so --

Q. (By Mr. Brooks) Now in this connection, Mr. Jones, are the -- a deep-trench -- if you use the deep-trench method for a centralized or commercial facility, would that be a landfill?

A. That would be a landfill. It would also require 100-foot separation to groundwater.

Q. Would it also require more extensive liner requirements than we require for deep-trench burial?

A. Yes, it would.

Q. Continue.

A. Certain parties such as the industry committee and Yates Petroleum Corporation have requested that this provision be removed from the rule. Such a change would allow operators to consolidate multiple closures in one location which would possibly be considered an unpermitted surface waste management facility and conflict with the provisions of part 36.

Subparagraph (c), the intent of the proposed provision is to provide operators with an opportunity and option to propose a method to treat the waste material. The proposed language is goal-oriented in order not to place any restrictions on the proposals and to promote the P2 (pollution prevention) concept.

We have multiple footnotes here. I'd like to address footnote 42 and 43.

Our original proposal that we had, the original language in the draft that was provided to the task force, we had a limit on the increase in volume that you could add something to the original waste material to -- I think it was a 1-to-1 ratio, meaning that there wouldn't be over 100-percent increase in the volume of the waste once it's been treated.

We got a lot of comments regarding this, and we talked to a lot of people in industry, and a lot of those parties expressed that sometimes it could be a 4-to-1, 6-to-1, especially to stabilize it and make it geotechnically stable.

So we put these standards in, and the standards are to optimize waste minimization and reduce contaminant concentration. So we think that they should be sufficient. They're goal-oriented.

We think also that if you were to increase that volume too much it becomes counterproductive, as in cost, due to -- that you would be disposing four to six times the volume of the waste material, which will require a larger lined pit, extra -- additional excavation. It would take a larger area to implement this program. So at some point it becomes counter- -- on the economic side, because it's going to take more to complete to complete that task.

So we left it up to industry to make that decision, if it's going to be a cost-benefit-type thing to implement this, based upon the treatment that they propose.

I believe comments 44 and 45, those footnotes -- There was some recommendations that we define treatment method. We felt that if we were to define it, it would make it finite and place restrictions on operators, it would not allow for the implementation of new ideas or new technologies.

So we chose not to define treatment method. We're pretty much opening up the door to allow them to propose what they think is appropriate and let us assess it to see if it meets these minimum standards that we have -- performance standards we have provided.

Subparagraph (d), the intent of the proposed provision is to ensure that the waste material which is buried on-site have reduced constituent concentration levels in order to prevent it from becoming an endless source of contamination if the deep-trench liner fails.

I believe that the method that is specified here, Mr. Price has already discussed that method and what it represents. Mr. von Gonten has summarized the results and identified the constituents detected during the sampling of that. Mr. Hansen's discussion of the volume results have demonstrated why we have proposed the standards that we have. So all the previous testimony demonstrates and support the need to establish standards for deep-trench burial.

We do have a couple of footnotes here. Once again, footnote 46 is a recommendation to allow other methods, so we have modified that language, that constituted a change. So we have provided language that states, other EPA method that the Division approves.

The -- Comments 47, 48 and 49. In our draft version that we submitted to the task force, the original standards that we had were the landfarm standards on part 36. A lot of things were brought to our attention for us to consider, that -- I believe the -- 47 talks of the landfarm standards and pits are very dissimilar. There was some comments about the WQCC standards. And I believe, if I'm not mistaken, comment 47 -- or 49 is the same comment as 47.

We looked at this, and it's true, the landfarms do not -- the standards -- they're not the same thing, they are dissimilar. Landfarms do not have liners, but landfarms do require that the operator monitor the vadose zone on a quarterly basis to determine if there's any potential threats to any type of contamination or groundwater. So we realize that there are differences, that's why we changed our standards.

We consider -- OCD considers the geomembrane liner for the trench and the cover, in association with the modified standards, to provide equivalent or better level of protection as the stricter landfarm closure standards and the quarterly vadose zone monitoring that's associated with those landfarms.

So we figured that since the landfarms don't have liners but they do monitor, in this case, if this waste is buried on site with our recommendations for the standards for the waste, the liner, the prep of the liner, the cover, to prevent further exposure, that -- and it will not be monitored -- that it's equivalent-type closure.

Certain parties such as --

Q. Excuse me a minute, but the standards in this rule are not the same as they are --

A. No --

Q. -- for landfarms, are they?

A. No, no. We have come up with new standards, we took into consideration of what industry had stated, we realized they're not the same. So instead of testing for BTEX, which is a landfarm standard, GRO/DRO, we have taken those out. We do require TPH to be tested, we do require that chlorides be tested, and we do require the 3103 constituents.

Q. Now the TPH standard is the same, the 2500, correct?

A. The TPH standard is the same as the landfarm standard.

Q. But is the chloride standard the same?

A. It is not. And part of it -- it was part of my discussion, maybe it wasn't clear. In landfarms we're looking at two different things. This is surface remediation -- it's remediation of soils at the surface, meaning that the difference between this and this type of closure, this deep-trench burial closure, is that at a landfarm those soils will remain on the surface. The chloride is set to allow re-vegetation. And I think under part 36 during the hearing proceedings this was discussed in great detail. It was understood that anything that exceed 1000 would -- I'm trying to think of the correct term, but it would impact the germination of seeds and wouldn't allow for proper re-vegetation to establish.

Q. In the case of a closed landfarm, is the waste on the surface itself?

A. Yes, yes.

Q. In the case of a deep-trench burial, how far beneath the surface is the waste?

A. It would be four -- at least four feet, because it requires a four-foot cover. It may be even deeper. The thing that they'll have to consider is the 50-foot separation to groundwater in that scenario, so it could be shallower. As long as there's a four-foot cover, and since it's going to be in the liner, wrapped up like a burrito with a geomembrane on top of it, we're not worried about the impact of the chlorides in this, because they'll be enclosed or encapsulated by -- enveloped by the liner material, that the chloride standards of that buried waste that's been enveloped by the liner will not be impacting the ground level four feet above it.

Q. Now under Rule -- under part 36, what is the chloride standard?

A. It depends on the depth to groundwater and depends on the type of facility.

Q. So -- There are two, are there not?

A. There are two standards.

Q. And what are they?

A. The two standards are, if the -- for a landfarm, if the groundwater -- separation to groundwater is 50 feet or less, it is 500 milligrams per kilogram. If it's 100 feet -- if it's greater than 100 feet, then it's 1000 milligrams per kilogram.

Q. Now, are those measured by the TPLP [*sic*] procedure, or are those the actual concentration in the soil?

A. I'm not prepared to answer that one, so I'm going to have to look that one up.

Q. Okay, very good. But what is the closure standard in this provision that you're talking about for deep-trench burial, the chloride --

A. The chloride closure standard is 5000 milligrams per liter, if I'm not mistaken. I think I stated earlier that for the landfarms it's milligrams per kilogram.

Q. Right.

A. So based upon the synthetic leaching procedure --

Q. The SPLP procedure?

A. The SPLP procedure that is required for this, this will constitute the chloride concentrations in the waste content, would be approximately 100,000 milligrams per kilogram.

Q. Okay, so it's very, very different from --

A. Very different --

Q. -- landfarming?

A. -- a different consideration.

Q. Okay, continue.

A. Trying to catch up where I was at. Okay, I believe I've addressed the footnotes.

Certain parties on October 22nd such as the industry committee and Yates Petroleum Corporation, they have recommended to increase the TPH concentration -- TPH, which is total petroleum hydrocarbon, concentrations to 5000 milligrams per kilogram, and they've also -- have recommended to decrease the chloride concentration to 3500 milligrams per liter. And through their recommendations they have also requested that the 3103, the Water Quality Control Commission, constituents be omitted from the testing requirements.

No justification was provided for the recommended changes, so I don't know really how to comment on that.

Mr. von Gonten's testimony, he identified a multitude of constituents that were tested during the sampling events. The sampling results shown in his presentation illustrate that TPH and chlorides may be absent while other constituents were detected. So to omit the 3103 constituents would limit OCD's assessment of buried waste.

Subparagraph (e). The intent of the proposed provision is to serve two purposes.

The first is to locate a deep trench within an appropriate distance of a drying pad or temporary pit. This prevents the accumulation of multiple pits or pads being buried together and allows the surface owner or future owners to determine the proximity of the buried waste after closure. This also prevents surface owners from digging into buried waste material and/or possibly building on top of it, which we had seen in the Westgate scenario.

The second is to inform applicant and operators of the design and construction requirements for the deep lined -- or lined deep trench.

As you'll notice, in this provision there is an opportunity for the district office to grant administrative approval for alternative distance. This was some comments that were provided by industry to us, their concern of an operator that wouldn't want buried waste to be so close to maybe the proximity of a residence or -- somewhat, or maybe they have a barn or something, and they would suggest that they have a dirt road and they thought since this is always going to be a road, maybe we can dig out this area and put it over here.

So we are allowing such considerations with this and allowing the operator to propose an alternative and have the district office consider those alternatives, with the possibility of administrative approval.

Subparagraph (f). The intent of the proposed language is to inform operators of the standards and conditions in which the excavated material must satisfy for placement in the lined pit.

Basically we're looking at the proposed limits for TPH and chlorides -- it references those -- and that waste must pass the paint-filter test, paint-filter liquids test.

Subparagraph (g). The intent of the proposed provision is to instruct operators that if it is determined that a release has occurred -- instead of going into this, I will hit the high points of this.

Once again, this is one of those provisions that would instruct operators that if a release has been determined, they must comply with Rule 116 and with Rule 19.

It also -- there's some additional language in this provision that states, the operator may propose to transfer the excavated, contaminated soil into the lined trench.

What we've done with this is that instead of having them to address that -- if there is contamination -- if it's determined that there is contamination and it requires excavation of that material or removal of that material, we are allowing the opportunity, instead of having them to address that at a later date or -- which would require them to -- in this case, it would not be associated with the pit contents anymore or the drying pad -- allow them to put this in this lined trench for the deep-trench burial, instead of coming back later and having to haul it off, to deal with this.

So we're allowing them to incorporate this waste, if it's determined that there is contamination beneath the pit, to address it and incorporate that waste, as long as it meets the standards for -- because it would become part of the buried material, that they could put it in the lined trench.

Subparagraph (h). The intent of the proposed language is to inform applicants and operators of the design, construction and installation requirements for the geomembrane cover. The installation of the geomembrane cover ensures that waste material is completely enveloped and that infiltration of rainwater will not come in contact with waste material. By requiring the operator to install the geomembrane cover in a manner that prevents collection, water should not accumulate or penetrate the geomembrane cover and will be diverted around the enveloped waste material.

Subparagraph (i). The intent of the proposed language is to ensure that the waste material is properly enclosed, backfilled with uncontaminated soil, the operator installs the appropriate soil cover, and the disturbed area is re-vegetated. The intent is to prevent or restrict the contract of moisture with the buried waste material. This reduces the risk of contaminants from leaching out of the waste material.

Subsection G. This is soil cover designs.

The concept of the soil cover originates from the suggested language recommended by the task force. The task force only recommended one design. Upon our development of the proposed rule, OCD realized that the recommended design from the task force would be excessive if required for all applications. Therefore, OCD created two different soil cover designs, each for a different application.

Paragraph (1), the intent of this provision is to establish minimal standards for soil covers utilized when restoring areas in which the operator has removed or remediated the contaminated soil. This is after the excavation of the contents or whatever activity it would be associated with. The goal is to ensure that enough topsoil or suitable material is present to establish vegetation.

Paragraph (2), the intent of this provision is to establish a more specific standard for sol covers utilized for deep-trench burial. Or it could apply to on-site burial, depending, but for this it's utilized for deep-trench burial. The primary goal is to ensure that the soil cover is structurally sound. The secondary goal is to ensure that enough topsoil or suitable material is present to establish vegetation. The compaction of the soil is crucial to ensure that the soil cover does not settle and collect water. This is important because the collection of water above the buried waste increases the likelihood of increased infiltration of water and increased risk of water coming in contact with the enclosed waste.

Paragraph (3), the intent of the proposed language is to establish general finishing construction specification for all covers in order to prevent ponding and erosion of the cover material.

If I'm not mistaken, a lot of this concept is similar language that is currently in Rule 50 for the surface restoration.

IPANM -- well, I think I've made my comments clear on that, and they've retracted this statement, so I won't comment on it.

Okay, subsection H, this is the re-vegetation requirements.

The intent of the provision is to create a practical standard of re-vegetation that can be established within a specific time frame.

There's a footnote that goes with this, it's footnote 50. There was some issue about the terminology that was used, especially the use of "substantially" may be interpreted in various applications. This was task force language that was presented for this. There was a lot of discussion relating to it.

The reason that "substantially restore" was utilized is due to the time limit that's specified within the regulation. This is through two successive growing seasons. In order to request someone to re-establish to what it was prior to the drilling or the activities of a certain area may not be practical, since that area has never been disturbed, and it could be undisturbed for 10 years, 20 years, 30 years, 100 years.

So to anticipate that you could re-establish an area that has been either dug up, soils moved around and totally disturbed, to establish to the standard that it has not been disturbed within two years, we didn't think that was a practical task that could be completed, that had the same amount of vegetation. So we thought if you could substantially restore it to the extent that you could within two years, that would be enough.

CHAIRMAN FESMIRE: However, I'm assuming, Mr. Jones, that you're generally in agreement with the comment, Weasel-words in rules may avoid conflicts now, but certainly will cause troubles later?

THE WITNESS: Yes. So certain parties -- and this would be -- I believe it was industry committee and Yates Petroleum Corporation -- they have recommended that the re-vegetation standards be consistent with the surface waste management rule. Their modifications to the proposed language don't quite coincide with the written comment that was submitted on October 22nd.

The Surface Waste Management Facility Rule, part 36, requires -- this is a direct quote -- Upon completion of closure, the operator shall re-vegetate the site unless the Division approves an alternative site use plan as provided in subsection G of 19.15.36.18 NMAC. Re-vegetation, except for landfill cells, shall consist of establishment of vegetation cover equal to 70 percent of the native perennial vegetative cover (unimpacted by overgrazing, fire or other intrusion, damage to native vegetation) or scientifically documented ecological description consisting of a least three native plant species, including at least one grass but not including nauseous -- noxious weeds, and maintained -- I'm sorry, and maintenance of that cover through two successive growing seasons.

Industry's recommendation -- or recommended language and interpretation of 36 is -- and this is from their document, and this is -- what they're stating is the same as part 36 -- Upon completion of closure, the operator shall substantially restore the impacted surface area to a similar condition to that the existing prior to oil and gas operations, by placement of the soil cover and re-vegetation of the site.

Such a recommendation provides no specifications to allow OCD to determine if the operator has satisfactually -- has satisfied that requirement.

Paragraph (2). I guess indirectly I've written my notes to address this by the footnotes. So footnote 51 and -- we'll address 51.

This language really hasn't changed from our original draft that we had submitted to the task force members to review, and so their comments apply to the language that we have proposed in part 17. Make sure we've got -- Okay, there we go.

As you can see from the comments, there was concerns that the -- this provision provides -- I think it's on down -- It provides the surface owner with the veto power over the proposed alternative, and it was -- the task force members that commented on this -- I'd like to point out this was a consensus item on the final summary report submitted to Mr. Sanchez with the OCD. There were no --

indication that there was any red to it.

And in that -- I'd like to preface this by stating that in that summary report -- and I'll read from that -- that this was written in the summary report that it was the landowner would be able to contemplate. And part of that -- I'd like to read from the July 10th summary report.

Q. (By Mr. Brooks) Now that is -- the July 10th summary report is Exhibit Number -- what? 24, I believe, correct?

A. I believe so -- down here -- and I believe this is page 7 of that summary report, and it's at the top of page 7 and it's under re-vegetation.

And it states -- and this was -- as you can see, it's green on that document, which indicates it was consensus by all parties -- and it states, Upon completion of closure, the operator will substantially restore the surface affected by oil and gas operations to the condition that existed prior to oil and gas operations and maintenance of that cover through two successive growing seasons, but not including noxious weeds. If the landowner contemplates use of the land where a pit is located for purposes inconsistent with re-vegetation, the landowner may, with Division approval, implement an alternative surface treatment appropriate for the contemplated use, provided that the alternative treatment will effectively prevent erosion.

So the original language for this concept was -- only addressed the landowner or surface owner's recommendation or contemplation.

As you can see from the comments now from the same parties that were involved in the task force, they agreed upon this. Their comments reflect that this would be a mechanism that will allow the landowners a veto power. This was originally proposed and discussed in the task force, since if a landowner may want to put a storage building or something out there, they could do that. And they -- since -- with the Surface Owners Protection Act and the agreement that may take place, they may have an agreement with the operator.

And so the problem that we have is, how do we implement this concept to stay true to the task force and the rule? So our language -- the only way we could address it was, since the permits are issued to the operator and the applicant, not the landowner, we had to use the operator as the mechanism or the person to go through to allow that landowner to request that.

So our language that we have here says, The operator may propose an alternative to the re-vegetation requirement if the operator demonstrates that the proposed alternative effectively prevents erosion and protects fresh water, human health and the environment. The proposed alternative shall be agreed upon by the surface owner. The operator shall submit the proposed alternative, with written documentation that the surface owner agrees to the alternative, to the Division for approval.

So the way that we addressed this was to use the operator, the party that we issue the permit to, to act as the go-between, between surface owner and the OCD.

Footnote 52. There was some concern about the language. The use of "effectively prevent erosion" is less clear than "prevent erosion".

If someone were to construct a building on site, it would be hard to say if the runoff from the building would create erosion or not. We think effective -- for building of a structure o whatever use it may be, as long as it effectively prevents that, it should be sufficient.

So some of the things, I believe, that were brought up were structures, stables, corrals, storage areas. They would be effectively preventive of erosion, depending on their use. If we state that it is to prevent erosion, then it may not -- we would restrict surface owners' right to use their land for a different purpose, which is not our intent.

Okay, I believe -- I don't have notes on this. I believe that the -- there was some recommendations from the industry committee and Yates Petroleum Corporation about the alternative -- regarding this alternative closure as well, and I would like to read their recommended changes and then address those.

Their recommended change, I'll read directly from their document. What they -- I guess to summarize it, they're looking at a written notice they think that should suffice. And their proposed language is that, The operator may propose an alternative to the re-vegetation requirement if the operator demonstrates the proposed alternative effectively prevents erosion and protects fresh water, human health and the environment. The operator shall seek the surface owner's agreement to the proposed alternative. If the surface owners agree -- if the surface owner agrees, submit the proposed alternative with written documentation that the surface owner agrees to the alternative, to the Division. If the surface owner does not agree to the alternative, the operator shall submit alternative to the appropriate district office. The submission must include evidence demonstrating the proposed alternative effectively prevents erosion and protects fresh water, human health -- I'm sorry, public health and the environment. The surface owner may submit written objection to the alternative method to the Division. The appropriate district office may reject the proposal after notice and opportunity for hearing if it finds the proposed alternative does not prevent erosion, protect fresh water, human health and the environment.

With this -- This is similar to the written consent for on-site burial at the -- for the intent of why we are in opposition to the written consent required for on-site burial. If there are agreements between parties under the Surface Owner Protection Act, if we end up approving something that is not agreed upon, we become a party of allowing something that may result in legal ramifications to OCD. It would be -- have to be argued that -- Who's right in this? Is it the written agreement between the surface and the operator, which we have no knowledge of? Can the operator say, Well, the OCD approved it, so we're doing it?

We'd rather not get ourselves tied up into those agreements. We've stated earlier that we don't consider that we should be a party of those agreements, but we need to protect ourselves from those agreements. And since it has been expressed that industry is unwilling to share those agreements with us, we have no idea of what's been agreed upon.

So by granting approval of something, in this case it's clear, if the surface owner disagrees it makes it difficult for us to approve it, because it may be in conflict with that agreement.

Q. Are you still on H.(2)?

A. Yes.

Q. Okay, go ahead.

A. Okay. Subsection I is closure notice.

The concept of the closure notice originates from a recommendation provided by the task force. OCD expanded upon their recommended language in order to instruct operators on how, when and where to satisfy the requirements.

Paragraph (1), the intent of the proposed language is to inform and instruct operators how or the method required, such as certified mail, return receipt requested, to provide notice, which closures require notice and -- or which closures will require notice, such as the temporary pit, permanent pit, below-grade tank, or where the operator has approved on-site closure, and what is required for a demonstration of compliance.

Subparagraph (2), the intent of the proposed language is to inform and instruct operators when -- when are required to notice -- okay, I don't know about my writing here, but when it's required to notify OCD of closure -- of a closure of a temporary pit or below-grade tank or the operator who is approved for on-site closure and what information should be submitted when providing that notice.

So this is a 72-hour notice, not more than one week prior to any closure. It should provide instructional information such as the name, location and, if there's a well associated with it, what was the well name, number and API number?

Q. Mr. Jones, is there any comparable provision to this in Rule 50?

A. As far as my review of it, no.

Q. Does Rule 50 require the operator to notify the Division after a pit is closed?

A. Yes, there is -- I believe the sundry notice is one mechanism for that.

Q. Will the advance notification provision, in your opinion, materially facilitate the Division's enforcement of the proper closure procedure?

A. Yes, actually knowing when a closure is going to occur will allow inspectors to be notified of when they should be out there, if a closure is occurring, to assess if there's any damage to the liner that may come up. Without that notice, they would be unaware of when a closure is taking place. Thus, they would not be able to be present.

Q. And -- Okay, I think we've covered that. Go ahead.

A. Okay, paragraph (3), the intent of the proposed language is to inform and instruct operators when notice -- when it's required to notify OCD for closure of permanent pits and what information should be submitted when providing that notice. The proposed language also provides instructions to operators that are closing an existing permanent pit that does not have a closure plan on file or approved.

Subsection J. The intent of the proposed provision is to standardize the format, which is the C-144 form, in which a closure report is submitted and to inform operators of the information required in order for the operator to submit a complete closure report. If this provision is accepted by the Commission, the C-144 form will have to be modified to include possible checkoff list as a reminder of the required attachments and inclusions of the certification statement.

The emergency action section.

This is -- as you can see, it's task force consensus language in the summary report. There are a couple small changes you'll see that are in black. This language was -- the original source of the language, I believe, is from the current Rule 50, and very little changes have been done. I'd like to hit the high points of this as it currently exists.

Just for a clear understation, these are -- understanding, these are emergency pits that if there's a kick that may occur, something that -- this is provided for a safety reason. So we realize there's kind of a -- it needs immediate reaction. And I think earlier when we discussed the siting provisions, we stated that it wouldn't have to meet the siting requirements, there were no siting requirements.

But as you can see, we modified this. The original language only referred to a pit. Since we have created new terms such as temporary pits and permanent pits, we thought it was prudent to modify the old language to comply with the new language that we use in the new rule, our proposed rule.

So under subsection B you'll notice that we have stated that this -- that if there is such a pit, it will be constructed in a manner of the requirements for a temporary pit. So we did make that modification.

It was up to the task force -- I believe the original provision under Rule 50 requires 24-hour notice. The task force wanted to make sure that there was ample time to remove fluids and solids, to make those arrangements, so we extended that time to 48 hours. And that's under subsection D.

And the same change was made to subsection E. This would require ample time to remove fluids and provide notice. We changed that from 24 hours to 48 hours.

Once again, this change -- the intent was to provide operators ample time to make the necessary arrangements for the removal and contact the appropriate district office.

Okay, we're in exceptions here --

MR. BROOKS: Excuse me. Mr. Chairman, I'm wondering if before we go into exceptions, this would be an appropriate time to take a break?

CHAIRMAN FESMIRE: It's a little early, but I wouldn't be adverse to it. Would anybody else? I'll take that total dead silence as acquiescence.

We'll break and reconvene at 10:25.

(Thereupon, a recess was taken at 10:16 a.m.)

(The following proceedings had at 10:33 a.m.)

CHAIRMAN FESMIRE: Let's go back on the record. Let the record reflect it is roughly 10:30. The record should also reflect that three Commissioners are still present, that we do have a quorum, and this is Case Number 14,015.

I believe, Mr. Brooks, your witness, Mr. Jones, was in the middle of his presentation?

MR. BROOKS: That is correct, and if it please the Commission I will ask him to continue.

CHAIRMAN FESMIRE: Mr. Jones, would you continue, please.

THE WITNESS: Yes. I believe we were starting in the exceptions section. There is a footnote there. The footnote -- it's footnote 53. As you can see there, there was a request, a general comment that most of this should be moved to Section 13, which is the closure requirements.

I believe -- What we did, we looked at this comment. There was some similar comments that appeared based upon this, and the reason why this comment came up is because in our version, our draft version that we've provided to the task force, it included any type of on-site closure, especially those pertaining to deep-trench burial, in the exception section.

We looked at this and considered this recommendation -- there was similar ones to this -- and thought it was prudent that we incorporate it into the closure methods. And except for the alternative closure methods, which were unspecified, we would still like to make that exception requirement, since they're undefined, and be able to review those and have certain consideration to those, and we'll talk about those as well.

Subparagraph -- or, I'm sorry, subsection A.

Subsection A, the proposed language for general exceptions is designed to identify to the applicant of operator which provisions are open to exceptions and the process or protocol in which the applicant must pursue that exception.

The OCD is proposing to protect certain provisions from exception, such as the provision for permitting, the surface owner's written consent for on-site closure, exceptions and permit approval, condition, denial, revocation, suspension, modification or transfer requirements. We were protecting these. We didn't feel it was prudent that someone should be able to get an exception to a permit, get exception to the surface owner agreed consent, because we need that to make a determination to make sure we're not conflicting with a prior agreement.

For the permit approval conditions and denials, we didn't want an exception stating that we couldn't deny a permit, approve a permit, revoke, suspend, modify or allow the transfer of that permit, so we didn't think it was prudent that those should be open to exceptions.

The intent is to prevent the request of these unreasonable exceptions that I just discussed. This may -- It may seem silly that we have to put this in the language, but we have experienced that certain parties have tried to utilize this under current and existing rules, which have been argued in front of the Commission. Our intent is to make the proposed language and provisions as clear as possible.

We do have some additional footnotes here. Footnote 54 -- and just for clarification purposes, it really doesn't pertain to what we have proposed in 17.

With the -- What we had in the draft version that was submitted to the task force, there was a restriction to the closure requirements and exceptions, and we had that restriction because in the closure requirements there were references to the exceptions for deep-trench burial in the exceptions, so we didn't want someone to ask for an exception to an exception to the closure requirements. Since we've re-modified and re-structured the regulation or the rule, the proposed rule, this no longer -- this comment really no longer is applicable.

Comment -- footnote 55. The comment 55 is asking that most exceptions should be reviewed by the local district office. I think we've made the statement before, we're trying to get some uniformity in the response to exceptions, some consistency. And so as we -- when we went through the application process, I believe I discussed that if you're applying for exceptions under this Section 15, those exceptions would come to the Santa Fe office, and the Santa Fe office would consider those exceptions and respond to those. This is to allow for that consistency and uniformity in responses throughout the state regarding enforcement of the rule.

Paragraph (1). I'd like to clarify what we're looking at under -- actually under this subsection A, and maybe I haven't made this distinction. This provision for general exceptions, these are -- anything that doesn't require administrative exception is identified, such as some of the siting criteria, a different location for deep trench burial, I believe the watercourse setback was subject to it, the -- if I'm not mistaken, the subsurface mine provision might be subject to it or the unstable area may be subject to administrative approval.

These general sections are open to anything that's not prohibited by it. So the 50-foot separation to groundwater will be open to this type exception, the 100-mile radius for on-site closure would be open to this exception. These are general exceptions.

The exceptions that would not be included in this general request would be the -- subsection B, which is specifically identifying, these are these -- the alternative closure methods which have special requirements but must be pursued under exceptions. But anything that's not identified for administrative approval by the district office would be open -- or would be pursued by this general provision.

Paragraph (1), there's some footnotes here. I'm talking in a general sense for this exception provision, so -- I think it speaks for itself. We're looking for -- if you're requesting an exception, we've established some form of standard in which it could be compared against. So if we're looking for equivalent or better protection, it should be based upon the standard, so we'd just like to make sure that's clear.

Q. (By Mr. Brooks) Okay, before you go to the standards, I want to be sure everyone is clear on the first sentence, which deals with what you can and can't get an exception to.

A. Okay.

Q. Now it says, The operator may apply to the Environmental Bureau in the Division's Santa Fe office for an exception to a requirement or provision of 19.15.17 other than the permit requirements of 19.15.17.8. What exactly does that mean, that you can't get an exception to the permit requirements of section 8?

A. Well, there's two things, two important things to point out. One means that -- Section 8 indicates what requires a permit. So a temporary pit, permanent pit, any pit, below-grade tank, requires a permit. Closed-loop system requires a permit.

And subsection A of section 8, there is a statement about the prohibition of unlined permanent pits and the statement that there will be no approval permits for unlined permanent pits.

Q. And by the same token, if you had some kind of pit that you thought should not be -- should not have to be permitted and you apply for an exception to let you establish that kind of pit without a permit, that would not be an exception you could get under this, correct?

A. You could not pursue that under exceptions --

Q. Right.

A. -- it is prohibited.

Q. So -- Okay, so basically does it mean that you can't get an exception to the requirement for a permit?

A. Yes.

Q. Okay. Then the next one is the closure requirements of subsection [*sic*] (c), paragraph (1) of subsection F. Now what is subsection (c) of paragraph (1) of subsection F of section 13?

A. That is the surface owner's written consent for on-site closure.

Q. Okay. Under this provision can you get an exception to the requirement for surface owner consent? Can you -- is there --

A. Based upon on-site closure, no, you cannot get an exception.

Q. Okay. And -- but this -- Can you still apply for exceptions to any other closure requirement?
A. Except -- You can, except for the alternative closure methods.
Q. And where does it say that?
A. Actually, that is -- since the alternative closure methods are subsection B of section 15, what is not allowed is exceptions for exceptions.
Q. Okay, so there is a restriction in subsection B of section 15 on the ability to apply for exceptions in certain contexts for on-site closure methods?
A. Yes --
Q. And you'll be going into that when you get to subsection B?
A. Yes.
Q. But as far as this provision, this limits exceptions only to the surface owner consent requirements?
A. Yes, for on-site closure.
Q. And then it goes on to say, The exception requirements of 19.15.17.15. Is that the one you explained about exceptions to the exceptions?
A. Yes, that means that you cannot get an exception for general exceptions, and you cannot -- which would mean if -- if that were opened up to exceptions, you could get an exception to one of these items that we're currently

discussing that are protected from exceptions.

The other is subsection B, which is the alternative closure method.

Q. And the only other thing that's excluded is the permit approval, condition, denial, revocation, suspension or modification or transfer requirements?

A. Yes.

Q. So under that, could you get an exception to -- could you get -- could you apply by exception for a permit that would provide that the Division could not revoke it?

A. You could not apply for such an exception.

Q. Okay. So basically most of these -- are most of these technical things where you're trying to prevent the exception procedure from being used for an end run around some other provision?

A. Exactly, yes.

Q. But the one biggie in there that you cannot get an exception to that's a substantive provision, then, is that the surface owner requirement?

A. Yeah, we put that in there -- we're trying to protect ourselves, since we have no knowledge or -- of what those agreements will be under the Surface Owner Protection Act --

Q. Correct.

A. -- we have to have some type of mechanism in place to make sure what we're approving is something that won't contradict those agreements.

Q. Okay, I think they understand that. I hope everyone understands that. I'll let you go ahead with your narrative.

A. Okay. So I assume exceptions are pretty clear. These are exceptions to the general provisions within the regulation that aren't otherwise protected by the exception provision. Since there are standards for those provisions, there would have to be some type of demonstration to show equivalent or better protection from the standard. And this is addressing paragraph (1).

There are some footnotes to this. Footnote 56, the -- 56 addresses the use of "equivalent". There's some question that "equivalent" could mean less than. We looked up "equivalent" in *Webster*. The first definition is "equal". And that's the way we see it, we consider it equal or better. There was a recommendation to add "better" to that and consider that, so we have modified that from the original draft version.

The comments relating to footnotes 56, 57 and 58. During our draft version we were looking at some language that had been brought to our attention about protection of fresh water. During that time we used the phrase, for the foreseeable future. This phrase was commonly used in conjunction with the protection of fresh water, public health and the environment. We utilized that in the draft version.

OCD chose to remove the phrase because it only relates to fresh water and would be repetitious because of the use of the definition of fresh water. So we have removed that, that no longer exists, those comments really don't pertain to the rule that is proposed in front of the Commission. But we'd like to show that it did constitute a change.

CHAIRMAN FESMIRE: Mr. Jones, may I ask a quick question? You don't use the phrase "foreseeable future" in the rule anymore?

THE WITNESS: No.

CHAIRMAN FESMIRE: Where did it come from, and how long a period of time was it --

THE WITNESS: Well, it came from -- my understanding, it came from the State Engineer's office and there was a -- and I don't have the direct source in front of me --

CHAIRMAN FESMIRE: Okay, if you --

THE WITNESS: -- but it alluded to the protection of fresh water. There was some flexibility in it, or some undefined determination of the -- I also think it was in an order, and I don't know which order that one was, offhand.

CHAIRMAN FESMIRE: Okay, but it's no longer relevant to --

THE WITNESS: No, it's no longer relevant. We thought that the definition for fresh water would suffice for that.

CHAIRMAN FESMIRE: Okay.

THE WITNESS: The footnote for comment 59 -- Mr. Hansen, is 59 up there, footnote 59?

What we had going on -- and I think I stated this earlier -- we had a certain closure requirement pertaining to on-site closure, deep-trench burial and the alternatives incorporated into this provision. So OCD titled -- and I think there was some misunderstanding as well, but -- from the task force members -- but we titled the subsection A of this section, general exceptions, and subsection B, section -- alternative closure methods to instruct applicants how to pursue their exceptions.

We would like to clarify that under subsection B, even as it stands today, there is some language in there that requires the applicant to satisfy the requirements of the general exception requirements under subsection A.

And you know -- and we'll get to these, because they relate to notice, an option for hearing and so forth, and a determination of the Director. So we thought this would re-take -- if you're applying for an exception under subsection B, which is the alternative closure method, there are specifications in what's allowed in that.

The process, though, is in the general exception provision. So we kind of say, Here's your -- what you have to do, but here's the protocol to pursue it, by going back up to A, and you must satisfy those. And we'll discuss those here.

Subparagraph -- or I'm sorry, paragraph (2). The intent of the proposed language is to comply with the Governor's executive order 2005-056, Environmental Justice Executive Order, which was dated November of 2005, regarding public notice and involvement. It also instructs the applicant and/or operator of the protocols required to pursue an exception.

I'd like to also point out, you'll see some of the language is green. Those were -- the language that was green was task force consensus language. The other provisions in black are proposed by OCD.

