

**Official Transcript of Proceedings**  
**NUCLEAR REGULATORY COMMISSION**

Title: Crow Butte Resources, Inc.

Docket Number: 40-8943-OLA

ASLBP Number: 08-867-02-OLA-BD01

Location: Crawford, Nebraska

Date: Tuesday, August 25, 2015

Work Order No.: NRC-1794

Pages 1240-1572

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## 1 UNITED STATES OF AMERICA

## 2 NUCLEAR REGULATORY COMMISSION

3 + + + + +

## 4 ATOMIC SAFETY AND LICENSING BOARD PANEL

5 + + + + +

## 6 HEARING

7 -----x

8 In the Matter of: :

9 CROW BUTTE RESOURCES, : Docket No. 40-8943-OLA

10 INC. : ASLBP No. 08-867-02-OLA-BD01

11 :

12 (License Renewal for :

13 the In-Situ Leach :

14 Facility, Crawford, :

15 Nebraska) :

16 -----x

17 Tuesday, August 25, 2015

18  
19 Crawford Community Center

20 1005 First Street

21 Crawford, Nebraska

22 BEFORE:

23 MICHAEL M. GIBSON, Chair

24 DR. RICHARD E. WARDWELL, Administrative Judge

25 BRIAN K. HAJEK, Administrative Judge

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P-R-O-C-E-E-D-I-N-G-S

9:01 a.m.

CHAIR GIBSON: Okay, a couple of housekeeping matters before we get back into the examination on the hydrogeology tests. I know you all are probably really pumped about talking about pump tests.

We have -- as I believe one of the things that was pending at the end of the day were some studies we talked about that no one was real sure exactly what they were and we certainly don't want to be receiving testimony about that. I believe one was Sauder and one was Terry. And it wasn't clear if it was in the record or not and you all were supposed to concur and make sure we were on the same page of the same hymnal. Is someone prepared to talk about that?

DR. LAGARRY: Yes, Your Honor.

CHAIR GIBSON: Okay. Be sure and speak into the mic. And in that regard, I might add, Mr. Lancaster and Mr. Spurlin, we were able to hear almost everybody, but Mr. Lewis, Mr. Spurlin, Mr. Lancaster, we really had to strain. So I would ask that if you all do any speaking today and I'm sure you will, please try to be sure and speak into the mic because you all have kind of soft voices and it's really hard

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1 for us to hear. And I'm sure it's even harder for the  
2 court reporter who has got to transcribe it. Okay.

3 Yes, Mr. Lagarry. Dr. Lagarry.

4 DR. LAGARRY: Thank you. I just conferred  
5 with NRC staff and they have a copy of Terry, 1998 on  
6 pdf and they'll provide it to you, if they haven't  
7 already.

8 CHAIR GIBSON: Okay.

9 DR. LAGARRY: And I have here Sauder's  
10 citation from the EA on page 136 on this piece of  
11 paper. A physical copy of it we weren't able to  
12 retrieve.

13 CHAIR GIBSON: Okay. Very well. Well, if  
14 it's possible to get a copy, that would be just  
15 splendid.

16 DR. LAGARRY: We'll keep trying.

17 CHAIR GIBSON: Certainly this week, if  
18 possible, but I do appreciate we are operating under  
19 some constraints. It's just that it's very difficult  
20 for us to know what we're talking about if we don't  
21 have the document in front of us.

22 DR. LAGARRY: I can try. This is a  
23 publication from the Upper White-Niobrara Natural  
24 Resource District in Chadron. I'll make contact with  
25 them today and see if they can bring us a copy.

1 CHAIR GIBSON: Thank you, Dr. Lagarry.  
2 Yes.

3 JUDGE HAJEK: Dr. Lagarry, is that the  
4 same Sauder reference that's referenced in -- I don't  
5 recall either the EA or the SER.

6 DR. LAGARRY: That's correct.

7 JUDGE HAJEK: Okay, so if that has been  
8 referenced in the EA and the SER, can we ask the staff  
9 or the CBR to help?

10 MS. SIMON: Your Honor, the staff has an  
11 electronic -- has just informed me they have an  
12 electronic copy of the Sauder's.

13 JUDGE HAJEK: Of this very specific one  
14 that he's referencing?

15 MS. SIMON: Yes, so as soon as we can I  
16 can get it.

17 CHAIR GIBSON: That's fine, that's fine,  
18 Ms. Simon. That would be great. Thank you so much.  
19 You may not have to go run that errand.

20 JUDGE HAJEK: That would be super.

21 CHAIR GIBSON: I suspect you think so. I  
22 was going to have you read the citation into the  
23 record, but it sounds like it won't be needed because  
24 we have a copy. Okay, very well.

25 We very much appreciate you all getting

1 those questions from last night. We will be weaving  
2 those questions into the ones that we have tonight.  
3 I just want to give you fair warning though, we'll be  
4 giving you the same homework tonight. So please be  
5 thinking about any holes that come up in the testimony  
6 that you need to have plugged. Okay.

7 MR. REID: Excuse me, on that --

8 CHAIR GIBSON: Yes, Mr. Reid.

9 MR. REID: We submitted our questions by  
10 email because we didn't have a printer and I believe  
11 your staff has that. I'm handwriting it out as we  
12 speak, but I'm not sure that you have a hard copy. I  
13 don't know if an email would be -- you have an e-copy,  
14 but I don't know if that's sufficient, but hopefully  
15 it is.

16 CHAIR GIBSON: Very well, thank you, Mr.  
17 Reid. We'll work your questions in when we get them,  
18 so thank you.

19 Okay, as I understand it, Mr. Smith, we're  
20 going to be -- we've had a newly proffered exhibit.  
21 Is that correct, sir?

22 MR. SMITH: Yes, Your Honor, in response  
23 to a follow-up question from yesterday, we have a new  
24 exhibit that we'd like to admit into the record at the  
25 appropriate time.



1 CHAIR GIBSON: Okay. And that is going to  
2 be marked as CBR061?

3 MR. SMITH: Correct.

4 CHAIR GIBSON: And it will be filed  
5 through EIE eventually. I know it's a little hard --  
6 difficulty with internet connections as Mr. Reid just  
7 indicated to function out here sometimes, but what  
8 we'll do is we will simply -- we appreciate you  
9 providing that exhibit. We know that it has to do  
10 with some of the questions that Judge Wardwell raised  
11 yesterday and that's why you're doing it. However,  
12 what we'll do is we'll just take it under advisement  
13 at this point. I assume you've provided copies to  
14 everyone else?

15 MR. SMITH: I have.

16 CHAIR GIBSON: And so if there are any  
17 objections, I'm not going to force you all to try to  
18 raise those objections now. If you have any  
19 objections to those, the tests that are reflected in  
20 there, we'll certainly take that up at the time that  
21 Judge Wardwell gets to that in some of the questions  
22 he wants to raise.

23 I believe that is everything. Is there  
24 anything else I overlooked that was pending at the  
25 conclusion of our hearing yesterday?

1 DR. STRIZ: Your Honor, you did request  
2 the USGS Ground Water Modeling Reports.

3 CHAIR GIBSON: This is the 2014 report?

4 DR. STRIZ: That I look into the date of  
5 the re-use to develop that report and I have done  
6 that. I believe that Ms. Simon could verify that we  
7 have given that report to this gentleman and that it  
8 should be available?

9 CHAIR GIBSON: That would be Joe Deucher?

10 DR. STRIZ: And I have a hard copy here  
11 for -- it's the only one because we are printing  
12 challenged, where I have tabbed all of the locations  
13 where there's references to the data that were used to  
14 develop the model. And I'm prepared to go through  
15 those with you or if you would rather wait, we can do  
16 that.

17 CHAIR GIBSON: I suspect that Judge  
18 Wardwell may get to some of those things later, and if  
19 he doesn't, Judge Hajek and I will, I'm sure.

20 DR. STRIZ: Okay.

21 JUDGE HAJEK: Dr. Striz, has this document  
22 been referenced in either the SER or the EA or only in  
23 your testimony?

24 DR. STRIZ: Only in our testimony because  
25 it's a 2014 document and we came across it late in the

1 process.

2 JUDGE HAJEK: Thank you.

3 CHAIR GIBSON: So what we'll do is we will  
4 take that exhibit, it's not an exhibit but it's a  
5 document that was referenced like this Sauder and  
6 Terry reports and somehow are we going to be getting  
7 a copy of that document to the Intervenors and to Crow  
8 Butte as well?

9 MS. SIMON: Your Honor, just to follow up  
10 on what Dr. Striz said, I did provide that to Mr.  
11 Deucher electronically. And what I can do is I can  
12 email counsel for the other parties and attach the  
13 document and so everyone can get it.

14 CHAIR GIBSON: That would normally be a  
15 great solution, Ms. Simon. I think part of the  
16 problem is that we're having difficulty receiving  
17 things that are sent. So I don't really know quite --  
18 so what you're saying is yes, you'll get them copies,  
19 but no, they won't be able to see it. And that's kind  
20 of a problem right now.

21 But to the extent that it raises questions  
22 we'll be addressing that. To the extent that you can  
23 possibly get a copy made and get copies to the Board  
24 and at least one to the other parties, that would be  
25 great, okay?

1 MS. SIMON: Okay.

2 CHAIR GIBSON: Thank you, Ms. Simon.

3 JUDGE HAJEK: And Dr. Striz, just one  
4 further follow-up on this document. Excerpts of this  
5 document have been submitted as an exhibit.