We made these changes because I believe, if I'm not mistaken, if you look at the task force language it only addressed pits. We thought it was prudent to include everything that is addressed in the rule, which includes closed-loop systems, below-grade tanks and other approved alternatives, or proposed alternatives.

We were -- also wanted to make sure that there was some clarification of what method should be used to provide written notice, so we made that distinction by having certified mail, return receipt. This would allow the applicant to demonstrate to us that that notice was provided, because it would be tracked and documented. It also allows -- if it is rejected by the surface owner, it will show that it was rejected by that party and they chose not to receive it.

It also -- just want to make sure here. Some of our additional language is to require public notice by publication. We felt this was prudent to comply with the mandate of the order issued by the Governor. So we have -- we're trying to comply with those -- the mandates that we're, as an agency, required to do. I think it was Ms. Foster that was trying to make the point that we do have mandates and orders that we must, as agencies, comply with. We're trying to comply with that mandate, and that's our goal here.

The other was -- and it actually came from a footnote that's down there, footnote 60. There was a footnote by a task force member that wanted to include what provisions within the rule address hearings and have that identified for parties that wish to pursue that. So we did add that language inside there, based upon a recommendation from the task force member.

And we do have other footnotes provided here, and they were footnote 61 -- I believe I've addressed footnote 60. But 61, there was concerns about the way the language was written to allow a hearing, I believe, in 61. And maybe some conflict between the Surface Owners Protection Act.

What I would like to state is that a lot of the language provided under this exception, especially the procedural part, actually comes directly from the current Rule 50. We just modified it to address our new rule, so.... And that's why task force agreed to a lot of this common language. So I would just like to point that out, it currently exists. That would suggest that the current rule conflicts with the Surface Owners Protection Act, which I don't think the intent of the Surface Owners Protection Act was to conflict with existing rules.

But -- So OCD has modified the rule by creating paragraph (1) to instruct applicants requesting approval for on-site closure to submit a closure plan that proposes other methods -- I think the other part there was these alternative methods or alternative approvals -- to submit a closure plan that proposes other methods if the initial closure method does not satisfy the specified or approved standards. This allows operator to have an approved backup plan.

The other part of their concern and -- that we address, is, we actually create closure section as discussed earlier because of their concern of additional notices. This is -- We've already discussed this, actually, it should have been up there.

But with these treatment methods that were proposed in the original draft, those concerned that if you were to apply -- apply for alternative closure method, then the -- under exceptions -- if you had to meet these requirements for notice, if your original plan did not satisfy the task -- I think I provided this example, that they propose to close and state that the contents -- and this is actually in this -- the contents meet the standard specified in the rule, and then they discover that it doesn't. Their concern was that they would have to provide additional notice in this provision, and in current Rule 50 you're required to get a written waiver --

Q. (By Mr. Brooks) Let me -- Well, go ahead, go ahead.

A. They were concerned that they would have to do this whole process again.

This comment instigated the development of the closure plan section in the application process -- if I'm not mistaken it's under Section 9 -- and we created -- we started that -- the creation of that provision based upon this comment. And this was to inform operators that if you're proposing an on-site closure method or alternative method and your initial proposal may not be reached, you may want to go ahead and address consecutive ones for the scenario to play out, such as if your waste contents do not meet the standards which you think they will meet then you would say, Well, if it doesn't meet this, we propose this treatment method, and we'll try to treat it to the standard. If we cannot treat it to the standard, then we will excavate it and remove it. And that way, that would prevent additional notice.

Q. Okay. I had a question about the notice procedure. I'm going to ask you about what may be an anomaly in the notice procedure. If you would read for us the first sentence that's in green in -- beginning in the middle -- beginning with the green portion that starts in the middle of paragraph (2) --

A. Which page is that on?

Q. On page 21 of the Exhibit 23.

A. And you're going to start where?

Q. In the middle of paragraph (3) where it resumes in green.

A. Okay.

Q. Sorry, paragraph (2).

A. Okay.

Q. Read the first sentence that's in green there.

A. The environmental bureau in the Division's Santa Fe office may grant exception administratively if either the operator files with the Environmental Bureau in the Santa Fe's -- in the Division's Santa Fe office written waivers from all persons to whom notice is required or the Environmental Bureau in the Division's Santa Fe office receives no objection within 30 days of the time the applicant gives notice.

Q. Now the exception under this procedure requires published notice, does it not?

A. Yes.

Q. And is there any provision -- is there any type of exception that does not require published notice, other than those that the Division can grant without any notice?

A. Yes, there are.

Q. And what would that be?

A. Well, they're not exceptions, but they're administrative approvals specified in the rule.

Q. Those don't require -- do those require any notice?

A. No.

Q. Okay, so is there any exception that's governed under this section 18 that does not require public notice?

A. No.

Q. So wouldn't it be extremely difficult to get waivers from every person to whom notice is required to be given if you're required to give public notice in the newspaper?

A. That would be true.

Q. So doesn't that indicate that maybe the Division made a drafting mistake by including that provision in there?

A. I guess the question would be -- and maybe some clarification to this, then, would be -- and this actually comes from the current rule. It was more of those -- it wasn't the parties that were given notice, it was the ones that require written notice. And so maybe we could talk about this to recommend a change.

MR. BROOKS: Mr. Chairman, I really was not prepared on this, and I didn't really notice it until I was reading this in connection with the witness's testimony, but I believe the Division may request another change in the rule after we've had a chance to confer about this.

CHAIRMAN FESMIRE: Seems like that would be a well-reasoned change, doesn't it --

THE WITNESS: Yes, our --

CHAIRMAN FESMIRE: -- given our mailing budget?

THE WITNESS: Yes. Our goal was to incorporate the provisions that are currently in Rule 50 into this, and by adding this additional language we didn't realize we were stepping out beyond that.

Q. (By Mr. Brooks) Okay, continue, Mr. Jones.

A. Okay. Let's see, I guess footnote 62, this comment was provided by a task force member and it states, From the standpoint of good operational planning, the rule should -- the rule should perhaps reward an operator when the pit contents are cleaner than anticipated, allowing modification to the pit permit while requiring further justification and notice when pit contents are dirtier than stated in the permit application.

We found this kind of difficult to address, because I don't know what cleaner or dirtier means in that respect. It wasn't defined to us, there wasn't a standard provided in that.

We would like to state, though, that since a closure plan is submitted and approved as part of the permit application, that public notice for an exception is required prior to approval and implementation of the closure plan. Somehow I think I got my comments mixed up with the other...

But with this, if they're looking for an exception to be granted, the exception would still require a public notice. So this would be an after-the-fact-type recommendation. You go out there, you find that your contents are cleaner -- We wouldn't know that prior to approving a closure plan. If they were dirtier, then the option to satisfy the notice requirements would not -- would be violated at that point, because it would be too late to make that determination.

So we didn't think it followed the flow of the current regulations or -- because this would be -- could be considered an exception, or if the proposed regulations made that clear. So there would be no way to satisfy this recommendation.

I would like to comment from the October 22nd recommendations from industry committee and Yates Petroleum Corporation that paragraphs (2) and (3), which include the notice, the opportunity for hearing, the opportunity for comments to be received for any exception and the determination by the Director to determine if a hearing should take place, based on technical merit -- they have suggested that these two paragraphs be eliminated from the proposed rule.

We think that allowing such a change would force OCD to defy the Governor's executive order and put us in a bad place on satisfying that mandate.

Subsection B -- Well, let me go back to paragraph (3). Once again this is a very simple intent. The proposed language is to instruct and inform applicant, once again, of the procedural protocols for an exception and the outcome that may come if there's objection to it that has some technical merit it may result to a hearing.

Okay, Subsection B. This is alternative closure methods. The intent of the proposed provision is to allow operators to propose an alternative closure method to waste excavation and removal or on-site deep-trench burial.

For clarification, the references that you see for this provision are only for temporary pits and closed-loop systems.

If the operator wishes to request an exception to any of the requirements of either of the two specified closure methods -- which would be those that are listed above -- any specific exception to it, that request for exception should be pursued under the general exceptions under subpart A and not made up under this provision.

A request for an alternative closure method would be a request for something other than the two specified closure methods which are waste excavation and removal or deep-trench burial.

A possible example would include utilizing the solidified pit contents to construct a tank battery. That would be an example of such a request.

The OCD's intent is not to limit the imagination of the applicant by listing which alternatives are approvable. If we identify which ones are approvable, it would put a restriction on applicants to propose something different, and that's not our intent with this provision.

There are several footnotes to this. Footnote 63, 64, 65, 66, 67, 68 -- if I'm not mistaken, a lot of these were based on something that's not proposed in this rule. In the draft version provided to the task force, in order to pursue this exception, OCD originally proposed an economic demonstration as part of the consideration for on-site closure.

We received several comments from task force members regarding the assessment of such a demonstration. OCD actually reviewed the information available at the APPA [*sic*] website that was suggested by a certain party to possibly be used to make a determination on the information. What we did determine was that the information was quite outdated. I believe it was -- the most recent information available on that website was from December of '03, 2003.

Q. Now what website was this?

A. It was -- I'll have to find the comment. It was a suggestion provided by one of the task force members, and -- looking at my comments here, there's -- which one it would be. If someone sees it, please let me know. Do you see it, Wayne? I'm sorry? 66, it was the footnote 66. It recommended that -- the website is from the Independent Petroleum Producers -- I don't know the full name of the -- the I -- I don't know the A part of that. I assume it's some type of association. They maintain a website that keeps current data of costs for operations, closures, price of oil. I've seen the website, I've gone to the website to review it.

MS. FOSTER: Just for the record, I believe the website he's referring to is the Independent Petroleum Association of America. It's actually AA.

THE WITNESS: Okay. Okay, thank you for that clarification.

We went to their website, we looked at the most recent available information they had from New Mexico. As I was stating, that information was dated December 31st, 2003. The average price of crude oil for that year at that time was $29.52 a barrel.

Since the current price doesn't represent the price that was in 2003, we didn't think that that was even a good source for us to utilize, so we chose to forego the economic demonstration and chose to require demonstration of a viable disposal option, which was a bit more practical. And we addressed that.

Since all that -- the on-site closure provisions were taken out of the exceptions, except for the alternative closure methods, all that was incorporated under section 13, subsection F.

Under the provisions, paragraph (1), these are pretty much -- pretty straightforward instructional provisions for alternative closure methods. You know, we're looking for the operator to demonstrate that their proposed alternative method will provide equivalent or better protection of fresh water, public health and the environment. They're similar to some of the other provisions for closure. The removal of liquids would be required.

And I guess the biggest part is the -- our expectation of what should be incorporated into consideration when you're requesting an alternative method. The basis of the alternative closure method is to support operators that implement pollution-prevention concepts. The factors inform operators on what basis the review will be considered. These factors consist of [*sic*] ensuring that the proposed alternative closure will protect fresh water, public health and the environment.

This, you know, kind of coincides with the footnote 69. They wanted -- I guess there was some confusion by the task force members. They thought that these factors would create some unknown amount of work and confusion to them, to come up with something that hasn't been come up with yet.

We've opened up the door on this. It's -- By providing this opportunity for alternative closure method, it's -- the only limit is based on the imagination of the applicant. It's kind of an open door. As long as it satisfies the goals within this provision, it's open to consideration. So we'd rather not put further restrictions on it.

If you look at paragraph (3), this alternative closure method should or will implement one or more of the following practices approved by the Environmental Bureau. Those include waste minimization, treatment using best demonstrated available technology, we're looking at reclamation, re-use, recycling and reduction in available contaminant concentrations. These are the concepts or the factors that we're looking at. We thought that was enough direction to give to applicants to run with. We didn't feel like by identifying any type of closure method -- if we did identify them, then we would restrict them and what they could propose in the future.

As I had stated earlier, paragraph (4), that's the provision I was stating that lets the party -- well, lets the applicant or operator know that if they pursue this alternative closure method, that they must satisfy the provisions of subsection A of 15, section 15, which are the general exception procedures which will require the public notice component and the procedural components.

Section 16, this is permit approvals, conditions, denials, revocations, suspensions, modifications or transfers.

I guess I'd like to address the footnote 70. There is -- under approvals and conditions, it's recommended that there be a time line -- time limit for review or denial. This recommendation was also proposed by industry committee and Yates Petroleum Corporation. I think their specified time line -- time limit was 60 days, and they had some additional language that stated that the Division does not approve -- deny or approve with conditions applicant -- an application within 60 days of receipt, the matter will be set for the next Commission hearing.

The OCD did not propose time limits for approvals, due to the notice requirements and potential hearings based upon the requested exceptions. It's kind of hard to -- to limit a review when you're waiting a 30-day period for a notice to exception, and if there's enough public comment and technical merit it may lead to a hearing which would not allow us the opportunity, due to the process, the protocol, to even grant approval, because it would be out -- it would have to go to a hearing at that point.

So we didn't think it was really reasonable to put time limits due to not knowing what would be pursued in an application. So we didn't do that.

We also -- the review and the response time of the application is usually based on the quality of the information provided in the application. In my professional life, I've reviewed multiple applications, and if the information is not provided you have to request for more information. The review time is based on what is initially submitted by the applicant.

What I've seen, what this brings about -- and I've seen this happen -- when you put a time restriction on an agency to review an application, if the information is not there and they have 60 days in this case to respond, as soon as something is discovered that seems to be inadequate in the application it can instigate an instant denial of the application being incomplete, to stop the time line. It does not allow the agency the opportunity to work with the applicant to meet the goal to complete that application. It doesn't even -- it doesn't grant them the opportunity for that, because as permit applications start coming in you have to address the next one, because the time line has started. So as soon as you discover something that's inadequate in the application, you -- you can -- you should -- you would have to, to meet the time line, deny that application and have them resubmit.

That's not the goal, that's not our intent of this. We want to assist applicants if they have a reasonable proposal. We want to make sure that the review process, working with applicants to resolve any outstanding issues to be resolved, to make sure the appropriate information is submitted, so we can move this process through.

If we are granted only 60 days to review it and make a determination, then we will be forced to do just that, to make a determination before the 60 days is up. And that's not our intent. We definitely want to work with applicants to make sure their application -- especially if they're viable applications, to be approved and processed, so...

As you'll notice, on the color-coding up here there were certain things that -- if we can go back to the top of that, Mr. Hansen, the title. Oops, we need to be in Section 16.

As you'll notice there are certain things in green in the title, there's permit approvals, conditions, denials and revocations. These were items agreed upon in the summary report by the task force, and that the task force believes should be included. They were not addressed specifically. There was discussion -- There wasn't a determination that they should be incorporated into the rule for certain things or if they should be set up aside, separately, as they are here. We thought a separate section to address each of these would be more appropriate than burying them into the rest of the rules so they may be missed by applicants. We just want to make sure this is a clearer format for these.

That's why we have certain things like the title is highlighted and not the language. Where the language is highlighted would indicate language proposed by the task force that we incorporate into this provision.

So this will allow us to -- once again, subsection A talks about the review and allows -- informs applicants that we may approve, deny or approve an application with conditions.

Subsection B is pretty straightforward, it's the granting of the permit, that we are -- this gives us authority to actually grant a permit under this rule.

These are more procedural-type things, this is why they're also protected by the exceptions.

The condition language, this language was task force language, and we did incorporate this into the rule, we did accept the recommendation to incorporate this, or this concept.

The denial of an application, once again the topic was discussed. We thought it was prudent to put it inside there. This gives us the authority to deny an application based upon any deficiencies or, if it's not sufficient, to demonstrate proper operation and construction of an activity.

Revocation, that was another topic brought up at task force that we should -- it was proposed that we should address, and we have. With this, we also included suspension or modification.

I'd like to state that some of this language did derive from, I believe, part 36 for formatting and consistency within our regulations, and we did modify the section pertaining to modifications. And in our format of modifying the part 36 language is that we discovered that the operator did not have the opportunity to modify their permit, so we did add additional language to allow the operator, if the chose to, to approach and have an opportunity within the rule and the procedure to pursue for a modification to their existing permit. Other than that, it would have been administrative-type modification by the Division.

Of course we thought transfer of a permit was prudent. This was not discussed by task force, but in a case that there was a permit that did exist for an activity, permitted activity, that if the operators did change we would grant -- or have a provision to allow the transfer of that permit so the original party wouldn't have to close, and the new party wouldn't have to seek a permit to re-open a pit, or permitted activity. Clarify that.

And of course subsection G, this is to define the Division approvals of what it would actually mean. And the plain language, it states, The Division shall grant or confirm any Division approval authorized by the provision -- by a provision of 19.15.17 NMAC, by written statement. So what we consider Division approval would have to be in writing. A verbal approval would not constitute Division approval. By having written documentation, it can be confirmed.

Okay, transitional provisions.

The pit rule task force requested that the OCD provide traditional provisions to the proposed rule. Instead of integrating individual transitional provisions into the rule the OCD decided to set them apart in order to assist operators in identify where they fall within those provisions. The proposed traditional [*sic*] provisions are pretty straightforward.

We did have a request -- I believe it's footnote 71 -- there was -- there's some language in the closure requirements that our addressed under -- if I'm not mistaken, it's under B, subsection B here, that -- there's a reference in subsection B that identifies certain activities requiring closure under the subsection A of the closure requirements, and subsection A are the specified closure time lines.

There was a request by parties to integrate that language down here instead of having it up there, and we had discussed that earlier, that when they made that request it also included pulling everything down that would address even the closure of activities permitted under this part, which would create further confusion because there would be no transition of those activities.

So we provided reference to that section. But I guess we could address each of these individually, to make sure these are clear.

Subsection A states that after the effective date, unlined temporary pits are prohibited. I'd like to make this clear, this is open to exception. These are -- once again, these are one of the provisions open to exception.

Subsection B, these are certain activities, existing activities, that are required to close within a specified time as of the closure time requirements. If they choose not to seek a permit, they're required to submit a closure plan. In our references here, we reference paragraphs (1), (2) or (3) of subsection A which identifies those activities under section 13.

And the submittal of the closure plan is described in detail under subsection C of section 9, which addresses closure plans. And in that provision it informs the operator which agency they're to submit their plan.

Subsection C. This deals with lined -- existing lined, permitted or registered permanent pits. There's -- We created this to address some issues, because we do have subsection E, which we'll get to, which will explain the development of this one.

There are requirements that allow certain operators under E to comply with the -- to continue to operate if they meet the construction requirements. This is to provide further clarification to those operators that prior to complying with the construction requirements the operator of an existing lined, permitted, permanent pit shall request a modification pursuant to E, which is up in the modification provisions. An operator of an existing lined, registered permanent pit shall apply to the Division for a permit.

I guess what we're getting at here is that these will be -- permanent pits, even though they're lined, they're not double-lined as required for the construction requirements under -- construction -- I believe it's -- I can't remember what section construction -- I believe its section 12, design and construction of a permanent pit.

These would be single-lined permanent pits. And what we're suggesting in this is that if you have a single-lined permanent pit, that if you're permitted -- if you're permitted -- and it states if it's permitted, you can request for a modification, which means you can put a liner, a leachate collection -- or a leak-detection system and a liner over your existing liner. You can actually retrofit your permanent pit. And we're providing instruction, if you choose to continue to operate this, you can modify -- you can request a modification to your permitted pit to come in compliance with Rule 17.

If you're registered and you've got a single-lined permanent pit, then at this point you're only registered, you're not permitted, which was required under the existing rule, such pits were required to be permitted by -- I believe it was September -- September 30th of 2004. If you're only registered, operating a permanent pit, you didn't fulfil your obligation under current Rule 50, so therefore you need to obtain a permit and apply for a permit and meet the construction requirements of that -- of Rule 17, the proposed Rule 17.

So this is more of a structural, transitional-type provision here.

Subsection D. These are transitional provisions for operators of existing below-grade tanks. Once again, there are -- the first part of that is compliance with the permitting requirements of part 17 -- these are for operators that, much like the permanent pit operators, if they did not comply with Rule 50, which required them to be permitted by September 30th of 2004, they should seek a permit. They're -- basically, they're out of compliance as of today, and so we're informing them that they must comply with that.

And prior to complying with the construction requirements, if you -- and these are for existing below-grade tanks -- the operator of existing below-grade tanks shall request a permit modification. These are for ones that are permitted, that do not have secondary containment leak detection. They should -- since they are permitted, we're asking them to modify their permit to come into compliance with part 17.

Subsection E. This is a transitional provision for operators of an existing pit or below-grade tank. It pretty much states that you may continue to operate in accordance with your existing permit or order, subject to the following provisions, that -- paragraph (1) would be, An operator of an existing lined, permitted or registered, permanent pit shall comply with the operational and closure requirements.

We thought that the other ones explained that if you're not permitted, you don't have the construction required, or if you're permitted and you don't meet the construction requirements, you've already been instructed what to do.

Paragraph (2), an operator of existing permitted or registered, temporary pit shall comply with the operational and closure requirements. This is letting people know that as of the date this rule goes into effect, if it goes into effect, that if you have an existing permitted or registered temporary pit, you must operate it under the operational requirements of 17 and close it under 17.

And based upon the Rule 50, since closure plans are not required for permitting and may be required by the district office, there is not a closure plan filed with the Division. Therefore, this goes back where we have the closure plan requirements, and their approval is under section 9.

Paragraph (3), an operator of an existing below-grade tank shall comply with the operational and closure requirement. Once again, this -- as it was for the temporary pits, these are existing below-grade tanks. They should operate it under the conditions of 17 -- or the requirements of 17. And since they were not required to submit closure plans, they are required to close it pursuant to 17.

And paragraph (4), the operator shall bring an existing below-grade tank that does not comply with the design and construction requirements of 19.15.17 NMAC into compliance to those requirements or close it within five years after effective date.

This is a reminder to those operators that they do have the opportunity to retrofit those tanks to come into compliance, they don't have to close them. Simple retrofits would include placing a tank within an existing tank. As long as they have secondary containment and leak detection in some form or fashion that's satisfactory to the Division, then that would be considered a retrofit.

Subsection F. An operator shall bring an existing below-grade tank that does not comply with the design and construction requirement of 19. -- I'm sorry, I'm reading --

Q. (By Mr. Brooks) You're reading E.(4).

A. Yes, I am reading E.(4). I meant to say subsection F.

The operator may continue to operate an existing closed-loop system without applying for a permit, but the operator shall close such system in accordance with the closure requirements of 19.15.17.13 NMAC.

This is to inform operators of closed-loop systems, once again, if they do not have a closure plan, because one is not required under the current Rule 50, so we're informing those operators that they would have to submit that closure plan to close within the requirements of the closure requirements specified within the Rule 17.

And then the final subsection, G, the operator of an existing sump shall comply with the operational requirements of 19.15.17.

Since these requirements have not really changed, this would just inform them that they must comply with these provisions.

Q. Does that conclude your presentation?

A. Yes, it does.

Q. Very good. Mr. Jones, I may have asked these questions before, but to avoid omitting something, I want to be sure I have done so.

Were Exhibits 23 -- 22 and 23 prepared by you?

A. Yes.

Q. Now, Exhibit 24 -- What is Exhibit 24?

A. Exhibit 24 -- My involvement with the task force was the last subgroup meeting and then the final task force meeting. In that final task force meeting we brought to that meeting a similar document for the parties to look at and to work out our consensus/nonconsensus items. The result of that final meeting is the summary report that was submitted to Mr. Daniel Sanchez, the enforcement and compliance manager for the Oil Conservation Division, as directed by the guidance provided by our Secretary.

Q. And is Exhibit 24 a copy of that summary?

A. Yes, it's the summary report and the matrix that was generated from the task force.

Q. Okay, is Exhibit 24 an official record of the Oil Conservation Division -- a copy of an official record of the Oil Conservation Division?

A. Yes.

Q. Exhibit -- What is Exhibit 25?

A. Exhibit 25 is the pit and below-grade tank guidelines that were created by the Oil Conservation, November 1st, 2004.

Q. Those are currently in effect?

A. I don't know if the term "effect" is correct, but they are currently available to operators, yes.

Q. Now is Exhibit 25 a copy of an official record of the New Mexico Oil Conservation Division?

A. Exhibit -- I thought that was Exhibit 25.

Q. That was.

A. Oh, okay. Yes.

CHAIRMAN FESMIRE: He hasn't moved on yet.

THE WITNESS: Yes.

Q. (By Mr. Brooks) Okay. Now Exhibit 26, is that a copy of a statute of the State of New Mexico?

A. Yes, and it's upside-down in my -- Yes.

Q. Okay. What is Exhibit 27?

A. Exhibit 27 -- I provided Exhibit 27. It's actually the Aztec city code for oil and gas wells.

Q. And is that a published document?

A. Yes, it's a public document; it was published on their website.

Q. Okay, and did you obtain it from their website?

A. I did, I did.

MR. BROOKS: Okay. And the next one is Carl's résumé, which I'm not going to ask you to sponsor.

Okay. Mr. Chairman, we will offer Exhibits 22 through 28 at this time.

CHAIRMAN FESMIRE: Any objection?

MR. CARR: No objection.

MR. HISER: We have no objection.

MS. FOSTER: No objection.

CHAIRMAN FESMIRE: Bruce, do you have any objection?

MR. BAIZEL: No objection, your Honor.

CHAIRMAN FESMIRE: Okay.

Mr. Brooks, did you mean 22 through 27?

MR. BROOKS: Sorry, I did mean 22 through 27.

CHAIRMAN FESMIRE: Trying to sneak Carl's résumé in, huh?

(Laughter)

CHAIRMAN FESMIRE: So there is no objection to Exhibits 22 through 27 being admitted to the record?

MS. FOSTER: That's correct.

MR. HISER: Correct.

CHAIRMAN FESMIRE: They will be so admitted.

Is there anything else, Mr. Brooks?

MR. BROOKS: Well, I'm going to pass the witness, Mr. Chairman.

There was a request that the witness's cross-examination be deferred until the parties had had an opportunity to study the work -- the talking points, the witness's notes, and we did not get copies of those notes to counsel until the beginning of this morning's session, so --

CHAIRMAN FESMIRE: I think this is going to be a self-correcting problem, Mr. Brooks.

We now have about 14 minutes before the lunch break. After the lunch break we're going to go to Dr. Stephens, so -- and Tuesday we have OGAP's witnesses, so they're going to have plenty of time to study and get ready for cross-examination.

MR. BROOKS: Very good, thank you.

CHAIRMAN FESMIRE: You bet. Mr. Hiser?

MR. HISER: Mr. Chairman, I was wondering if, since we have 14 minutes, if this might be an appropriate time to recall Mr. Martin -- Mr. Hansen, sorry, to talk about his model?

CHAIRMAN FESMIRE: We've got to have public input.

MR. HISER: Oh. I'd be happy, if you're willing to wait, to do it after Dr. Stephens. We could do it then as well.

CHAIRMAN FESMIRE: How long do you think it'll take?

MR. HISER: My guess is, it's about 14 to 15 minutes --

(Laughter)

CHAIRMAN FESMIRE: Hell of a coincidence.

MR. HISER: You know, we do need to take public comments, so I think maybe it would be best to defer it.

CHAIRMAN FESMIRE: Okay, that would be my choice, and I think the choice of the Commission, at least from what was said when you raised the issue. So why don't we go ahead --

MR. HISER: Mr. Chairman, we got -- before the end of the day, per your direction.

CHAIRMAN FESMIRE: Okay. Oh, Dr. Neeper, did you have something?

DR. NEEPER: Mr. Chairman, would you care to start cross-examination now, to get some of it out of the way in the short time that's available?

CHAIRMAN FESMIRE: Cross-examination of Mr. Hansen?

DR. NEEPER: Of this witness.

CHAIRMAN FESMIRE: Of this witness? I don't think we'd be able to get started, and -- Is there a scheduling conflict where you might need to --

DR. NEEPER: There is not a scheduling conflict.

CHAIRMAN FESMIRE: Okay. Why don't we go ahead and at this time open it up for public comment? Is there anyone who would like to give a public comment?

Sir? Why don't you come forward? You understand that -- since I think you've done this before, you have the option of either presenting a statement of position or sworn testimony, and if you take the option of sworn testimony, you're subject to cross-examination. Do you understand that?

MR. MICOU: I do.

CHAIRMAN FESMIRE: Have you made a choice?

MR. MICOU: Yes, I have.

CHAIRMAN FESMIRE: Okay. Are you going to tell us what it is?

MR. MICOU: Yeah, I think I won't go under oath, if that's okay.

CHAIRMAN FESMIRE: Okay, you'll make a statement of position. You understand that it shouldn't be repetitive of anything that you said previously?

MR. MICOU: Yes, sir.

CHAIRMAN FESMIRE: And would you start by stating your name for the record, please?

MR. MICOU: Johnny Micou. I'm with Drilling Santa Fe, working on some oil and gas issues in the State of New Mexico.

Given the OCD report from 2005 about groundwater contamination from oil and gas activities, I support pit rules that protect the environment absolutely. In addition, the rule should explicitly discuss methods of enforcement and actions that can be taken for violation.

That is all.

CHAIRMAN FESMIRE: Okay, thank you, Mr. Micou.

MR. MICOU: Thank you.

CHAIRMAN FESMIRE: Are there any other statements, public comment, that would like to be put on the record? Sir, would you come forward, please?

MR. GALLOWAY: Where do you want me?

CHAIRMAN FESMIRE: Anywhere you're comfortable, sir. You understand we have two options of ways to speak today. Is that --

MR. GALLOWAY: I'll swear in.

CHAIRMAN FESMIRE: Okay, would you raise your right hand, please?

MR. GALLOWAY: You guys follow the Geneva Convention, correct?

CHAIRMAN FESMIRE: We do. Ask Ms. Foster.

(Thereupon Mr. Galloway was sworn.)

CHAIRMAN FESMIRE: Sir, you'll have to start by stating your name.

ZANE GALLOWAY,

the witness herein, after having been first duly sworn upon his oath, testified as follows:

DIRECT TESTIMONY

BY MR. GALLOWAY:

MR. GALLOWAY: My name is Zane Galloway, I'm the president of ORE Systems, and we're a five-person company and we install reserve pit liners in the San Juan Basin. We've been in business this year for 30 years, installed liners for 28 of those 30 years. In that time, we've never had a claim of contamination. We take care to install the liners properly, and after they're installed we take care of all the refuse, trash, that is left over, we take it back with us and dispose of it.

I feel I'm responsible for the now 12-mil liner that is being used in the San Juan Basin, and also the geotextile.

Our track record with the liner and the installation is good.

I've lived in San Juan County all my life. My father is retired from El Paso Natural Gas Company. My wife's grandmother was born and raised in San Juan County, so we've been here a while.

The current regulations -- the current regulation, not the proposed regulations -- do allow for a clean environment. There's not been any contamination that's been proven.

We own two small farms east of Bloomfield, we irrigate off the San Juan River. We also -- We're outdoorsmen, we hunt, fish, ride horses, ride dirt bikes on BLM land. Reserve pits pose no problem to us in that fashion.

I've never seen a pit, as was stated Monday, open for years. Most now close in 90 days, as per the rules.

I'm concerned about the economic impact of the new rules on the citizens of New Mexico, cities of Farmington, all cities, and the County of San Juan.

Per the Department of Taxation and Revenue, the taxable value of oil and gas is $6,057,762,744. The taxable value of equipment is $1,202,127,776. San Juan County's net taxable value is $1,000,769,000. The equipment is $353,000,000.

We feel that if these rules are put into place, that revenue is going to go down considerably. This is going to affect the state, the cities, our schools will suffer, the county will suffer. The trickle-down effect will hurt the retail industry. And we wonder who will support the United Way, Boys and Girls Club, the Hospital Foundation and all other charities provide the -- directly and indirectly by oil and gas funds.

We worry about the extra trucks on the road, we've heard it's going to be three times as much. Not only the impact on the highways, safety of the people. You know New Mexico drivers, they're getting run over by trains, much less trucks.

The dust. We have a lot of dirt roads in San Juan County, and the dust now, as dry as it has been, is pretty good problem. Three times the trucking is going to make that almost unbearable.

My wife was a highway commissioner under the Johnson administration. She did attend a task force meeting a couple weeks ago, and there's no money in the highway -- in the road department, zero money right now. So all that extra truck traffic on the highways, how are we going to repair them? There's no money. Right now they are repairing the highways with gravel. There's no money to put asphalt down.

The hauling of the said contaminated waste to a land- -- San Juan County Landfill, that's going to fill up our landfill. Where are we going to build a new landfill? About 5 percent -- 75 percent of San Juan County is private, the rest of it is government land.

I feel the new rules are going to take my living away, and my neighbors' and lots of friends', and I don't think there's a contamination problem. Like I said, we do fish and drink and play and grow gardens, and so I don't see that as a problem.

I'm proud to work in the oilfield. Commission look at the real facts to consider the effect that these rules will have on thousands of families. Do not change the rules that apply.

Again, I don't think you guys are using real facts and real science to list the problems.

There was some statements later, after I wrote this, you know, we cannot tell if contamination occurs until it has occurred. Well, that tells me it hasn't occurred.

At one point Mr. Jones said at closing of a temporary pit, the liner is always compromised. I wrote that down, so... How does he know this, and why would the liner be compromised?

That's all I have, thank you.

CHAIRMAN FESMIRE: Thank you, sir.

Mr. Brooks, do you have any questions of this witness?

MR. BROOKS: Just a couple of questions. I'm sorry, I forgot your name?

MR. GALLOWAY: Zane Galloway.

EXAMINATION

BY MR. BROOKS:

Q. Mr. Galloway, were you present during Mr. Hansen's testimony?

A. What day?

Q. That would have been day before yesterday, Wednesday.

A. No, sir, I was not.

Q. Okay, if Mr. Hansen testified that even with no liner in the San Juan Basin the migration of pit contaminants to groundwater at a depth of 50 feet could reasonably be expected to take 50 to 75 years, then that -- then his testimony would not be inconsistent with your statement that you've been in business for 30 years and haven't had any problems with these liners; is that correct?

A. That is correct.

Q. If he further testified that with a poor liner it would take several hundred years, the same would be true, correct?

A. That is correct.

Q. That would not be inconsistent with your experience?

A. No, sir.

Q. Now are you aware that OCD rules do not require that there be any testing underneath the liner at the time that the pit is closed?

A. Yes, sir.

Q. And would that testing underneath the liner -- would it be -- are you prepared to accept that it might be difficult to determine if there had been a contamination escape from a liner if you did not test underneath it?

A. Yes, sir.

MR. BROOKS: Okay, thank you, that's all I have.

CHAIRMAN FESMIRE: Ms. Foster?

EXAMINATION

BY MS. FOSTER:

Q. Yes, Mr. Galloway, I just wanted to ask you, how many employees do you have in your company?

A. Well, there's five total.

Q. Okay, and what is -- You maintain that there was an economic impact of this rule. How about you personally on your business, what is the economic impact on the number of employees that you have, for example?

A. If it goes through, there'll probably be down to two, the two owners.

Q. Okay. And the employees that you laid off, do they have families?

A. Yes, they do.

Q. And do they have children?

A. One has two, and the other one has one.

Q. Okay, and do those children attend schools in San Juan County?

A. Yes, ma'am.

MS. FOSTER: Thank you, I have no other questions. Thank you.

CHAIRMAN FESMIRE: Mr. Hiser?

MR. HISER: No.

CHAIRMAN FESMIRE: Mr. Carr?

MR. CARR: No questions.

CHAIRMAN FESMIRE: Mr. Baizel?

MR. BAIZEL: Yes, I do, just a couple.

EXAMINATION

BY MR. BAIZEL:

Q. Good morning. Mr. Galloway, it sounds like you've been in business for a while; is that right?

A. Yes, sir.

Q. Thirty years you said?

A. Yes, sir.

Q. And you said 28 of those you've been installing pits?

A. Yes, sir.

Q. When you first started work on pits, were liners in use then?

A. That's the way we got started, installing liners, yes, sir.

Q. Installing liners.

A. We do not build, we install -- We do not build pits, we line them.

Q. Over the years have you seen changes in the requirements as to how those liners are to be put in?

A. Yes, sir.

Q. And you've been able to adapt to that as a businessman?

A. We pretty much set the standards on how they're put in, in the San Juan Basin. So yes, I guess adapt -- you know, we've set the procedures to set the liner.

Q. And you're aware that under the proposed rule there would still be instances where a liner installation would be possible? Liners would be used?

A. Possible, but why? If it's got to be dug up and hauled off anyway, why would anybody line a pit? Why would they go to the cost of digging the pit, lining it, and then they just have to go to the cost of digging it up and hauling it 400 miles to a landfill?

Q. Are you aware of the testimony about the distance of the existing landfills in the San Juan Basin? There are landfills within the proposed 100-mile radius?

A. They said the San Juan County Landfill -- it was my -- it's my understanding that they are not going to be allowed to haul this in there because it's going to fill up the landfill.

Q. So you weren't here for the testimony regarding the capacity or lack of capacity?

A. No, sir.

MR. BAIZEL: Okay, all right. No further questions.

CHAIRMAN FESMIRE: Commissioner Bailey?

COMMISSIONER BAILEY: I have no questions.

CHAIRMAN FESMIRE: Commissioner Olson?

COMMISSIONER OLSON: I have no questions.

EXAMINATION

BY CHAIRMAN FESMIRE:

Q. Mr. Galloway, you said you were responsible for the 12-mil liners. What did you mean by that?

A. I don't remember the year. We were using --

we've been using the 12-mil liner for quite some time. Before that, we were using an 8- to 10-mil reinforced liner, and that product became unavailable.

One of my competitors was using a 6-mil to line pits. The BLM in Durango, Colorado, called me and asked me to come up and visit with them. The Southern Ute tribe -- the BLM was after their properties -- was a little upset over the other liner. They were going to go to a 30-mil reinforced, which is quite -- very pricey.

I assured the BLM that this was what we used -- this was 8- to 10-mil liner -- and when it became no longer available I went up there and got their permission and their blessing on the 12-mil reinforced. It's a woven, coated product that we use today.

Q. Okay. You said that your track record -- I don't know whether it was with the 12-mil liner, or perhaps you were discussing your company's track record. You said the track record is good. That almost damned by faint praise. What did you mean by that?

A. Well, like I said, we've never had an instance of contamination. The liner is tough, it holds up well. To say that they're all -- have holes in them, I think is a false statement now. It's like saying you're guilty of stealing without proving it. That's not...

Q. Okay.

A. The seams, we are -- we do now sew them. I don't feel -- they do leak fresh water. Put drilling mud in there, and that's what the drilling mud does, it seals up -- seals up the hole when you drill it and seals up the holes in the liner. So I don't feel that they leak. Most of the time we try to get a liner to pit-to-pit, so we do not have to add on to it, but when we do, as of right now, we sew it.

Q. Are most of the pits in the San Juan Basin lined?

A. Yes, sir.

Q. Are there some that aren't lined?

A. Not to my knowledge.

Q. Okay. Now you said that the seams leaked. Are there other leaks that occur, generally?

A. Can, yes.

Q. Okay. And Mr. Brooks pointed you to some testimony that -- and I don't remember whether you said you were here for it or not -- that in the San Juan Basin it can take up to 50 to 75 years on average conditions for a contamination from a drilling pit that's closed in place to -- an unlined drilling pit that's closed in place to reach the groundwater at 50 foot.

A. Could or will?

Q. It will, according to the model.

A. How do you know?

Q. That's a good question. The scientific evidence, though, seems to indicate that it occurs.

A. Well, now, all of the -- all of the holdings in this pit -- the way they make it sound, it's all going to groundwater. And my contention is, why? Why -- It's in the earth to begin with. It's in an 8-1/2 hole to begin with. They drill it out and put it in the pit.

It's encapsulated in bentonite, which is a clay material, and if you've ever been stuck in the mud in New Mexico, the gray stuff, it's bentonite. It's hard to get through that stuff. So it's encapsulated. Why would that go to groundwater? Why would that not stay pretty much where it is?

It seems like the chlorides that are in the earth are more concentrated where they are and less concentrated when you bring them up and put them in a reserve pit. They're spread out a little bit, and they are diluted. On one of my farms, the ditch running down was flooding. I've got salts, alkali, in my hayfield. It has nothing to do with drilling.

Q. Okay. But you understand, bringing those salts to the surface is detrimental to the surface water that it wouldn't otherwise be exposed to, or am I wrong in that statement?

A. I don't think you're exposing them to the surface water because they are in the pit, they are encapsulated in a liner, and then when they cover them up -- Again, they act like when it rains, it only rains on that spot and it's just going to take those through an impervious liner. It might have a little hole in it. But how are all of the contents in that pit going to get in the groundwater?

My contention is, maybe a little bit will leach out Maybe, maybe, a little bit will leach out. But by the time it gets to the groundwater -- it won't get to the groundwater --

Q. Okay --

A. -- it's going to filter out in the earth, as a river filters itself out.

Q. Okay. Now, Mr. Galloway, your opinion is based on empirical evidence and your beliefs, right?

A. My beliefs, yes, sir.

Q. Okay. And you were present for Mr. Hansen's testimony, were you not?

A. Monday?

Q. Tuesday, I think it was.

A. No, sir, I had to -- Some of us still have to work.

Q. Yes, sir. I guess the point I'm trying to make is, if you'd been present Tuesday you would have seen the scientific evidence that counters some of your interpretations and some of your beliefs. I respect your beliefs, and believe me, I appreciate you coming down here, but I think if you were to take the time to, maybe after this hearing is over, spend some time with Mr. Hansen, he can show you where the scientific analysis leads and why it might counter some of the things that you've said.

A. Possibly yes, but will and could is my problem. Mr. Price here, his -- all his charts on Monday were of unlined production pits and how they were going to go. And I'd almost argue that not all of that's going to get in the groundwater, so... And then again, if it does it's going to get diluted.

Q. Okay, where do you live in San Juan County?

A. I live in Farmington.

Q. Okay, you're familiar with Flora Vista, aren't you?

A. Very, yes, sir.

Q. Okay. And you know that in the late '80s the Flora Vista water supply system was contaminated by a pit leak.

A. Could that have been the old Beeline refinery?

A. No, this was traced back to a dehy pit leak in the oilfields. It was run by a gas company.

A. That wouldn't surprise me, because right near Flora Vista there was a Beeline refinery, and they had an open pit for years. I'm sure it was -- I'm not sure, I believe it was closed under the Superfund. And so...

Yeah, also Flora Vista, I'd also say back -- way back when, you could drive from Farmington to Aztec at night and see one or two lights. Now it's like a city, right? Everybody's on a septic system. So you've got a septic system and a water well on top of each other. So I'm kind of wondering about that kind of contamination also being blamed on the oil industry.

Q. Mr. Galloway, I sure appreciate it, and I hope I'm not trying -- not being obnoxious --

A. No, sir.

Q. -- trying to make a point, but -- And I appreciate it. Is there anything else you'd like to say?

A. No, sir.

CHAIRMAN FESMIRE: Okay. Thank you very much, Mr. Galloway.

MR. GALLOWAY: Thank you, sir.

CHAIRMAN FESMIRE: Is there anybody else who would like to make a comment on the record?

MR. BOYD: Can we comment to his statement?

CHAIRMAN FESMIRE: Sure, come on up. Would you come up, please, sir, and state your name for the record?

MR. BOYD: My name is Irvin Boyd. I live south of Eunice in Lea County.

CHAIRMAN FESMIRE: Okay, and do you intend to make a statement of position, or do you wish to make testimony and be sworn?

MR. BOYD: No, sir, I just -- what I wanted to do, later on I'd like to make a statement of position. But I think it's pertinent, I've got something I'd like to address to his statement.

CHAIRMAN FESMIRE: Okay.

MR. BOYD: Had I not received a telephone call this morning dealing with 12 wells drilled within the last year -- three have been on my property, and I believe there was five on the neighbors' south, and then some more -- some others that I'm not even familiar with where they were -- the company called me and said, Irvin, we've got a problem, said all 12 pits that we drilled in that package were dirty underneath the liners. The water table is in the 50-foot area. They had to remove the contents and the liners.

And I asked them, Do you use closed-loop only?

And they said it was too costly. But they said none of the 12 liners held. Some of them they were able to clean up within three foot of the liner, some of them they're cleaning up now 30 foot, and it's not clean yet.

And you know, I live this problem and there's a lot of us that live it. And our contention is, if you test underneath these liners it's not going to be as good as we would wish.

CHAIRMAN FESMIRE: Thank you, Mr. Boyd.

Is there anybody else that would like to make a comment before we break for lunch?

Okay, with that we will break for lunch.

Mr. Carr, are you still expecting your witness at one o'clock?

MR. CARR: I certainly am.

CHAIRMAN FESMIRE: Okay, we'll give you a few minutes to talk to him and we'll --

(Mr. Carr crosses himself; laughter)

CHAIRMAN FESMIRE: We will reconvene at 1:30 and begin with Mr. Carr's witness, taking him out of order. Thank you very much.

(Thereupon, noon recess was taken at 11:55 a.m.)

(The following proceedings had at 1:30 p.m.)

CHAIRMAN FESMIRE: Okay, let's go ahead and begin. Let the record reflect it is now 1:30. We are going to reconvene after our lunch break, we have reconvened after our lunch break. This is a continuation of Case Number 14,015.

Pursuant to a prior agreement, and due to the scheduling of the experts for the industry committee, Mr. Carr has asked that he be allowed to present his first witness this afternoon, and before he do that -- "before he do that" --

(Laughter)

CHAIRMAN FESMIRE: -- before he does that, he's also asked to give a short opening statement to set the stage for his examination of his witness.

Mr. Brooks, I assume since we have all the --

MR. BROOKS: Mr. Chairman, since he reserved his opening statement the previous time, I have no objection.

CHAIRMAN FESMIRE: Are there any other objections? Okay.

First, before we start, let the record reflect that Commissioners Bailey, Olson and Fesmire are all present, there is therefore a quorum present.

That having been said, Mr. Carr, it's all yours.

MR. CARR: Thank you, Mr. Chairman. First I'd like to thank the Commission for taking us out of order. When the case was originally scheduled to start on the 22nd of October, Dr. Stephens had blocked out what we thought was ample time, but when it was moved two weeks this created scheduling problems for us as it has for others, and I appreciate your assistance.

Second, I'd like to introduce Deb Gwyn. She's the paralegal at Holland and Hart in Santa Fe who's here helping me here today, and this is the person to whom all of us in our office are ultimately responsible.

I reserved the opening statement, and I was hoping to present it at the beginning of our entire case, but this is the beginning of the case, and I'd like to give a very abbreviated statement. The purpose of it is to identify our concerns, put the testimony that's going to be coming today and in the next couple of weeks in some sort of a context and identify the witnesses and hopefully assist the Commission, as you hear them, to understand where these pieces of our puzzle fit together.

I think it's important also to remember what we're not here today to advocate. We're not opposing your regulations on permanent pits. We're not advocating unlined pits.

Our concern are with temporary pits, and even in that regard we are in favor of rules that protect groundwater, human health and the environment.

We're here today to advocate and start what will be a case in which we're going to try and convince you that the way to manage these wastes is with a risk-based approach, not based on a value judgment. And you'll see as our case unfolds that we believe that's what you're doing. We believe that the rules, when you peel them back, that have been proposed, really don't require balancing of risk. We don't even think they require the balancing of the various component parts of your statutory obligations to protect human health and the environment and also to prevent waste and correlative rights [*sic*].

We're going to advocate a risk-based approach to the management of these wastes that we believe we can show will obtain the same results at a lower cost. We're going to show you that only a few of the constituents found in drilling and recycling pits may really be of regulatory concern, and that these pose little risk to public health and the environment by expected pathways of exposure.

In our case we're going to show you that the proposed rules really do not risk -- reduce risk, they transfer risk and exposure to groundwater to landfills.

And we're going to try to answer questions about the costs, we're going to try and provide for you evidence that quantifies the costs that will spring from these rules and show that we can provide a similar benefit at significantly less cost.

We've filed written modifications to the rule, as you know. They're based on current science and operating -- and provide operating flexibility. They've been endorsed and adopted by the New Mexico Oil and Gas Association. And today we'll call the first of three witnesses to review our proposal in the light of current science. They are going to present testimony in support of our recommended modifications.

And so at this time I would call Dr. Daniel Stephens.

CHAIRMAN FESMIRE: Dr. Stephens? Over here, Doctor.

Doctor, before you start, would you stand to be sworn, please?

(Thereupon the witness was sworn.)

DANIEL B. STEPHENS,

the witness herein, after having been first duly sworn upon his oath, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. CARR:

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

A. Daniel Bruce Stephens.

Q. Dr. Stephens, where do you reside?

A. Albuquerque, New Mexico.

Q. And by whom are you employed?

A. Daniel B. Stephens and Associates, Inc.

Q. And what is your position there?

A. I'm a principal hydrologist.

Q. Could you review for the Commission your education and your work experience?

A. I have a bachelor of science degree in geological science from Penn State University, a master of science in hydrology from Stanford University, and a doctorate in hydrology from the University of Arizona. That was in 1979.

I've been a professor at New Mexico Tech for 10 years from about 1979 to 1989, and during that time I began a consulting practice which I'm involved in at the present time.

Q. Do you currently teach?

A. From time to time as an -- I'm an adjunct faculty member at New Mexico Tech and the University of New Mexico.

Q. Have you taught classes that involve computer modeling?

A. Yes.

Q. How much of your work has actually been involved with the properties located in New Mexico?

A. It's hard to estimate a percentage, but a lot of my experience is in New Mexico, both in terms of academic research and private practice.

Q. Is Exhibit Number 1 a copy of -- or a summary of your education and work background?

Dr. Stephens, let me hand you what has been marked as the Industry Committee Exhibits 1 through 3. Is Exhibit Number 1 a summary of your educational background and experience?

A. Yes, it is.

MR. CARR: And at this time, may it please the Commission, we tender Dr. Stephens as an expert in geohydrology and environmental matters.

CHAIRMAN FESMIRE: Mr. Brooks?

MR. BROOKS: No objection, your Honor.

CHAIRMAN FESMIRE: Mr. Frederick, no objection?

MR. FREDERICK: No objection.

CHAIRMAN FESMIRE: Okay. I'm assuming that --

MS. FOSTER: No objection, thank you.

CHAIRMAN FESMIRE: Okay. And Mr. Hiser, while I'm having trouble keeping who's who organized, I'm assuming you have no objection?

MR. HISER: I have no objection.

CHAIRMAN FESMIRE: Let the record reflect that Dr. Stephens was so admitted.

Q. (By Mr. Carr) Dr. Stephens, have you -- what have you been asked to do in this case?

A. I've been asked to review the proposed rules, rule change, and evaluate impacts from temporary pits to groundwater.

Q. Have you focused your work on subsurface fate and transport issues?

A. Yes, sir.

Q. Have you looked at -- what substances have you looked at?

A. In this matter we've looked at chloride and we've looked at solvents and benzene.

Q. Have you reviewed the rules that are being proposed in this case by the New Mexico Oil Conservation Division?

A. Yes.

Q. And could you just generally summarize for the Commission what you have done in preparing your presentation?

A. In preparation for the testimony today, we've looked at hydrologic conditions generally that are important in assessing impacts to groundwater --

CHAIRMAN FESMIRE: Dr. Stephens, may I interrupt here? Mr. Carr keeps asking you, have *you* looked? And you keep saying *we* have looked. Could you elaborate on that a little bit?

THE WITNESS: Myself and the staff under my direction have been involved in the project.

CHAIRMAN FESMIRE: Okay.

Q. (By Mr. Carr) And what have you and your staff that's involved in the project -- Have you done any modeling?

A. Yes, we have.

Q. And has this been both saturated and -- modeling unsaturated and saturated conditions?

A. Yes, sir.

Q. Why don't we go to the slides that you've prepared for presentation here today? And Mr. Chairman, there is a complete set of the slides marked as our Exhibit Number 2.

Dr. -- Let's go to the next slide, and Dr. Stephens, would you just explain what this is?

A. This is a summary of the testimony, that regulations should be internally consistent, reasonably protective to public health and the environment, and implementable.

Q. Let's go to the next slide, and start now by talking about natural recharge. You could perhaps start by explaining the invasive mechanisms or factors that recharge aquifers in New Mexico.

A. Yes. What we mean by a natural recharge is the water which percolates below the root zone and eventually reaches the groundwater table. This is important because that water will transport chloride that leaches within it down to the water table and may, depending on concentrations, exceed the standards. Or it may not exceed standards.

Q. Now in this presentation, Dr. Stephens, previous witnesses have been allowed to testify using basically a narrative approach. So if you'd like to work through these slides, whenever you're ready to move to the next one you can tell Mrs. Gwyn.

A. Sure. Next slide, please.

This illustrates conceptually the hydrologic cycle. The -- Do we have a light -- laser pen, by any chance? I know I don't, but -- I don't see one here.

CHAIRMAN FESMIRE: I believe Mr. Jones has one left over.

THE WITNESS: Thank you. This is a fairly traditional conceptualization of the hydrologic cycle. It begins with precipitation, the water that falls on the landscape, some of which runs off. Some of the water infiltrates through the surface. The water which infiltrates is extracted by the roots in the root zone, and in some cases the water that's in the soil can evaporate directly back to the air, across the land surface. So the combination of evaporation and transpiration is called evapotranspiration, sometimes abbreviated as ET.

But the water that the plants can't take out would become deep percolation, or sometimes it's referred to as net infiltration. And that, in the absence of any other sinks to take the water out below the root zone, would ultimately percolate to recharge the aquifer as it migrates downward through the vadose zone, which is that part of the subsurface between the land surface and the water table, and that recharge occurs as the water flows across the capillary fringe and into the aquifer.

Next slide.

In the review of the requirements in the proposed rule, one of the elements is that the pits would be 100 feet from watercourses. What this means to me in importance, in terms of evaluating impacts to groundwater, is that those pits will be located in areas that are in diffuse recharge zones. In other words, their water is moving downward through the soil profile over large areas, rather than focused in narrow areas such as in a stream channel. So the diffuse recharge occurs over large areas, generally in small amounts, in between the watercourses.

The amount of diffuse recharge that occurs depends on site characteristics and can be either downward as recharge to groundwater, or that soil water movement in the vadose zone could also be upward, or in some cases the water movement may be virtually nil. So it really depends on a variety of site characteristics as to whether water in the vadose zone is moving downward, upward, or not moving at all.

Next slide.

This is a slide of what I mean by a diffuse recharge in an experiment that was done near New Mexico

Tech on the Sevilleta National Wildlife Refuge, probably in the mid- -- latter part of the '80s. At any rate, this was a saltbush community, and the students working on this project instrumented the barren area, the unvegetated part of a floodplain of the Rio Salado with instrumentation to allow them to examine the direction that the water was moving.

In this area, rainfall was about 200 millimeters per year. And what we found most of the time in this unvegetated area, that the recharge rate was between 2.5 ad 8.4 millimeters per year.

Next slide.

Other workers, for example down at the New Mexico State University Ranch site, as it's been called, found comparable amounts of recharge in -- this is in a sandy loam area. There are some carbonates. You can see these -- in this trench there are -- just for scale, you see that gentleman standing here, and there's a couple of people down in the trench, so you can get an idea of how deep this facility was. And they were mapping out the soil. You can see some white bands here which are called paleosols. These are zones of carbonate accumulations, caliche, buried soils.

And in this area the rainfall is about 230 millimeters per year, and we're finding it as recharge rates using different techniques. In this example -- in this particular site, rather, three different methods were used to compute recharge, ranging from 1.5, there was another one that was 2.5 millimeters per year using chlorine 36 methods, and I believe the 9.5 millimeters per year came from the chloride mass balance method. At any rate, this was what was found at the site you're seeing here in south -- in the southern part of the state.

Q. (By Mr. Carr) In areas like the typically dry areas in New Mexico, can you make any estimate as to what would be a typical annual recharge rate?

A. Well, it depends on the particular area, of course. But for areas that are vegetated like this you're going to find recharge rates of a few millimeters per year, perhaps, at most. Generally very scant. There are places where recharge is more and places where it's less, but typically you'd find a few millimeters per year at most sites, wouldn't be a surprise.

Q. You stated --

COMMISSIONER BAILEY: Could you please put that in perspective for those of us who are used to hearing precipitation in inches per year?

THE WITNESS: Well, let's see, it would probably be about -- maybe seven-hundredths of an inch --

COMMISSIONER BAILEY: Thank you.

THE WITNESS: -- something like that.

Q. (By Mr. Carr) Now you talked about recharge moving down, circumstances where it, in fact, might move up?

A. Yes.

Q. Do you have an example of that?

A. Yes. Next slide, please.

There was some work we did a number of years ago at a place called Sunland Park near the border, and rainfall rate there is about 8 inches per year. The potential for evapotranspiration far exceeds the rainfall rate, but that's pretty common in New Mexico.

And at this site which had Santa Fe group sediments -- these are older, partially cemented sands and sandstones of the Santa Fe group, derived from the Rio Grande -- ancestral Rio Grande anyway -- and vegetated with creosote, similar to what we saw in the prior slide, we thought there was virtually no recharge to -- in places in upward gradient, what we measured with soil water potential sensors, and this was published in an article in 1994 with Larry Coons and myself.

At any rate, this was one example that I had some experience in where it appeared to us that water movement in this deep soil would possibly -- likely be upward.

Q. Is this a common occurrence?

A. People are finding this in some places. My experience most of the time, there is some recharge moving downward, but in a few places you do see upward flow. I know there's been some work in west Texas where this has been observed in places.

Q. What are the factors that enhance diffuse natural recharge?

A. One of the most important characteristics or elements that affects diffuse recharge is how permeable the soil is and how well vegetated it is. Vegetation is critical. The plant, the desert plans, are very aggressive. They know where the water is, they'll find it, and their root systems are fairly extensive laterally. And the presence of vegetation is key to whether or not significant amounts of recharge will occur.

Next slide.

Well, my point about the prior work is to illustrate, as I just said, that vegetation is important in evaluating recharge, and generally this diffuse recharge could be expected to be on the order of maybe a few millimeters per year, that pits will be sited in areas of diffuse recharge, and that for the most part what we see in these areas of diffuse recharge is pretty much a constant water content.

The flow is unsaturated, the -- you don't really see a lot of translocation of water moving downward as sharp fronts, wetting and drying at depth. There are places where that happens, but generally, in most well-vegetated soils, you see a fairly constant water content with depth and time.

Q. And your last point there, would you explain that?

A. It relates to the fact that rainfall is generally not that abundant, that the soils and the vegetation take most of the moisture out, leaving very little water to percolate downward below the root zone. You don't see these large pulses of high water content moving downward through soils except in some local areas where the vegetation is absent and the soils are highly permeable. That can happen there. But for the most part, you don't really see bulges of water moving downward through the soils --

Q. Is it fair to say --

A. -- under natural conditions.

Q. Is it fair to say that your testimony shows that there is limited recharge or very slow recharge in most parts of New Mexico?

A. Yes, most parts of New Mexico, recharge is, like I say, on the order of a few millimeters per year.

Q. Let's go to the portion of your presentation concerning natural chloride soil profiles.

A. Next slide, please.

Researchers have found -- and, you know, we've found this too, even at our -- many sites that we've drilled throughout the Southwest, but when you dig down into the soil with an augur rig and take samples of the soil and analyze it for chloride, you'll find that in the upper -- perhaps the upper 30 feet, 10 meters or so -- generally concentrated around maybe 5 feet or 3 to 10 feet below land surface, the chloride concentration is quite high under natural conditions.

Here, for example, are plots of the chloride concentration with depth below land surface at a site in the Amargosa Desert and another one out in Nevada. Here's another one in Texas, another one in the high plains of Texas. And what you see, all these sites seem to have an increase in chloride concentration up to 8000, 9000 milligrams per liter in these shallow depths.

This is an accumulation of chloride naturally, and this has been there, and you see the concentrations down below that, the chloride concentrations down below about 30 feet, are quite low, much, much lower than they are in the chloride-bulge zone.

And that chloride bulge is fairly stable. It's been there, probably for -- you know, has accumulated over the last 10,000 years or so. So this is sort of the natural condition in many parts of the southwest, including many parts of New Mexico.

Next slide.

This natural profile of chloride, the accumulation of chloride in the soil, depends on a number of factors:

The soil texture. Soil texture meaning, is it sandy, is it silty, is it clayey soil?

And the moisture content.

It's dependent on the vegetation and the evapotranspiration.

The amount of chloride depends on the net infiltration, the time at which -- over which that chloride has accumulated.

And what the chloride concentration was in the rainfall or the dust that fell on the land surface. And many times, the farther you are from the ocean, the lower the chloride in the rainfall and the lower the chloride in the dust that falls on the land.

And as the previous slide of chloride showed that concentrations vary considerably with depth, but there are peaks of -- if you look at the concentration in the soil, not the soil pore water but the soil itself as a soil matrix, 540 milligrams per kilogram at three feet would be a surprise.

Now what we do with this chloride data is use it to evaluate recharge rates. It's called the chloride mass balance method, and what it basically says is, the more chloride there is in the soil, the more concentrated -- the more concentration took place due to evapotranspiration. And the more evapotranspiration there is, the less amount is left for recharge.

Q. And the reason for that is, the water leaves but the chlorides remain behind?

A. Correct.

Q. Okay, let's go to your next slide. Review this information, please.

A. This is a table that looks at the chloride bulges in areas of New Mexico. There's some studies in the Chihuahuan Desert of Texas and New Mexico where these chloride peaks occur at depths of 6 to 22 feet. You look at the pore water concentration in milligrams per liter, up to 6500, and if you converted that to a soil concentration it would be 50 to 290.

And there's other studies in the San Juan Basin, Santa Fe County, Socorro County and the southern high plains. And you find similar results, several thousands of milligrams per liter pore water chloride under natural conditions, isn't moving anywhere, and peak matrix chloride concentrations of a few milligrams per kilogram, of that order.

Next slide.

Q. What does this show, though -- Maybe it is on the next slide, let's go to that.

A. This is preparatory to looking at the applications of this data in part. And what it tells us is, if you reconstruct how long it took that chloride to accumulate, it would have accumulated on the order of maybe 10,000 years or so. Looking at the rates at which chloride is deposited by rainfall and dust, it would take 10,000 years or so for that to have accumulated.

Next slide.

Using a variety of methods in the southwest, specifically in New Mexico, I've summarized here some of the studies by various researchers in areas such as the San Juan Basin, for example, Bill Stone at New Mexico Bureau of Mines did a study. I believe most of his work used the chloride mass balance method on samples from the San Juan Basin, and he was getting .25 to 2.29 millimeters per year of recharge.

Q. In inches, what would that be? Very, very minimal?

A. Yes, similar -- you know, low numbers, hundredths -- several hundredths of millimeters per year.

In Socorro, in west Texas, in Las Cruces, Sunland Park, fairly low down in Sunland Park area, there is the Ogallala, 2.3 up to -- there's some very old work by C.V. Theis, up to almost 16, but that's kind of the -- more the exception in that area. But these are the numbers that you're finding under natural conditions.

And probably the same kind of conditions -- if the land were disturbed and vegetation were to be re-established to the same degree that it was prior to the disturbance, these are the long-term rates of percolation below the root zone I would expect.

Next slide.

So low levels of diffuse natural recharge are the result of transpiration by vegetation. That's a key here, that establishing vegetation in areas where there are pits is the key to re-establishing the natural recharge condition, and that vegetation will take water out before it has the opportunity to percolate through pits or their contents.

Next slide.

In summary, the piece that we've just covered here is that recharge is low in diffuse areas of natural recharge in the southwest, and we attribute most of that to the importance of vegetation in taking up water that percolates or infiltrates through the land surface.

Q. Now Dr. Stephens, when we talk about putting a pit on the surface, aren't we just sort of superimposing the pit on the natural situation or conditions that you've just reviewed?

A. In the long term, yes, that's the way I would envision it over these areas. You're putting a pit on an area where there's -- your natural conditions, limited recharge, and there's chloride that has been accumulating naturally in the soil for, you know, tens of thousands of years. That's the background setting.

Q. When you're trying to predict the impact of a pit on groundwater, isn't it essential that you consider this recharge mechanism or the lack thereof that you've been discussing?

A. Yes, it is.

Q. Let's take a look at pit operations in both southeast and northwest New Mexico.

A. Next slide, please.

First in the southeast, the operating pits are placed on natural soil surfaces wherein this vadose zone dynamics that I've just described take place, these few millimeters per year, have taken place, and this is the situation that's been occurring there for the last -- you know, tens of -- 10,000 years or so.

The operation here has -- it's this deep-trench burial concept where there's a liner on the sides, the pit is covered with four feet of clean soil, there's vegetation established over time. And based on information provided to me, the geotechnical evaluation is that the pit -- the liners would be likely to remain intact on their own for 270 years, perhaps.

And whether it's 270 or 100, it's probably not that critical. The main point is that there's an opportunity for the vegetation to re-establish itself. And that's what will take the water out over long periods of time, is the re-establishment of vegetation on the fill that's put on top of the pits.

Next.

This puts in a picture, more or less, the description I just put forward, and we're looking at a deep trench that might be 200 feet long and 40 feet wide, 11 feet deep with four feet of fill, backfilled soil, on the top. If we look at a cross-section here, you can see the 12-mil reinforced plastic liner around the pit contents.

Next.

In the northwest, similarly, the northwest pits are placed on natural soil surfaces which have these established natural vadose zone flow dynamics. The pits are lined on the bottom and the top with 12-mil plastic, covered with four feet of soil, and again the vegetation would likely establish itself over a long period of time prior to the time the pit begins to fail -- or the liner begins to fail.

Q. Okay, let's go to the diagram of the operating pit in northwest New Mexico.

A. This is an illustration that shows a sloping side with some bermed material that was taken out of the excavation. It's a little shallower than the southeast pit, about seven feet or so. The geometry is a little shorter, 100 foot long, perhaps, 55 feet wide. This would be the operating condition.

Next slide.

In a closed condition the bermed material is put back in, there's some mixing with the pit contents that takes place, and vegetation to re-establish itself on that four-foot-thick cover.

Next slide.

Q. All right, review the modeling that you have done on this issue.

A. We've used models to predict the soil concentration that the pit soils would have that would be protective of human health and groundwater.

We assumed that the leakage begins 270 years after the pit is emplaced. However, it really doesn't matter in our simulation when the liner begins to fail, it's just -- we almost assume it -- for our modeling purposes, it happens instantaneously, so the time doesn't affect the impacts to groundwater.

Q. What kind of models did you select?

A. We're using two models. The vadose zone model is called VADSAT, and the aquifer is modeled using MODFLOW and MT3D. These are industry-accepted computer models of the vadose zone and the aquifer, respectively.

Q. The Oil Conservation Division used a HELP model and a MULTIMED. Are you familiar with those?

A. Yes.

Q. Would you use those for this kind of modeling?

A. We didn't. I don't know that HELP is the right one for this particular application. Those aren't models that we chose.

Q. Let's return to the slides.

A. Okay, the modeling that we did assumed that the pit liners completely and instantaneously fail at 270 years, or you could make that time zero if you like. As I say, the time doesn't really affect the results here.

That the pit and the natural soils have a uniform texture.

That the recharge rate is steady and downwards. We're not allowing the water to move upward or remain static. Constant flux of water moving through the pit and its contents over time that is controlled by the natural recharge rate.

Next slide.

A sketch to conceptually illustrate. What is going on here is that we have a pit, there's chloride in the pit that is above the water table, but there's leaching of chloride from the pit that finds its way through the vadose zone and impacts the groundwater, where there's mixing by dispersion in the aquifer, and then a well at some depth into the aquifer.

Next slide.

The chloride impact to groundwater depends on a number of factors here. That is, the chloride concentration in the pore water, which is related to the concentration of the constituents in the pit, of course. And the chloride impact to groundwater depends on the recharge rate and the size of the pit.

Next slide.

Whatever flux of contamination or chloride comes into the aquifer mixes with the groundwater, and the concentration you find in the groundwater depends on the rate at which chloride mass is coming in over time to the aquifer and then how much mixing occurs in the groundwater. The more groundwater is flowing, the more rapid the flow rate of groundwater, the more mixing and dilution occurs.

Likewise, the smaller the amount of flow from the pit area relative to groundwater, the more dilution and mixing would occur. So that's why it depends on the groundwater flow rate.

And the aquifer characteristics, how heterogeneous the aquifer is and how much mixing and dispersion will occur in the aquifer, a physical part of the aquifer composition, and also on the aquifer thickness.

Next slide. So take that conceptual model into more of a depiction of what we did with our modeling, numerical modeling or computer modeling. We were looking at two layers, if you will.

The upper layer is the vadose zone, and that has a pit. We look at one-dimensional flow within the vadose zone underneath the pit, and we model the concentration coming out the bottom of the vadose zone using a code called VADSAT. This is an analytical solution for contaminant transport that's been around since the 1980s.

The mass of chloride that comes out the bottom of the vadose zone model is input into the aquifer -- for example, the Ogallala -- and we model that flow in the aquifer with MODFLOW and the contaminant movement with MT3D.

Next slide.

It's important to obtain reasonable properties to represent the soils in the vadose zone and the aquifers. We assume the soils were comprised of loamy sand. The loamy sands are -- that texture have been characterized throughout the country and cataloged by many researcher, one of whom -- a group of whom is called the Carsel and Parrish study. And for loamy sands, the saturated hydraulic conductivity is about 11 1/2 feet per day.