6 DR. STRIZ: Yes.

7 JUDGE HAJEK: Can you just reference what  
8 that exhibit number is for me, please?

9 DR. STRIZ: The exhibit is NRC 026.

10 JUDGE HAJEK: Zero --

11 DR. STRIZ: 2-6.

12 JUDGE HAJEK: 2-6. Thank you.

13 DR. STRIZ: Correct.

14 CHAIR GIBSON: Very well, if there is  
15 nothing else, seeing nothing, then I believe Judge  
16 Wardwell has some more questions.

17 JUDGE WARDWELL: Yes. That's an  
18 understatement, sir. I think I'd like to start off  
19 just by saying how much I appreciated each and every  
20 witnesses' responses yesterday. This is probably the  
21 best set of panels I've ever had before me and I just  
22 want to say how much that makes our job a lot easier  
23 and also encourage you to keep carrying that banner  
24 forward for a few more hours and days. So I just --  
25 you're doing great.

1 I will say one thing though, I would like  
2 everyone to take your microphone and lift it up and  
3 push the little lever down and then move it closer to  
4 you. Because even you were hard to hear this morning  
5 and I've got to remember that I've got to speak into  
6 it and I go back like this, like I do, and I think Dr.  
7 Lagarry does also and then we go back like this. And  
8 so I need to be more disciplined also, but it helps  
9 the recorders, it helps everyone here and I'm the  
10 biggest one that flaunts that disrespect for my use of  
11 the microphone.

12 Having said that, we're moving on to  
13 aquifer testing and characterizations, specifically  
14 the pump tests. And the Intervenor in their exhibit  
15 069, page 4, Dr. Kreamer quotes the aquifer test as  
16 follows. "Reported aquifer testing in the CBR in  
17 Crawford area include tests in 1982, 1987, 1992, 2002,  
18 throughout 2004 and 2005 (5 tests in that time period)  
19 and 2006. The aquifer tests are entirely insufficient  
20 and potentially misleading as typically only one  
21 observation well was placed in the overlying Brule  
22 formation to determine vertical migration."

23 Dr. Kreamer, could you start off and give  
24 us an indication of the site? That's good. Your site  
25 for all these tests, where did you come up with the

1 fact that all these tests were conducted out there?  
2 Do you have that handy in regards to where you found  
3 those? Have you found the information for those  
4 tests?

5 DR. KREAMER: Yes, sir. Your Honor, I  
6 found those in the Petrotek Report. They list the  
7 first four tests in 1984, '87, '92, and their own test  
8 in 2002.

9 JUDGE WARDWELL: Did you say '84? I had  
10 '82.

11 DR. KREAMER: '82, excuse me. I misspoke.  
12 Petrotek who did the test in 2002 lists the first four  
13 tests in '82, '87, 1992 and 2002. And the ARCADIS  
14 Report articulates the tests that were done in 2004  
15 and 2005 and 2006.

16 JUDGE WARDWELL: And I know I've got it in  
17 my notes somewhere, but do you have the exhibit number  
18 for the Aquitek and the Petrotek reports?

19 DR. KREAMER: I'm sorry, Your Honor, I do  
20 not.

21 JUDGE WARDWELL: Okay, we'll come to it.  
22 I know that I've got it here somewhere and they are  
23 exhibit numbers.

24 DR. KREAMER: We'll look that up as we go.

25 JUDGE WARDWELL: That will be great.

1 Thank you. Just to verify, were all of those tests,  
2 pumping tests or were they some other type of  
3 hydraulic conductivity testing effort?

4 DR. KREAMER: Yes, they were, Your Honor.  
5 I guess the term now is aquifer tests because pumping  
6 tests can mean testing the actual pump and the  
7 efficiency of the pump. They used to be called  
8 pumping tests and it's still common in the industry.  
9 The actual phrase is an aquifer test. Yes, sir.

10 JUDGE WARDWELL: What I want to make sure  
11 is that this is aquifer test that deals with long-term  
12 pumping as opposed to other types of aquifer testing  
13 where you're trying to just determine the hydraulic  
14 conductivity, for instance, of a --

15 DR. KREAMER: That is correct. That is  
16 correct, Your Honor. These were long-term tests.  
17 Your Honor, I think the reference is Petrotek CBR012.

18 JUDGE WARDWELL: Okay. And how about --  
19 was the Aquitek or Aqui --

20 DR. KREAMER: ARCADIS. ARCADIS. The  
21 ARCADIS Report. We don't have ARCADIS yet.

22 JUDGE WARDWELL: And where were these  
23 tests performed? Can you go through each year and say  
24 where these tests were performed?

25 DR. KREAMER: Sure. The first four tests

1 were in the area that we're considering for the  
2 license renewal. They were spread out. The test in  
3 2002 was more central. There were earlier tests that  
4 were further south in that license renewal area. The  
5 test in 2004 through 2006 were in the North Trend  
6 Area.

7 JUDGE WARDWELL: Okay, thank you. I'll  
8 switch over to Crow Butte now at this time. Given  
9 this information, why did you only list four pump  
10 tests in your license renewal application? And I'm  
11 citing to the CBR011 exhibit which is a license  
12 renewal application, pages 2-201 where I quote, "CBR  
13 performed four ground water pumping tests within the  
14 license area boundary between 1982 and 2002 in order  
15 to comply with the requirements of the UIC permit."  
16 And I can also reference the figure 2.7-8 at page 2-  
17 203 in the license renewal application associated with  
18 that.

19 MR. BEINS: Wade Beins with Crow Butte.  
20 To date, there have been only four long-term aquifer  
21 pumping tests within the license boundary of Crow  
22 Butte. The other tests that you're referring to from  
23 the 2004 to 2006 time period, those tests were done at  
24 the North Trend Area.

25 JUDGE WARDWELL: Haven't there been times



1 yesterday, if I remember correctly, where you want to  
2 use information from the North Trend Area to  
3 extrapolate to the license area and why weren't these  
4 tests mentioned as ones that were conducted and might  
5 provide some useful information in regards to  
6 extrapolating the behavior of the Basal Chadron,  
7 assuming they are -- were they also in the Basal  
8 Chadron.

9 MR. BEINS: Allow me a moment to confer.  
10 I guess I'm not sure which results, test results from  
11 North Trend we were trying to extrapolate back to the  
12 current license area.

13 JUDGE WARDWELL: We spent a bit of time  
14 talking about the ground water flow patterns and so  
15 you had information from the North Trend Expansion  
16 Area that you wanted to offer in regards to confirming  
17 flows that were in the license area. I wasn't saying  
18 there was pumping tests. You had North Trend  
19 Expansion Area data and you were using it for various  
20 aspects dealing with this license renewal. Why did  
21 you all of a sudden decide that you didn't want to use  
22 these pump tests as some information in regards to the  
23 extrapolation of how the Basal Chadron performed?

24 MR. BEINS: Certainly. We did gather  
25 water level data as part of the initial permitting

1 process. And all of that data ties together to  
2 complete the picture of the regional flow within the  
3 Basal Chadron, within the Brule Aquifer as well. And  
4 that's why we've included that for that regional  
5 picture.

6 JUDGE WARDWELL: As far as you are aware,  
7 there's been no exhibits submitted that reference or  
8 talk about the 2004 to 2006 tests?

9 MR. BEINS: The North Trend aquifer  
10 petition that has been referenced, I believe, has  
11 references to the pumping tests completed at North  
12 Trend.

13 JUDGE WARDWELL: So we do have an exhibit  
14 in this hearing process that has a pumping test?

15 MR. BEINS: I believe so. I'd have to get  
16 back to you with the number of that exhibit. CBR013.

17 JUDGE WARDWELL: That contains information  
18 about these other tests besides the four that were  
19 taken in the license area, is that correct?

20 MR. BEINS: Yes, sir.

21 JUDGE WARDWELL: Thank you. Let me ask  
22 staff. Are you aware of any discussion of these five  
23 tests in any of the exhibits for this proceeding?

24 DR. STRIZ: They're discussed in both the  
25 SER and in the EA exhibits.

1 JUDGE WARDWELL: Again, if you can speak  
2 louder.

3 DR. STRIZ: I apologize.

4 JUDGE WARDWELL: There you go.

5 DR. STRIZ: They're in both the SER and in  
6 the EA sections.

7 JUDGE WARDWELL: You do discuss it in the  
8 EA also?

9 DR. STRIZ: Yes.

10 JUDGE WARDWELL: Okay, good. Now  
11 Intervenors Exhibit 069, page 4, the Kreamer testimony  
12 again states and I quote, "The five aquifer tests in  
13 2004 and 2005 were invalidated on the basis reported  
14 as follows." And then you provide a quote within this  
15 quote.

16 DR. KREAMER: Yes, sir.

17 JUDGE WARDWELL: And this quote says  
18 "Results from the initial testing activities conducted  
19 in 2004 to 2005 (tests 1 through 5) were not  
20 definitive as a result of such problems including  
21 improperly abandoned old exploration holes, equipment  
22 problems, insufficient stress (drawdown) to provide  
23 usable data and infiltration of surface water into  
24 observation wells."

25 Dr. Kreamer, what's the cite for this

1 quote? Is it, in fact, NRC Exhibit 028 at G10 which  
2 is the CBR Class 3 UIC application?

3 DR. KREAMER: I'm unsure. It's from the  
4 ARCADIS Report which I believe they just said was  
5 CBR013. But I'm unsure. It was in the documentation.

6 JUDGE WARDWELL: Can you get back to me on  
7 what the cite for that quote is?

8 DR. KREAMER: Happy to do that, sir.

9 JUDGE WARDWELL: And you did say, Mr.  
10 Beins, that the five tests during 2004, 2005, and 2006  
11 were conducted in the North Trend Expansion Area, is  
12 that correct?

13 MR. BEINS: That's correct.

14 JUDGE WARDWELL: Thank you. Does the  
15 quote that Dr. Kreamer mention ring a bell to you in  
16 regards to any exhibits?

17 MR. BEINS: Yes, I do recall.

18 JUDGE WARDWELL: Any reasons for why the  
19 inadequacy of those tests?

20 MR. BEINS: Yes, sir. To say that we had  
21 difficulty with the pump test at the North Trend  
22 location would be an understatement. And I can go  
23 through some of the issues we encountered there and  
24 the actions we took.

25 JUDGE WARDWELL: Let me ask you some of

1 those ones that are really of interest to me.  
2 Specifically, here all of a sudden crops up the fact  
3 that you're using the reason that bore holes weren't  
4 adequately abandoned as a reason for these not  
5 performing. And I think we had some testimony  
6 yesterday that encourage us on how well you always  
7 abandon bore holes. Could you explain the  
8 discrepancy?

9 MR. BEINS: Certainly. When we did the  
10 initial pump test at North Trend, we saw a number of  
11 variations that caused concern. We saw draw down in  
12 the Middle Chadron sand in response to the pumping.  
13 And then we also saw an increase in the water level in  
14 the Brule. The increase in the water level to the  
15 Brule was due to infiltration of our water just  
16 pooling on the ground and percolating down through.  
17 So that one we were able to identify relatively  
18 easily.

19 JUDGE WARDWELL: So let me make sure I  
20 understand. You were taking the pump water and just  
21 pouring it on the ground and that's why you had  
22 infiltration?

23 MR. BEINS: Yes, sir.

24 JUDGE WARDWELL: An action you're probably  
25 not very proud of.

1 MR. BEINS: No.

2 JUDGE WARDWELL: Thank you.

3 MR. BEINS: The response that we saw in  
4 the Middle Chadron sand, however, was more problematic  
5 for us in being able to clearly identify where that  
6 connection between the Basal Chadron and the Middle  
7 Chadron sand was coming from.

8 At the time, our consultant which was  
9 Petrotek, had us take a look at nearby exploration  
10 holes and as we gathered that data, we did find a pair  
11 of holes that were relatively close within 200, maybe  
12 300 feet of the pumping well. Those holes met the  
13 mineral exploration permit abandonment guidelines for  
14 viscosity and mud weight, but they met those  
15 requirements minimally, that is, they met the minimum  
16 requirement to be accepted by DEQ.

17 Our consultant, Petrotek, theorized that  
18 perhaps we had a leaky abandonment job on one of those  
19 test holes. As a result, we went back in. We  
20 redrilled that well. We drilled out the abandonment  
21 mud that was in those particular holes and at that  
22 point then we re-abandoned those two test holes. We  
23 then attempted to do the pump test one more time. We  
24 got the same result. We saw a drawdown in the Middle  
25 Chadron. In that instance, we were able to determine

1 that it was not due to improperly drilled exploration  
2 holes.

3 And so then we began to look at what were  
4 the other potential indicators that would help us  
5 determine where we needed to look to find where this  
6 connection point between the Basal Chadron and the  
7 Middle Chadron was located at. We installed the  
8 series of wells in the Middle Chadron. Ran the pump  
9 test again or small portion of it. Monitored the  
10 response times in those wells and it helped us  
11 identify an area that we were able to take a look at  
12 to focus our observations and investigation upon for  
13 determining the location there.

14 From that, we were able to determine and  
15 figured out that it was actually the result of an off-  
16 site, privately owned well that had been cased through  
17 the Brule, but below the Brule Zone. It was left open  
18 hole. And therefore, there was a connection in that  
19 private well between the Basal Chadron and the Middle  
20 Chadron.

21 We went in. We talked to the landowner.  
22 Hired an independent contractor to come in. They  
23 abandoned that well and then at that point in time we  
24 were able to run the pump test and we got a good,  
25 valid pump test showing no connection.

1 I apologize. That's a really long story,  
2 but I hope it paints the picture for you.

3 JUDGE WARDWELL: Thank you. That does  
4 help.

5 Dr. Kreamer, do you have any comments on  
6 what you've just heard in regards to the -- some of  
7 the problems associated with the pump tests in the  
8 2004-2006 era?

9 DR. KREAMER: Your Honor, none of this was  
10 documented. These explanations were not available for  
11 review. There are indications in the invalidated  
12 tests, the five tests that there was some vertical  
13 movement. And I have not had an opportunity to  
14 independently review and either support or deny what  
15 was just said.

16 JUDGE WARDWELL: How many of those tests,  
17 1 through 5 in 2005 and the 2006 one, showed  
18 interconnections in your review of that data?

19 DR. KREAMER: Well, five of the six tests  
20 that were done were invalidated. They only reported  
21 the sixth and final test. So none of the information  
22 from the first tests were available except for the  
23 statement that I quoted which indicates some sort of  
24 vertical movement.

25 JUDGE WARDWELL: So you're saying that



1 tests 1 through 5 weren't reported. It was only the  
2 sixth test that was, that had information?

3 DR. KREAMER: That is correct. The one in  
4 2006 was the only one that the information was  
5 available to me.

6 JUDGE WARDWELL: And did that test show  
7 the connection with the Middle or Upper Chadron?

8 DR. KREAMER: No, it did not.

9 JUDGE WARDWELL: And back to you, Mr.  
10 Beins, was that tests 1 through 5, were some of those  
11 tests that you were talking about in regards to your  
12 efforts to run a pump test in the North Trend Area?

13 MR. BEINS: Tests 1 through 5 at North  
14 Trend, yes.

15 JUDGE WARDWELL: Were those that you were  
16 just previously describing in your efforts to locate  
17 why you saw a connection with those?

18 MR. BEINS: Yes, sir.

19 JUDGE WARDWELL: Thank you. You go on to  
20 state on page five of your testimony, Dr. Kreamer,  
21 that "Finally, the reasoning to draw this conclusion  
22 that the tests were not definitive because there might  
23 have been a vertical flow of" quote and you again cite  
24 someone else, "'surface water into observation wells'  
25 in the 2004 to 2005 tests was not supported."

1 Again, do you have a cite for that quote?

2 DR. KREAMER: That's also from the ARCADIS  
3 report, the sand.

4 JUDGE WARDWELL: Is there a reason that  
5 you also tend not to cite things that you quote as a  
6 scholar? I'm a little bit surprised, but --

7 DR. KREAMER: I'm sorry. When I wrote  
8 this, I didn't have all the citations and the numbers  
9 and it is a lacking on my part. And not as scholarly  
10 an effort as I would have liked.

11 JUDGE WARDWELL: As long as you're  
12 embarrassed, then I'm happy.

13 DR. KREAMER: I am, Your Honor.

14 JUDGE WARDWELL: Considering all the abuse  
15 I took in my younger years of education for such  
16 efforts.

17 So again, can you say the cite again?

18 DR. KREAMER: It's the ARCADIS report.

19 JUDGE WARDWELL: And you believe that's  
20 what exhibit number?

21 DR. KREAMER: I think CBR just said that  
22 it was 013, CBR013.

23 JUDGE WARDWELL: Okay, somehow I have  
24 written down on my notes that it's NRC028 at G10.  
25 NRC, would you like to comment on whether that is the

1       ARCADIS report or whether -- we could probably call it  
2       up quickly.

3               That might have been the Class 3 UIC  
4       application. Did they do that or did someone else?

5               MR. BACK: We believe it was just excerpts  
6       from that ARCADIS report.

7               JUDGE WARDWELL: Right, right. That's  
8       fair, but it is the ARCADIS report though albeit  
9       excerpts.

10              MR. BACK: Yes.

11              JUDGE WARDWELL: So we know it's one or  
12       the other, so we can find it anyhow. DBR Testimony  
13       001, page 17 to 18, Answer 43 states that "Crow Butte  
14       performed four ground water pumping tests within the  
15       license area." And under -- so that's probably where  
16       we're at. CBR013 is the entire report and 28 is  
17       excerpts.

18              DR. KREAMER: Your Honor, we've just  
19       confirmed that CBR013 is the report by ARCADIS.

20              JUDGE WARDWELL: Thank you. Okay, under  
21       the license renewal application, pages 2-201 and 2-214  
22       is where these four pump tests that were run between  
23       '82 and 2002 are described. And Figure 2-7-8 on page  
24       2-203 shows the location of the pump test which is  
25       brought up on your screen there. I'll ask anyone from

1 Crow Butte that -- first of all, I'll say what are the  
2 approximate diameters of each of these pumping wells?

3 MR. BEINS: Roughly 5,000 feet, 4,000,  
4 5,000 feet.

5 JUDGE WARDWELL: No, no. What's the size  
6 of the casing of the pumping well?

7 MR. BEINS: My apologies. These wells are  
8 4.5 inch diameter wells.

9 JUDGE WARDWELL: And how many observation  
10 wells were used around these pumping wells during  
11 these pump tests?

12 MR. BEINS: It varies somewhat from test  
13 to test, anywhere from -- within the production zone  
14 that we're monitoring, we may have anywhere from three  
15 to up to five, maybe six. I'd have to get you an  
16 exact number.

17 JUDGE WARDWELL: Do you install specific  
18 ones or were they just the ones that were part of your  
19 production sequence?

20 MR. BEINS: We generally install wells  
21 specifically for the pump test in this instance.  
22 There are a few occasions where there's other existing  
23 wells that we've installed either for mining purposes  
24 or other baseline testing. We do utilize those if  
25 available.