So if you go to this look-up table, so to speak, of Carsel and Parrish -- and you have to ask yourself, how reasonable is that? -- what we find is, from our work in the Ogallala, that this textbook value, so to speak, of 11.5 feet per day is reasonably consistent with 6.8 feet per day that we've been using in the Ogallala area, and other researchers who've been modeling in the San Juan Basin have found three to 300 [*sic*] per day for the hydraulic conductivity. So the number we chose seems reasonably consistent with data other people have been using for saturated hydraulic conductivity.

Next slide.

Another model input is the recharge rate, and the number that we used was 2.5 millimeters per year. We use this for all the simulations. It really comes from Fred Phillips' study down in the Jornada del Muerto near Las Cruces.

But the choice of this number for all our simulations is reasonable because, if you remember back in that one table that I showed you, the San Juan Basin study and the work by Bill Stone in 1986, where his upper limit was 2.29 millimeters per year, we're using a number that's a little bit larger than that.

So this 2.5 millimeters per year is consistent with recharge rates found in the San Juan Basin, as well as in the southern part of the state. In other words, it happens to overlap the ranges found in both areas.

The simulations that we conducted were based on the larger and thicker pits, which are found in the southwest [*sic*], and so if the standards are developed for the pits likely to have the most impact to groundwater, the standards should apply to the area where the pits are smaller, which would be in the northwest.

Next slide.

This summarizes the results of the modeling, and what we find in terms of the SPLP chloride concentration when we take the pit and just have the pit contents in our -- in other words, 11 feet of pit contents -- if the SPLP chloride concentration is 1240, that would be protective of groundwater.

But when the pits are mixed with clean soil, then the concentration in the pit is not as great as it was in our so-called base case, so if you mix 50-50, clean soil and backfill, with the pit contents you should be able to double the amount of leachable chloride in the standard.

So for a 2-to-1 mix -- in other words, two parts of clean soil to one part of pit contents -- your SPLP chloride standard would be proportionately larger than the condition when the pit was just -- had no backfill in it at all.

So we go down, you can -- you know, the less mass that's in the pit and the more mixing you have with clean backfill, the higher this standard could be and still protect groundwater, because there's not as much mass present.

Probably a 2-to-1 mixing, my understanding, is not unrealistic, so that's kind of the mid-range.

Next slide.

Q. All right, now you've finished your presentation concerning -- chlorides?

A. I'm sorry?

Q. You're now moving from chlorides?

A. We looked -- Yes, we looked at a couple other constituents. We looked at benzene, and we looked at PCE dissolved in the moisture, and applied a model called HYDRUS to predict what concentrations would be left in this pit.

Now the pits prior to closure are left open, it's my understanding that the pit contents are mixed, and so there's an aeration. And with the assumptions of -- well, mixing and aeration, the constituents benzene and PCE would volatilize in a fairly short period of time, a matter of days. So when these pits are open for months, there should be an ample opportunity for the benzene and PCE to volatilize and not likely be present in any appreciable concentrations in the pit waste after closure.

Next.

Q. Let's go to your summary.

A. So in summary, the deep-percolating -- deep percolation and recharge in the arid and semi-arid areas of New Mexico is really quite limited, a few tens of millimeters per year, more places than not.

The modeling that we conducted to determine what concentrations of chloride and the pit contents would be to protect groundwater indicated a range, depending on how much mixing there was with the backfill. That range went from about 1240 milligrams per liter to 6200 milligrams per liter. And the VOCs, more likely than not, given those assumptions about aeration and mixing would volatilize.

Q. Dr. Stephens, when you say that groundwater will be protected for chlorides, for example, what do you mean by that?

A. We were looking at the standard 250 milligrams per liter, and that that would not be exceeded.

Q. Let's go now to your recommendations.

A. Okay. Well, based on the work done that I've just presented, a leaching standard of about 3500 milligrams per liter seams reasonably protective.

That small pit contents, in my view, are not as likely to cause as much of an impact as larger areas such as would be found in a landfill, for instance.

And modeling shows that organics, benzene and PCE, likely will volatilize to levels that will not be of concern.

Q. Dr. Stephens, when you talk about small dispersed closure pits being preferable to commercial landfills, in your work you were looking at pits and modeling pits, I think you indicated, that had -- how much waste in them? Eleven feet?

A. Yes, sir.

Q. When you get to a landfill, how many feet of waste might you have?

A. Landfills could be several tens of feet thick, or more maybe.

Q. And what's the impact on the potential for chlorides being released from a landfill in that situation?

A. Well, generally the thicker the landfill, the more mass there is and the longer the time it will take for the water to leach that mass out into the aquifer. So you're prolonging the time that the risk persists.

Then the size of the facility will increase the concentration as well. In other words, the smaller the area over which that chloride is input into the aquifer, the smaller the impact to the aquifer.

Q. When you're dealing with these small pits, you talked about whether the liner failed in 270 years or 100 years, that probably, I think you indicated, wasn't significant?

A. More likely than not.

Q. And why is that? Could you explain that?

A. The main point we're dealing with is that the vegetation should re-establish itself probably in a much sooner time than 100 or 270 years, and that vegetation is an important component to limiting the water movement down through the pits. And during that time, until the vegetation is established, the liner would be protective of the contents within the pits.

Q. And during this period of time when you re-establish the vegetation, is it fair to say that natural recharge conditions sort of return to the soils?

A. Yes, sir. Yes.

Q. And then as we look forward with a number of these pits after this has occurred, have not, in effect, they basically corrected themselves?

A. I'm sorry, can you repeat that?

Q. I mean, once this happens and we have vegetation and we have the -- natural recharge conditions in the reservoir, do those pits remain any kind of a problem or a potential source for contamination?

A. Not in the long term, assuming it gets back to the natural recharge rates and the assumptions upon which the modeling is built are met, then no.

Q. If you're concerned about contamination resulting from drilling pits, is this preferable to having one large landfill where you have concentrated this mass?

A. Yes. That would be the result of having a mass from a small area versus a large area and a thicker area. The impacts from small, thin source are much smaller than a large, thick source on groundwater.

Q. Now Dr. Stephens, is Exhibit Number 1 a -- and I think you indicated earlier when I finally found it for you -- a summary of your educational background and work experience?

A. Yes, sir.

Q. And is Exhibit Number 2 a copy of the slides you've presented here today?

A. Yes, sir.

Q. What is Exhibit 3? Is that just a written summary of your presentation?

A. I don't know that I have Exhibit 3. I don't know that I have it on my desk.

Q. All right, let's try this again. Let me hand you what's been marked Exhibit 3. Is that just a written summary of your presentation?

A. Yes, sir.

Q. All right, Dr. Stephens, I'd like you to also identify what's been marked as Exhibit 10.

A. This is the effects of the reserve pits removal report.

CHAIRMAN FESMIRE: Mr. Carr, I don't think I have a 10 either.

MR. CARR: Exhibit 10 is the last -- very last exhibit in the exhibit book, behind Dr. Thomas's exhibits.

Q. (By Mr. Carr) Would you identify that again, Dr. Stephens?

A. This is a report by our firm, October 24th, 2007.

Q. And for whom was this prepared?

A. The industry --

CHAIRMAN FESMIRE: I do have it, Mr. Carr, thank you.

THE WITNESS: The industry committee joint defense technical team.

Q. (By Mr. Carr) And was this report prepared by

Daniel B. Stephens?

A. Daniel B. Stephens and Associates, Inc.

Q. And was it prepared under your direction and supervision?

A. Well, the staff in our company prepared the report, yes.

Q. Is this a compilation that will be referred to by Dr. Ben Thomas when he makes his presentation at a later date?

A. That's my understanding.

Q. Was this report prepared by your staff using generally accepted methods and techniques for environmental analysis?

A. It appears to be so.

MR. CARR: May it please the Commission, at this time we would move the admission of Industry Committee Exhibits 1, 2, 3, 10.

CHAIRMAN FESMIRE: Is there any objection, Mr. Brooks?

MR. BROOKS: There's no objection to Exhibits 1, 2 and 3. We do have a little bit of an administrative problem with Exhibit 10, which I think the fault is shared by various parties to that, but in the books that were furnished to us there was no tab for Exhibit 10 --

CHAIRMAN FESMIRE: Yeah, I think that's --

MR. BROOKS: -- and we assumed therefore that it was a part of Dr. Thomas's materials, and accordingly we have not reviewed it in preparation for Dr. Stephens' testimony. I don't know what's in it at this point, I don't believe Mr. Hansen has reviewed it either, so we -- while we have no objection to Dr. Stephens' work, we would like to have Dr. Stephens available at sometime after we've had an opportunity to review it for further cross-examination.

MR. CARR: Mr. Chairman, we can do that. We asked Daniel B. Stephens to just compile some information for Dr. Thomas, and since Dr. Stephens is available to be here today, we wanted to explain that it was done by Daniel B. Stephens at our request, and Dr. Thomas will be referring to it. We can arrange that Dr. Stephens at a later date -- since it looks like we're going to have later dates -- to come back -- to be back, and we'll resubmit it at that time.

MR. BROOKS: With that understanding, we would have no objection.

CHAIRMAN FESMIRE: Okay, so we're not going to admit --

MR. CARR: Not going to admit it, but this testimony was basically background to show how it was prepared, who was -- by whom, what methods were used, and then when we get to Dr. Thomas we'll follow up with that.

CHAIRMAN FESMIRE: Okay, will Dr. Thomas be cross-examined on the contents?

MR. CARR: Yes, he can be.

CHAIRMAN FESMIRE: Okay, with that we'll admit Exhibits 1, 2 and 3.

MR. CARR: And that concludes our direct examination of Dr. Stephens.

CHAIRMAN FESMIRE: Mr. Brooks?

CROSS-EXAMINATION

BY MR. BROOKS:

Q. Good afternoon, Dr. Stephens.

A. Good afternoon.

Q. Let me be sure I have the right materials in front of me here.

Dr. Stephens, I had some difficulty in attempting to compare your materials to Mr. Hansen's materials, because you were seeking a different output, so I want first to understand the output you were seeking.

Were you attempting to state a level of chlorine concentration -- chloride concentration that would -- in a pit, that would be such that it would never reach groundwater in sufficient quantities to cause the water to exceed? So was that -- is that the burden of your work?

A. Conceptually, yes.

Q. Now you're not saying that at this level it will never reach groundwater, correct?

A. No.

Q. Are you --

A. Excuse me, what level are you --

Q. The levels that you're recommending, your recommended chloride screening level, which I gather is basically 3500 parts per million leachate.

A. Milligrams per liter in the --

Q. Milligrams per liter.

A. -- in the source of the --

Q. Yeah.

A. -- pit contents.

Q. And you're not saying that -- at that concentration, that the chlorides will never reach the groundwater?

A. No, I'm not saying that.

Q. And you're not giving any particular weight to distance to groundwater; is that correct?

A. Not a heavy weight, but we do model it as 50 feet to water, we do have dispersion in --

Q. Okay, and you're saying 11 feet of pit contents and four feet of cover, so that's 15 feet. Now are you starting your 50 feet from the surface of the land or from the bottom of the pit?

A. My recollection, we have 35 feet below the pit.

Q. So you're measuring 35 feet from the base of the pit to the water table?

A. That's my recollection.

Q. Okay. But to the -- Would you agree with the statement, Dr. Stephens, that as long as there is groundwater below the pit, the distance to groundwater will make a difference in the time that it will take for the groundwater to reach -- for the contaminants to reach the groundwater, but it won't make a difference in whether or not they will do so?

A. I think that's generally correct.

Q. So you wouldn't necessarily take issue with Mr. Hansen's presen- -- conclusions about at what point in time the chlorides will probably reach groundwater?

A. I'm not so sure about that.

Q. Okay, you have reviewed Mr. Hansen's work, have you not?

A. I've reviewed -- I wasn't here for his presentation, his -- during this week --

Q. Right.

A. -- but I have reviewed the materials that he handed out.

Q. You've reviewed the written materials that he prepared, correct?

A. Well, what I know -- what I've seen were copies of the slides that he presented. I don't know if that's --

Q. And did you see OCD Exhibit 20, which was included in the OCD's exhibit package, which was the output -- the actual computer output from Mr. Hansen's simulations?

A. I believe we've had that.

Q. Okay. Now, Mr. Hansen used the HELP model, and if I understand correctly he used the HELP model to predict what level of -- or to predict the rate at which the moisture that would carry the contaminants would move out of the pit contents and into the vadose zone. Is that your understanding of what the HELP model does?

A. Yes, sir.

Q. And the HELP model is a generally recognized model, is it not?

A. Yes, sir.

Q. And is not the purpose of the HELP model to determine the effect of the structures that go into the designed landfills?

A. Generally HELP is used to evaluate landfill covers and liners, solid waste landfills. It's an EPA program.

Q. And is it an appropriate tool to use for that purpose?

A. It depends on what kind of data you put into it. But as a code, as a tool, it's commonly used.

Q. Now, Mr. Hansen further used the MULTIMED model to predict the movement of the water containing the chlorides through the vadose zone down to the ground table -- down to the water table; is that your understanding?

A. That's my understanding, yes.

Q. Okay. Is the MULTIMED model a generally accepted modeling tool?

A. It has been used in the past. I don't see it used that much anymore. In my experience, we don't use it in our firm.

Q. Well, do you --

A. I'm not sure how widely used it is. It has been -- I believe it's a mid-'80s --

Q. Do you believe --

A. I'm not sure when it was developed, exactly.

Q. Do you believe that it is -- Have you ever used the MULTIMED model?

A. Have I ever used it?

Q. Have -- Yes.

A. I don't recall that I have, no.

Q. Has your company used it?

A. We may have at one time.

Q. Now, do you believe that the MULTIMED model is an appropriate model for that purpose?

A. It really depends. It depends on -- again, like HELP, it depends on what kind of data you put into the model, it depends on just the assumptions that you use, the time you run the model. The codes are, you know developed, they have been tested, but their reliability depends on how you apply them, how you use them and what data goes into them.

Q. Well, couldn't that be said of any computer simulation model?

A. It could, yes.

Q. You've heard of the principal, GIGO, garbage in, garbage out?

A. I have.

Q. And so if you use the wrong input parameters for any computer model, then your results are not worth a great deal, correct?

A. That's correct.

Q. Okay. Do you know at what time your company might have used the MULTIMED model?

A. I don't offhand recall.

Q. Do you know if it could have been as recently as two years ago?

A. We may have used it. I personally haven't, but I recall we may have. I just don't remember it coming up very often.

Q. Well, when you're saying it's not used that much anymore, are you saying it's no longer a valid model?

A. No. No, no. We just use other tools, I mean --

Q. Okay.

A. -- researchers have a variety of choices to accomplish the same task, and people are more familiar with one tool than another. Some people in our firm may have used MULTIMED in the past. I've just used other tools more recently.

Q. Now you would expect, would you not, that if two different researchers, competent researchers, approaching the same problem in the same area, use different models to run a computer simulation, that they would get somewhat similar results, would you not?

A. I'm sorry, could you repeat that for me, please?

Q. You would expect if two competent researchers use -- approached the same problem in the same area and used different valid, generally accepted models to do computer simulations, that they would get somewhat similar results, would you not?

A. You'd hope so.

Q. Now in one respect your assumptions differed from Mr. Hansen's, because Mr. Hansen used the HELP model to predict the infiltration rate, correct?

A. Yes, he did.

Q. Whereas you used what you called the diffuse natural recharge rate; is that correct?

A. That's correct.

Q. Or what you have concluded to be the diffuse natural recharge rate, correct?

A. That's correct.

Q. Of 2.5 millimeters per year?

A. Yes, sir.

Q. And satisfying people like me -- for the satisfaction of people like me and Commissioner Bailey who are accustomed to thinking in English units, that's approximately 1/10 of an inch per year?

A. It would be a little less than that, maybe.

Q. Now in Mr. Hansen's work -- not much less, though, because 25.4 millimeters would be one inch, would it not?

A. Right.

Q. So 2.5 is just a hair less than 1/10 of an inch.

A. (Nods)

Q. In Mr. Hansen's modeling procedure -- give me a minute to find it here -- when he assumed the use of a good liner, he used .09 inches per year for the infiltration rate. That's pretty close to 2.5 millimeters per year, is it not?

A. Yes, it is.

Q. Now, Mr. Hansen -- I'm sorry, don't want to call you Mr. Hansen. Dr. Stephens, when you -- going back to your Exhibit Number 1 here -- I'm sorry, Number 1 is your résumé. That's not what I wanted to ask you about. No issue with your qualifications.

CHAIRMAN FESMIRE: Mr. Brooks, so that we'll all know what we're talking about, why don't we start with page 1 and number the pages of Dr. Stephens --

MR. BROOKS: I have actually done that, Mr. Chairman, but of course my copy is numbered doesn't mean that anybody else's copy is numbered, so if you want to pause for a moment so everybody can get on the same page, so to speak, I have no objection.

CHAIRMAN FESMIRE: I skipped the cover page and then started numbering 1 through 32. Could we do that so that everybody will be dealing with the same --

MR. BROOKS: Okay.

CHAIRMAN FESMIRE: -- same page? Starting with 1 at the summary of testimony.

MR. BROOKS: I have to change all my page numbers, because I didn't skip the cover.

CHAIRMAN FESMIRE: Just subtract 1.

Q. (By Mr. Brooks) Okay, Dr. Stephens, I have to go back to your work here, find the correct slide.

Okay, I believe the one I want to refer to is page 14, as his Honor has numbered the pages.

You have a variety of estimated annual recharge rates for various places reported on slide number 14, and you picked one that -- you picked the 2.5 number, you said, in the vicinity of Las Cruces, New Mexico?

A. Can we put that up on the screen, please, make sure I'm looking at the same one you are? Is this the table you have?

CHAIRMAN FESMIRE: No, the 15th page is the other table.

THE WITNESS: Next slide.

CHAIRMAN FESMIRE: I think it's two slides after.

Q. (By Mr. Brooks) Yes, that's the one.

A. Okay.

Q. You picked that for the -- you said you picked that for the Las Cruces area?

A. It's within the three methods that were used to evaluate the recharge at the Las Cruces site.

Q. Yeah, but it's quite on the low side with the range that's given for that Las Cruces site, is it not?

A. It's the middle of the three. I don't know that there's any weight applied to -- that 1.5 is any more accurate than 9.5 or 2.5. We chose the middle of the two of those, in part because if you -- I'm thinking about it this way, that here's the range of values for --

Q. I thought you were giving the University of Texas --

A. Oh, no --

(Laughter)

A. I felt like I should stand up -- I'm sorry, but this is the range for the Las Cruces site, and here was a range for the northwest that the 2.5 would overlap, or just about --

Q. Yeah.

A. -- overlap those two, and so that helped guide the choice.

Q. Well, we will concede that your range for the northwest has some appropriateness. But if you look at the sites that you have selected in eastern New Mexico, the Ogallala aquifer in Portales and the Ogallala aquifer in Lea County, it looks like you're having considerably higher -- your data indicate considerably higher recharge rates.

A. The thing about the Ogallala aquifer in Lea County, for example, this is a regional model. It's -- I believe Doug McAda's work was -- but a regional scale, which would include some of the channelized local recharge as well as the diffuse recharge in between. And it's a more regional -- it's not necessarily only from inter- --

in fact, now that I look at this, maybe we shouldn't have put it up there. But it is a regional recharge rate that does encompass all the little drainage channels that might be the ones you're going to avoid in the pit rule. So it probably is biased high.

And the same is true with the Theis method. C.V. Theis in 1937 did a study of the Ogallala, looking at how much recharge might be needed to support the discharge coming off the flanks of the -- the escarpments of the Ogallala, and came up with this larger number.

And so that's the reason why these values in the regional studies are larger than the ones when you do site-specific and local studies.

Q. Well, these are not specifically recharge levels for watercourse channels, are they? Or drainage channels?

A. Probably below a drainage channel that you're trying to keep the pit out of. The recharge rate would be even greater than the numbers that are shown in this --

Q. Well, that's what I was saying, they're not specific for a drainage channel, these numbers are not?

A. Nor is it specific to the channel -- the zone between the channels. These numbers for these particular studies that you've pointed out here are all encompassing of the Caprock, for example.

A. Now other things equal, if you used a larger infiltration rate, you would get a larger amount of the chlorides going to groundwater; is that correct?

A. Yes, the higher the recharge rate, the greater the impact to groundwater. And the other thing that happens is that the amount of mass that's present is reduced faster. The more flushing there is, the more rapid the recharge rate flushes through, the less the duration of the impact.

Q. Yeah. Now Mr. Hansen used a pulse. His simulation showed a pulse, which he said was assumed. And is that what you're talking about, that the groundwater concentration -- the chloride concentration in the groundwater will tend to go up and then back down again?

A. It could have a pulse input. Then there would be an impact to groundwater which looks pulselike.

Q. Yeah. Okay. But establishing, anyway, that if you -- if one used a higher recharge -- a higher infiltration rate, one would get a higher number. But in fact, as we went over a little bit before, you used an infiltration rate which was very, very close to the same as what Mr. Hansen used from the help model for a lined pit?

A. Well, yes and no. I think -- The numbers are the same, but they're different -- they're derived differently. And it's been very difficult for me to try to understand what was done, based on what information I was provided.

But my understanding of how the HELP model was used in one case was to simulate rainfall, evapotranspiration and runoff and the residual going down through bare soil with no liner, and then scenarios in which there was a liner with many holes -- that was called the poor liner -- and then a scenario where there were just a few holes that was called fairly good liner.

In the case that there's no liner present, that's the case that we're simulating. If you look at the recharge rates that come out of the HELP model, or the deep percolation rates that come out of the HELP model, they're like 1.2 inches per year, which is over 30 millimeters per year. That's the natural recharge rate that the HELP model would calculate. That's over 10 times greater than what is on -- in our assumption and what this found in many parts of the southwest.

So that's the difference. When you're trying to compare the HELP model, it's the HELP model with a liner that has just a few holes, against what we're using as a natural rate. So they're, in a way, the same number, but they're derived with the assumption that the natural recharge rate is much greater than it actually is.

Q. Okay. But even if you -- with your transport models, though, if you use a given infiltration rate assumption, that should be comparable, should it not, regardless of how it's derived?

A. I don't understand your question.

Q. Well, you are assuming 2.5 millimeters per year infiltration into the surface, but you're not making any allocation for the liner retarding the flow, because you're assuming that you begin your work from when the liner completely fails --

A. Correct.

Q. -- is that correct?

Mr. Hansen is assuming that 2.5 millimeters per year is the infiltration out of the liner during its operation.

Now given that those are basically the same infiltration rate, and the infiltration rate is the input factor to the transport model, shouldn't it produce a similar result, other things equal, for the transport model?

A. Yes, I think it should.

Q. And are you aware that Mr. Hansen did not make -- in his modeling, did not make any allowance for liner failure, other than what's incorporated into the HELP model, which, it's my understanding, is really not liner failure but, like you said, holes in the liner or defects in the liner.

A. Can you repeat that please?

Q. Are you aware that Mr. Hansen did not make any allowance for liner degradation, other than what's incorporated in the HELP model?

A. I don't know one way or another.

Q. Okay.

A. If there's something besides the HELP model, I'm not aware of it.

Q. Very good. Very good. Now what concentrations of chloride in the waste did you assume in your modeling? I assumed you tried several different factors to get to the conclusions you got to?

A. No, not really. The way -- the way we approached the problem was to assume at the beginning that the waste had a concentration of 1000 milligrams per kilogram, and then we have 2.5 millimeters per year, moving through that amount of mass --

Q. Now let me stop you a minute. 1000 milligrams per kilogram, that was your initial assumption?

A. Right.

Q. Now under the SPLP test, 1000 milligrams per kilogram would equate to 50 milligrams per liter, as a result of the SPLP test?

A. Say that again?

Q. If there's 1000 milligrams per kilogram of chlorides in more or less solid state and you took a leachate test by the SPLP procedure, would that be equivalent to 50 milligrams per kilogram in the leachate?

A. I think 50 milligrams per liter.

Q. Per liter, I'm sorry.

A. Yes.

Q. Okay. So you assumed 50 milligrams per liter in the leachate, this is your initial assumption?

A. Well, it doesn't -- Yes, the answer is yes. But what we do is to look at what the impact is to groundwater. And let's say that the groundwater concentration is not impacted to above the standard. Then you could have more mass in the system to get us up to the standard, and we just scale it proportionately to the one --

Q. So you're saying that it's a linear function, essentially?

A. Yes, sir.

Q. Which is basically, I believe, consistent with Mr. Hansen's work, is it not?

A. I think it is.

Q. But you just did the one test on the 1000 milligrams per kilogram; you didn't run simulations on various levels, as Mr. Hansen did?

A. Well, you know, we presented results with different concentrations in the source through different mixings with the clean backfilled. But the results are scaled, you can run one simulation and get results for --

Q. So you're saying that --

A. -- many others.

Q. -- the amount that will reach groundwater is, other things equal, a linear function of the amount that goes in -- the concentration of waste in the waste?

A. Generally --

Q. I'm sorry, of chloride. Concentration of waste in the waste, I guess, is one to one.

Now, Mr. Hansen did a simulation of 1000 milligrams per liter initial concentration for the San Juan Basin. Did you see that?

A. I do recall that.

Q. But that's 1000 milligrams per liter in the leachate, as I understand it, and not 1000 milligrams per kilogram in the waste?

A. I believe that's in the pore water in his source area that's coming out of the waste, so I believe that's the leachate. That's his assumption.

Q. That's what I said, I believe, wasn't it? That it's -- 1000 milligrams per liter is the leachate? No, no, what I was saying was 1000 milligrams per liter, so what you're telling me is, the 1000 milligrams per liter is the leachate volume. That's what you are assuming, that's your --

A. I believe -- That's what I think he assumed, but --

Q. That's your construction of his materials?

A. I'm not real sure about everything he did, so...

Q. Okay, if you had 1000 milligrams per liter in the pore water, what would that equate to if you applied the SPLP test?

A. What was it in the pore water? 1000?

Q. 1000 milligrams per liter, that was the assumption that Mr. Hansen made. Now if Mr. Hansen was assuming that that equated to 1000 milligrams per kilogram in the waste, would that be incorrect?

A. Yes.

MR. HISER: Mr. Chairman, if Mr. Brooks is going to ask our expert to do complicated math in his head, can I at least provide him with a calculator?

CHAIRMAN FESMIRE: I will.

MR. HISER: Thank you, Mr. Chairman.

CHAIRMAN FESMIRE: Why don't we go ahead and take a 10-minute break and allow Dr. Stephens to do what he needs to do? We'll reconvene at 10 minutes after three.

(Thereupon, a recess was taken at 2:58 p.m.)

(The following proceedings had at 3:10 p.m.)

CHAIRMAN FESMIRE: Okay, let's go back on the record. Let the record reflect that it's 3:10 p.m. on

Friday, November 8th. This is a continuation of Case Number 14,015. We were in the cross-examination of Dr. Stephens.

The record should also reflect that Commissioners Bailey, Olson and Fesmire are all present and that there is a quorum present.

I believe, Mr. Brooks, you had just asked Dr. Stephens a question?

MR. BROOKS: I believe so, and I don't recall exactly what I asked him. Do you want me to have the court reporter read the question back, or do you want me to start over?

CHAIRMAN FESMIRE: Well, since Dr. Stephens had to do a rather complicated calculation to answer it, perhaps we'll let him answer the question.

THE WITNESS: Well, let me state what I thought the question was. I thought the question was, if the pore water in the waste had a concentration of 1000 milligrams per liter, what would be the SPLP concentration?

Q. (By Mr. Brooks) That's correct.

A. 6.25.

Q. 6.25?

A. Yes, sir.

Q. And how do you arrive at that result?

A. Well, again I'm --

Q. That's 6.25, and that's in milligrams per liter, right?

A. Yes.

Q. Okay, and how do you reach that result?

A. Well, preliminary -- this is just sort of seat-of-the-pants, and I need to think things through a little bit more, perhaps, but my understanding of what was done here and how the system is working is the following. That is, to convert to the concentration in the SPLP method you have to multiply the concentration in the soil core sample by 20. That's a 20-fold dilution on taking 100 grams of soil, adding 20 times more water, and looking at the solution that derives from that.

Q. Right.

MR. HISER: Mr. Chairman, since this is essentially and equation thing, would it be helpful if we get a large piece of paper and he could write it out as he's explaining it? Because otherwise equations are, for me as a lawyer, very hard to follow if somebody is saying $C_w$ times 8 divided by something else, just where we're going to go with this.

CHAIRMAN FESMIRE: Okay --

MR. HISER: I don't know that we have a piece of that paper, but maybe we could have him sit and type or -- I don't know what else --

THE WITNESS: Well, here's the work.

(Laughter)

THE WITNESS: I'll pass it around.

(Laughter)

CHAIRMAN FESMIRE: Does that become part of the record.

THE WITNESS: I don't know.

MR. HISER: I think it's demonstrative at this point.

MR. BROOKS: We would have no objection, Mr. Chairman.

CHAIRMAN FESMIRE: Okay, why don't you go ahead and continue, Doctor, and we'll circulate this around --

MR. BROOKS: Okay.

CHAIRMAN FESMIRE: -- to counsel especially.

Q. (By Mr. Brooks) Is the 1000 milligrams per liter that Mr. Hansen used in his hypothetical test -- does that correspond to the 1000 milligrams per liter that you used in your modeling, or is it different?

A. No, we used 1000 milligrams per kilogram in the soil.

Q. You used 1000 milligrams per kilogram in the soil.

A. Right.

Q. And I haven't seen what you produced up there yet, but how does that correspond?

A. I don't know.

(Laughter)

A. Let me see. It was 1000 milligrams per kilogram in the soil, and you want to know what the pore water concentration would be? Is that your question?

Q. (By Mr. Brooks) That's the general idea, yes.

A. About 8000 milligrams per liter.

Q. In the actual waste itself?

A. If you took a core sample and --

Q. Right.

A. -- sent it to the laboratory, you'd find that the concentration of 1000 milligrams per liter in the pore water would be about equivalent to 8000 milligrams per liter.

Q. Now the numbers that you arrived at for the numbers that would be protective, on page 29 of your materials, you were using kind of an average, I take it, of these various numbers when you arrived at your 3500 recommendation because your numbers, depending on the dilution, range from 1240 up to 6200.

A. Yes, sir.

Q. Okay. Now that number of 3500, you have labeled this, SPLP chloride standard. So what concentration does that correspond to in the pore water?

A. Which one? Which --

Q. Let's try the -- Let's work on the 3500, because that's your bottom-line recommendation.

A. Oh, this is the SPLP. Let's see, I think that would be 560,000 milligrams per liter.

Q. 516,000 --

A. 560.

Q. -- -60,000 milligrams per liter. So your recommendation is that pit waste can safely be closed in place if it has up to 560,000 milligrams per liter?

A. That's what the calculation suggests.

Q. Yeah. And it's -- and you're saying it's even more when you back it to what's actually in the waste? That's an even -- that gets you to an even higher figure?

A. I don't understand your question.

Q. Well, I'll back off -- I'll withdraw the question.

Now, did you testify that you used -- you arrived at these figures by testing 1000 milligrams per liter input?

A. No, I didn't say that. I think it was 1000 milligrams per kilogram in the soil.

Q. And you testified that you didn't have to run more than one quantity because of the proportional factor, correct? That's the way I understood the testimony.

A. Yes, we ran the simulation with no dry soil mixing and dilution, and the rest of the results were scaled proportional to the mixing.

Q. And that 1000 that you ran, that would be equivalent to, you said, five hundred and some -- 560,000 milligrams per kilogram, would be -- at that figure, it would give you an SPLP figure of 3500?

A. That's what the calculations show, based on the assumptions and preliminary calculations, just sitting here.

Q. Okay. Now --

A. I might want to take a look at those more carefully after I'm off the stand, but that's first cut.

Q. -- Mr. Hansen, when he ran his model on 1000 milligrams per liter initial concentration, he showed that with a good liner that would never -- that would never contaminate groundwater. And then -- That was San Juan Basin. And then when he ran --

A. I'm sorry, is that a question?

Q. No, I'm -- It's an assumption for purposes of a question I'm going to ask.

Then when he ran a 10,000-milligram-per-liter model in the San Juan Basin, he found that it would reach groundwater, and a maximum concentration of -- it looks like about 400 milligrams per liter in the groundwater.

Now if it is a linear function, then you and he are not going to be too far off on the correspondence of where it will not reach -- where it will not pollute groundwater. But you're telling your figures -- the input figures are not at all comparable, right?

A. Well, I think the -- some of the figures are similar. We looked at the recharge rate. I think some of the permeabilities are a little different. I think there are some inconsistencies in his model between the soil and the aquifer properties. There are some other differences in how the problem is set up and...

But one of the inputs that we need to remember with the HELP model is that the -- to the extent that our inputs are similar in recharge rates, it's based on the assumption that the water movement through a liner with a few holes is the same as the natural recharge rate. But in order to get that you have to have, in the HELP model, an unusually large amount of water percolating down that I don't think exists.

If in fact his base case, which has no liner, had a few millimeters per year, then the HELP model with a few holes in a good liner would probably give you even less than he found. And that's where I think an important difference is. It's coincidence that the good liner flux of water is similar to the natural recharge rate.

Q. But it wouldn't make any difference in the results of your work, because you didn't make any assumptions about the liner, right?

A. Well, sure we did. We assumed the liner was gone. I mean --

Q. So if the liner --

A. -- you were asking about how comparable the input parameters were, and I think they're coincidentally similar in just that one regard, but I think there's a mistake that was made in how much water is coming down through the HELP model, to start with.

I think the HELP model and all the assumptions -- all the fluxes that they get, whether it's unlined or whether it's a good liner or a poor liner, are overestimated.

Q. Well, I am having trouble understanding why that makes a difference in the results of the transport model when you're using the same infiltration rate, essentially the same infiltration rate, as your input to the transport model. But I will move off that, move on to another area.

MR. HISER: Is there a question, and does he get to respond to that statement.

MR. BROOKS: He may respond to it if he wishes.

THE WITNESS: Can you repeat the question?

(Laughter)

CHAIRMAN FESMIRE: I will overrule that objection, and we'll just move on, okay?

MR. BROOKS: Okay.

Q. (By Mr. Brooks) I have not looked at what's in your Exhibit 10 for the reasons that I explained, but the Exhibits 1, 2 and 3, you did not furnish any of your input or output data; is that correct? Your actual data is not included?

A. Well, the input data are listed in a table. There's a table in the back. You should be able to derive the results from that table.

Q. Which table is that?

A. On page 8, Exhibit 3.

Q. Okay, you do not list the chloride concentration as an input data here, do you?

A. I thought that was in the text.

Q. Okay, where did you -- where did you -- Now you went beyond the entry point to groundwater, didn't you? Because you have another model that deals with the movement of the chlorides in the groundwater once it gets there?