1 JUDGE WARDWELL: And what size were the  
2 observation wells, diameter?

3 MR. BEINS: They are also 4.5 inch with  
4 the exception of a pair of wells for aquifer test  
5 number 2 that were smaller diameter 2-inch wells that  
6 we put down just transducers, piezometers down the  
7 wells to sample the upper and lower confining units.

8 JUDGE WARDWELL: You were using this to  
9 sample or just to measure the water pressures?

10 MR. BEINS: Just to measure the water  
11 pressures.

12 JUDGE WARDWELL: How many of these wells  
13 were placed in the Basal Chadron, and how many on the  
14 Middle to Upper Chadron, and how many in the Brule for  
15 each pump test?

16 MR. BEINS: I would have to get back to  
17 you with the exact numbers for each test. Generally,  
18 like I say, we'll have anywhere between three to five  
19 wells in the Basal Chadron.

20 JUDGE WARDWELL: That's fine. Do you know  
21 specific in regards to the Upper Chadron and the  
22 Brule?

23 MR. BEINS: I can tell you that at the  
24 current license area, the Middle Chadron sand that is  
25 present at North Trend, that sand is not present

1 across the current license area and therefore that  
2 particular sand, we're not monitoring it there because  
3 it's not present.

4 The Brule aquifer, the overlying aquifer  
5 in most cases, I believe we had just a single well  
6 located relatively close to the pumping well within  
7 the Bruce.

8 JUDGE WARDWELL: And what's this  
9 "relatively close"?

10 MR. BEINS: Within 100 feet.

11 JUDGE WARDWELL: And you're saying you  
12 didn't place any well within the upper confining unit  
13 to see if there was any -- they didn't put a well or  
14 an electronic device to measure the water pressure to  
15 see if there's any connection through the upper  
16 confining unit and any of those pump tests? It was  
17 only in the Brule?

18 MR. BEINS: Just the one test that we had  
19 the piezometer in the upper confining unit, yes, sir.

20 JUDGE WARDWELL: And what one test was  
21 this?

22 MR. BEINS: I believe that was aquifer  
23 test number 2.

24 JUDGE WARDWELL: Did have that 2-inch well  
25 you were saying in the Brule, that's the one you were

1 referring -- in the Upper Chadron that you were  
2 referring to?

3 MR. BEINS: Yes, sir. And I might note  
4 there was one test, I believe, that had a pair of  
5 Brule monitor wells as wells.

6 JUDGE WARDWELL: But at least every test  
7 had at least one well in the Brule?

8 MR. BEINS: Yes, sir.

9 JUDGE WARDWELL: What was the pumping rate  
10 and the pumping duration and how were these values  
11 selected for each of these wells?

12 MR. BEINS: The pumping rates typically  
13 are going to be dependent upon how much water the  
14 particular producer is able to draw from the aquifer.  
15 I believe I've read something here the other day. I'm  
16 going to use a range. It's somewhere around 20 to 50  
17 gallon a minute.

18 DR. KREAMER: Your Honor, I have the exact  
19 numbers.

20 JUDGE WARDWELL: Sorry, who is --

21 DR. KREAMER: Dr. Kreamer, I'm sorry.  
22 Excuse me, if you need the exact numbers, I have the  
23 exact numbers.

24 JUDGE WARDWELL: Why don't you give them  
25 to us and how about citing where you're getting them

1 from, too?

2 DR. KREAMER: These are from the LRA.

3 JUDGE WARDWELL: All right, what page  
4 number?

5 DR. KREAMER: Pardon?

6 JUDGE WARDWELL: What page number?

7 DR. KREAMER: I'm sorry.

8 JUDGE WARDWELL: Never satisfied, are  
9 they?

10 DR. KREAMER: No, sir. I am so sorry,  
11 sir. Aquifer test 1, the pumping rate was 32.8  
12 gallons per minute. There were four wells in the  
13 Basal Chadron/Chamberlain. There were in Shallow  
14 Brule.

15 Test 2 --

16 JUDGE WARDWELL: Before you go any  
17 further, can I interrupt? Are you reading from a  
18 license application or are these your notes from the  
19 license application?

20 DR. KREAMER: These are notes. These are  
21 actually -- these are Mr. Wireman's notes.

22 JUDGE WARDWELL: All right.

23 DIRECTOR KEENE: Pump test 2, it was 47.4  
24 gallons per minute. There were three wells in the  
25 Basal Chadron/Chamberlain. And one in the sand in the

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1 Brule. They did have one in the unconfined -- excuse  
2 me, the low conductivity, yes.

3 And they had one in the Pierre, as well,  
4 for that test. They actually saw a little leakage out  
5 of Pierre, but it was just a very, very minor leakage  
6 out of the Pierre in that test.

7 Test 3, the pumping rate was 51.2 gallons  
8 per minute. They had three in the Basal Chadron, one  
9 in the Brule.

10 And Test 4 that was in 2002, was a pumping  
11 rate of 50.2 gallons per minute. I can also give you  
12 the depths of the well if you want, but there were  
13 four in the Basal Chadron and one in the Brule.

14 JUDGE WARDWELL: Thank you. Crow Butte,  
15 do you have any reason to doubt those numbers or do  
16 these look appropriate and would be found by searching  
17 the pdf in the license renewal application to get  
18 their exact page numbers?

19 MR. BEINS: I would expect that those  
20 numbers are correct.

21 DR. STRIZ: Your Honor, may I interject?  
22 I can verify those numbers. I also have the exact  
23 same numbers that he quoted.

24 JUDGE WARDWELL: And do you know the page  
25 number from which you got those?

1 DR. STRIZ: No, I don't. But they're in  
2 the license application.

3 JUDGE WARDWELL: Okay, thanks. These  
4 tests were run sequentially not all at once. Is that  
5 correct in that they were really done just prior to  
6 going into a new area, if I remember my reading  
7 correctly?

8 MR. BEINS: That's correct.

9 JUDGE WARDWELL: And that's why we have  
10 the span of years between '82 and I assume number 1  
11 was done in '82?

12 MR. BEINS: Yes, sir.

13 JUDGE WARDWELL: And it proceeded  
14 sequentially from there for the various units through  
15 the '92 period?

16 MR. BEINS: Yes, sir.

17 JUDGE WARDWELL: You mentioned that you  
18 said it was dictated by the amount of water that would  
19 be yielded at the Basal Chadron, but isn't it also a  
20 function of the size of the well you put down? I mean  
21 if you put down a 2-inch well and you tried to pump  
22 out of it, you probably wouldn't be able to get the  
23 right size pump down there enough to get what you  
24 want. Don't you have to match your pump size with  
25 your well size with the yield of the aquifer to stress

1 it to the degree that you want?

2 MR. BEINS: That's correct.

3 JUDGE WARDWELL: And what kind of thought  
4 pattern went into the selection of the of 4-inch well  
5 -- and do you know what size pump you did have in  
6 these wells? Well, they're about 50 gallons a minute  
7 pump probably or close to it. Strike that. You don't  
8 need to respond to that part. But do you describe  
9 anywhere in the license renewal application the  
10 analyses you did to select the 4-inch wells and the  
11 50, approximately 50 gallons per minute of the pumping  
12 rate?

13 MR. BEINS: The wells again were 4.5 inch  
14 just to correct the record. That was just a typical  
15 size well. I do know that the pumps were sized to get  
16 the maximum flow for the well and everything to  
17 receive -- get the results that we needed.

18 JUDGE WARDWELL: What was the pumping  
19 duration for these?

20 MR. BEINS: I'd have to get back to you on  
21 that. It varies between tests. Typically, it's going  
22 to be two to three days.

23 JUDGE WARDWELL: And again, you haven't  
24 documented any justification or analysis for the two  
25 to three days' worth of pumping duration either? How

1 did you select that value?

2 MR. BEINS: I believe the duration of the  
3 test typically was determined by our consultants that  
4 were doing the tests. When they began to see  
5 acceptable data that was representative of the  
6 aquifer, it was that point then that we would go ahead  
7 and terminate the test. That time that the pump test  
8 is run is approved by the DEQ in our pump test  
9 approval plan that we submit to them.

10 MR. WIREMAN: Your Honor, I'm sorry -- I  
11 can answer his question about the times, that's all.

12 JUDGE WARDWELL: Okay. What about the  
13 maximum draw down in the wells? Do you have a table  
14 of that in the license application or any data  
15 associated with these pump tests in the license  
16 application or anywhere else in the exhibits that have  
17 been filed?

18 MR. BEINS: I believe that's all in the  
19 license application.

20 JUDGE WARDWELL: And I'd be curious as  
21 you're looking at it, I'd like to get that data or  
22 point to where it is and I would like it as a function  
23 of the maximum water level that's available above the  
24 Basal Chadron at that point. How much draw down could  
25 have been done compared to what you actually did do is

1 of interest to me and I think you know why because the  
2 question is did you stress that aquifer hard enough to  
3 determine whether there was any leakage between the  
4 Brule and the Basal Chadron is obviously where my  
5 concern is with this line of questioning.

6 MR. BEINS: Certainly, we can get that  
7 data for you.

8 JUDGE WARDWELL: Thank you. Crow Butte  
9 Exhibit 045, page 20, Answer 36, states that "Crow  
10 Butte's aquifer pump tests were reviewed and approved  
11 by NDEQ and were consistent with the industry standard  
12 techniques used for this type of test."

13 Dr. Kreamer, do you have any evidence  
14 refuting that these tests were done according to NDEQ  
15 standards? And do you have any objections that these  
16 standards weren't met?

17 DR. KREAMER: I do not have any refutation  
18 that the standards were or were not met. I don't  
19 think the tests were optimal. They were not optimal  
20 in many ways, but as far as the standards go, they may  
21 have met the standards.

22 JUDGE WARDWELL: What would you have done  
23 different? What does your analysis show in regards to  
24 -- and what evidence have you provided to demonstrate  
25 that these tests were not sufficient for the given

1 aquifer that was being pumped?

2 DR. KREAMER: There is indication of  
3 vertical leakage in Test 4. That would be Figure 7 of  
4 CBR012. There was only one well.

5 JUDGE WARDWELL: And just briefly mention,  
6 what's that figure?

7 DR. KREAMER: It's Jacob-Cooper or Cooper-  
8 Jacob semi-logarithmic draw down curve.

9 JUDGE WARDWELL: Okay.

10 DR. KREAMER: And there's a diversion  
11 after 700 minutes showing a recharge boundary. I  
12 guess also the fact that they only had one well in the  
13 Brule and very few wells above the pumping formation  
14 that they were looking at was not optimal for finding  
15 --

16 JUDGE WARDWELL: My question now leads to  
17 what have -- what analysis have you looked at or  
18 conducted that would show that the pumping rate and  
19 the size of the well wasn't sufficient to stress the  
20 aquifer to the degree you believe it should be  
21 stressed?

22 DR. KREAMER: I did not do that analysis,  
23 sir. And Your Honor, it very well could have been  
24 insufficient.

25 JUDGE WARDWELL: Thank you. Crow Butte,

1 in their testimony, 001 Exhibit, page 29, Answer 58,  
2 you state "That in addition to the four tests spanning  
3 the full license application, similar conclusions were  
4 related pertaining to the adequate confine between  
5 these two aquifer zones as a result of multiple  
6 aquifer tests at other CBR expansion areas around  
7 Crawford, suggesting regional competency of the upper  
8 confining units."

9 What did you mean by "these other tests"?  
10 Are you referring to these ones that you struggled  
11 with and ended up with this one test, or are there  
12 some others that you are talking about?

13 MR. BEINS: It would be in reference to  
14 the test that was done at North Trend, the test number  
15 6 and those other tests that we did leading up to  
16 number 6.

17 JUDGE WARDWELL: It's only number 6, then  
18 because the other five --

19 MR. BEINS: The other five didn't -- yes.

20 JUDGE WARDWELL: -- were the failures  
21 leading up to the solution arrived at coming up with  
22 a decent test?

23 MR. BEINS: Yes, sir. We do have  
24 references for you on the different pump tests that  
25 were done. It's in the license renewal application,

1 CBR Exhibit No. 11, page 2-06 to page 2-14.

2 JUDGE WARDWELL: Great, thank you.  
3 Appreciate that. In this test number 6, what was your  
4 -- was the pumping rate similar to what you were doing  
5 here in the license application as best you can  
6 recollect or were there different pumping rates?

7 MR. BEINS: The best of my recollection,  
8 yes, it was in that neighborhood.

9 JUDGE WARDWELL: Four and a half inch  
10 casing?

11 MR. BEINS: Yes, sir.

12 JUDGE WARDWELL: I assume fully screened  
13 in the Basal Chadron?

14 MR. BEINS: Yes, sir.

15 JUDGE WARDWELL: Pumped at about 50  
16 gallons a minute for 2 to 3 days?

17 MR. BEINS: I don't believe it was quite  
18 that high a flow rate.

19 JUDGE WARDWELL: Okay, could be lower.

20 MR. BEINS: Perhaps more around the 30  
21 gallon a minute range.

22 JUDGE WARDWELL: Okay.

23 MR. BEINS: I'd have to check.

24 JUDGE WARDWELL: And that again was  
25 limited by that if you cranked it up any more, you



1 were going to drop the levels too fast. You were  
2 going to dewater the well before you were going to be  
3 able to pump out the aquifer?

4 MR. BEINS: Yes, sir.

5 JUDGE WARDWELL: Thank you. Dr. Kreamer,  
6 in his testimony on page 4 says "Only 2 of the 4  
7 aquifer tests performed in '82 and 2002 including an  
8 upper confining unit monitoring well." And states  
9 that "Given the size of the mining area and the  
10 spatial heterogeneity that this is inadequate for  
11 that." And I think you talked about that earlier.

12 NRC Exhibit 076, page 37, Answer D.13  
13 states that "The 1987 aquifer pump test," that's test  
14 2 that we talked about "does have this one piezometer  
15 in the upper confining layer. And that all four  
16 aquifer pump tests performed by CBR had observation  
17 wells in other parts of the Brule aquifer."

18 The really one question I have remaining  
19 from that because we've covered that in depth, but  
20 NRC, I do have a question that in this quote that I've  
21 taken out of 076 that I just mentioned, at one point  
22 you call it a piezometer and at another point you call  
23 it an observation well. I wonder if you might clarify  
24 if there's any difference between those two.

25 DR. STRIZ: I believe that would be an

1 oversight. It was a piezometer. There is an  
2 observation well in the Brule in that test, but there  
3 were piezometers in the upper confining layer and in  
4 the lower confining layer in test number 2.

5 JUDGE WARDWELL: And what is the  
6 difference in your mind between a piezometer and an  
7 observation well?

8 DR. STRIZ: There's a substantial  
9 difference. If you read the description of that test  
10 in pumping test number 2, they actually used a very  
11 small tube with a porous cup at the bottom and that  
12 was the piezometer that was put into place in the  
13 overlying and the underlying confining layers.

14 JUDGE WARDWELL: And so what would be  
15 typical of an observation well at that same location  
16 if it was -- if one was to put an observation well in  
17 instead of an piezometer?

18 DR. STRIZ: Well, as Crow Butte described,  
19 it would be a 4.5 inch monitoring well with a screen  
20 that had been cemented in place which is totally  
21 different than a piezometer with a little porous cap  
22 at the bottom that's used in soil moisture analysis.

23 JUDGE WARDWELL: CBR, may I clarify also  
24 then that the observation well you put in, were they  
25 fully screened in the Basal Chadron or were they only

1 screened at a short interval within the Basal Chadron?

2 MR. BEINS: The observation wells were  
3 screened through the Basal Chadron sand, yes.

4 JUDGE WARDWELL: If I understand correct,  
5 the real difference would be that a piezometer  
6 attempts to measure water pressure at a point as  
7 opposed to an average value over the screened  
8 interval?

9 DR. STRIZ: In addition, the way that the  
10 piezometer picks up water because you expect that  
11 there's very little water that will move, so you use  
12 these porous caps to detect very small water movement  
13 in these zones.

14 JUDGE WARDWELL: But if you really wanted  
15 that, why did you bother putting it even the -- what  
16 size diameter did you say the casing was?

17 DR. STRIZ: For those little piezometers?  
18 I'm not exactly sure. But the ones that I've worked  
19 with in the field are like two inches. I'm not sure  
20 that they described it. I can attempt to find it in  
21 there.

22 JUDGE WARDWELL: But even so, why wouldn't  
23 you just drill down, put this electronic device that  
24 you're talking about -- it's an electronic device  
25 you're talking about?

1 DR. STRIZ: No, it's an actual physical  
2 tube with a porous cap at the base of it. It's not a  
3 --

4 JUDGE WARDWELL: So it's a two-inch tube  
5 going down there with just a porous cap on the Basal  
6 --

7 DR. STRIZ: Porous cap.

8 JUDGE WARDWELL: Rather than a screened  
9 interval that has a porous cap on the bottom of it?

10 DR. STRIZ: Correct.

11 JUDGE WARDWELL: So it's still measuring  
12 a water level and water has to flow into that and rise  
13 up and drop based on reactions to changing water  
14 levels? It's not measuring pressure. And it's trying  
15 to do it at a point, but yet it's still taking some  
16 type of average value and it has a certain delay time  
17 and response time before you're actually measuring the  
18 water pressure difference from a pump test. Is that  
19 correct?

20 DR. STRIZ: Correct.

21 JUDGE WARDWELL: Thank you. NRC Exhibit  
22 706, page 66 to 67, your answer 6.9, you state that  
23 "the most important information obtained from these  
24 aquifer pump tests was the assessment of the behavior  
25 of the units overlying the Basal Chadron sandstone

1 aquifer to determine the degree of confinement created  
2 by the overlying, low permeability layers."

3 Doesn't the number of observation wells  
4 that the Applicant has placed in these units and in  
5 the Brule appear to be inconsistent with that goal?  
6 I mean it doesn't seem like there's much of an effort  
7 to actually measure any potential effects associated  
8 with the pumping in those units.

9 DR. STRIZ: We would disagree with that.  
10 These are very standardized tests. They were  
11 performed in a standardized manner. Three to four  
12 observation wells in the Basal Chadron is totally  
13 sufficient to assess the draw down in that particular  
14 formation. One overlying well in the Brule is  
15 sufficient because they put it close to the pumping  
16 well and then they also had the piezometer test and  
17 they did consolidation tests in the overlying and  
18 underlying zones in addition through core samples that  
19 they took. This is very standard practice to have  
20 these many wells and their locations. And NRC has  
21 based many licensing decisions on such configurations.

22 JUDGE WARDWELL: Certainly, I can  
23 understand that if everyone was very confident in the  
24 homogeneity of all the geologic strata, but I'm  
25 somewhat -- didn't yesterday get a very strong feeling

1       that there was much homogeneity from any of the  
2       parties here in regards to geologic strata. And given  
3       that, wouldn't it easily happen that one well may not  
4       show a draw down where 10 feet, 10 inches, whatever,  
5       away from that may, in fact, show some draw down if it  
6       happened to be located in the fracture pattern that  
7       may or may not exist. How do you handle the  
8       heterogeneity associated with that with one well?  
9       That doesn't seem very ambitious to me is my initial  
10      reactor. Why am I wrong?