A. That's correct.

Q. And how far did you assume the distance to be between the entry point and the well?

A. I believe the well was right at the edge of the pit.

Q. I thought it said that somewhere in your materials, but I couldn't find it. Okay.

Are there any other input parameters that are not listed here, that are of significance?

A. I don't believe so.

Q. Well, we've been over your input on chloride concentration several times, so I'm reluctant to go back to it again, but I'm still not sure I understand it because there are so many different ways of measuring chloride concentrations.

You said your input was 1000 milligrams per kilogram of chloride in the waste, correct?

A. Yes.

Q. And that was the only chloride assumption you made -- chloride concentration assumption you made?

A. Well, we then mixed to -- you know, the concentration was reduced after mixing occurred. We had 11 feet of pit waste in our base simulation, and that generated an impact to groundwater. We then made a recalculation assuming that the pit was only half filled with waste and half filled with clean fill, and it was mixed in a one-to-one proportion. That gave another result.

Q. Well, did you ever model any concentrations other than -- any concentrations higher than 1000 milligrams per kilogram?

A. I don't believe we've done a forward simulation. It was basically a -- calculate the concentration that would be necessary to create the impact in excess of the standard.

Q. What concentration would you expect to find in the pit contents in New Mexico, in the San Juan Basin and in the Permian Basin?

A. Oh, I just don't recall offhand. I know there's -- We had some data on it, I just don't remember it offhand --

Q. There would be a very significant difference between those two areas, would there not?

A. Yes, I believe the southeast would be more enriched in chloride.

Q. You would agree with the principle, would you not, that the higher the chloride concentration, the more chloride will get to groundwater, right?

A. The higher the chloride concentration where?

Q. In the waste --

A. In the waste.

Q. -- the more will get to the groundwater, other things equal?

A. Everything else equal, yes.

Q. Was this 1000 milligrams per kilogram -- was this the actual number you inputted into your model?

A. Yes.

Q. Okay, that's what I thought you were saying.

And did you furnish any model output data for us?

A. I don't believe you have anything other than these exhibits.

Q. Very good. Once again, perhaps this is repetitious, but I believe you stated that you normally expected two parties modeling -- two researchers modeling with accepted models, with similar data, to reach similar results. And I'm going to ask you again, how do you account for the -- If I am understanding the numbers you're giving us -- and they're significant because there are so many different ways of measuring chloride concentrations, what appears to be an order of magnitude difference between your results and Mr. Hansen's results.

A. Well, I think Mr. Hansen's pore water concentrations are greater than the ones I just calculated, in his model. And also I think that the way MULTIMED was run, that more mass gets put into the soil and the groundwater than was put in the pit to start with. And that's not possible with the way VADSAT is constructed.

Even though they model similar processes, there are some assumptions which are in the code MULTIMED that allow in 50 years, the arbitrary period of time for this event to occur, that more mass is created -- that there's mass created that never existed, it's physically impossible.

So, you know, that's a difference, a significant difference. Even though we might have the same parameters, just something about an assumption will create the big difference in the output.

Q. Did you make any effort to run any numbers in MULTIMED to verify that assumption about the discrepancy between your and Mr. Hansen's work?

A. Which model? Which numbers?

Q. Did you run any numbers in MULTIMED to verify your assumptions about why there was such a big discrepancy between yours and Mr. Hansen's work?

A. Well, we looked at the assumptions that went into the model. We did not run MULTIMED *per se*, but we did some calculations from the output we understood came out of the model, and one of those led us to believe that there is more chloride at the end of 50 years than was put into the pit to start with, with that model.

Q. Since you -- Did you do that in evaluating Mr. Hansen's work? Did you do that after you received Mr. Hansen's work?

A. I did it last night.

Q. Okay. Could you furnish us those calculation?

A. I'd be happy to.

Q. Very good, thank you. Excuse me a minute while I switch books here.

Now, Dr. Stephens, Mr. Hansen stated that he assumed that this waste would be in a moist state, but is that an accurate -- is that valid assumption?

A. I'm sorry?

Q. That -- He assumed this waste -- there would be a high moisture content of the waste. Would that be a valid assumption?

A. Well, initially. But I think what's done is to dry -- to remove the liquids, in practice. The liquids are pumped off, and the pit is allowed to aerate and dry out before closure. That's my understanding of how the process works.

Q. The only -- Assume for me, though, that the only requirement for closure in regard to moisture is that it pass the paint-filter test. It could still be quite moist in the sense that we're talking about for hydrological purposes and still -- and pass the paint-filter test, could it not?

A. And I'm not that familiar with the paint-filter test to tell you one way or another.

Q. And if the waste did have a considerable moisture content, would that affect the infiltration rate?

A. I guess it could.

Q. And even though you're assuming a fairly long period of time before it begins to escape from the liner, if it's encased in that plastic liner it's not going to lose moisture content very much, is it?

A. Probably not appreciably during the time it was closed. There would be some -- probably some vapor transport, I suspect.

Q. Okay. Now as to another issue here, you testified that chlorides could move up as well as down in some areas.

A. I was talking about the water, the recharge, in that context, that pore water in the soil will move --

Q. If the pore water is --

A. -- upward in places.

Q. Chlorides are very highly soluble, are they not?

A. Yes.

Q. And they will move -- Once the water gets to the chlorides, the chlorides will dissolve and move in the water wherever the water goes, will they not?

A. Yes, it can.

Q. So isn't there a possibility, then, that chlorides buried under four feet -- four feet of cover -- if the geomembrane cover deteriorates or has leaks and the pore water is moving upward in the area, isn't it a possibility that the chlorides will move up and infiltrate the root zone?

A. I guess it really depends on the type of plants that are re-established and the density and depth of those root systems. I mean, some is possible, but I think by and large we see peak chloride concentrations usually at around three feet, about one meter or so.

It's -- you know, I can't rule it out, but I would expect on average that the net water movement is downward on the long haul, because sometimes during the year the plants are a little less active. They're most active in the summertime, they'll capture most of the thunderstorms. Sometimes in the winter, on cooler days, shorter days, cooler temperatures and more uniform rainfall might lead to more downward percolation.

So maybe a net consistent with what we see, a few millimeters per year would be the net downward percolation, but at times of the year maybe there's some moving up, moves up one, down two, up one, down two. You might see that oscillatory kind of behavior.

Q. If surface owners have testified before this Commission that they have observed situations where chloride moved up to the surface from abandoned pits, though, that would not necessarily be inconsistent with your work, with your description of the way --

A. Could you repeat that, please?

Q. Pardon me?

A. I'm not tracking you, can you repeat the question, please?

Q. If surface owners have -- Assume with me that surface owners have testified before this Commission that they have observed situations where chlorides have moved up from abandoned pits and adversely affected vegetation. That would not be inconsistent with your description of how chlorides may move, correct?

A. It's really a function of the permeability of the soils. I think more likely you'd be expecting to find that in finer clays, silty materials. But in the coarser soils I think you'll have -- or sandy, loamy materials, you should have a net downward movement. I wouldn't expect buildup of salt under these deep water table conditions.

Q. Wouldn't that depend on the amount of moisture available, partly?

A. Can you repeat -- I don't understand your question.

Q. I'll withdraw it. The HELP model has some parameters of -- Well, first of all, you testified that the presence of vegetation was a very -- was an important factor in determining infiltration rate, right?

A. Yes, sir.

Q. And are you aware the HELP model has some -- I believe you yourself -- you testified to it yourself, as a matter of fact, that it has some factor -- input factors of good vegetation, poor vegetation, no vegetation?

A. I believe those are -- You can evaluate how effective the vegetation is. I'm not recalling that particular input choice.

Q. In many areas of New Mexico, would not poor vegetation be an accurate description of the landscape?

A. If by poor you mean no vegetation or barren?

Q. No, I'm assuming there's a distinction between no vegetation, poor vegetation and good vegetation.

A. Maybe you're referring to density of the vegetation, in a low-density -- I'm not sure I can evaluate good and poor. It's usually, vegetation is dense or it's not dense. There's a certain spacing between plants. I'm just not fitting those definitions into my understanding.

Q. Okay --

A. But if you mean barren or sparse or low density and that's equating to poor, then I understand what you mean.

Q. And is that characteristic of many areas of New Mexico?

A. There are some areas that have poor vegetation, that's true.

Q. Okay. Do you have any experience with pit liners?

A. Some.

Q. Have you observed the construction of landfills and the installation of liners?

A. I believe I have. I'm not sure exactly where. I've looked at some liners that are part of mill-tailings piles, I've looked at some pit liners for -- in the oilfield area, and -- I can't remember whether it was during construction or not, you know, looking at some solid waste landfills.

Q. Well then, would you be in a position to comment -- to testify as to what effect a landfill or liner -- pit liner installation might have -- emplacement, might have on the local recharge rate?

A. If the pit liner is impermeable, then underneath that area it would certainly halt the recharge underneath that area. There may be -- depending on the size of the area, the moisture that's moving surrounding the lined area will fill in, especially if it's a deep water table condition, will just sort of go around it and then merge and flow back down to the water table eventually, but at a slower rate than it would have without the pit.

Q. Would the water tend to -- Is there a possibility that the water would tend to flow preferentially along the sides of the lined encasement, as opposed to through the soil generally?

A. Not necessarily. I mean, if the pit has a berm and it sheds the water away from the materials or if there's a drainage that prevents the water from accumulating, it shouldn't happen.

Q. Now, what precipitation rate did you assume for your work?

A. I don't believe we directly assumed a precipitation rate. The 2.5 millimeters per year was derived from studies in both the San Juan Basin where precipitation probably ranges from maybe six or seven inches up to maybe 12 inches or a little more, and then the Permian Basin precipitation ranges from maybe about 14 to 16 or 17 inches per years.

Q. Wouldn't the availability of precipitation make a difference in the proper infiltration rate to assume?

A. It can. It depends, again, on the vegetation and the permeability of the soils.

Q. How long was the study for the purpose of -- What period of time did you use for your studies to arrive at the infiltration rate?

A. I don't understand what you mean.

Q. Okay, you said the infiltration rate is to some extent a function of precipitation, right?

A. Yes.

Q. And -- but you used the same infiltration rate for the San Juan Basin and the Permian Basin, and you've testified that the Permian Basin has a considerably higher precipitation, annual precipitation rate.

A. In most areas that's true.

Q. And in any area the precipitation varies substantially over time, correct?

A. Sure.

Q. So I was wondering what period of time you used to determine your infiltration rate.

A. Oh, I see. The 2.5 -- in the Las Cruces experiment, if I remember correctly it came from the soil sampling which found chlorine 36 in the soil, and I forget what depth, but we know chlorine 36 was derived from -- I believe the mid- to late 1950s, the explosions in the Pacific, the atolls that were sites of atomic explosions, but a lot of seawater and chlorine 36 into the atmosphere, and they found that spike or pulse of the chloride in the soil at some depth. So they knew that in 50 years or whatever it was to that depth, they could compute the rate of travel, so that was the recharge rate they could determine, length divided by time. So that would be over the last 50 years or so.

Then in the San Juan Basin, I believe Bill Stone used the chloride mass balance method, which would have been an integration of chloride deposition probably over thousands of years.

So in a way, two different time scales, but you get similar results.

Q. Well, precipitation would have varied very considerably over 1000 years, wouldn't it?

MR. HISER: Could you repeat the question, Mr. Brooks? I didn't hear it.

Q. (By Mr. Brooks) Precipitation would have varied rather considerably, likely would have varied rather considerably over 1000 years, wouldn't it?

A. You mean from one year to the next or --

Q. Well, the average precipitation over fairly long periods of time could vary --

A. It could.

Q. -- over a period that long, could it not?

A. It could.

Q. Are you the author of a book called *Vadose Zone Hydrology*, Dr. Stephens?

A. Yes, sir.

Q. And did you state in that book that water balance models will under-predict surface infiltration rates?

A. I may have, I'm not sure --

Q. And what --

A. -- what the --

Q. -- did you mean by that?

A. I just need to see the context. Can you show me the book, please?

MR. BROOKS: May Mr. Hansen approach the witness to give him the book?

CHAIRMAN FESMIRE: Yes, he may. Kind of looks like he was going to anyhow.

(Laughter)

Q. (By Mr. Brooks) I believe it's on page 61, right on the bottom.

A. Okay, this was in a paragraph describing water balance modeling based on a field capacity concept, as opposed to understanding the physics of unsaturated soil. So this is a different situation.

Q. And you're saying that the modeling that you used would not understate the infiltration rate, in your opinion?

A. I think the modeling input, the 2.5 millimeters per year, is a reasonable recharge rate to assume for the long term, to assess impacts to groundwater.

Q. Well, is that rate -- Did you derive that rate from experience, or did you derive that rate from a model?

A. No, it's derived from the data, the studies people have done in New Mexico, in the San Juan Basin and the southern part of this state. We didn't use a model to develop the recharge rates. Mr. Hansen did, is my understanding. We looked at the natural recharge rate and said, Nature's going to tell us what's going to come through this pit, because the present is the key to the past. The present is the key to the future in this case.

Q. Well, you said at least one of the computations of the 2.5 -- that reached the 2.5 infiltration rate covered over 1000 years.

A. It was based on chloride accumulations that likely occurred over at least that length of time.

Q. And you wouldn't have actual historical data over 1000 years, though, would you?

A. What data do you mean? Are you referring to --

Q. The climatological data.

A. Just tree rings, I suppose, to reconstruct the paleoclimate.

Q. So you would have to arrive at that result by some character of modeling, would you not? Making some assumptions?

A. You can, but the chloride -- what the chloride bulge and the chloride profiles tell us is that probably 10,000 years ago the climate was much wetter, there was more percolation, more recharge, probably a different vegetation community, maybe more like piñon-juniper at lower elevations that now have creosote and saltbush, for example.

So in the last 10,000 years it appears that the climate, from this and other indications, has become much more errant, and chlorides have accumulated because the evapotranspiration has increased in comparison to what it was thousands of years ago.

Q. Dr. Stephens, in arriving at your conclusion that a small input is better for the environment -- that the input from a small pit closure is better for the environment than input from a landfill, did you give any consideration to cumulative effects?

A. What do you mean by cumulative effects?

Q. Well, a landfill is going to primarily have more adverse effects if contaminants escape from it, because there are more contaminants in it, correct?

A. Yes, and because the area is larger.

Q. If the contaminants are present -- if a large volume of contaminants is present overlying an aquifer and it enters the aquifer in various places, there will be a greater contaminant effect on the aquifer than if there's only one pit entering the -- entering in one place, if they're the same size, correct?

A. It really depends on the spacing between the pits, and if you think of a pit that might be -- what? 20

or 40 feet, 55 feet wide, let's say, the plume of chloride won't be much larger than that. Maybe it's going to be one and a half, maybe two times -- I don't think it's quite that big, but maybe, for example, twice as wide as the pit. If the spacing between pits is greater than that, like on quarter sections, then you might not have overlap.

It depends too on, you know, how far upstream these pits are and whether they exactly overlie one another -- the alignment, rather, of the plumes or the laps.

Q. Well, is it not entirely possible that the entry of further plumes into the aquifer, when pollutants from several sources have already entered the aquifer, may further increase the pollution level in the aquifer above that which would occur from just one source?

A. That's possible.

Q. And so my question is, then, that's what I mean by cumulative effects. In reaching that opinion, did you give any consideration to cumulative effects, the possibility of cumulative effects?

A. No, I pretty much assumed that looking at the small area, versus a large area, that you're comparing those two without any other increments to background chloride, if you will.

Q. Now your-- even in one pit, even if it didn't raise the contamination level in the pit -- in the aquifer to above the standard, it would raise the contamination level somewhat, at least in the area that it affected, correct?

A. It depends where you are. I mean, within the plume, yes, as defined by a plume there will be some additional mass.

Q. Now one other area, and I think I will conclude here.

The infiltration rate assumptions that you use are an average, are they not? Some kind of average?

A. It's a single number, represents -- I suppose you could think about it, the average over 50 years or average over thousands of years, depending on the method.

Q. Well, I was thinking, is it not an average geographically? That is to say, is it not entirely possible that in some areas it will be much higher than that?

A. Possible.

Q. Now when I asked one of our witnesses yesterday about cumulative effects -- I'm sorry, about preferential pathways -- Mr. Hiser asked a question which assumed -- which asked our witness to assume that the average diffuse recharge rate took account of preferential pathways. Is that a correct statement?

A. Can you repeat that, please? I don't quite understand.

Q. Well, if you have preferential pathway, diffusion will occur much more rapidly, will it not?

A. By diffusion you mean water moving down a narrow area will then wick into the surrounding area?

Q. Yes.

A. That's true.

Q. Does your -- does the infiltration rate take account of that factor?

A. Probably on -- I think in a way it does, because it just averages things out. In a preferential pathway there will be a -- maybe a -- in a small area a larger impact. But then in the area where there aren't any preferential pathways there won't be any impact, so it kind of averages it out in a way.

Q. But your modeling -- Does your modeling predict what will happen in any one particular place, accurately?

A. Well, if the site has characteristics that are the same as those we input into this model, then I would say the model is appropriate for that exact --

Q. But there will be some sites that will not have those characteristics, right?

A. Every site will have somewhat different characteristics, and --

Q. And some sites will have preferential pathways, right?

A. It depends. Usually you need -- There might be a preferential pathway that's present at a site, in part because the preferential pathway connects to the land surface where there's ponding, such as sheet flow after a rainfall event. But in the unsaturated zone you may -- you may not see those kinds of preferential pathways, because there's not quite as much opportunity for ponding or perching to occur. That's just my opinion.

Q. Preferential pathways could occur from a great number of different factors, could they not?

A. Yes.

Q. And if there were preferential pathways, it's entirely possible that the contamination could move to groundwater in greater quantities than the model will predict?

A. Not necessarily.

Q. Not necessarily, but it could, could it not?

A. It would depend. Let's say you had a preferential pathway, was a pipe --

Q. Yes.

A. -- that went right to the bottom of the liner and down to the water table.

Q. Yes.

A. And if there was unsaturated flow, you shouldn't see water moving down that pipe. It will go around it.

Although if you poured water inside the pipe, it would flow right down. But that's not what we're doing. It's kind of like -- Maybe if you had a sponge --

Q. Yes.

A. -- with a hole in the middle, and you had some -- and it was a dry sponge, let's say, and you were able to wet up and moisten the top of the sponge, you'd see the sponge slowly wet, but you wouldn't see water pouring down the hole.

I think you can imagine that intuitively wouldn't happen, because the capillaries in the sponge hold the water. And in the capillaries the water is under a tension, which means it's under a pressure less than atmospheric pressure, and in the hole the air is at atmospheric pressure so the pressure in the hole -- or the macropore, the preferential path, the pipe in this case -- is greater than that in the water, so the water won't go into the preferential path. Although there's one there in the unsaturated zone, you shouldn't see water flowing into that pipe.

Q. Once more, just in conclusion, because I find this -- I'm finding this somewhat surprising. You are telling us that there could be up to 500,000 milligrams per kilogram -- by your modeling, according to your modeling, there could be up to 500,000 milligrams per kilogram of waste in the -- in a pit without any liner, because you're assuming that the liner is irrelevant after whatever period of time, and it would never reach groundwater so as to raise the groundwater -- the level in the groundwater above 250 milligrams per liter?

A. Can you repeat that for me, please?

Q. Well, you're telling me that according -- you're telling us that according to your modeling there could be as much as 500,000 milligrams per kilogram of waste -- of chlorides in waste that was encased in a pit, and in effect there could be no liner underneath it because you're assuming that the liner is irrelevant after some period of time, whatever period of time?

A. No, I didn't say that. It's -- I think the calculation that you're referring to was pore water concentration.

Q. Well, I was trying to back-calculate the 3500 milligrams per kilogram that you used and figure out exactly what that relates to in terms of contamination in the waste, the 3500 milligrams per liter that you used, and trying to back-calculate from that to what it corresponds to in the waste.

A. Okay, it would be -- in the waste itself, it would be 20 times that.

Q. So that would be 70,000 milligrams per kilogram?

A. Milligrams per kilogram.

Q. Milligrams per kilogram. And did you do any modeling using that as an input, using 70,000 milligrams per kilogram as an input?

A. Well, not directly. I mean, we start with 1000, and then we figure out that the concentration should be whatever it is to create an impact to groundwater.

Q. So you're saying it's just a linear relationship?

A. The way we approached the problem, yes.

Q. Okay. Now I realize I can't complete right now because I want to ask you one or two questions about hydrocarbons.

You are assuming that -- You're stating that hydrocarbon concentration in the buried pit will not be a problem, because it will volatilize before the pit is buried; is that basically what you're saying?

A. That's the assumption and what the calculations show.

Q. And you used benzene to predict that, correct?

A. Yes, sir.

Q. And benzene is a highly volatile hydrocarbon, is it not?

A. It's volatile, yes.

Q. And if you had used, say, gasoline range organics, you wouldn't have gotten volatilization anywhere nearly as quickly, would you?

A. I'm not sure which chemicals you're referring to specifically.

Q. Well, I'm not sure either, I'm a lawyer --

(Laughter)

Q. -- but that's one of the parameters that I've heard a lot of testimony about, and I believe there is an EPA method, is there not, for measuring gasoline range organics in hydrocarbon?

A. There is, but I just don't know that there's a published volatilization rate of TPH as gasoline.

Q. Okay.

A. It's by chemical.

MR. BROOKS: Okay. Thank you, I believe that's all. I'll pass the witness.

CHAIRMAN FESMIRE: Mr. Carr, due to the complexities of whose this witness is, I don't know if there's any --

MR. CARR: Mr. Chairman, I will be doing redirect --

CHAIRMAN FESMIRE: Redirect.

MR. CARR: -- for the industry committee, but there are other parties as well.

CHAIRMAN FESMIRE: Right, but nobody from IPANM or the industry committee or Yates or ConocoPhillips needs to do any? Okay.

MR. HISER: I think we'll just do it as redirect.

CHAIRMAN FESMIRE: Okay. Mr. Frederick?

MR. FREDERICK: They're just waiting for me to do the searing cross-examination.

(Laughter)

CROSS-EXAMINATION

BY MR. FREDERICK:

Q. Good afternoon, Dr. Stephens.

A. Good afternoon.

Q. I think I want to start out with the slide on page 29, at least I numbered it 29. It's called, Predicted chloride concentration which is protective of groundwater. Can we put that up now?

CHAIRMAN FESMIRE: Mr. Frederick, along the lines of complete disclosure, you're not an ex-student of Dr. Stephens, are you?

MR. FREDERICK: He was my thesis advisor.

(Laughter)

CHAIRMAN FESMIRE: And yet you find yourself --

MR. FREDERICK: That was about 20 years ago. In fact, it was exactly 20 years ago. No, I went to law school, and so -- you know, that's all --

CHAIRMAN FESMIRE: And so you've forgotten all of it, huh?

MR. FREDERICK: Yeah. You know how that is.

Q. (By Mr. Frederick) I want to talk about this because I want to tie it into -- Mr. Carr had said that industry is proposing a risk-based approach, correct? You heard that?

A. Yes.

Q. Okay. And I want to understand these numbers. And on the right column you say SPLP chloride standard. And I don't know if we've said in the record. What does SPLP stand for?

A. It's a synthetic precipitation leaching procedure.

Q. Okay. And the number in the column, that represents -- I think that's a -- that's in milligrams per liter, and that's where you're taking a certain matrix by weight, and then you're putting in a slightly acidic liquid, I think 20 times the -- by weight, 20 times greater, and then mixing the two and then looking at the resulting concentration in the leachate? Is that how that's done?

A. Basically, yes. Mixture of water in the soil.

Q. If you can say it better than that -- ?

A. Did good.

Q. Okay, thanks. Thank you.

So -- and I -- I hear you say -- now where you have the first row across it says none and the number is 1240. Is that assuming an input of 1000 milligrams per kilogram of solid matrix?

A. You know, I'd have to compute what the solid matrix is that corresponds to 1240 milligrams per liter in the leaching procedure. But the 1000 is just like a unit concentration. We could have used 1 and then found out that, you know, we would have had to increase the concentration 1000 times in order to build the chloride up to the 250 milligram per liter. It's just a dimensionless, unitless kind of place to start, from which to scale all the other results.

Q. All right. And I want to -- I want to try to understand the risk-based approach here and what these numbers represent. Are you saying that if you start off with the waste and you subject it to the SPLP test, and the resulting fluid is 1240 milligrams per liter -- or let's say less than that standard, it would be okay to dispose of that waste in place? Is that essentially what you're saying?

A. Yes --

Q. Okay.

A. -- based on all the assumptions that went into that calculation.

Q. Okay. And then if you had a 1-to-1 mix, it would go up, the standard would go up, you could have greater leach- -- is that true, you could have greater leachate potential there?

A. No, you're just -- you're just saying -- yes, you're saying the concentration could be higher because you only have the pit, let's say, half full of waste, and the rest -- the other half of the pit is clean soil, so you mix them together --

Q. Okay.

A. -- you get a -- half the concentration. So when you put water down through there you don't get as much concentration coming out as you had previously.

Q. So you start off with the same weight of waste, and then as you go down that table you mix that waste with clean soil; is that what that means?

A. No, you're actually starting out with smaller masses in each step.

Q. Oh, that would be another way to do it?

A. Well, kind of the way -- when you look at the 2-to-1, that's two parts of clean soil to one part of pit waste. 4-to-1, four parts of clean soil to one part of pit waste. And then you mix it up, you get a concentration which would be, you know, less than the 1000 milligrams per kilogram proportionately, and so then you could -- and that's the way the results go.

Q. Okay. So -- And again, if you have a mixture of two parts clean soil to one part waste, and you do an SPLP test on that and you end up with 3720 milligrams per liter -- or let's say less than that standard, that would also be safe to dispose of as you're advocating?

A. Yes, as --

Q. Okay.

A. -- in the pit waste material, before it's homogenized you could have that higher concentration because when you homogenize it, it will be diluted in the mixture.

Q. Okay. So the way I understand it, it doesn't really matter what waste you're starting out with; as long as it doesn't exceed these leaching standards, industry would say it would be safe to dispose of in place?

A. Yes.

Q. Assuming the regulations are followed?

A. Yes.

Q. Okay. How do you collect soil samples for SPLP analysis?

A. Like a grab sample, a core sample.

Q. Can you explain that, grab sample or core sample? How much do you need for a sample?

A. I just don't recall the method. It's probably on the order of tens of grams. I don't remember exactly what the number is.

Q. Okay. And how big are these pits? Or just give me a range of size that the pits can be, these burial pits?

A. The pits in the northwest, I believe, were -- I think we had a chart that showed it was like 40 feet or -- 50 feet by 55 feet or something like that.

I think if we go back to the slides, number -- down one row, go down one row -- back to the pictures. Just scroll down, scroll down so I can see -- There you go, now number 20, let's see what that one is like.

This is in the southeast, it's 200 feet by 40 feet.

Q. Okay, they can be bigger than that, though, right?

A. I think -- It's my understanding this is a nominal size. I suppose it could be a little bigger, it could be a little smaller.

Q. Okay, and then they're 11 feet deep. Now the problem -- or is a problem with the SPLP test or collecting samples, is, you want to get a representative sample, correct?

A. Yes, sir.

Q. So how many samples would you need to collect to get a representative sample?

A. I don't know that I've done that calculation.

Q. Okay. Would that be an issue, though, if you want to accurately find out what the leaching potential is of a pit, of a waste in a pit?

A. To obtain the average concentration, you more likely than not need more -- you know, more than one sample.

Q. Did you say you would need more than one?

A. Yes.

Q. Okay. All right. And does the leaching potential of a waste -- does that depend on the matrix of that waste, whether it's kind of sand, soil, silt, things like that?

A. Yes.

Q. And could that vary quite a bit throughout a waste, from one end of the waste to the next and from one depth to another depth?

A. I suppose it's possible. But they're -- you know, during closure it's my understanding that there's a mixing process that goes on, which would tend to homogenize whatever might be stratified from the drilling fluids.

Q. Do you have personal knowledge of the mix -- that the wastes are always mixed, homogenized?

A. It's my understanding that that's the practice.

Q. But you don't have personal knowledge about that, right?

A. I'm not sure what you mean by personal knowledge.

Q. I mean, have you seen them do it in a number of closures of pits?

A. I haven't seen -- I haven't personally witnessed that.

Q. All right. And just like the matrix can vary from one location, the percentage of, say, silt, sand, clays, et cetera -- that can vary from one place in the pit to another place in the pit, so could the contaminant levels, correct?

A. It's possible.

Q. Okay. And when you do an SPLP test, do you know if the soils are allowed to dry before you do that test, the wastes? Are they allowed to dry or drain in any way?

A. Do you mean in the laboratory or --

Q. In the lab --

A. -- do you mean --

Q. -- or --

A. -- before the sample is taken?

Q. How are they preserved? How are those soil samples preserved from the time they're collected to the time they go to the lab, and does the lab want a uniform moisture content in those soil samples, or does it matter?

A. I don't think the lab has a specification on that.

Q. Okay. Would the moisture content that you go in with, with that sample, would that -- if it was a greater moisture content, would that affect the results of your test?

A. No.

Q. So it would be the same in both cases? Say you had 28-percent content to begin with, and you had 10-percent moisture content in another waste. All other things being equal, you'd get the same result from the SPLP test?

A. Oh, I see. Are you assuming the concentration is --

Q. Right, everything --

A. -- is the --

Q. -- else is the same.

A. -- is the same in the two situations? Well, you'll have a little bit more mass with it. If the concentrations are the same and you have a higher water content, you'll have a little more mass.

Q. Okay, and the moisture content could vary, the unsaturated moisture content in the pit waste could vary from location to location to location in a pit of that size?

A. It could.

Q. Okay. And I guess the concentration of chloride in the pit water -- in the pore water, could vary from location to location to location in the pit as well, correct?

A. It's possible.

Q. Okay. I'm not pretending to have this in any particular order, so my next question is, How sensitive is your model, the outputs of your model, to recharge rates? You used 2.5 millimeters per year, I think. What if you doubled that? What would the output be?

A. You'd have probably double in the peak concentration.

Q. Would that change your standards that you show on the table that we have on page 29, at least how I numbered it, with the SPLP standards? Would that change?

A. If you have different assumptions and different modeling inputs, you'll change these numbers.

Q. So if the precipitation was -- Say instead of 2.5 millimeters per year, if it was 5 millimeters per year, would these numbers change?

A. Yes.

Q. Okay. Are there local assumptions to the chloride bulge? I know that occurs -- that phenomenon occurs, but does it occur throughout the state?

A. Not everywhere, but in many places that are characteristic of the state you do find it.

Q. Where there's greater recharge you find it less, I would assume?

A. That's correct.

Q. Okay. Now I'm going to go to the diffuse recharge rate. That's calculated over large areas, correct?

A. Well, it's been -- Well, let me back up. We talked a while ago about the regional modeling that was done by the USGS, and the work that C.V. Theis did. That's fairly regional, but that includes some very local recharge as well. It's a little bit different than the test plots like Fred Phillips did or the core samples Bill Stone did, but they both -- and the work that was done by Pete Wierenga down at Las Cruces. Those are local but they cover a large region of the state from south to north. But the more regionally extensive ones take into account these local -- somewhat localized recharge sources that bias the areal recharge to be high.

Q. Okay. But when you talk about diffuse recharge rates, you're talking about -- is it an average, is it -- what is it? It's over a large area outside of recharge areas, isn't it?

A. It would be on average -- for example, if you have an area right between a community of shrubs, there's maybe 25 feet between shrubs, maybe the dead center of that root system has lower density of roots, so more water would go down that little zone right underneath the plant canopy.

But on average we're getting -- you know, this 2.5 millimeters would be an average. But in some local areas where there's no vegetation the number would be higher. Where there's -- you know, right underneath the canopy and the roots are very dense and deep, the number would be actually lower in that small area.

So recharge probably does, you know, spatially vary with vegetation, but these are average numbers.

Q. Okay. Now in your report you note that most recharge is going to occur along mountain fronts and along watercourses, correct?

A. Yes.

Q. And also recharge could be locally increased in concave areas, in bowl-shaped areas, correct?

A. Yes.

Q. Okay. So that would be a local exception to the 2.5 millimeter per year average -- diffuse recharge rate, or it couldn't?

A. It could be. It depends whether that depression has been filled in with silty and clayey material. Sometimes depressions create like playas where they may have low-permeable materials and the infiltration rate may be less.

Q. Okay. And you -- I think in your model you say that -- you rely on the rule to say that there won't be any pits in drainage areas, in watercourses or in drainage areas in general, correct?

A. Yes.

Q. And there's -- I think there's thousands of pits out there; is that your understanding?

A. I believe there are quite a few, yes.

Q. And do you think it's possible that some of them might be located inappropriately in drainage areas and, say, in -- also in bowl-like concave depressions as well?

MR. HISER: Is this question about existing pits or future pits?

Q. (By Mr. Frederick) You can take it as both. If there's a distinction between those, if you -- I can ask the question differently. Do you think that future pits may be located in drainage areas or concave areas?

A. Not based on the rule and the decision to keep the pits out of the channels and arroyos and depressions.

Q. So you would assume 100-percent compliance, then, with that rule?

A. I don't have any other basis to --

Q. Okay.

A. -- assume otherwise.

Q. All right, but there's no rule against putting it in local concave areas?

A. I can't recall a rule to that effect, although I would characterize it as probably a watercourse because it's going to be the topographic low area to which water will drain and pond up, or pool up, more likely than not. So I think the rule would include that situation. That would be my interpretation.

Q. Okay. Now do you think it's possible that drilling operations at a site would create their own localized concave area? You know, the very act of creating that pit would create a concavity?

A. Well, during the time the pit is there, yes, it's a concave structure. But when it's backfilled and compacted and re-vegetated, I'm not sure I see the concavity --

Q. All right --

A. -- in the engineering design.

Q. -- if the pit is closed, constructed, closed in all cases appropriately, you shouldn't have that concavity; is that what you're saying?

A. Yes.

Q. Okay. Now you've heard of the monsoon season in New Mexico, correct?

A. I have.

Q. And that produces localized thunderstorms?

A. Yes, sir.

Q. And would that locally increase the recharge rate if there's an intense thunderstorm, in a certain area beneath that thunderstorm?

A. It depends. Usually it's the winter storms that produce most of the recharge, because that's when the plants are dormant and whatnot, taking the water out of -- What we've seen in the summertime -- actually, I've seen work we did at the Sevilleta, was how fast the plant roots can actually move during the summer growing season to capture that rain from areas that the roots weren't present before. And in the wintertime the leaves fall off and the stomates close, and you don't see the roots very active. So it's more the winter storms, rather than the summer thunderstorms. And the winter storms are generally more frontal, so they cover larger areas more uniformly than a summer thunderstorm.