11               DR. STRIZ: Because pumping tests are  
12      actually set up initially assuming that the aquifer  
13      will respond in a homogeneous isotropic manner. And  
14      you place those wells assuming that in the beginning.  
15      And it is the response off the aquifer that lets you  
16      know if it deviates from that model. The large-scale  
17      tests are designed to average the conductivity and the  
18      response across the aquifer. So when you look at the  
19      response of the draw down over time, you look to see  
20      if you see that homogenous isotropic curve. And  
21      mostly, they do. And these tests all demonstrated  
22      that with slight deviations. They did not demonstrate  
23      any of the behavior of fractured media. Fractured  
24      media, the initial response comes from the fractures  
25      delivering water to the well. So you get a very

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1 initial drawdown curve that's flat because there's a  
2 lot of water being delivered to the well. Then as the  
3 aquifer starts to stress the matrix, you get a  
4 separate response. So there's two responses that show  
5 that it's fractured media. None of the pumping tests  
6 at Crow Butte demonstrated that behavior. In fact,  
7 all the pumping tests came very close to demonstrating  
8 homogeneous isotropic behavior except for Test 1 and  
9 Test 2 that showed very small amounts of anisotropy.

10 JUDGE WARDWELL: And where may we see  
11 those plots in either your EA that you did that  
12 culminated in you saying that it was approving that  
13 these tests were -- you were comforted that these  
14 tests showed the response that you just described.  
15 And where may we see those types of plots that you  
16 just referred to?

17 DR. STRIZ: Well, they're in the license  
18 renewal application.

19 JUDGE WARDWELL: That's fine.

20 DR. STRIZ: I'm sorry, I don't have the  
21 cite. And I also have the original aquifer tests that  
22 were done in the Ferret application in 1987 and all  
23 the plots are here. But I can absolutely guarantee  
24 that the responses were very close to homogeneous  
25 isotropic responses with small amounts of leakage at

1 lay time.

2 JUDGE WARDWELL: And the '82 test, has  
3 that been submitted as an exhibit in this proceeding?

4 DR. STRIZ: No, but I could submit it. I  
5 do have the tests and all the analysis.

6 JUDGE WARDWELL: Crow Butte, do you know  
7 where to cite for those plots that may show the  
8 homogeneity of the results of the pump tests that  
9 support the sparse number of wells in the other strata  
10 besides the Basal Chadron?

11 MR. BEINS: I understand the charts are  
12 not part of the exhibit. I imagine we can get that  
13 for you though.

14 JUDGE WARDWELL: But we have the entire  
15 license renewal application, so are you saying it's  
16 not in the license application because I understood  
17 NRC to say it was in that.

18 MR. BEINS: Test number 4 is included as  
19 CBR No. 12 and it has all the charts with it.

20 JUDGE WARDWELL: And what about the other  
21 tests? Were there similar reports to that we got for  
22 that exhibit for the test number 4 for the 1, 2, and  
23 3?

24 MR. BEINS: I don't believe that we've  
25 included those as an exhibit.



1 JUDGE WARDWELL: Is there any reason why  
2 you didn't or why did you select 4?

3 MR. BEINS: I believe that we included  
4 Test 4 at the time we submitted this as it was still  
5 in the process of being reviewed and everything as we  
6 sent in the license application.

7 JUDGE WARDWELL: I see. So this report  
8 was from a recently active pump test moved into the  
9 new mine unit and the others were years earlier than  
10 that.

11 MR. BEINS: Yes, sir.

12 JUDGE WARDWELL: And would have already  
13 been submitted.

14 MR. BEINS: Test number 4 was completed in  
15 2006 and at that time we were preparing the license  
16 renewal and we had summarized the results from test  
17 numbers 1 through 3.

18 CHAIR GIBSON: Rich, just a sec. I just  
19 am curious about this information we've just been  
20 talking about. Has this information been provided to  
21 the Intervenors?

22 DR. STRIZ: This is publicly available  
23 information that is in ADAMS. I don't believe that we  
24 physically --

25 CHAIR GIBSON: Was it part of your

1 disclosures in the case, I guess that's my question.

2 DR. STRIZ: I don't believe so.

3 MR. SMITH: This is Tyson Smith for Crow  
4 Butte. It was listed in our disclosures.

5 CHAIR GIBSON: Okay, thank you. Very  
6 well.

7 MR. SMITH: And just for clarity, it was  
8 listed -- the pump tests 1 through 4 were listed in  
9 our disclosures.

10 MR. REID: This is counsel for the Oglala  
11 Sioux Tribe. While we have this short break, our  
12 witness, Charmaine White Face, had arrived. She was  
13 sitting in the back and I didn't realize that. I've  
14 had her come to the front. I don't think she's been  
15 sworn in. I just draw that to your attention. Thank  
16 you.

17 CHAIR GIBSON: All right, well, let me  
18 take care of that real quick in case Judge Wardwell  
19 has any questions for her.

20 JUDGE WARDWELL: I do, but I'm not sure  
21 I'm going to get to them today.

22 CHAIR GIBSON: That's all right. That's  
23 all right. You never know, you may move faster than  
24 you think.

25 JUDGE WARDWELL: Fat chance. If I don't

1 stop talking we won't.

2 CHAIR GIBSON: Would you please stand up,  
3 ma'am. Would you please raise your right hand and  
4 state your full name?

5 MS. WHITE FACE: Charmaine White Face.

6 CHAIR GIBSON: You do affirm that all  
7 testimony you're about to give in the case now before  
8 this Board will be the truth, the whole truth, and  
9 nothing but the truth, this you do affirm under the  
10 pains and penalties of perjury?

11 MS. WHITE FACE: I do.

12 CHAIR GIBSON: Thank you, ma'am. You may  
13 sit now.

14 JUDGE WARDWELL: Crow Butte's license  
15 renewal application, page 2-205 and 206 and I quote,  
16 "Aquifer pump test data collected, as part of this  
17 investigation, were analyzed using a variety of  
18 methods including the Theis, Jacob, Cooper-Jacob,  
19 Hantush, Newman and Winterspoon methods, Darcy's law  
20 and the standard laboratory consolidation test. In  
21 your testimony on page CBR Exhibit 45, page 29, Answer  
22 51, you say that in regards to the low permeability of  
23 the upper confining unit you state "site-specific  
24 testing of cores from the upper confining units have  
25 been performed and indicate a very low permeability

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1 that is representative of an aquiclude."

2 Let me start off by saying or asking  
3 what's the difference between an aquiclude and an  
4 aquitard?

5 MR. LEWIS: Bob Lewis at Crow Butte. The  
6 definition of aquiclude is basically a material that  
7 doesn't transmit any water or very close to an  
8 impermeable material. An aquitard, on the other hand,  
9 is a material which transmits a relatively small  
10 amount of water, but is not impermeable.

11 JUDGE WARDWELL: And is there any such  
12 thing as an impermeable geologic strata?

13 MR. LEWIS: Not that I know of.

14 JUDGE WARDWELL: So you wouldn't be  
15 surprised if someone else took the same information  
16 and called it an aquitard instead of an aquiclude?

17 MR. LEWIS: I've seen that used  
18 interchangeably, yes.

19 JUDGE WARDWELL: And are you referring  
20 under this statement, this testing of the cores to  
21 some consolidation testing made of the clay strata  
22 taken out of the upper confining unit?

23 MR. LEWIS: Yes.

24 JUDGE WARDWELL: And where are those tests  
25 described? It would be nice if you had something in

1 regards to sample preparation, the consolidated stress  
2 and the changes in permeability with overburdened  
3 stress, things like that, would you have available?

4 MR. LEWIS: I believe you've asked a  
5 similar question yesterday as to the source of the 10  
6 to the minus 10 centimeters per second reference. The  
7 consolidation tests were performed in the aquifer  
8 tests number 1 and 2. And those consolidation tests  
9 were mentioned in the narrative to the LRA in 1995.  
10 That's where that reference comes from. The narrative  
11 for that basically just simply describes consolidation  
12 tests which were evidently a geotechnical or  
13 engineering type of a test that was done back at that  
14 time that could be used to measure conductivity of  
15 materials.

16 The narrative indicated that the test was  
17 completed to an ASTM standard, but there was no  
18 reference as to which standard was used or any details  
19 of how that consolidation test was performed, other  
20 than it was performed to some ASTM standards. There  
21 was note on the tables that was included in the LRA in  
22 1995 that tabulates the values for those consolidation  
23 tests which said they were calculated for a 600 psi  
24 effective overburden pressure. And that is the extent  
25 of the detail that I could provide regarding how those

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1 consolidation tests were performed.

2 JUDGE WARDWELL: Have you developed any  
3 table or such that you want to offer as an exhibit  
4 here to summarize the information from these tests?

5 MR. SMITH: This is Tyson Smith for Crow  
6 Butte. We would move to admit Exhibit CBR061 as we  
7 discussed earlier this morning. We have provided  
8 copies to the parties and to the Judges and we'll be  
9 filing that electronically later today.

10 CHAIR GIBSON: Okay, CBR061 has been  
11 offered. Is there any objection? This is basically  
12 the information we've been -- Judge Wardwell asked  
13 people about yesterday.