Q. Now a thummer -- a summer thunderstorm could produce enough rain at an intense rate so that plants couldn't take up all the water that was produced and that infiltrated into the ground; isn't that correct?

A. It's possible, if the soils are very coarse and the vegetation is sparse, that high-intensity sustained rains could penetrate below the root zone under a natural setting.

Q. And if you had a series of thunderstorms, say one right after the other, that would also create infiltration down into, say, a 50-foot aquifer and could locally increase the recharge rate at those sites, would it not?

A. Well, in the hypothetical you posed it could. But generally over large areas thunderstorms are convective cells that might cover square miles, and they track different directions.

If you look at a watershed with a number of rain gauges during the summertime, you'll find one gauge has very little rain, another one might have quite a bit of rain, and the next event, even though it's a high intensity -- a heavy storm, just the opposite. So they tend to average out, these thunderstorms, the amount of rain falling on a watershed, because they have a random character to the storm fronts and where the cells develop.

Q. And that's why they're referred to as localized thunderstorms, because they're local?

A. Yes.

Q. Okay. And there's no prohibition against locating a pit underneath a thunderstorm, is there?

(Laughter)

A. No, I don't believe so.

CHAIRMAN FESMIRE: Mr. Price, how come you didn't cover that one?

MR. PRICE: We're working on it right now.

(Laughter)

Q. (By Mr. Frederick) In the Sevilleta -- you used some data from the Sevilleta, and the precipitation there is eight inches per year. Is that typical of New Mexico, or is that on the dry side?

A. Let's see. Well, eight inches is probably on the drier side. It's not uncharacteristic of the San Juan Basin though. I'd say it's, you know, probably average for the San Juan.

A. Eight inches is average for the San Juan?

A. Probably, eight or nine.

Q. And is recharge -- the recharge rate is correlated to precipitation, is it not?

A. The recharge rate is --

Q. The recharge rate.

A. It can if they're the same type of soil, but --

Q. The recharge --

A. -- it depends on where you are.

Q. -- comes from precipitation, does it not? I mean, if you're talking about mountain-front recharge or you're talking about recharge along a watercourse or you're talking about diffuse recharge, it's all a function of precipitation, is it not?

A. No, it's not just a function of precipitation.

Q. Not just a function, but it is a function --

A. It is a function --

Q. -- of precipitation?

A. -- of precipitation, right.

Q. So if you increase precipitation, all things being equal, wouldn't you see -- wouldn't you expect an increase in recharge?

A. Yes, you would.

Q. Okay. Now your model assumes 2.5 millimeters per year in precipitation and that, I believe, is a tenth of an inch per year.

A. (No response)

Q. Okay, and you're assuming that the liner will go bad in 270 years?

A. Yes.

Q. Okay. Is that an average defect or failure rate? What is that -- where is that number -- How is that number calculated?

A. I think it's just the manufacturer's experience in calculations for the material.

Q. Do you know if that was a peer-reviewed study?

A. You know, I don't know offhand.

Q. Okay. Now we're talking about hundreds of years, and you've heard about global warming, correct?

A. Yes.

Q. How will global warming affect precipitation rates in New Mexico, say in 270 years?

A. My recollection -- and I could be wrong on this because I didn't study this before coming, but my recollection is, you can't really tell with global warming except that the temperatures will rise. But in some places you'll get more rain, in some places you'll get less rain. But in New Mexico my recollection is that we're in for a drier spell, that there will be less rain due to global warming here than elsewhere.

Q. You haven't seen any predictions of greater rainfall in southern New Mexico?

A. It depends on the model. I'm thinking back on a couple years ago when I did look at this a little bit, and what all the global warming models agreed was, with greenhouse gas the temperature will rise.

But what several models and the researchers didn't agree on, because they had different models, was the results. Some found that rain will increase, some found that rain will decrease. But my recollection from listening to a paper at an AGU meeting in San Francisco a couple of years ago was -- I sat forward in my chair when I saw the red zone for the drought prediction from the USGS. That's my recollection, you know. I'm trying to do my best to answer the question, but my recollection is that we would be in for hotter and drier times due to global warming in New Mexico.

Q. All right. Would you agree we can't accurately predict what the precipitation -- what that precipitation rate is going to be in 270 years in New Mexico? Can you predict it?

A. Can I predict it?

Q. I'm not asking you to do math, I'm just asking you to predict the precipitation rate is going to be in 270 years.

A. No, I really can't. I can't say for sure. I wouldn't be surprised if it's lower than it is today.

Q. It could be higher though, couldn't it?

A. You know, it's possible, but my expectation is that with the global warming trend expected to continue out a hundred years or more, that it will probably continue the drier spell. But I don't think anyone really has clairvoyance out that far.

Q. I would agree with that.

What kind of vegetation will exist in 270 years?

A. It depends on where you are, what elevation and --

Q. Do you think it will necessarily be the same as the vegetation we have today?

A. Again, it depends. I mean, if -- I'm not sure I can answer it.

Q. Is it not speculative? Can you answer that question?

A. Well, if the rainfall -- if the rainfall gets lower, I think the vegetation -- depends how much lower, but some of the vegetation can tolerate less rainfall, other species will -- to take its place and extract the moisture that is available. But you know, there may be some changes. We may look like Arizona in southern New Mexico, more so than we do today. But there's still a lot of vegetation that takes up the moisture, it's just different vegetation.

Q. Now did you do a sensitivity analysis on your model to see how sensitive it was, how sensitive the outputs were if you changed certain parameters?

A. Not formally, no.

Q. So you've assumed 2.5 millimeters of precipitation per year, and you don't know how the output would change if it went to 3 millimeters per year?

A. I didn't say that. We didn't run the model to say, you know, what would happen. But you can calculate that from the table, it's pretty much a --

Q. Did you calculate it for us today?

A. I haven't, no.

Q. Okay. Now in your model you have -- I think you used a -- First off, do you know for sure whether the model you used had the pit bottom 35 feet from the water table?

A. Let's see.

CHAIRMAN FESMIRE: I think 2-26 shows that, Doctor.

Q. (By Mr. Frederick) Okay, the reason I -- If we go to page 6 of that report and you go to -- I guess the second full paragraph, the second from the bottom, really, and you go five lines down where you talk about the dispersivity -- It's not a big issue, but I notice it says vertical dispersivity is 1.05 feet based on a depth to water of 50 feet. Is that assuming -- And maybe you could explain what that means.

A. Okay, that's a calculation based on the assumption that the transport of chloride through the vadose zone would be 50 feet. If you go back to table 1 on page 8, I believe the way the model is set up that the depth to water in the vadose zone is 35 feet below the bottom of the pit. That's --

Q. I see that in the table, but it seems like a conflict with the text.

A. You're right, it's a -- there's a little bit of an inconsistency. But I think as far as the dispersivity that's calculated it's really of no consequence.

Q. Okay, and that's probably true. Did you actually run the model, you yourself?

A. No, I didn't.

Q. Who did?

A. Todd Umstot.

Q. Okay. Now your model also assumes -- once the contaminant load gets to the aquifer, there's a certain amount of mixing, correct?

A. Yes, sir.

Q. And was that mixing along the entire 50 feet depth of the aquifer?

A. Yes.

Q. And along what pathway? How long was the pathway before that became entirely mixed?

A. Oh, it was pretty much right at the edge. We just assumed it was mixed at the edge of the pit.

Q. Does that happen in real life?

A. Well, if the well were pumped, you put a well in at a point of future use right underneath the pit and it's a 50-foot-thick aquifer, I think, you know, you'd get mixing over 50 feet.

Q. If there is no well, pumping well, next to the pit, drawing water up to it and so forth, would there be that kind of mixing, or would you have a plume that pretty much stayed at the top of the aquifer?

A. I don't know about staying near the top of the aquifer. I think there would be some vertical mixing over these time scales. It might take some distance of transport downstream for full mixing to occur in the absence of any pumping.

Q. What chloride plumes have you actually investigated? Chloride plumes in groundwater?

A. Anywhere?

Q. Anywhere?

A. Anywhere? One near Caprock, New Mexico, for example, is the first case I worked on.

Q. Okay. What was the source of that contamination?

A. In my view it was an injection well.

Q. Were you an expert witness, was that a lawsuit?

A. Yes.

Q. Okay. And what was the depth of chloride contamination in the aquifer there?

A. The depth?

Q. How -- What was the thickness? What thickness of aquifer had chloride contamination in it, if you know?

A. About 60 -- I would say between 40 and 60 feet.

Q. Do you -- did you do vertical -- how did you determine that the contamination actually went down 60 feet into the saturated section?

A. There were wells, and also in the well there were discrete depth samples collected.

Q. How did you do that?

A. They were taken with a thief sampler.

Q. Can you explain what that is?

A. That's lowering a bailer down the well and tripping the valve --

Q. Oh, in certain valves in the well?

A. -- taking a sample out. Lowering the bailer down --

Q. Okay.

A. -- tripping the valve, collecting a sample.

Q. There would be a certain amount of mixing in the well, would there not, in the wellbore?

A. Well, to some degree. You could be careful and, you know, lower it down slowly. That's the way we do it.

Actually, if I'm not mistaken, I think the State Engineer collected the data.

Q. And did the state engineer conclude that the chloride contamination went down to 50 or 60 feet?

A. Yes.

Q. And again, what was the source of that? Was it an injection well?

A. It was an injection well.

Q. And how deep was the injection well?

A. 10,600 feet.

Q. All right, so it's a different situation than you have with pits, is it not? Where you have a surface source of contamination with a pit and you have source of contamination with an injection well at depth, correct?

A. Well, in a way. I mean, there was also a pit nearby that was -- and there were other pits in the area, I believe, that were impacted based on groundwater monitoring. But a pathway by which the chloride got into the aquifer from the injection well wasn't know.

Q. Okay. So do you -- have you worked on any cases where the source of contamination was a pit or -- chloride contamination, we're talking about, where the source was at the surface, such as a pit, and the chloride infiltrated down into the water table and then contaminated that groundwater? Have you worked on that kind of a site?

A. Yeah, the same case had that. I mean, you could see -- there was an area -- this particular case was really centered on distinguishing between a pit and an injection well --

Q. Okay.

A. -- and they were not far from each other, maybe 1000 feet or so. And so I had to study both locations, and both had chloride at depth. The mixing was full throughout the Ogallala, there's no doubt about it.

Q. Do you know that the source of the chloride at depth was from the pit?

A. In part of the area it was, the pit and the injection well were not collocated, and in my view you could distinguish between the contamination that came from the pit and the contamination that came from the injection well.

Q. So is it your testimony that when you have chloride contamination entering the groundwater table, you will have complete mixing within a 50-foot column of water, almost within a few feet of the pit?

A. Well, I'm just telling you in my experience that we just talked about relative to this pit, that the chloride was found throughout the depth of the aquifer.

Q. How close were -- when you found chloride at depth -- and I don't want to -- If you found chloride at depth, how far was it from the pit source?

A. Probably -- I don't remember exactly. I mean, it's 30 years ago, almost, but --

Q. It was 30 years ago?

A. Almost, maybe twenty- -- maybe 27 years ago. Probably a couple feet --

Q. Can you divide that by .56?

(Laughter)

A. I've got the calculator.

Q. Gimme that.

CHAIRMAN FESMIRE: Actually, it belongs to Mr. Jones.

(Laughter)

Q. (By Mr. Frederick) Now I gotta ask you this one. You assumed a certain dispersivity in the aquifer, right?

A. Yes.

Q. And what kind of matrix was it? What kind of aquifer was that?

A. Sandy loam, I believe, sand.

Q. Consolidated, unconsolidated?

A. Well, at 11 -- I think it was -- conductivity was -- let's see. 11 1/2 feet per day, that's a -- you know, that would be characteristic of a good aquifer, so it could be semi-consolidated. There's not a lot of cement in the pore space.

Q. All right. And the assumptions you make, of course, wouldn't be applicable to, say, a fractured limestone or a basalt with lava tubes in it, would it?

A. If they had a conductivity of 11 feet per day, I mean, that's -- on average, they would be comparable, and you'd have to assume an effective permeability for those materials. But they're different materials, there's no doubt about it.

Q. And the results could be different if you made assumptions based on, say, a fractured limestone, as opposed to a sandy loam?

A. Well, you take the fractured limestone, which probably has a -- maybe a higher hydraulic conductivity than the one we used, or you take the --

Q. Depends where you are in the --

A. -- basalt -- well, I'm just assuming that -- you know, you gave me the hypothetical, and in my experience a fractured limestone would have quite a bit of flow to it, probably more permeable than this. So you're going to get more dilution than the example that we've used here.

Q. Now you testified in general that it's better to disperse waste over a large area, small amounts of waste over a large area, than to concentrate it in one area such as a landfill, correct?

A. Yes.

Q. Now you've heard of WIPP, correct?

A. I have.

Q. And isn't that what's happening with WIPP, you're taking the area -- the wastes from dispersed areas, dispersed areas, and you're concentrating them in one particular area? Is that -- is that a good description of WIPP?

A. Well, in WIPP you're putting it in a geologically secure and unique underground environment that is the reason for centralized waste disposal for the radioactive waste. But that environment doesn't exist everywhere, and I think that's the distinction.

Q. All right. So if -- if the -- your recommen- -- or your opinion that dispersed small amounts of waste is better than large amounts of consolidated waste has some exceptions to it, does it not? WIPP would be an exception of that.

A. I don't understand why you're bringing WIPP into this. I mean, it's just the math and the calculation, that if you have a small area and a small thickness, you'll get concentration number one. If you have a large area and a thick pile, you'll get a concentration well north of one --

Q. All right.

A. -- and that's what I'm saying.

Q. What if the large area is regulated and it has a liner underneath it and there's leak detection and it undergoes regular inspections? Does that change your assumption or your opinion any?

A. Well maybe in the short term, but I think about what's going to happen, now -- I believe we're looking at some of the simulations that were done out thousands of years. So will the landfill be monitored and complied with a thousand years from now? I don't know. I don't know if I'd make that assumption. Will the liner stay intact for a thousand years? I don't know. I think you'd probably have to assume similar failure scenarios to the ones we used.

Q. And the precipitation rate will be 2.5 millimeters per year in a thousand years?

A. I didn't say 2.5 millimeters per year was the precipitation rate.

Q. Or, I'm sorry, the recharge rate?

A. It could be less, if the global warming models are accurate.

Q. Could be more too, couldn't it?

A. Not if the global warming models predict drier conditions.

Q. What do you mean by -- you know, these standards, these SPLP standards, you say those are protective of groundwater. What does that mean, precisely?

A. That means that based on the model assumptions and the data that have been input into the model, that the concentration of chloride in groundwater would not exceed the standards in that well.

Q. In a pumping well that's right next to the pit?

A. Not necessarily a pumping well, but in a well screened across the aquifer.

Q. Okay. How close to the pit is it? It's right next to the pit?

A. We just assumed complete mixing underneath the pit.

Q. Okay, but the well that you're sampling, it's --

A. -- at the edge of the pit.

Q. Right at the edge of the pit, okay. And if you sample that well, and those standards are respected, that you suggest, you won't exceed WQCC standards right at the well?

A. That's what the calculations show.

Q. Okay, so you're not showing any dilution other than that 50-foot column of water right beneath the pit?

A. I'm not sure what you mean. I mean, we have transport in the vadose zone, and there's dispersion happening in the vadose zone, then there's mixing in the aquifer.

Q. Okay.

A. I think that's something important to recognize, is, the mixing in the aquifer is very likely to occur.

Q. Okay, and then the -- but it's -- but what you're saying, though, is you're sampling the well that's right next to the edge of the pit. So the only dilution, it sounds like, is right underneath the pit in the aquifer.

A. Well, if you were to have the well screened across the aquifer, maybe the upper part would be a little higher, the bottom part might be a little bit lower, then the average, you'd get the condition that we've --

Q. Okay.

A. -- assumed, with the full mixing.

Q. And did you say there's going to be dilution in the vadose zone?

A. To some degree.

Q. And you're using a recharge rate, though -- I thought that's the -- that's what you were loading the aquifer up with, is the 2.5 millimeters per year, but I -- is the concentration in the leachate that's coming out of that pit -- it's actually diminishing as it goes through the vadose zone?

A. To some extent, yes.

Q. Okay. What's the factor?

A. I don't know offhand.

Q. Okay. But the load in the aquifer is 2.5 millimeters per year, the recharge rate at end of the vadose zone?

A. Yes.

Q. Okay. And are you going to be providing all the documentation to back up this model that has been run, all the input data and all the output data, to the Commission?

A. If requested, I will.

MR. FREDERICK: I would make a motion that that data be provided to the Commission, because a model shouldn't just be accepted on -- you know, on face value. You need to see all the documentation.

CHAIRMAN FESMIRE: Okay, Dr. Stephens said he'd provide it. Mr. Carr, would you see that that gets done?

MR. CARR: Will do.

Q. (By Mr. Frederick) I just have a couple more. I'm just seeing what hasn't been addressed.

Could you go to page 27 on the slides, model input parameters?

All right. Now, your model assumed 11.5 feet day on the saturated hydraulic conductivity. That's in the aquifer and the vadose zone?

A. Yes.

Q. Okay. It's a little higher than what Blandford found in the Ogallala, but you also state it's well within the range in the San Juan Basin, in the alluvium. That's an incredible range, 3 to 3000 feet per day. Where is that data from? What kind of materials are we talking about there?

A. I believe some of the higher ones must be in the -- be some gravels. I'm not certain, I'd have to look at the Walvoord report.

Q. Okay, and just page 32 of the slides, the recommendations. That standard of 35 milligrams per liter, how is that calculated? 3500 milligrams per liter?

A. How do you mean how it's calculated?

Q. How is that cal- -- how did you arrive at that?

Explain the difference between the table and that number.

A. Oh, I see. Rounding. You know, we ended up with an average -- We looked at the four simulations, we got 3700, and -- you know, so we just made it 3500.

Q. Okay.

A. A little bit lower than the average.

Q. And I don't know if I asked you these questions. Were there actually any -- Were any SPLP tests actually conducted as part of this modeling exercise?

A. I'm not sure I follow you.

Q. Were there any -- did you do any actual -- collect some samples from some wastes and see what the results were?

A. I didn't, no, I didn't.

MR. FREDERICK: Okay. That's all I have.

CHAIRMAN FESMIRE: Mr. Frederick, you've got your thesis under oath on the record, and that's all you want to ask him?

THE WITNESS: Too late.

(Laughter)

CHAIRMAN FESMIRE: At this time, since it is getting late and it looks like it's going to go later, we're going to provide an opportunity for anybody present who wants to, to make a comment on the record, and then we're going to take a break, and then we're going to proceed to the end.

Is there anybody here who would like to make a comment on the record this evening?

MR. BOYD: Yes, I'd like to make a comment on my experience. It's not scientific whatsoever, it's just what's happened.

CHAIRMAN FESMIRE: Well, come forward, Mr. Boyd and make that comment. I think we talked about it prior to lunch, but you understand that you've got two options, you can make a position statement or you can make sworn testimony, and would you have a preference?

MR. BOYD: I can't see any benefit in me making a sworn statement.

CHAIRMAN FESMIRE: Okay.

MR. BOYD: Like I say, it's not science, it's just what I have experienced in my life, living in the oilfield.

CHAIRMAN FESMIRE: Okay.

MR. BOYD: And Commissioners, I appreciate this opportunity to come here, and I appreciate the diligence and the work that you all have put into this. I know I was part of the prior pit work group before you were Director of the OCD. They started a pit group then. So this has been a problem that's been ongoing, and people has been working on it for a long time.

And you know, I've been to meetings, I've listened to some people talking now. Well, this is a pretty big deal. Maybe we need to get the Legislature to make the decision what we need to do. And you know, that would be wonderful if they could make the decision that would protect our water or our environment, you know, and the surface is the environment, and below surface is also environment. And I can't see how they can be any more diligent, any more fair, than you all have been.

You all have invited the industry, you've invited the environmental community, you've invited land-use people, you know, ranchers, farmers and so forth, to participate, and you know the problem.

And I think that the most important thing would be for everybody to say, Hey, we've got a problem. And for you to know that we've got a problem all you have to do is to be out in Lea County. Now I can't speak for the northwest, I've not been there and I don't know.

But you know, it would be wonderful -- Dr. Stephens -- and I was at a presentation one time that Dr. Thomas put on. And these guys have worked and worked and put theirselves through school or have had schooling. You know they've got lots of knowledge.

What would come of it if they had been hired under the directive, Hey, we've got a huge problem out here? You know, it's evident, all you have to do is look at it. How could these guys have helped us then? You know, I'd like to see stuff like that.

We've talked about how this deep burial will take hundreds and hundreds of years to contaminate, if it ever contaminates. My contention on this is, any person sitting in this audience right now would not like to have a pit buried close to them, to their home. I just can't see that they would.

Then we talk about on-site deep burial. I brought to your attention this morning of a telephone call that I've got from a company telling me of the deep contamination that they had experienced, on my property and my neighbors' properties. And this guy -- I'll tell you, in my instrument I had in it that they should remove the contents of the pit and the liner, or preferably use closed-loop systems. Well, they decided it was too expensive to use the closed-loop system.

Well, they told me this morning, they said, Irvin, you were exactly right. This stuff has cost us tremendous. They figured that it would cost them approximately $30,000 to use a closed-loop over the dig-and-haul. And he told me this morning, he said, Irvin, it's cost us at least $40,000 over what we estimated the closed-loop system would have cost us.

And they're proposing to me that they put a barrier over the contaminated soil that's remaining and cover it up and leave it there. And so, you know, $40,000, hasn't cleaned the project up.

Those guys told me -- he said, Irvin, we've got another drilling program coming up next year, and we are most definitely going to look at trying to get rigs for closed-loop systems. He said, This has really opened our eyes.

And you know, from the time that I've grown up -- where my granddad homesteaded and my dad lived and now I live, and hopefully I can pass it on to my children and their children -- it's gone from good drinking water to water that we've got to use reverse-osmosis system.

We have been -- And then I think that's questionable, because one of the guys that -- operators that has a well within 200 yards of my home, told me, he said, Irvin, he said, You know, these scale inhibitors and rust inhibitors and certain carcinogenics, they'll pass through an RO filter before water will. And he said, You may not be protecting yourself with an RO system.

But I think that we all need to work together. I think a closed-loop system would really, really minimize the contamination, especially if it's operated with integrity, it's operated by people that care. And I can say part of the problems with these pits that are leaking is, people work around them that don't care. They don't know that their actions may cause water contamination or soil contamination. And it may not cause water contamination in my lifetime, but what about my children's? You know, we're all concerned about that.

And I've seen guys take and throw T-posts out like a javelin, or they'll throw a pallet out there. And I was visiting with some truck drivers the other day that -- you know, they'll drive these reserve pits and so forth, and they'll come out there and you've got to throw your hose out there and suck the water out. Sometimes those liners will suck up into that hose, and it will rip the liners.

You know, it's very, very hard to keep the integrity of a liner. And it may not be something that we want to do intentionally or anybody wants to do intentionally, it's just stuff that happens. And I would like to see us using the closed-loop systems to try to prevent this.

Another thing that's very important to me is the landowner, because I care about my land. And I like to be notified. I like to be notified of, you know, where we're going to put this well and so forth, which has been addressed by the surface use agreement.

But other aspects, just like these pit cleanups, I hired a guy to represent me, to split samples with them. And evidently whenever they found out that they had deep problems and they were wanting to get it closed up, they quit notifying him if sampling times. So he doesn't have any of the latter samples.

And you know, we need to be notified so we'll know how it's affecting us. And you know, I feel like that's just as important, be it fee land, state land or federal land. You know, the people that are responsible for the surface and the land, they need to be kept apprised of what's going on.

And getting back on the deep burials, I've always said and -- I make my living to support my ranching habit in the pipeline industry. And you know, if the oilfield is not there I don't make a living, I have to change my lifestyle completely. But I've laid pipelines that have been staked right through these places where these contaminants are buried. And when you run your ditching machine through there, up comes the plastics. It don't matter how thick that plastic is, that ditcher gets it.

And I've seen service poles for electricity to these wells, they'll drill it down and they'll set a pole. And people that do this, they have to do it where this stuff is staked. And really, in order to keep the integrity of the containment there, that needs to be fenced and barred from any further substantial use other than grazing, wildlife and so forth, if you can get a cover that can forage.

And so I just can't -- I can't support the deep burial there.

Now if it happened like we all wish it would, then it probably wouldn't be a problem. If these pit liners happened the way Mr. Galloway stated this morning, it wouldn't be a problem, we wouldn't have to worry about it. But every one of us know that it's there, and we need to try to work on it. And I'd like to say that, you know, we need to support the people that are going out there.

I've got several oil companies that they come on me and they drill closed-loop. And they've found out that for them it's more beneficial to do it that way than to try to haul it. And one guy told me, he said, Irvin, hauling the contents of the pit is not that expensive. The expensive part happens whenever we find that that liner has leaked, and then we've got to clean that up.

And you know, it's not just from one source. It was -- to me it was very, very disappointing to hear the news that I did this morning, you know, because that just really causes lots more problems in my life, and I wished it hadn't happened. And I feel like the only thing that they can realistically do is to go ahead and clean it up.

And I don't feel like that -- throw some plastic over it, throw some dirt back over it, that it's cleaned up. Because anytime you disturb the soil and break the soil's natural barriers, then the water is going to follow the paths of least resistance, and it's going to go down to these encapsulations, these containments, and it will hit the plastic, and it -- if there's not any gophers been cutting through there and cut holes in them or any ditch machines or anything, it'll hit that plastic and it'll run off to the side to where the plastic stops and then it'll go down. And then it'll continue to follow the path of least resistance. And unless the soil is just very, very sandy or gravelly, that probably is going to hit the surface that plastic is going to lay on, and it's probably going to work its way underneath that plastic and then right down where the soil has been disturbed.

And you know, I've seen this, I've got another encapsulation at my place, and I've seen a huge wash come at the edge of the encapsulation. And this part just happened to be on my neighbor's across the fence, and it washed a huge hole out with rainwater. And so your encapsulations is useless. It's letting the water flow underneath and go to the place of least resistance.

And you might say, Well, how come you think it washed underneath that liner? Because outside the liner there wasn't a huge hole washed out, it was washed where the excavation had been, not outside where it hadn't been excavated.

And I just -- I just want you all to know that the ranchers, the landowners -- I have people from the industry says, Irvin, why do you let people do this to your place? They say, Man, if it was mine I wouldn't let them do it. Guys, minerals take priority over surface, and we can't do stuff about it.

You know, fuel and stuff that the oil industry produces is just as important to me as anybody else. I use it every day. And I don't want to hurt the industry. I wish that the industry and everybody could come together and work at one goal, and that's preventing future contamination, and let's decide how we can do it and be economically feasible for them.

I made notes and notes and notes, but I don't need to be redundant, I don't need to keep telling you all what's out there, you know. I know that some of you all have seen it, I've seen you out there. And again, I'd like to appreciate you all's efforts.

CHAIRMAN FESMIRE: Thank you, Mr. Boyd.

Okay, we'll --

COMMISSIONER BAILEY: There's another --

CHAIRMAN FESMIRE: Oh, I'm sorry, would you like to speak, sir?

MR. OBERLY: Yes.

CHAIRMAN FESMIRE: Why don't you come forward. As you heard me say, we have two options. You can either make a statement of position or you can make sworn testimony, but if you make sworn testimony you're subject to cross-examination.

MR. OBERLY: I'll -- sworn testimony.

CHAIRMAN FESMIRE: Do you want to be sworn, sir?

MR. OBERLY: Yes.

CHAIRMAN FESMIRE: Okay, please raise your right hand.

JOHN OBERLY,

the witness herein, after having been first duly sworn upon his oath, testified as follows:

DIRECT TESTIMONY

BY MR. OBERLY:

MR. OBERLY: My name is John Oberly, I'm with Applied Plastics. We're a manufacturer of pit liners, and I'm here to discuss the temporary pit liners, the specifications.

I was reading the specifications, I was going over, and there are the 20-mil string-reinforced LLDPE, and I want to bring that up, that that would be a sole-source product, and that is really not used in the industry right now. It hasn't been proven.

Right now, it's all unreinforced 20-mil used out there, and the company who's sticking it in, they're my competition, and they use unreinforced in Texas, Oklahoma, Arkansas, Pennsylvania. And even in their brochures, the unreinforced -- they call it a premium liner, the unreinforced that's used for pit liners.

And all I'm asking for is that we consider changing the spec to a 20-mil liner low spec, and not just string-reinforced. This would add several competitors, and Raven, our competitors on this, does manufacture this. And I think if you ask them, they'll tell you that that's their number-one-selling product in the oil industry today, period.

Let's see, excuse me.

I have some pictures of the 20-mil being used, and the welding procedures. I just want to touch base with the welding.

In here you have just overlap, four to six inches. Doesn't mention what kind of seaming procedures to be used.

Today I heard a -- sewing. When you sew, you put holes in the liner, and you will have holes -- You can have the best liner, but if you poke a hole in the liner you're going to have leaks there.

Some other methods that are used would be tape and glue. Glue and tape are prone to chemical attacks. Some of your hydrocarbons or your benzene will actually attack these and make the liner fall apart.

In the field, there should be a hot-air wedge or fusion weld, like it's made in the factory, and you won't have these problems.

I just notice in the spec, it leaves it wide open. Why have a really good liner if you're not going to do it right.

And in these other states, this is one where they're putting it together. They actually weld them, heat-weld them, on the site. So it can be done, and you have a lot better containment system.

I know he was saying about leaks -- When you do put these needle marks in there, you have leaks, period. It's not used in other states, and it really shouldn't be used here. It's not allowed in Superfund sites, it's not allowed in refineries, you can't do any of this sewing. It all has to be heat-welded.

In fact, also the string-reinforced products are not used in the Superfund sites, in landfills. In landfills it's not used because you can get a wicking through the string, and they would have to capsulate every string that's exposed.

It's not a bad product, it works. They make good products. Their roughcut 22,000-B is a great product.

We have an equal product. There's probably three other manufacturers that have the same products. And what you have is, you have a more competitive base here. And manufacturers too, we do -- we'll go out and our installers -- we'll train them and show them how to weld, so if they're a representative of our product, we don't want them to mess up.

And that's basically what I wanted to say.

CHAIRMAN FESMIRE: Thank you, Mr. Oberly.

THE WITNESS: So I was going to -- One more thing.

So in conclusion, I'm asking that you change the speak to read 20-mil linear weld and to correct the seaming to do some kind of fusion welding system.

CHAIRMAN FESMIRE: Okay. Mr. Oberly, before I submit you for questions from the attorneys, have you contacted our Environment Department and given them the specs that you're talking about?

THE WITNESS: Yes, yes.

CHAIRMAN FESMIRE: Okay. Are there any questions for this witness?

Mr. Brooks?

MR. BROOKS: I think just one, Mr. Chairman. Well, two.

EXAMINATION

BY MR. BROOKS:

Q. Are you aware that the Division has recommended a change to its recommendations during this proceeding to adopt the welding requirements?

A. No.

Q. Okay. The other one was, if I understood right, that your recommendation was 20-mil --

A. -- minimum.

Q. -- but not reinforced?

A. It can be both. I'm not saying -- 20-mil minimum, it can be reinforced or non-reinforced. When you have a reinforced product, that's more of a cover, it has a ripstop in it. And these strings, in some ways it's strong, it won't break in the wind. But these strings can wick. You also have a string in there that has only 10 mils of liner on one side of it, on the 20. And that can be scraped, there's ridges so they can be scraped. It's a product, it will work. Raven makes great products. I'm not here to say anything bad about -- But there's other products. Even in their literature, their non-reinforced, it says right here it provides elongation, tremendous tear-resistance and bursting strength. It's a high-quality liner. I don't know whether that one would work.

Q. In your opinion, is a 20-mil liner preferable to a 12?

A. Yes, the thicker -- you know, you're going to have less -- you're going to have less holes in it.

Another thing is, it's weldable in the field. Right now these 12-mils are being sewn or taped, and -- I can make them in the factory, I can weld them in the factory; but in the field they're sewing and taping, and you're getting a lot of it that's going to have holes in it.

Q. Is a 20-mil less subject to tearing than a 12-mil?

A. Anything thicker is going to be less subject to tear and puncture, yes.

MR. BROOKS: Thank you, that's all I have.

CHAIRMAN FESMIRE: Ms. Foster, do you have any questions?

MS. FOSTER: I do.

EXAMINATION

BY MS. FOSTER:

Q. Have you -- I believe in response to Mr. -- Commissioner Fesmire's question, have you been in contact with the Environment Department here?

A. Yes.

Q. And in fact, did they not ask you to come today and testify?
A. Yes.
Q. And is Raven here in the audience? Are they --
A. No.
Q. -- here in the audience?
A. No.
Q. They're not here today? Okay.
And I believe you stated also that a 20-mil liner is better because it's thicker?
A. Yes.
Q. Does that also mean that it's heavier?
A. Yes, it is.
Q. All right. And comparing a 20-mil liner to a 12-mil liner, which is easier to weld?
A. 20-mil.
Q. Why is that?
A. The thicker the liner -- You're going to have burn-throughs, and when you're running a wedge weld on 12-mil, it's going to -- the burn-throughs are going to be -- you're going to have a lot more holes on your welds in the fields.
In the factory we have a concrete workbench, a controlled environment, and doesn't make a difference to us.

But out in the field, one little rock or one little thing hangs that up, you're going to have a lot more burn-holes in 12-mil.

Q. Okay, and when you're welding in the field are you going to have any issues with dust or wind or anything like that?

A. Oh, yes, of course. In fact, in this one picture here, you see sandbags. That's the wind hitting it. They had to stop.

But the thing is to do it right, and you don't have these leaks that you're talking about.

Q. Okay, and how much longer does it take to weld a liner on location than it does to stitch one?

A. I'd say about 20-percent more time.

Q. Assuming that you don't have a wind incident, correct?

A. Well, even wind incidents in sewing are going to be problems. You can't sew when the liner's blowing all over.

MS. FOSTER: All right, I have no further questions for this witness. Thank you.

CHAIRMAN FESMIRE: Mr. Carr?

MR. CARR: No questions.

CHAIRMAN FESMIRE: Mr. Hiser?

MR. HISER: I don't think so.

CHAIRMAN FESMIRE: Mr. Huffaker, do you have any?

MR. HUFFAKER: No thank you, Mr. Chairman.

CHAIRMAN FESMIRE: Mr. Frederick?

MR. FREDERICK: No questions.

CHAIRMAN FESMIRE: Doctor?

DR. NEEPER: No questions.

CHAIRMAN FESMIRE: Bruce?

MR. BAIZEL: No.