14 MR. REID: Not from the Tribe.

15 MR. BALLANCO: Not from Consolidated  
16 Intervenors.

17 CHAIR GIBSON: Staff?

18 MS. SIMON: Not from the staff, Your  
19 Honor.

20 CHAIR GIBSON: Very well, then CBR061 is  
21 admitted.

22 (Whereupon, the above-referred to document  
23 was received into evidence as CBR061.)

24 One other thing, it won't be available in  
25 the World Wide Web for a little while, apparently,

1 because we haven't gotten it on EIE yet. But it will  
2 eventually get out there.

3 MR. BEINS: Your Honor, Wade Beins with  
4 Crow Butte. We have the full citation for that  
5 testing measure, the ASTM measure. It's American  
6 Society for Testing and Materials, dated 1985,  
7 standard test method for one dimensional consolidation  
8 properties of soils, Annual Book of ASTM Standards  
9 1977, Section 4, Soil, Rock, and Building Stone,  
10 designation D as in Delta, 243-5, excuse me, 2435-80,  
11 Volume .4.08 and it's found on pages 526 through page  
12 534.

13 JUDGE WARDWELL: Thank you. Is it fair to  
14 say that testing -- well, when the phrase was used by  
15 Crow Butte yesterday in regards to compaction tests,  
16 is this the test that you were -- are these the tests  
17 that you were referring to when you used the phrase  
18 compaction tests?

19 MR. BEINS: Yes, sir.

20 JUDGE WARDWELL: Thank you. And is it  
21 fair to say that these are small, core samples taken  
22 out of a large area so that the chances of reflecting  
23 any potential fracturing or discontinuities in that  
24 strata would not be tested by these methods? You're  
25 really testing the soil-like material itself, rather

1       than the whole hydraulic behavior of the strata in its  
2       entirety. Is that a fair assessment?

3               MR. BEINS:       That would be a fair  
4       assessment.

5               JUDGE WARDWELL:   So it would be hard  
6       pressed to pick up the behavior of any fractures or  
7       joints in the formation. Is that correct?

8               MR. BEINS:   In this type of a test, yes.

9               JUDGE WARDWELL:   And we may be at a good  
10      time to stop right now.

11              CHAIR GIBSON:   Good. We'll go for a ten-  
12      minute recess as soon as we finish in the rest room.

13              JUDGE WARDWELL:   Thank you.

14              (Whereupon, the above-entitled matter went  
15      off the record at 10:10 a.m. and resumed at 10:22  
16      a.m.)

17              CHAIR GIBSON:   All right, very well.  
18      Before we get back to Judge Wardwell's questions,  
19      there was a reference to these four tests that we  
20      don't have, apparently, exhibits for. Could either  
21      the Staff or Crow Butte give us a hard copy of that?  
22      Would that be possible?

23              MR. SMITH:   It's Tyson Smith for Crow  
24      Butte. Pump Test No. 4 Report is an exhibit. That's  
25      Exhibit CBR 12. The other three are not exhibits. We



1 do have electronic copies of those.

2 CHAIR GIBSON: Could you get that to us?

3 MR. SMITH: Yes, I can provide that to you  
4 in hard copy.

5 CHAIR GIBSON: The problem is how are we  
6 going to get it, right?

7 MR. SMITH: Right. They're rather large  
8 documents, I believe, on the order of a couple of  
9 hundred pages each, so I don't know that it's  
10 practical to print out.

11 CHAIR GIBSON: It wouldn't be practical to  
12 worry about that. Would it be possible to maybe get  
13 us a copy tonight --

14 MR. SMITH: Electronic --

15 CHAIR GIBSON: -- to maybe get it copied  
16 tonight, maybe, and then get us it tomorrow?

17 MR. SMITH: Yes, of course.

18 CHAIR GIBSON: Would that work?

19 MR. SMITH: So you will be looking for a  
20 hard copy of the first three pumping test reports.  
21 How many copies of that would you like?

22 CHAIR GIBSON: Actually, yes, that'll  
23 work. If you just get us two hard copies, we can have  
24 one for the Board, and that way Intervenors will have  
25 a copy. You all have got electronic copies there, the

1 two of you, and then you'll send us an electronic  
2 copy, as well?

3 MR. SMITH: Correct.

4 CHAIR GIBSON: Okay? What I will do -- I  
5 just want everybody to know in advance -- I'm going to  
6 just call those -- those three tests is going to be  
7 called Board Exhibit 2, just for identification  
8 purposes, so we'll all know what we're talking about,  
9 okay? We'll get a copy of that to the Intervenor,  
10 and a copy to the Board -- the hard copy -- and then  
11 you'll send an electronic copy and we'll get it  
12 whenever we've got Internet access, fair enough --

13 MR. SMITH: Sounds good, yes, Your Honor.

14 CHAIR GIBSON: -- Mr. Smith? Thank you so  
15 much.

16 MR. BALLANCO: Your Honor, Tom Ballanco  
17 for Consolidated Intervenor.

18 CHAIR GIBSON: Yes, sir.

19 MR. BALLANCO: We're able to accept an  
20 electronic copy. We do get Internet in the evening,  
21 so --

22 CHAIR GIBSON: So you won't need a hard  
23 copy?

24 MR. BALLANCO: That's correct, Your Honor.

25 PARTICIPANT: Why can't we just do that?

1 MR. REID: The same for the Tribe.

2 CHAIR GIBSON: The same for the Tribe?

3 MR. REID: Right, we have Internet access  
4 at the hotel, so we can certainly download it.

5 MR. SMITH: We'll send it electronically  
6 to all the parties. We'll also bring an additional  
7 hard copy, in case someone wants to have --

8 CHAIR GIBSON: That'll be great. Thank  
9 you so much.

10 MS. SIMON: Your Honor, this is Marcia  
11 Simon.

12 CHAIR GIBSON: Yes, Ms. Simon.

13 MS. SIMON: For the earlier USGS report,  
14 I can do the same, now that we know that the  
15 Intervenors have email. I can provide one hard copy,  
16 and then electronic copies for everyone.

17 CHAIR GIBSON: That'll be fantastic.  
18 Thank you, Ms. Simon. Anything else? Very well, we  
19 will get back to Judge Wardwell's examination.

20 JUDGE WARDWELL: Back to the Kreamer  
21 testimony, Exhibit 046, Page 2, Dr. Kreamer's critical  
22 pump test calculations, for a number of reasons,  
23 including the use of old data and old research, in  
24 concluding that the license admits to using the Tyce,  
25 Cooper-Jacob, Hantush, Neuman and Witherspoon's

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1 methods, which are all inappropriate for the stated  
2 field conditions. Dr. Kreamer, what field conditions  
3 are you referring to?

4 DR. KREAMER: Your Honor, these tests were  
5 conceived and made for homogeneous isotropic systems  
6 strata that was of equal depth thickness throughout.  
7 They were made for horizontal media that didn't vary  
8 or slope. Those conditions are not met.

9 JUDGE WARDWELL: Wouldn't any deviations  
10 from the homogeneity show up on the results of these  
11 tests if, in fact, it was different than what these  
12 tests assume?

13 DR. KREAMER: Yes, they would, Your Honor.

14 JUDGE WARDWELL: So isn't it a good  
15 screening tool to start off with in regards to  
16 determining whether or not there is such a thing as  
17 leakage between the aquifers?

18 DR. KREAMER: It can be, Your Honor. It  
19 can be a good first step.

20 JUDGE WARDWELL: Okay. So there's nothing  
21 wrong with starting with these tests?

22 DR. KREAMER: Absolutely not, Your Honor.

23 JUDGE WARDWELL: Do people oftentimes  
24 start with these tests?

25 DR. KREAMER: That is standard, sir.

1 JUDGE WARDWELL: They are common  
2 industry-accepted tests for evaluating the results of  
3 aquifer pumping tests. Is that a fair assessment?

4 DR. KREAMER: Yes, Your Honor.

5 JUDGE WARDWELL: Thank you. Do you have  
6 any specific tests that you would use in addition to  
7 these three initially -- not three, these groups that  
8 they have -- that you would suggest be used?

9 DR. KREAMER: I'm not sure how broad the  
10 question is, Your Honor. There are certainly ground  
11 water dating techniques. You could look at parameters  
12 that were not looked at.

13 JUDGE WARDWELL: Let me just ask you this.  
14 I'll stop you there, so you don't get in a long,  
15 involved answer to my somewhat abstract question. If  
16 you were doing this yourself, what test would you run  
17 on these that aren't listed here, what one test?

18 DR. KREAMER: I would have more wells to  
19 start with. I would have --

20 JUDGE WARDWELL: Not asking you that.

21 DR. KREAMER: Okay. As a beginning  
22 measure, I think that this is a good start that I  
23 would run.

24 JUDGE WARDWELL: Thank you. Crow Butte,  
25 do you agree that these tests are eventually designed

1 to really determine whether or not you have  
2 homogeneous isotropic strata?

3 MR. BEINS: Yes, Your Honor.

4 JUDGE WARDWELL: It's inherent in their  
5 assumption, right?

6 MR. BEINS: Yes, sir.

7 JUDGE WARDWELL: If you saw a deviation,  
8 then some other steps would have to be taken, but if  
9 you don't, then fine. This may not be a homogeneous  
10 strata, but it acts like one when you're looking at  
11 average conditions shown over that radius of influence  
12 that we saw on that chart. Mr. Deucher, could we pull  
13 up that chart again, the last one we had? I think we  
14 had that -- yes, that was, I believe, the License  
15 Renewal Application 2782-203. That's it -- the plan  
16 view, the map, whatever. Just to verify, am I correct  
17 that the circles are the radius of influence for each  
18 individual well, is that correct, Mr. Beins?