CHAIRMAN FESMIRE: Okay. Commissioner Bailey?

COMMISSIONER BAILEY: No.

CHAIRMAN FESMIRE: Commissioner Olson?

COMMISSIONER OLSON: No questions.

CHAIRMAN FESMIRE: Mr. Oberly, I do have one question.

EXAMINATION

BY CHAIRMAN FESMIRE:

Q. You mentioned that sewing is not used in other states? We were told that it's the way it was done in Texas.

A. It's not, period. These pictures -- this is Cleburne, being welded. This is a liner in Barnett shale. It's not used at all. I can't imagine it -- at least in my areas of Texas, Fort Worth, Barnett shale, it's not used at all.

Now the Permian Basin, down in that area, I'm not into that area, but -- There is no real spec in Texas, but Fort Worth they have the aquafilters and stuff, they require 20- and 30-mil and no sewn material.

Q. So even in Texas they're protecting their water with --

A. Yes.

Q. -- welded-seam 20-mil?

A. Right.

CHAIRMAN FESMIRE: I wasn't aware of that.

Mr. Oberly, thank you very much.

Why don't we go ahead and take a 10-minute break? We'll reconvene at 5:35.

(Thereupon, a recess was taken at 5:24 p.m.)

(The following proceedings had at 5:35 p.m.)

CHAIRMAN FESMIRE: Let the record reflect that we've come back on the record, it is 5:35 p.m. on Friday evening, November 8th --

COMMISSIONER BAILEY: 9th.

CHAIRMAN FESMIRE: -- 9th, 2007. I believe we were in the middle of the cross-examination of Dr. Stephens.

Dr. Neeper, did you have any questions of this witness?

CHAIRMAN FESMIRE: Yes, I do, sir.

CHAIRMAN FESMIRE: Would you approach, please?

DANIEL B. STEPHENS (Resumed),
the witness herein, having been previously duly sworn upon his oath, was examined and testified as follows:

EXAMINATION

BY DR. NEEPER:

Q. Dr. Stephens, I appreciate your patience in answering all of our questions. I have two initial questions that are almost housekeeping items.

Am I correct that the paper you sited by Koerner in 2005 does not appear in your list of references?

A. That appears to be correct.

Q. You have stated that you didn't know if that was a peer-reviewed paper. Do you know if it is an open literature paper?

A. You know, I don't recall. I'd have to check it.

Q. Would you be able to supply to the Commission and all parties a citation to that paper so that they could look at it?

A. Sure.

Q. And would we be able to get that soon, by e-mail, soon, perhaps?

A. Sure.

CHAIRMAN FESMIRE: Mr. Carr --

MR. HISER: I would also note that Dr. Neeper already has that in his task force materials. It's part of what was provided to the task force --

DR. NEEPER: We will understand it's in the task force materials.

CHAIRMAN FESMIRE: Do you still have those materials, Doctor?

DR. NEEPER: I have the materials, I didn't remember to --

MR. HISER: We'll get them as well, just in case you want to look at them sooner --

DR. NEEPER: I thank you, I appreciate that.

CHAIRMAN FESMIRE: Thank you, Mr. Carr, Mr. Hiser.

Doctor, continue.

Q. (By Dr. Neeper) Early in your slides you mention a specification of 100 feet to surface water. I wasn't clear if you were advocating that distance or if you had calculations to support it or where that came from, because I don't believe you discussed it at length.

A. It was just my understanding of a hundred-foot spacing setback to a drainage.

Q. You believe that's what the rule specifies?

A. Yes, my understanding.

Q. Do I understand correctly from your testimony that the thing which overwhelmingly is the control on the recharge is the recirculation or recycling of water back to the atmosphere by the transpiration by the vegetation?

A. That's the major component of the hydrologic budget after precipitation, yes.

Q. And do you have an estimate of, let's say on the average, the depth to the roots of the bushes that seem to be the characteristic vegetation in these very dry environments?

A. I think a lot of the grasses are maybe a foot or two. I think some of the creosote might be three to four feet, somewhere in there, for the most part.

Q. So the bushes might be three or four feet. Would we get an indication of the depth of significant roots by where the peak in the chloride bulge occurs, since the -- presumably the chloride bulge is caused by the withdrawal of the water by the roots?

A. Probably.

Q. So then --

A. You know, in some cases that might be true.

Q. Then at least some significant fraction of those roots would be reaching to the proposed depth of burial of the waste; is that correct?

A. It's possible, depending on the plant.

Q. You have suggested that a good average number for the recharge rate is 2.5 millimeters and that the precipitation on the average might be something like 230 millimeters or 8 inches per year. Would I be correct, the approximate ratio of those two is about 90 to 1?

A. What were your numbers again?

Q. I'm not trying to trick you into numbers. If you have 2.5 millimeters of recharge and 230 millimeters of precipitation, is the precipitation not approximately 90 times the recharge? Roughly two and a half hundred, compared to two and a half.

A. Yeah, they're 90 or 100 times different, yes.

Q. All right. So it is correct -- am I correct in saying that the 90 parts of the water must go up and down in the evapotranspiration process, and only one part of the water makes it through that process to go on down into the ground?

A. On average, if you have one percent of the precipitation becomes recharge, then 99 percent is lost.

Q. So most of it is the part that goes up and down in the upper section?

A. When you say up and down, I'm talking about evapotranspiration --

Q. Yes.

A. -- it may not -- you know, may not go up or down, it's just in the root zone, is the concept I have.

Q. Yes. I thought you had used that term of the water flowing up and down, so I used it.

A. Well --

Q. It comes in as precipitation, it somehow is returned to the atmosphere?

A. Yes.

Q. Is it the case, then, that your model, which operates with recharge as its driver, effectively, leaves out those 90 parts of the water that happens from the precipitation? Does it essentially ignore those 90 parts, or the 99 percent, of the hydrologic cycle, the hydrologic behavior?

A. Not necessarily. It's -- You know, we have the soil cover, and we are modeling the net result of the process by which 99 percent -- I mean, that's what the long term vegetation pattern suggests to us, that, you know, 1 percent or less of the precipitation might become recharge, so that's part of our conceptualization. But we take the net of that and assume that goes below the four-foot cover through the waste.

Q. Yes. But let us say if there were a disease or a fire that damaged that vegetation, then it would no longer be there to reabsorb that moisture. Would not then the moisture be able to reach at least the top of the waste?

A. It would depend on the integrity of the liner materials, in fact, at that point in time.

Q. Yes, but it would reach at least that depth? You could reach that depth?

A. Could reach the top of the liner that forms the cover beneath the soil layer.

Q. And if the liner were no longer present, if at that time it had worn out, whatever that may mean, then any roots that tried to re-establish at that depth would run into some of the concentration of the wastes, particularly chloride?

A. It would depend on the plant, whether -- you know, what kind of plants you had.

Q. But in the meantime, would not this infiltration and return to the atmosphere by evaporation carry chlorides back toward the surface?

A. Well, if it was direct evaporation from the soil, the chlorides would be left behind. With direct evaporation, soil moisture might occur to depths of maybe a foot or so --

Q. Yes.

A. -- something like that.

Q. So then any moisture, if it rained and managed to, let us say, trickle down to four feet or so in depth, as it returned back to the atmosphere for evaporation or back to the top of the soil, it would then be carrying chloride with it?

A. If it was vapor transport, it wouldn't. If the evaporation took place at the one-foot depth --

Q. Then --

A. -- which, you know, I suspect it may well occur --

Q. All right.

A. -- then the salts would be left behind.

Q. So once the vegetation is destroyed on this site, would it not then be very difficult for nature to re-establish vegetation on this site?

A. I don't think that's the experience where we've seen fires in desert areas. I remember some work at -- I believe it was the Hanford site where there was some fires, and the cheatgrass came back pretty quickly, in a year or two, if I'm not mistaken, so that whatever condition was present was suitable to re-establish vegetation after the fire.

Q. Would you characterize Hanford as an arid environment?

A. Yes, semi-arid.

Q. As is New Mexico?

A. Yes.

Q. You have mentioned with your picture of New Mexico State University Ranch that there are intermittent carbonates in the soil there. Would the presence of such things as carbonates, caliche, clay layers in the soil tend to retard moisture so that you would have a different hydrologic behavior? And also, would they possibly tend directly, due to their suction, to suck moisture out of the pit material if the liner failed?

A. Well, the latter part of the question, I can say that there will be some -- If there's a substantial amount of moisture in the pit contents and it's very dry down below or above or surrounding, wherever it is, there will be a potential for moisture to move from moist to dry areas.

As for the -- your other -- the first part of your question about the importance of caliche layers, I'm not sure I quite understand that one.

Q. I should rephrase my question.

If you have -- Your model used a uniform soil all the way down, as I remember?

A. Yes.

Q. So if you had layers of different hydrologic properties, could that in places significantly alter the unsaturated recharge flow, and also is it possible, if the pit material were very moist, that the different hydrologic properties of those materials could laterally or vertically suck moisture out of the pit, giving one an initial pulse of moisture and chlorides out of the pit material?

A. Probably not.

Q. Probably not. Thank you.

Do I understand your model correctly that for flow -- that is, the recharge -- it is nearly a steady-state model for the liquid flow and that the dynamic part is the gradual depletion of the source region of its chloride?

A. Yes.

Q. And did you also state in previous cross-examination that the concentration of the chloride in the downward moving water increases somewhat as it moves towards the aquifer?

A. Yes.

Q. Can you tell us where that chloride goes?

A. It just disperses, it's spreading --

Q. -- horizontally?

A. Yes, to some degree.

Q. Well, if it dispersed vertically, that's where it's going, so if it got -- if it didn't show up in the plume going down, then it must have gone horizontally; is that correct?

A. To some degree. And also the front -- if it's like a -- the vadose zone were very thick and it was able to capture all the mass that was moving down, then you'd see the peak diminish somewhat as the travel time increased --

Q. Yeah.

A. -- because of dispersion on the front and back sides of the slug.

Q. I may have misinterpreted your model, but I understood that the chlorides would be delivered to the groundwater over a long period of time, that this was a long, slow-moving thing, rather than a little instantaneous --

A. Right, it is --

Q. -- one-year pulse --

A. It is.

Q. -- groundwater?

Your slide, I believe number 25, indicates a picture of the -- it indicates a picture of the aquifer and the motion of the aquifer deep underneath the pit and chlorides arriving at the aquifer.

Did you consider what might be the case with that if there were multiple pits, let us say, upgradient of the pit of concern?

A. Not directly, no. We assumed the concentration, say, in the southwest area -- I believe it was 66 milligrams per liter -- that would be the background condition. And whether that has an influence of some other pit, some old chloride, doesn't matter. It's just what it is, 66 milligrams per liter. So that was the background assumption, whatever the source of the chloride.

Q. This is not a question, I recognize, addressed by your model, so I'm looking for your -- just for your professional opinion. If you had a pit, say, about every 40 acres with maybe something like 400 yards between pits, would the cumulative effect be any different than your single-pit model shows?

A. I suppose it would depend on the time and the concentration, whether the plumes actually overlap and commingle. If they don't commingle, then no, there's no additive effect in a uniform flow direction.

Q. But you presumed some speed to a -- water in the aquifer in order to get its chloride content; is that right?

A. Yes.

Q. And what speed was that? An approximation will do.

A. A little over a tenth of a foot per day.

Q. And so if we had something like 400 yards between pits, that would be, in my guess, something like 1200 feet. So by this estimate, am I correct, it would be perhaps 12,000 days for one plume to reach another? In other words, a considerable number of years, but still finite?

A. It would be about 30 years.

Q. Something within a human lifetime?

A. In terms of the linear transport velocity, that's what you would calculate. In terms of a concentration, to what extent there's a measurable additive effect, would probably take longer than that.

Q. Because of dilution in the aquifer; is that right?

A. Yes.

Q. I have a final question with numbers. I know it's been difficult to follow numbers, so if counsel are willing I will try to tell you where the numbers are coming from, because this doesn't relate -- this is not a part of your modeling, it's part of a larger question that concerns all of us who discuss water and chloride motion here.

We have talked about the leachate standard of 3500 milligrams per kilogram, and I'm not sure if you or others said that that's equivalent to about 70,000 milligrams per kilogram on a dry soil sample, the original sample.

MR. BROOKS: Excuse me, did you say 3500 or -- 3500?

DR. NEEPER: 3500 milligrams per kilogram --

MR. BROOKS: Yeah --

DR. NEEPER: -- I'm trying to say -- I'm trying to say the number that is the standard you proposed for an average situation.

MR. FREDERICK: And just as a point of clarification, do you mean kilograms or liters?

DR. NEEPER: Excuse me, you are correct. 3500 milligrams per liter in the leachate. It would be approximately a kilogram of water. Thank you.

MR. HISER: What was the -- I'm sorry, I forgot the question.

(Laughter)

DR. NEEPER: Well, we are moving up on the question.

MR. HISER: So the first thing is the standard of 3500 milligrams per liter --

Q. (By Dr. Neeper) -- is equivalent to about 70,000 milligrams per kilogram on dry soil?

A. Yes.

Q. If then we consider this thing that was -- earlier seemed confusing, and we want to know what was the concentration in the pore water on that soil, it would be acceptable to me if you used something like a 20-percent gravimetric moisture, but would you have a number, or would you like me to speculate a number for the concentration in the pore number that would result?

A. I think maybe it would be about eight times that.

Q. About eight times. Eight times the 70,000 would be about 560,000, then?

A. Yes.

Q. If I were to speculate that the saturation level of sodium chloride is about 200,000 to 220,000 milligrams per liter, then this number is something like twice the saturation level that could be achieved with sodium chloride, and yet this number is significant to us in this proceeding. How can we possibly get that kind of chloride concentration in the wastes we are dealing with? How does this occur? I know it's significant, and at the risk of making a statement, I will say I believe it has been shown by other testimony here that such concentrations might occur in measurement. How can this possibly happen? Are we missing something?

A. It's just mathematical calculation. We end up with 560,000 milligrams at that assumed water content. The water content may be 10 percent, probably is closer to 10 percent than 20 percent --

Q. I would agree.

A. -- and -- or five percent, so --

Q. And in this case --

A. -- initially.

Q. -- in which case, if the water were 10 percent rather than 20 percent, that would again double the concentration of the chloride in the water, would it not?

A. In the pore water.

Q. In the pore water. But if the salt were brought to the pore water by water, by saltwater in the beginning, how can we achieve such concentrations? Are we missing something? Would you suspect we're missing something in this problem?

A. I'm not sure I understand your question.

Q. Is there any consideration we should be making, other than sodium chloride?

A. In what regard? I'm not sure I follow.

Q. If we cannot achieve our observed concentrations with just sodium chloride and water, is there possibly some other chemical or physical effect going on that we have not yet discussed?

A. No, I don't believe so.

Q. So we have an impossible situation, but we're not sure how it got there; is that right?

A. Well, like I say, we don't know the actual water content and, you know, it's the mathematical calculation of what the concentration would be. At these low rates of -- What I'm saying is that at these low rates of natural recharge, that even concentrations that high should be protective.

Q. I understand that. I was just concerned with how we got to concentrations that high.

A. Well, you probably -- in your analysis you wouldn't, so there's be an extra factor of safety built into the process, just by virtue of the solubility if your numbers are correct.

Q. Even if such high concentrations happen to have been measured in some wastes, we would still think this is a numerical --

A. If what concentrations?

Q. Concentrations that could exceed the solubility of sodium chloride.

MR. HISER: Hypothetically, I presume?

Q. (By Dr. Neeper) Hypothetically.

A. So you're saying if there's concentrations that have been observed that exceed the solubility of sodium chloride and water, and there's some other process going on?

Q. I'm asking you, is there another process going on?

A. There may be. There may be, it's possible.

Q. I will ask, then, one final question that my colleagues urge me to ask. We see public interest in what we are doing and the public being concerned with the science. In your experience, have you had opportunity, or do you see confusion in the public and do you see any opportunities to try to explain the science to the public? We have a gap between the scientists and the public that is a challenge to a lot of us here.

A. I'm not sure I can answer the question.

DR. NEEPER: Thank you.

CHAIRMAN FESMIRE: Mr. Baizel, do you have any questions of this witness?

MR. BAIZEL: No, Mr. Chairman, thank you.

CHAIRMAN FESMIRE: Okay. Mr. Carr, Mr. Hiser, do you have some redirect?

MR. HISER: Normally the Commission would ask questions at this time, and I hate to cut them off.

CHAIRMAN FESMIRE: Oh, boy. Yeah. Mr. Huffaker, did you have anything?

MR. HUFFAKER: I have nothing, Mr. Chairman.

CHAIRMAN FESMIRE: Okay, I'm sorry. Commissioner Bailey? I'm sorry, I'm getting tired here.

COMMISSIONER BAILEY: Yes, I do have some questions.

EXAMINATION

BY COMMISSIONER BAILEY:

Q. You have stressed the role of vegetation in the hydrologic regime and the rate of transport and potential subsurface fate of chlorides. For those, is there a threshold amount that is optimum for vegetation cover, in order for your modeling to be correct or effective?

A. Are you referring to the density of the vegetation?

Q. Yes.

A. I think the understanding is that the surface is fully vegetated with whatever species will invade or be established in the cover. It may appear that there's a shrub here and a shrub there and another one over there, but their root systems are fairly efficient. And between the shrubs of, say, creosote, there may be various grasses.

So what I think the assumption is, is that on average there's a uniform distribution of plant roots that have evolved over time to be efficient in capturing the water that goes through the soil wherever it occurs.

Q. And the sooner that there's a uniform distribution of rooting systems in the surface, subsurface, then the slower the rate of transport to the water table?

A. Yes.

Q. Is the type of vegetation important, or is it simply vegetation rooting systems? Are succulents or cacti as efficient as, say, grasses or forbs?

A. They do -- each plant has its own potential to extract moisture, and that potential varies throughout the year. I can't recall specifically offhand what the difference is from one vegetation type to another, but I do know that when you try to compute the characteristic for that vegetation type, it will be a function of that vegetation type. You need to know what type of vegetation is there to figure out exactly how much evapotranspiration is going to occur throughout the year.

Q. So the type of vegetation that is native to that particular site is important in your rate of transport?

A. It can be, although some of the species that can come in, that are not native, might be even more aggressive in extracting moisture than the plants that are native. That can happen as well.

Q. As a hydrologist, if the input parameters into a model are skewed in some way, then logically the output would be skewed that way, correct? Particularly if those input parameters were described as very important to the model?

A. If the model was sensitive to those parameters and you adjusted them up or down, then the output would be effective to some degree up or down.

Q. So if you were given a model where the input parameters -- Let's say the HELP model. If those input parameters were different for a location which may not be in the San Juan Basin, and the precipitation is different, the temperature is different, the plant cover is different, the solar radiation is different, would you expect the results to be skewed?

A. Sure.

Q. Let's look at page 23. Your first bullet point says that you used models to predict soil concentration in pit soil that would be protective of human health and groundwater. I note you don't say human health and environment. Is there a good reason why you left off environment, since that is the catch-phrase that's always used for the OCD's mission?

A. I'm not sure that was intentional. I think the focus for us was on the groundwater, that's what we were looking at. I didn't do, for example, an evaluation of habitat, per se, you know, whether there were burrowing animals or some other environmental related issue. I'm focusing on the groundwater part of the environmental problem. That's what my analysis is about.

Q. But you do recognize that the land surface and the vegetation is part of the environment that needs to be protected also?

A. Yes.

Q. On page 29, these figures are protective of groundwater. But given the chloride sensitivity of this extremely important vegetation, would you expect vegetation to be able to survive and thrive at these chloride levels as they come to the surface, given the chloride bulge of the soils of New Mexico?

A. Well, the chloride bulge probably would stay, you know -- The chloride bulge basically is something which occurs at around three feet and deeper, somewhere in there.

Vegetation probably would be affected by very high salt concentrations if there were no vegetative cover. If that material, the planting medium, was just pit contents at very high salt concentrations, it would be difficult to establish native vegetation, more likely than not.

But I think the concept is, they'd have a four-foot soil cover over the top of the pit contents, so that the net effect would more likely be a downward water movement through, certainly, the upper part of the profile, where most of the plant roots are, in the upper three feet or so. The chloride tends to accumulate, you know, maybe around three feet, and some places deeper.

But I don't envision that the pit contents would be in the planting medium. In plant roots, in these desert environments, we've looked at the chloride concentrations of, you know, 8000 or 9000 milligrams per liter, tens of times the standard for drinking water, anyway, and that's what you see normally in these chloride-enriched soils that are supporting native vegetation.

Q. You were part of the case on landfills in Rule 36, and there was quite a bit of testimony concerning chloride levels in the soils and its impact on plant health and thriftiness.

A. (No response)

COMMISSIONER BAILEY: That's all I have.

CHAIRMAN FESMIRE: Commissioner Olson?

COMMISSIONER OLSON: Yeah, thank you.

EXAMINATION

BY COMMISSIONER OLSON:

Q. Dr. Stephens, I have a couple of questions. And one, I guess, was some points of clarification, too, as to what it means. I was noticing in your model you're assuming that you have -- your conceptual models, you're having a leak after 270 years when the liner fails. What's the significance of a 270-year period in your model?

A. It really isn't, it's not an input to the model, there's really no significance to it at all from a practical standpoint. The modeling basically assumes the liner is not there.

Q. Okay. So essentially we could just assume that something happened right today and --

A. Exactly. The only point about putting in 270 years was to say that there should be ample time for vegetation to establish before the fabric might fail.

Q. Well, I guess, were you here for some of the testimony -- I guess you must have been here, you heard from -- what Irvin Boyd had to say about 12 out of 12 pits recently on his property had already breached, and it seems to me that -- well, I understand the industry is proposing to continue to close pits in place with the existing liner, a little different than what I understand the deep burial process. And I saw you mentioned that here. Maybe you can explain to me -- Maybe I'm picking up something wrong from this. Are you assuming, then, that the pit is actually removed and placed into a lined system, or is it actually just folded in on itself and buried in place?

A. I believe there's a liner -- a cover under the soil, a plastic liner underneath the soil in the deep-burial concept, the deep-trench burial.

Q. So when the pit is -- life is done, in addition -- another, essentially, pit is dug next to it, lined, and then all those contents are removed from that pit into the second --

A. That's my general understanding, yes.

Q. Okay. And so you're assuming, then, that that system itself, not the original liner, is what's going to be lasting 270 years?

A. Yes, sir.

Q. Okay, that helps me understand what you're -- your model a little bit.

And along that same line, I think it was in one of your slides -- you had slide 2-19, I guess, the way I've got it marked from the convention we have -- you have the contents placed into those now, into plastic-lined trench, pit contents. Is that what you're describing here, is what you understand the practice is?

A. Is this the figure you're looking for?

Q. Yes, that's the one.

A. And so what's your question again, please?

Q. Is that what you under- -- is that my understanding of what you're saying the system is going to be placed into this, and that's the current practice?

A. I think to some extent it is the current practice. Maybe not everywhere, but it's the -- I understand, the current practice in some areas and maybe the intended practice or choice and option, going forward, for many. But it's the one we chose to simulate, was a deep trench. We only have 35 feet to the water table in our simulation. That was fairly large. So we took the largest one, closest to the water table, and did the analysis on that one.

Q. Okay, you're saying current practice. That's the current practice since when, do you know?

A. I don't know offhand.

Q. That's not the historic practice, is it?

A. Probably not, throughout time of, you know, oil production in New Mexico.

Q. And I want to see if I understand some difference in your models. You can help me if I get something -- a misimpression of something.

As I understand it, using the models that the OCD had run, they are calculating a flux coming through the liner and then using that to determine what that -- how that flux moves to the groundwater and affects groundwater concentrations. And then the model that you have developed is assuming there is no liner system, you're assuming just waste in contact with the grounds as there is no liner; is that correct?

A. Yes.

Q. Okay. And on your model -- I mean, depicted on slide 2-26, I think your conceptual model, I think Mr. Frederick asked you a little bit about the mixing zones.

Do I understand that correctly that you're assuming that the flux of the contaminants that's coming from the vadose zone into the water table instantaneously mixes across the full 50-foot thickness of the aquifer, as well as across that full area, so that flux is mixing into that total volume of 50 by 200 by 100, or whatever it is?

A. Yes.

Q. Okay. Are you aware of the OCD ever accepting that type of a mixing zone in models that they've accepted for remediation purposes and abatement plans or --

A. I'm not aware one way or another --

Q. -- remediation sites?

A. I'm not aware one way or another what has been accepted by OCD.

Q. I think you're saying, I guess, is, the only way instantaneous mixing would occur is if there was a pumped well that penetrated the full thickness of the aquifer? Is that what you're --

A. That's certainly one way. But in areas where there's groundwater recharge and leakage down, say, from the aquifer down across an aquatard, or if the density is great, you'll get downward migration of the chloride.

Q. And you'll get mixing --

A. Yes, you'll get mixing.

Q. -- from turbulence?

A. With very high -- you know, high salt contents, you'll get density effects and they'll cause mixing.

Q. And I guess when we're doing a contaminant investigation, what's the typical monitor well screen that's installed? What kind of length is usually installed across the aquifer?

A. For a monitor well, typically it would be 20 feet or so, maybe a little less. Ten to 20.

Q. Would you be surprised if I said that the OCD, in its past guidance in sites that they've worked on, has used

10-foot monitor well screening across the --

A. I'm not surprised.

Q. And then I guess when we're doing a contaminant -- when we're looking at groundwater contamination, we are measuring groundwater contamination from a monitor well, say, completed in the top 10 feet by the concentrations that are observed in that interval; is that correct?

A. I'm sorry, can you say that again?

Q. When -- Assuming that the Division has acquired 10-foot screen intervals, if we are sampling groundwater quality from a monitor well that's installed in the top 10 feet of the aquifer, we're sampling groundwater quality in the top 10 feet, then; is that correct?

A. Right, you're sampling groundwater in the top 10 feet, and are you then assuming that the mixing is limited to 10 feet in your question? I'm not sure I'm following, given a 50-foot-thick aquifer and 10-foot-thick monitor well. Are you assuming that there's no mixing below the monitor well?

A. Well, I guess what I'm trying to get at is, aren't we measuring at that point what the contaminant concentration is in the top 10 feet of the aquifer for compliance purposes?

A. Yes.

Q. So wouldn't it seem more appropriate to use a 10-

foot -- a maximum 10-foot mixing zone for determining compliance purposes?

A. You could use 10 feet, I think it's commonly used in monitoring groundwater. If the -- you know, the situation is, you're sampling the top 10 feet, but if it's mixed over 50 feet, then whether you sample the bottom 10 feet or the top 10 feet or the middle 10 feet, it's really the same. You need to see where the plume is going.

And in a lot of situations, depending on where that monitor well is, before a plume -- let's say it's not sinking all the way to the bottom right underneath the source, but it tends to dive slowly. The shallow monitor well may miss the contamination, because the plumes move below it. I've seen that happen as well, so -- Just trying to be precise in answering your question.

Q. Well, I would agree with you. I've yet to see, in all the groundwater investigations I've worked on, the chloride consistent from the top to the bottom of the aquifer, uniform mixing.

So I guess if we took a 10-foot mixing zone, how would that affect your model results?

A. If you only have the 10-foot-thick mixing zone -- if you had a 50-foot-thick aquifer and you didn't allow any mixing to occur, it's like assuming the aquifer is only 10 feet thick.

Q. Uh-huh.

A. Then the results would be -- you know, we'd have a factor of, in our case, five for a difference in the concentrations, approximately.

Q. So then the concentration, I guess, on -- if I took that approach on page 229, then the concentration would be one-fifth of that -- of 1240?

A. In that analysis, yes.

Q. And then the subsequent portions go with mixing?

A. Right.

Q. And then sticking with the modeling, I guess I would go to page 2-14. That's your estimated annual recharge rates.

I guess as I understand it, you're saying you testified you used 2.5 millimeters per year as your input for the model?

A. Yes.

Q. But we have quite a range, I think, as I heard in some of the other cross-examination, even under Dr. Phillips's work and Theis and McAda as well, for ranges anywhere -- also up as high as almost 17 millimeters per year from this; is that correct?

A. That's what the numbers say. I tried to clarify what -- in the case you mentioned with Theis's work that these were regional over the Ogallala, and on the Ogallala caprock there would be places that would have presumably drainage channels that you would avoid. And when you look at the recharge directly underneath the drainage channel, it would probably be greater than those numbers. And in between the drainage channels it would be less than those numbers. And I think in between the drainage channels you'd find a few millimeters per year, and in the drainage channels you may find several tens of millimeters per year. But on average you'd get three to 16. But that would include the areas of somewhat local depressions or the channels that you're trying to avoid at that scale.

Q. Well, I guess in southeastern New Mexico there's a lot of lower depressions, et cetera, that are not any type of named systems that are not actual watercourses, are they? Some are just an area where it's a little lower than others, and things drain a little bit towards that area?

A. Yeah, you really need to define carefully what you mean by watercourse. But if water is flowing towards something, you can see, obviously, I think that would be a place to avoid.

Q. But that's not always -- Have you observed that as the practice in industry?

A. You know, I really can't say one way or another. I haven't made that judgment.

Q. Well, along that same line, isn't it typical, instead of using averages when you're looking at modeling purposes and trying to predict the worst-case scenarios, if you want to -- you usually try to -- if we protect towards the worst-case scenario, then we protect towards all other scenarios; isn't that correct?

A. Yes, you could choose -- There are more extreme cases. We tried to be realistic, we tried to be consistent with data. Once you start to just pick all the high numbers or all the -- if you had high recharge rates, then you had very low flow in the aquifer and you assumed all the -- the aquifer is only four inches thick and it didn't flow at all and you had, you know, lots of recharge coming into this four-inch-thick aquifer, yeah, you'd have -- you couldn't put hardly any chloride in the pit.

So there's extremes, you just have to see what's reasonable. And I think that's the approach we took.

Q. Well, I guess as you're going toward an average, that means some cases, if you're using an average, some cases will cause contamination and some won't; isn't that correct? If you have other extremes in that -- in those scenarios? You're not calculating a range, you're calculating the average?

A. Well, yeah, I think that's true. I mean, you're trying to protect the -- with 100-percent assurance that -- you know, you'd have to take such unrealistic assumptions.

I'm just not sure it's practical to do that. You can change from four-inch-thick aquifer, you could change it to a one-inch-thick aquifer. You could have, instead of a groundwater flow and permeability and gradient, you could have zero flow and just have a pool of stagnant water. But that's not the way it is in nature.

I don't know, you can always -- you could take these numbers and argue, well, maybe somebody should double it or triple it, in case it rains more in the same cloud, in the same place on the watershed year after year after year. You know, I don't know how you can anticipate all those extreme conditions.

But the numbers that we're using here, like 2.5 millimeters per year, in some cases those are averages that represent the accumulations of recharge rates averaged over thousands of years.

Q. I think you said that was correct for the San Juan Basin in Stone's reference, but I don't believe that was -- Was that what you were saying was the results of what was going with the work on the Ogallala?

A. Well, in west Texas, I think, if you look at the -- say, the work of -- some of the work in the west Texas areas, I think there are some places where they've anticipated that the water is moving upward, in some of the work done by the Texas Bureau of Economic Geology.

But you know, it varies site to site. How do you get a regulation that will cover every single site? I'm not sure exactly how you'd go about that.

So the approach we're taking is to see what's reasonable and representative, reasonably consistent with findings that researchers have made to obtain input parameters for the model and predict what may happen in the future.

Q. And the model is highly sensitive to recharge rate, isn't it?

A. It's sensitive to recharge rate, it is, yes.

Q. And it seems that from a number of these, we look at a high range of, you know, not -- considering Theis, because that seems to be -- there's -- what actually is going on with that number, but the rest of them seem to run anywhere from, like I said, 9.6 to 7, so you're pretty consistent on the high range.

A. Right, you could -- you know, you could say that it -- let's use the highest recharge rate, and you could use higher hydraulic conductivities or steeper gradients or thicker aquifers, allow the, you know, mixing to occur at a greater depth. How do you balance it all out? At what point do you say, We're going to look at the reasonable scenarios?

Otherwise, you end up modeling on a site-specific basis. Then you require field investigations for every pit closure to get pit permeability and gradient and concentrations and, you know, it's a field investigation to evaluate each site on its own.

Q. Well, I guess I was just thinking, that's what I'm used to in modeling, looking at the worst-case scenario. Everything after that is -- should be okay, if you know, at least, what your worst-case scenario is, and I don't think you've presented that to us here. You've presented an average. If we have some worst-case scenarios with higher rates from this -- Are you aware that the Water Quality Control Commission regulations don't allow for groundwater contamination, period? Not just the average of cases, they don't -- it's not to occur.

A. My understanding of the WQCC regs on groundwater is that it was the standard that wouldn't be exceeded, as opposed to a non-degradation policy.

Q. That's correct. But you are not allowed to cause groundwater contamination at any site; is that correct?

A. In excess of the standards; is that --

Q. In excess of the chlorides -- in this case, of the chloride standard of 250.

A. Correct, that's kind of the approach we've taken here.

Q. And you're not -- it doesn't say that you'll only protect -- the average of your sites doesn't exceed the standards, as any site; isn't that correct? Doesn't allow contamination above the standard; is that correct?

A. I'm not tracking your question.

Q. I guess I'm getting at the idea that you're using the averages and not using worst-case scenarios. And worst-case scenarios, if they can cause groundwater contamination, is still not allowed. If you're using average -- if you're using a lot of the average values -- I would just appreciate just seeing some of the ranges of some of these things. Average is fine, but I'd like to see as well what the effects -- and it comes back to the sensitivity analysis, then, I think that Mr. Frederick was bringing up, as what's your minimum, maximums, and what's your average, so we can get a better idea of the level of the confidence of the model and its protection of our groundwater quality.

A. Generally, you increase -- double the recharge rates will increase the concentration by a proportional amount. You can see that on the work that was done by the OCD. And the same is true in looking at our approach in, you know, using recharge. You increase the recharge ratio, increase concentrations. You change one parameter -- if you increase the hydraulic conductivity from 11.5 to 100, roughly half -- or ten -- make a tenfold reduction in the concentration that's allowed.

So you know, at what point do you say, This is a reasonable scenario, but it could be this, it could be that, it could be anything in between? We're not looking at it in a probabilistic fashion. If we took all the extremes -- I just don't know what would be the -- a reasonable extreme case to take.

I mean, even OCD has taken -- made some assumptions. I don't think they've taken an extreme view of this either. They've looked at hydraulic conductivities and looked up textbook values. Dr. Neeper has done the same thing in his analysis. That's what reasonable people do.

Q. Well, I guess I'm just trying to get some idea of what some of our worst-case scenarios are with these, instead of just the average.

A. Well, if you're asking me what the maximum recharge rates that have been measured, there they are. They're up on the -- you know, so you're looking at maybe a factor of five or so, maybe a few more millimeters per year of recharge than what we've assumed. You can use 10 millimeters. It just depends on the actual site. But you want to use the place, you know, that has the most rainfall, any site ever measured, without vegetation, those numbers will be higher than this. It just depends on what you want to assume. And we've assumed that in the long term the recharge rate is going to be 2.5 millimeters per year. That's consistent with the environmental chloride data historically.

Would it be reasonable for us to assume that the long-term recharge rate, that all the chloride mass balance work and all the other work here was invalid, that we should have used ten times more? That's more than times-fold -- as what the OCD has used as their recharge rate through the unlined pit. They have like 33 millimeters per year. That's more than twice what any maximum number is up here. Is that the extreme case you want to use? If so, then their standard of 5000 milligrams per liter, SPLC [*sic*] is even higher than our.

Q. Well, I guess you just brought up a very good point which is confusing me, because I think this is the first time I can recall that industry has ever come in and asked for a more stringent standard than what OCD proposed, and I was maybe a little curious as to why the industry wasn't satisfied with the 5000 milligrams per liter SPLP.

A. I don't know if they're not satisfied with it, I just -- the way we did the analysis -- I showed you the table.

Q. Uh-huh.

A. We did just did the analysis, and that's what it came out to be. Among those numbers is 5000, you know. It just depends on how you mix things. But --

Q. So then it's your testimony, based on your modeling, that for deep-trench burial of drilling pit wastes we should use 3500 milligram per liter chloride by the SPLP method?

A. Based on the assumptions that we've used in the modeling and the modeling results, that's what we calculate, yes.

Q. Okay. And has the industry done any sampling of either the soil profiles or groundwater to confirm any modeling results, or done any kind of field verification of the modeling?

A. I'm not sure how we would go about doing that with, you know, our assumption of the liner being intact, or maybe we'd have to find a site where the liner was -- had its contents dried out and failed in the manner in which we're talking about and was subject to 2.5 millimeters per year.

Probably some of these other scenarios didn't have enough time for the vegetation to re-establish, or -- I'm not sure what all the cases were that have been brought before -- to your attention.

Q. But I guess -- I thought the assumption of your model was -- is that in order to do the modeling, the exercise itself, that the time that the liner is in place is really irrelevant, because what you just modeled was essentially an unlined system. So I would think that we've got a lot of former pits out there that have been in place or just bulldozed and ripped and would meet that criteria throughout southeastern New Mexico, that could easily be studied.

A. That may be. I just haven't done any sampling myself. But you'd have to assume that, you know, you had -- the pit contents were mixed with clean soil and they were dried out and then covered with the plastic, and -- in the same way we've looked at, you know, modeling here. But there may be some good analog sites to sample.

Q. Well, I guess a site being buried and covered really doesn't have any bearing on the model results.

A. On the model results, to look at a site which has no --

Q. I'll admit, you know, I'm -- you know, always bee skeptical of models, because I think the same -- similar thing that counsel Brooks brought up, you know, you can vary the parameters in models and things change. But what's important is the, you know, verification of the results of those. And I know the Division is always strapped for resources, and I thought the industry might -- I know this is an issue of big importance to them, and I would think that they would try to get some information to verify their modeling. That hasn't been done, to your knowledge?

A. Not to my knowledge. They may have done it, I -- There was some sampling done, but I'm not sure whether and how it was, you know, relevant to these model results or not. I just don't know what they sampled, whether it was an active -- or saltwater disposal pit, a mud pit. I just don't -- I can't -- I just don't have that information.

Q. Well, I think we had testimony before, there's been about a thousand pits a year, so there should be plenty of them out there look at over time. But I'll let that -- let that go, because I was just curious as to whether there's going to be any information presented to us by -- and I guess maybe that's not your question to answer, because -- if you don't know, so...

On another issue you brought up the idea of having all these more diffuse sites, all these buried sites, spread around, versus picking materials up and taking them to a centralized site, and you seemed to think that was preferable; is that correct?

A. From the standpoint of concentrations and impacts to groundwater, you would get a smaller concentration beneath a small source than you would from leachate generated from a large source that was quite thick. The thicker the source, the longer the impact will persist. The smaller the source, the lower the concentration in groundwater. And just looking at, you know, the modeling and how the transport works, those are the facts.

Q. If we have a thousand pits per year, do you think over a period of time -- that's, you know, 10,000 pits in 10 years -- that that is preferable to trying to control things at just several sites that have stricter standards?

A. You know, I'm not sure -- All I've looked at was the impacts to groundwater at a point underneath a small pit as opposed to underneath a large landfill. And the large landfill would have higher concentrations in groundwater than would the small pit. That's my point in bringing that issue up.

Q. Well, I guess I'd just like to clarify then, that you understand that those landfill systems also have multiple liners, leachate collection systems and other types of protective measures installed than we do at the proposed deep-burial sites?

A. They don, and I think in the short term, you know, they're likely to be effective. When we look out, you know, a thousand or so years, some of these calculations are run out, then I don't know how -- what kind of assumption you could make on the leachate collection system's effectiveness and how well the liners will behave.

Q. But there is a higher level of environmental protection placed on those facilities than there is on the deep-trench burial sites; is that correct?

A. In terms of monitoring in the short term and the leachate collection system, for example, yes.

Q. And in terms of construction, operation, monitoring, et cetera?

A. Yes.

Q. Okay. That might be about it, let me just take a look here. Yeah, I think that's it. Thank you.

A. You're welcome.

CHAIRMAN FESMIRE: Doctor, I'll be much quicker, I think.

EXAMINATION

BY CHAIRMAN FESMIRE:

Q. I need to compare two pictures, 2-6 and 2-21, if I could.

Now one of the things that you presumed in 2-21 is, when that pit is closed it will be backfilled and compacted. What did you mean by compacted?

A. That there would be some tamping of the soil or compression.

Q. More than just run over by equipment?

A. I don't have a specification on the type of equipment, but there would be some equipment, presumably, to firm up the soil.

Q. Okay. But if that berm is pushed in -- and let's say for the time being, for this hypothetical, that the liner is cut off and thrown in and the berm is pushed in and it's run over a couple of times with the Cat, you're going to have a plane of preferential flow along what was the edge of that pit, aren't you? You're going to have a coning effect, I guess, is what I'm saying, if it's not properly compacted?

A. I'm not quite seeing what you're talking about, the coning effect?

Q. The coning effect. You're going to -- along what was the berm, you're going to have a preferential flow path for any precipitation that falls on that pit location after it's been pushed in, aren't you?

A. I'm not sure I see why.

Q. What was a berm, it's just a pushed in, it's not compacted, there's no engineering work other than just pushing it in and driving a piece of equipment over it.

A. You compact it to some degree, but you need to establish the vegetation as well.

Q. Okay, I'll get to that in a minute. But right now I'm saying that that berm is pushed in, and it's -- and the only compaction that's done is, the Cat's run over it a couple of times to get it flat.

A. Okay.

Q. You're going to have a tendency for that slope to gather -- or -- well, the remnants of that slope to gather whatever precipitation falls in that location, are you not?

A. I believe it's folded -- I believe it's folded in on --

Q. In this hypothetical it's just cut off and thrown in and pushed in.

A. Oh, you're cutting off the plastic and putting the bermed material inside there?

Q. And just pushing the berm in.

A. And then rain falls and it's -- You're assuming it slides along the plastic?

Q. Right, the plastic or the remnants of the slope, the subsurface remnants of the slope.

A. That may happen, yeah.

Q. Okay, and so that's going to, in essence, significantly increase the infiltration rate, wouldn't it, if you're concentrating the precipitation like that?

A. Well, it would be -- it would be not an optimal design to collect water and move it into the pit contents, but you're assuming, I guess, that it's not covered with the plastic.

Q. Okay, but if it's just pulled back, though --

A. Your question is an uncovered --

Q. Right --

A. -- scenario?

Q. -- we're assuming for this hypothetical it's just cut off and thrown in the pit and pushed in.

A. Then there would be a tendency for moisture to collect in the bottom of the lined --

Q. Okay. Now I think I understood your modeling enough to know that that would increase your infiltration rate, wouldn't it?

A. Well, it would increase the moisture in the pit, at the bottom of the pit. So you have a little bit of a -- you might have a little bit of a concentration effect, so that you have this water going through a smaller area at the bottom.

Q. And the point I'm trying to make is that that's not properly compacted when it's closed, and that wasn't the procedure for many, many years in the oilfield, there's going to be a tendency to, at least to a certain extent, increase the influx rate on your models, wouldn't it?

A. Well, yes, I think locally that's probably true, the assumption, if the liner fails at the bottom.

Q. Okay. Now if I understand your statements -- and it's getting late and I may not, so I'm going to apologize in advance -- but in example 2-18, you talk about a 12-mil liner, right?

A. Yes.

Q. 2-19, you talk about a 12-mil liner. 2-20 you talk about a 12-mil liner -- I think -- yes. And then on 2-21 your diagram shows a 12-mil liner.

But if I understood your modeling right, the only real benefit from a liner is to allow the vegetation to get established; is that correct?

A. In our analysis, the liner is really not impeding water at all, it's --

Q. So why would you recommend any liner?

A. Well, it was just a design to show what is actually present and -- you know, that's essentially what we understood to be the operation. And then from that understanding we simplified the modeling to be more -- I guess there was -- in a way, more worst-case by taking the liner out.

Q. Okay. So in essence, if we were to accept your modeling, you're recommending no liner; is that correct?

A. Well, the flux rate would be -- you know, the 2.5 millimeters per year would be the same through a poor liner as through an unlined structure, an unlined pit.

Q. So in your drawings you're just showing it because that's the way you thought it was, you're not recommending the liner because in essence your modeling shows that the liner has no effect?

A. Well, I think we're -- if we had included a liner and -- it would probably -- maybe we would even get slower infiltration than what we did. But I think our 2 millimeters per year is very -- you know, it's a reasonable recharge rate. I can't say whether the liner would --

Q. But the question is, it's not liner-dependent, right? It's independent of whether there's a liner there or not?

A. In the mathematics that we did, that's correct.

Q. Okay. Now Doctor, in some prior testimony we had 10 examples in the southeast of groundwater contamination caused almost instantaneously in hydrogeologic terms from leaking pit liners, drilling-pit liners. I guess you weren't here to hear that testimony, were you?

A. No.

Q. Like I said, these all occurred in the southeast, the liners were pulled up, we chased down the contamination, and we found 10 cases of groundwater contamination from liners in the last year and a half.

Given, you know, some of the assumptions that you've made, what would have had to have happened for that to occur?

A. The liners would -- the contents of the liners would have had to have been under some head of water, the liner would have lost its integrity, and the soils would have had to have been permeable --

Q. Okay, well --

A. -- and probably no -- well, to a lesser extent vegetation probably didn't really establish itself in a short time, but those -- you'd probably need some kind of head of water.

Q. Okay. Now these were temporary pits, these were drilling and workover pits, and you said the liner would have to have lost its integrity. But in your modeling the liner didn't make any difference, so why would that be a factor in these cases?

A. In these cases what I don't now -- and I don't know if anybody does -- is what kind of head of water there was in the liner at the time of failure. If there was a pool of water soaked to the bottom, then that head would have -- of water would have caused downward migration much more rapidly than what would have otherwise occurred. If it was allowed to dry out, if the contents were allowed to dry out before they were covered -- that's a big factor.

Q. Okay. But these were drilling and workover pits, and presumably they weren't in violation of our requirements that they be de-watered within a reasonable period of time.

But I guess what I'm asking is -- Mr. Hiser?

MR. HISER: Commissioner Fesmire, since he wasn't here and hence didn't hear of the 10 pits, perhaps it would be helpful if you would tell him if they were in operation or if they were exposed, because that may make a difference in his analysis.

Q. (By Chairman Fesmire) Okay. The contamination was found in the process of closing the pits in the southeast part of the state.

So I guess what I'm saying is, I ask you why -- what's the difference? And you tell me the liner failed. But in your modeling the liner has no effect, so I guess I'm seeing an incongruity there.

A. No, in the -- I think the disconnect is probably that in the field situation there was a head of water, and -- as opposed to moisture.

Q. Okay, and I think I just saw the difference. In your modeling you had no head of water on those pits at any time, right?

A. We had a saturation percentage, which we assumed was 100-percent saturated, and that created a mass, certain mass, because we had the 1000 milligrams per kilogram, so we knew what the total mass was, so we could deplete that over time as the flux was going out the bottom.

Q. Okay, so you're telling me -- I think I see the difference here. I'm talking about during the operational life of that drilling and workover pit, and you're talking about -- your modeling just incorporates after that pit has been drained and in the process of closing it?

A. Yes, our modeling is more consistent, I think, with the situation where there's no head of water acting on the bottom of the pond liner.

Q. Okay. So the -- I'm going to use very poor English here -- the relative benignness of drilling and workover pits depends on getting the fluid out of them and maintaining the integrity of the liner until after that fluid is removed, correct?

A. That's an important part of minimizing impacts, yes.

Q. Okay. Doctor, in your modeling -- and I'm going to have to read the transcript to figure out the argument that Dr. Neeper made, but in your modeling, to get to the 250-milligrams-per-liter standard and then back that up to the 3500 milligrams-per-liter -- milligrams-per-kilogram, I'm not quite sure on that yet -- did you assume a background concentration for the groundwater --

A. Yes.

Q. -- of chlorides? What was that?

A. 66 milligrams per liter.

Q. How did you arrive at that?

A. I believe it was an average that came out of some

USGS work, if I'm not mistaken.

Q. Now you said that you had some experience with pit liners. In fact, that's the quote I wrote down, experience with pit liners equals some. Could you elaborate a little bit on that?

A. Well, I'd seen in the process of -- you know, when I was in the oil patch looking at this groundwater contamination case I described, I had seen a saltwater-disposal-pit liner, and I recall visiting another site where there was a mud pit and seeing the plastic liner and the desiccated, you know, drilling muds in the pit. I've been to uranium-mill tailings ponds, which are like pits.

Q. Okay. Now you told us that the time to failure on these liners, according to the material that you've been exposed to, was about 270 years, perhaps. And then you followed that with 270 or 100, not that critically important. Why would have reason to doubt that 270 and then reduce it to 100? It seemed to me that you didn't have a lot of faith in that number?

A. No, I didn't mean to imply that. It was only -- 270 came out of the publication. But to me, had they said it was 100, or 370, it wouldn't have mattered. It was a long enough time that vegetation would establish itself, so in the long term -- at the time of failure, vegetation would be inhabiting the soil cover and limiting the rate of percolation through the waste. And that was an important assumption for us. Otherwise we would have, you know, had to approach the problem a little differently.

Q. Okay. So the 270 years, according to the information that you've presented, is -- could we call that a design life or an expected life on the liner?

A. It would be my understanding that's what it would be, yeah.

Q. Okay, and is that dependent on the mil thickness or anything like that?

A. It probably would. I don't recall exactly what the thickness was on that one.

CHAIRMAN FESMIRE: Doctor, I don't have any more questions right now. I don't have any more questions.

Mr. Carr, do you have a redirect of this witness?

MR. CARR: I do not, Mr. is going to do redirect.

CHAIRMAN FESMIRE: Tag-teaming you, Doctor.

MR. CARR: Yes, sir.

MR. HISER: Alas, yes. With my apologies to the Commission, I do have -- in fact, have a few redirect questions. And I will try to -- as I go through them, I will try to knock off ones that have been adequately covered in the subsequent discussions, of which there have been a number.

So if you'll give me a minute or two, I'll look at the question and decide whether I need to answer it -- ask it. I hope that's okay with the Chair.

CHAIRMAN FESMIRE: Do we have a choice?

MR. HISER: Well, you can kind of just tell me to go through them all.

CHAIRMAN FESMIRE: I don't think we'll do that.

REDIRECT EXAMINATION

BY MR. HISER:

Q. Okay now, Dr. Stephens, we've heard a lot about how water moves and how contaminants move, and in general is it true that contaminants move with water, like chloride, for example?

A. Yes.

Q. And can a contaminant like chloride move upward with the water? If water is in its --

A. In a liquid phase, it can.

Q. -- in its liquid phase.

Now, water can also move in a vapor phase; is that true?

A. Yes.

Q. And when the water is moving in its vapor phase, would it take the chloride with it?

A. No.

Q. And if you're looking at water in the upper part of the soil, so the upper three feet or four feet of the soil, what is the relative significance of the liquid phase to the vapor phase?

A. Probably in coarser soils the vapor phase transport is more important.

Q. Okay, but in a finer soil you might see some more liquid movement.

A. Yes.

Q. Would that be saturated or unsaturated movement, generally?

A. Unsaturated.

Q. Now there's been some question whether in your model -- whether we modeled it with 50 foot between the ground surface and the groundwater or 50 foot between the bottom of the pit and the groundwater, and so it may have been 35 foot. If, in fact, you modeled at 35 and the Division did it at 50, what would be the impact on your results if we moved it up to 50 foot from the groundwater to the bottom of the pit?

A. I'm sorry, can you repeat that, please?

Q. I'm sorry, that's confusing.

If -- Let's say that you had modeled this with a distance of 35 feet from the bottom of the pit to the top of the groundwater, and we now back that distance up to 50 foot. What would be the effect on the concentrations that you'd observe?

A. Not much.
Q. Not much.
There's been some discussion about the data that Mr. Hansen put into the HELP model, and just for the record, do you agree with all the assumptions that are in that HELP model?
A. I haven't looked at it in detail, but I can see from the results that something's awry.
Q. Okay. Now is a direct observation of the recharge value likely to be more accurate or reliable, in your opinion, than one that's derived from a model? For example, the Division used the derivation from the HELP model, and you went to a number of scientific sources to derive your recharge rate.
A. Well, you know, I've used the HELP model in simulating infiltration at landfills, and you can find very low numbers that are entirely consistent with the assumption that I've used here, based on the chloride mass balance and other tracer techniques. So modeling can be -- including the HELP model, can be reasonable. It just depends on what kind of input you have to the model.
Q. Okay. Now one of the comments that you had made is that you thought there might have been too much water flux in the HELP model that Mr. Hansen presented. Why would that be of concern to you, if there's too much water

flux?

A. That would lead to higher impacts to groundwater than what might otherwise occur.

Q. And that's because the water flux is what's carrying the contaminant?

A. Yes.

Q. Based on your experience, how far can water move up in its liquid form, not in vapor transfer, in the soil column?

A. Oh, I would say liquid transport upward from a water table may occur, depending on the soil of course, maybe on the order of a few feet to several feet, in finer soils a little more.

Q. Okay, but we're not talking 20 foot or 15 foot in your --

A. No.

Q. -- observations and professional experience?

A. No, not in my experience, probably not.

Q. Now there's been a number of discussions about cumulative impact. Do you recall those? I think there were some questions from Mr. Brooks, and I know that there's been some questions from the Commissioners on it.

A. Yes.

Q. And those questions have gone to the idea that there might be a number that -- I think Commissioner

Olson's thousands, if that's a correct attribution, of these little pits, and there would be a smaller number of landfills. Is that your understanding?

A. Yes.

Q. And when we're looking at these smaller pits, is it your understanding that they are all grouped closely on the landscape, or are they going to be dispersed?

A. My understanding is, they would be scattered.

Q. And as a result, as water were to flow through that, what would be the effect of having small, scattered sources as you were to move downwards in the regional water table?

A. It would depend on where you were, whether you were immediately downgradient from a pit or if you were in between pits.

Q. But would there not be some addition of water that hadn't gone through pits coming through the areas between where those little pits were located?

A. Yes.

Q. And would that tend to, over time, reduce the concentrations that would be observed in the aquifer itself?

A. Well, yes, it would be part of the mixing, the dispersion that goes on.

Q. Now, there were a number of questions about whether you had personally evaluated pits and pit contents or seen liners or things like that, and that seemed to be questions about whether you were personally familiar with these. Based on your expert experience, is it necessary for you to have personally observed all the activities in order to understand what the processes involve?

A. No, I don't believe so.

Q. So you're comfortable --

A. You know, and I think I have seen enough that helped me understand this.

Q. Now in the 3500-milligrams-per-liter value that you recommended in support of the industry committee's position, was that just a median value or a mean value, or was that a value that also had some elements of conservatism built into it, both in terms of the modeling and in terms of some professional judgment that was exercised?

A. I think all of that was involved, professional judgment.

Q. Okay. And could you maybe give us an example or two of some of that professional judgment that you utilized?

A. I think professional judgment was the -- you know, the long-term recharge rate, the establishment of vegetation. We didn't use the highest hydraulic conductivity of the aquifer, we could have used higher permeabilities, steeper gradients. We assumed that the liner failed instantaneously, as opposed to dribbled out over -- you know, drop, drop, drop, over time.

Q. Okay. Now there's been some concern about local concave areas -- I think Mr. Frederick called it concavity -- and that we might locate pits in areas where there might be -- I think they used the term preferential or accelerated recharge.

Doesn't the provisions of the rule require that the pits when they're closed be developed in a way to avoid ponding as part of the design standards?

A. I believe that would be the intent of the regulation, yes.

Q. And would that address some of those concerns?

A. It should.

Q. And then there's been some questions that I think Commissioner Olson had raised about comparing the relative benefits of protectivity of a landfill which has certain additional measures such as leak detection and monitoring, as opposed to a pit.

What's your understanding of the normal post-closure care period of a -- of a landfill?

A. I'm not sure I have that understanding of how long post-closure care period is.

Q. And then perhaps for just some clarification for -- There was a discussion with Commissioner Olson about the impacts of how we monitor the aquifer, and we had a discussion of where the monitor well is in the aquifer. And am I correct in understanding that your opinion was that if I have an aquifer which was, say, 50 foot or 40 foot in depth, and I have a monitor well that only goes 10 feet into it, that you would still need to consider the relative impact on the rest of that aquifer in determining what the concentration is that you'd expect to see in the monitor well?

A. Yes.

Q. And so if we were to say that we would only look at the top 10 feet, your position as a person who does a lot of modeling and an expert in this field is that you would still need to consider the rest of the depth of the aquifer to the extent it was relevant to seeing what concentration would be in that range?

A. Right, if you have a 50-foot-thick aquifer and you have a well screened across the top 10 feet, you'd want to know what the -- it seems to me, the concentration at the bottom of the aquifer would be as well. So a well screened across the aquifer might make some sense, to get the average.

Q. Now do you recall Commissioner Olson saying that

OCD used a 10-foot monitoring well and hence mixing zone?

A. Yes.

Q. And can you tell me what was the mixing zone that was used in the HELP model presented by the Division?

A. I believe that was four inches.

Q. And so four inches is considerably less than even 10 foot?

A. That's my understanding, yes.

CHAIRMAN FESMIRE: To that leading question you're not going to object?

(Laughter)

MR. HISER: That was a leading question, and I apologize to the Commission.

Q. (By Mr. Hiser) Now, Commissioner Fesmire had given you a hypothetical involving the liner being cut off and just -- the berm just being sort of pushed in and then -- I think he described it as run over one or two times with a bulldozer. Is that your understanding of the actual closure methodology that's being proposed by industry in this rule?

A. That's not my understanding.

Q. And would the closure methodology that the industry has recommended in this rule, and to some extent what the staff is recommending as well, address some of the concerns raised by Commissioner in his hypothetical?

A. I believe so.

MR. HISER: I believe that concludes my questions.

CHAIRMAN FESMIRE: Okay. Are there any recross questions, strictly limited to the subject of the redirect examination?

MR. FREDERICK: I have one.

CHAIRMAN FESMIRE: Why don't we give Mr. Brooks a chance first?

MR. BROOKS: Okay. If he goes ahead, it will give me a chance to confer with Mr. Hansen here, so I have no objection to Mr. Frederick --

CHAIRMAN FESMIRE: Okay, Mr. Frederick, why don't you go ahead then?

RECROSS-EXAMINATION

BY MR. FREDERICK:

Q. Just a point of clarification. If the liner fails after 270 years, is there a chance that there could be saturated conditions at the bottom of the pit when the liner does fail?

A. Well, if the top of the liner isn't failing, then there wouldn't be water coming in.

Q. If the top liner, say, did fail, could water not infiltrate and then collect in the pit before the bottom liner failed?

A. I suppose it's possible.

Q. If there were, say, several feet of saturated thickness, or a foot of saturated thickness, in the bottom of the pit when it fails in 270 years, how would that affect your modeling results?

A. I'm not sure how it would affect the concentrations. I think it would affect the time at which the impact occurs.

MR. FREDERICK: Okay, I don't have anything further.

CHAIRMAN FESMIRE: Mr. Brooks?

MR. BROOKS: Very briefly.

RECROSS-EXAMINATION

BY MR. BROOKS:

Q. Dr. Stephens, you testified, as I understood you, that the HELP model was a good model and you didn't have a quarrel with the HELP model if the proper input parameters were used?

A. For -- Yes, I've used it and I thought I got good results with it.

Q. Can you tell us what it is that -- what input parameters were improperly used in this case?

A. You know, I don't recall specifically, I didn't look at it in that much detail. But I think it has -- I think there are some permeability values for the soils that might be high.

Q. Seemed to me your major quarrel was with the output, which was the recharge rate, not with the input. Is that accurate?

A. Well, it depends on whether the -- Yes, you're right, my quarrel is with the flow of water that's coming out the bottom of the HELP model.

Q. Right.

A. But the factors that affect that, given the precipitation rate, are not only the vegetation but how much water shed laterally off of the cover, and that's a factor, and so is the vegetation characteristics, so...

Q. So you're saying Mr. Hansen used different soil assumptions than you did?

A. I believe he did, yes.

Q. Okay. What do you mean by water flux?

A. That would be a flow rate per unit area.

Q. And how does that differ from the infiltration rate?

A. It's the same.

Q. Okay, so --

A. Well, infiltration rate being net infiltration out the bottom, as opposed to infiltration across the land surface. They're --

Q. Yeah.

A. -- comparable units.

Q. So I get back to the question I asked before, that your liner-degraded model and Mr. Hansen's good-liner model generate essentially the same number to use as an input into the transport model, so aren't you making the same waterflow assumptions?

A. Yes, I think that's pretty much what I've said, is that if you have a -- you know, if you have a plastic liner, and the good condition is, there are a few holes in there, you'll probably find that that line will transmit a flux about equivalent to the natural recharge rate.

Q. Okay, one other question. You said the Division used a four-inch mixing zone?

A. Well, you know, we're struggling a little bit to try to figure out exactly what the Division did. But when we look at what we understand they did and try to decipher it from the files, that's what it appears to be.

Q. What do you base that on?

A. Just looking at the output files and the input files of the MULTIMED model.

Q. Doesn't the MULTIMED model actually use the same mixing zone assumptions as your model?

A. Well, I think the aquifer is 70 feet thick, but I think the zone within which the mixing occurs is limited to the top four inches, if I -- We might have missed it, but that's our read of what the numbers tell us, so we're just trying to be detectives and figure out backwards what you all did, because it's not clear from the outset.

MR. BROOKS: And we're doing the same thing with yours.

(Laughter)

MR. BROOKS: That concludes my questioning.

However, we'd like to have an understanding before we conclude as to when we're going to be able to get Dr. Stephens' output work and also the work that he did examining our work that he said he had no objection to providing us. I don't know how to characterize the latter exactly, because I'm not sure what he did, but there was something he did that we requested be provided.

CHAIRMAN FESMIRE: I take that's Tad -- Thad?

THE WITNESS: Todd.

CHAIRMAN FESMIRE: Todd.

MR. HISER: Mr. Chairman, we think that we can probably have the materials in terms of our output reports and all that at the start of the hearing on Tuesday, if that would be acceptable --

MR. BROOKS: That would be acceptable.

MR. HISER: -- to the Division.

In terms of the -- sort of a detailed evaluation of the HELP model that was done by the Division, we're in the process of developing some specific rebuttal exhibits and stuff like that, that address those, but those are not yet ready to go. We're close but not there. And so that's probably going to be a little bit later next week.

CHAIRMAN FESMIRE: Mr. Brooks, is that satisfactory?

MR. BROOKS: That is satisfactory --

MR. HISER: And we'd be happy to point out the one factor which is where we're getting the four inches from, because we know where that is and --

MR. BROOKS: Yeah.

MR. HISER: -- can show it to the --

MR. BROOKS: I think of the work that you're doing on our work -- I don't understand all these things, but Mr. Hansen is reminding me that Dr. Stephens said he performed a mass balance last night; is that correct, Dr. Stephens?

THE WITNESS: Yes.

MR. BROOKS: That's one of the things we were asking for.

MR. HISER: This is the one where he determined there was more mass after the model than there was before; is that what you're thinking of, Mr. Hansen?

MR. HANSEN: Yes.

MR. HISER: Okay. Yeah, we can -- That is probably part of the stuff that's in development, and we can try to get that put together for you.

MR. BROOKS: Thank you. That concludes my concerns with the witness.

I do have one other question for the Chair or the Commission after -- which doesn't relate to this witness.

CHAIRMAN FESMIRE: Why don't we bring that up when we get done with this witness?

MR. BROOKS: Very good.

CHAIRMAN FESMIRE: Mr. Frederick, did you have anything else, strictly limited to the subject of the redirect?

MR. FREDERICK: I thought I already did --

(Laughter)

CHAIRMAN FESMIRE: Okay, I'm sorry.

Dr. Neeper?

It must have been memorable, I apologize.

DR. NEEPER: No further questions.

CHAIRMAN FESMIRE: Mr. Baizel?

MR. BAIZEL: (Shakes head)

CHAIRMAN FESMIRE: Or Mr. Huffaker?

MR. HUFFAKER: No, thank you.

CHAIRMAN FESMIRE: Okay. Commissioner Olson, I believe you have one other question?

COMMISSIONER OLSON: I couldn't resist.

FURTHER EXAMINATION

BY COMMISSIONER OLSON:

Q. Coming back to -- I guess from what we're looking at your mixing zone, you're looking at a recharge rate of 2.5 millimeters per year into the aquifer, roughly?

A. Flux, yes.

Q. Flux coming on. And you have a pore water concentration of -- I thought you said, of 560,000, equate to, is that -- that 3500?

A. That would be in the -- in the pore water, in the pit contents.

Q. And you're saying that that's going to instantaneously mix, coming in at 2.5 millimeters per year across 50-feet-thick aquifer, 100 by -- whatever it was, 200, I don't know what -- remember what the dimensions were -- by 50-foot-thick, it's going to instantaneously mix over that whole zone?

A. Yes.

Q. That's the assumption of the model. Have you ever seen actually occur?

A. Have I seen what occur?

Q. Instantaneous mixing across the aquifer?

A. When you have dense -- really dense salts, it does.

Q. You have seen that?

A. Yes.

Q. Okay.

A. Not -- well, instant in terms of, you know, nanoseconds or something, but you know, relatively short periods of time, water will move downward, if it's dense water.

COMMISSIONER OLSON: That's all I have.

CHAIRMAN FESMIRE: Okay. With that, Mr. Brooks, you have one other issue?

MR. BROOKS: Well, actually I've thought of two now. But the one I was primarily concerned with, because it affects this weekend -- When the schedule was, we were going all weekend, the Commission indicated, although the written order has not been superseded to my knowledge, that the briefing schedule will be extended to a later time. I am assuming that that still holds, although the schedule has been changed somewhat. Is that a correct assumption?

CHAIRMAN FESMIRE: That's correct, we won't expect that briefing until we begin our deliberation.

MR. BROOKS: The other thing is, I believe you indicated, Mr. Chairman, that counsel should advise you before the adjournment today whether they intended to recross Mr. von Gonten and Mr. Hansen on their changed materials. And I don't really particularly care whether they have that information for us now or not, actually, because both people will be available next week. But I just bring it up because I believe you said that -- I believe the Commission had indicated that --

CHAIRMAN FESMIRE: I did, Mr. Huffaker [*sic*], but if it's not of time-sensitive importance to Mr. Brooks, it isn't to me either. Are you prepared --

MR. BROOKS: Okay --

CHAIRMAN FESMIRE: -- to answer that?

MR. BROOKS: -- very good.

CHAIRMAN FESMIRE: I don't know about Mr. Huffaker, but Mr. Hiser is not.

(Laughter)

CHAIRMAN FESMIRE: An H is an H. What can I say.

MR. HISER: Actually, I would be flattered to be a representative of the solid waste industry of this state, but I think --

(Laughter)

MR. HISER: We would like to cross-examine Mr. Hansen on a couple points that we saw when we got the new materials, some of which is related to the questions that they were asking us earlier today.

At this time we do not have, nor will we have, any additional questions for Mr. von Gonten.

CHAIRMAN FESMIRE: Okay, we will release Mr. von Gonten from his emotional hold and plan on providing Mr.

Hansen for cross-examination at the end of the OCD case.

At this time we're about ready to adjourn until nine o'clock Tuesday morning in Porter Hall, at which time I'm not sure where we're going to go. Let me think about it and announce it Tuesday.

What do we do next? Do we still have the --

MS. FOSTER: OGAP on Tuesday.

CHAIRMAN FESMIRE: Oh, that's OGAP's witnesses are Tuesday morning, and they will probably take all day Tuesday?

MR. BAIZEL: That's not entirely up to us. We wouldn't anticipate that.

CHAIRMAN FESMIRE: Okay, so we will plan on continuing with the OCD case after the OGAP witnesses on Tuesday.

MR. BROOKS: Yes, and I would assume that counsel will then be ready to begin their cross-examination of Mr. Jones.

CHAIRMAN FESMIRE: Yes.

MR. BROOKS: Very good.

CHAIRMAN FESMIRE: With that, we will adjourn -- Oh, wait a minute.

Dr. Stephens, I guess you can be released, unless you don't have any other plans for the weekend.

MR. HISER: Actually, Mr. Chairman, we would release him except for the question about Exhibit 10 that the Division wanted to --

MR. BROOKS: That's correct, we would like to have the opportunity to have him available again, in the event that when we do Exhibit 10 we have questions -- when we review Exhibit 10 we have questions.

CHAIRMAN FESMIRE: Okay. So Dr. Stephens will be released pending recall concerning Exhibit 10.

MR. BROOKS: Right.

MR. HISER: And we'll just have to work with his schedules.

CHAIRMAN FESMIRE: Within the schedule.

With that -- Can you tell I was in a hurry?

MR. CARR: Don't pause.

(Laughter)

CHAIRMAN FESMIRE: Commissioner Bailey, go ahead and pack up while I'm --

(Laughter)

CHAIRMAN FESMIRE: We will adjourn until nine o'clock Tuesday morning.

(Thereupon, evening recess was taken at 7:26 p.m.)

* * *

CERTIFICATE OF REPORTER

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

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

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

WITNESS MY HAND AND SEAL December 25th, 2007.

STEVEN T. BRENNER
CCR No. 7

My commission expires: October 16th, 2010