19 MR. BEINS: That is correct.

20 JUDGE WARDWELL: And that the radius of  
21 influence is in the neighborhood of 4,000 to almost  
22 6,000 feet?

23 MR. BEINS: Correct.

24 JUDGE WARDWELL: So almost a mile -- a  
25 little under a mile?

1 MR. BEINS: Yes, sir.

2 JUDGE WARDWELL: So fairly large test, and  
3 it covers -- the yellow is the LA, is that correct?

4 MR. BEINS: The yellow highlighted area is  
5 the license area -- permit area, yes.

6 JUDGE WARDWELL: In interpreting this  
7 data, in Crow Butte Exhibit 045, Page 5A-17, and I  
8 quote, "Aquifer testing and well field operations at  
9 Crow Butte would have identified the presence of  
10 significant joints or faults that affect ground water  
11 flow, given the large and overlapping radius of  
12 influence of these tests. No boundary conditions were  
13 encountered during the aquifer testing that would  
14 indicate any existence of these features." The  
15 Intervenor's Exhibit 069, Page 5, Dr. Kreamer  
16 testifies that Petrotek's analysis of the 2002 aquifer  
17 testing is insufficient, in that only the first 700 or  
18 800 minutes of the 3,780-minute drawdown fully match  
19 a Cooper-Jacob straight line approach for several  
20 observation wells and observation well response beyond  
21 the time that was not fully discussed. Dr. Kreamer,  
22 are you referring to the Petrotek analysis -- I'm  
23 pulling up the CBR Exhibit 012, Figure 7, Page 22,  
24 which is Page 26 in the PDF. Is this one of those  
25 that you were referring to?

1 DR. KREAMER: Yes, Your Honor.

2 JUDGE WARDWELL: Where are you pointing to  
3 in regards to the deviation from what would be a  
4 homogeneous isotropic response with no leakage?

5 DR. KREAMER: It's a logarithmic scale for  
6 the time, on top. If you look at the very top, where  
7 the cursor is now, that's normal to not have a  
8 straight line at that time. It then becomes a  
9 straight line curve. You can see that continues on  
10 down to about 700 minutes into the test. The time is  
11 compressed because it's logarithmic. The test goes on  
12 for more than 3,700 minutes. At that point where the  
13 cursor is now, you have a diversion. Diversions up  
14 from that line mean there's less drawdown than  
15 expected. The diversions down mean there are more.  
16 If there's a diversion more vertically downward, that  
17 means you've hit an impermeable boundary of some sort,  
18 and there'd be less water available. But it deflects  
19 upward, and that's usually indicative of a recharge  
20 boundary, some other water source, which could include  
21 vertical movement.

22 JUDGE WARDWELL: How many of the -- do any  
23 of the other analyses that were performed show this  
24 same boundary, or is it just this Jacob test -- the  
25 Cooper-Jacob test that shows it?



1 DR. KREAMER: We did not have access to  
2 Tests 1 through 3 in the data.

3 JUDGE WARDWELL: I know. I mean in test  
4 --- in 1 through 3, that's why I'm asking for the  
5 others, in fact.

6 DR. KREAMER: Yes, there are some  
7 indications in the others, which are minor, but to  
8 stress, I didn't do an analysis, as I just testified,  
9 but there is indications that the drawdown was not  
10 great in Pump Test 2. But in this test, this, I  
11 think, is the most easily seen and the most telling  
12 that there is, in fact, non-homogeneous conditions and  
13 possible vertical movement of water.

14 JUDGE WARDWELL: NRC, why isn't this an  
15 illustration of what you were just describing to us  
16 before the break?

17 DR. STRIZ: I believe Mr. Back analyzed  
18 this test and will answer this question.

19 JUDGE WARDWELL: Okay, thank you.

20 MR. BACK: Your Honor, when a boundary  
21 condition is hit in an aquifer pumping test, it  
22 provides a continuous source of water. These  
23 transient effects that you see -- and there's a  
24 classic response, too, where you have the straight  
25 line without the boundary effect, and you'll actually

1 see the curve continue to go up with a boundary  
2 effect. You don't see the transient responses like  
3 you do here. Basically, we agree with Crow Butte's  
4 hydrogeologist, who looked at this and felt that it  
5 was from a nearby well field, either wells going on or  
6 off. But anything over these distances in this very  
7 confined system could create a transient effect like  
8 this.

9 JUDGE WARDWELL: So you believe the  
10 deviation from that straight line that would indicate  
11 not as much drawdown as what would be anticipated in  
12 a non-boundary condition in an isotropic homogeneous  
13 material that would follow a straight line is a  
14 transient, rather than a --

15 MR. BACK: That's exactly right.

16 JUDGE WARDWELL: -- recharge from some  
17 other water source? How can you delineate between  
18 those two potential causes for this response?

19 MR. BACK: Your Honor, if you look at that  
20 response, it picks up that the drawdown decreases,  
21 like we've said, but it starts to go back to that  
22 straight line again. That's not what would happen in  
23 a recharge boundary. It would continue to move off of  
24 that straight line as you moved out with time. The  
25 whole curve would curve up. You would never get back

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1 to that straight line again.

2 JUDGE WARDWELL: You're pointing to the  
3 part of this deviation there near -- close to the  
4 right-hand side, which I believe is the 3,780-minute  
5 time frame.

6 MR. BACK: That's right, Your Honor. It's  
7 a very classic response when you hit a recharge  
8 condition. This is not it. This is more like what  
9 the actual analysis described where -- a well field  
10 system going on or off nearby.

11 JUDGE WARDWELL: Why would the well field  
12 provide recharge to the --

13 MR. BACK: If there's an injection well,  
14 then that --

15 (Simultaneous speaking)

16 MR. BACK: -- could potentially do it.  
17 Quite honestly, a train running over a confined system  
18 has the same effect.

19 MR. BEINS: Your Honor --

20 JUDGE WARDWELL: So your well field you're  
21 referring to is the mine units, not some well field  
22 beyond the license area, as I was envisioning when you  
23 said the word a well field?

24 MR. BACK: Yes, Your Honor.

25 JUDGE WARDWELL: I see. Crow Butte, it

1 looks like the key area here is right near the end of  
2 the test. Why wasn't it run longer, so that you could  
3 determine that better and isolate on that, or at least  
4 expand the curve to support your position in regards  
5 to your interpretation of this behavior?

6 MR. LEWIS: Bob Lewis at Crow Butte. Your  
7 Honor, it's my understanding that production in the  
8 adjacent mine unit was turned off at this point during  
9 the test that you see the deviation from the curve.

10 JUDGE WARDWELL: You're saying the mine  
11 unit was turned off, and that's why you see the --  
12 okay.

13 MR. LEWIS: The adjacent mine unit, which  
14 clearly we have -- radius of influence on these well  
15 fields are thousands of feet, so you do see influences  
16 from adjacent mine units if the tests are going on  
17 simultaneously with operation. When the production is  
18 turned off, the drawdown is decreased and, therefore,  
19 has the appearance of a recharge condition. That's  
20 the reason for that appearance. The fact that it  
21 returns to the curve in the latest time shows that  
22 essentially, the test has been run long enough to show  
23 that transient effect is gone, and the fact that it  
24 has returned to the straight line curve.

25 JUDGE WARDWELL: Did you see any such

1 behavior in any of the other first three tests that  
2 were performed at the site?

3 MR. LEWIS: I don't recall any other of  
4 that type of behavior, the recharge boundaries, no,  
5 sir.

6 JUDGE WARDWELL: Dr. Kreamer, what's your  
7 response to their explanation for this?

8 DR. KREAMER: Normally, I would agree, but  
9 when you actually read the document, they talk about  
10 mine operations in a vague way. The only thing they  
11 explicitly say -- can I quote -- from Page 8 of the  
12 Petrotek document, that would be CBR 012, they say,  
13 "An increase in drawdown versus time was observed late  
14 in the test in all of the wells, particularly in  
15 CM9-13 and CM9-14, Appendix D," where they list the  
16 data. "These responses may be related to the  
17 operation of Well Houses 10 and 11, rate fluctuations  
18 of 160 and 60 gallons per minute, respectively." The  
19 only information they provided on outside wells was  
20 not wells shutting off, was not injection wells, it  
21 was just an increase in drawdown at the end through  
22 pumping.

23 I agree with Mr. Back that a classic  
24 recharge would have continued out, but they have  
25 documented in the Petrotek report that there was

1 increased drawdown due to pumping wells nearby, near  
2 the end of the test. That's the only specific  
3 reference they make. I didn't have information that  
4 wells shut off. That was not in the document, and  
5 that would've been conjecture for me.

6 JUDGE WARDWELL: Mr. Back, if there was  
7 some recharge from a water source outside that was  
8 encountered during the test, and then someone turned  
9 on some other pumping wells, as I heard the quote from  
10 the report and applies to me, wouldn't that result in  
11 that shape of the curve, or could it not be a  
12 possibility that is a reason for the shape of that  
13 curve?

14 MR. BACK: Yes, there are any number of  
15 things that could result in the shape, but the  
16 important thing is that whatever happened had a quick  
17 response. It's not continuously feeding water or  
18 having a long response. That's what's important.

19 JUDGE WARDWELL: Couldn't it be feeding  
20 water near the end, but it's being sucked out by these  
21 other wells that were turned on? That's what the  
22 consultant said it was.

23 MR. BACK: Your Honor, I disagree with  
24 that.

25 JUDGE WARDWELL: Why?

1 MR. BACK: Because these are all pressure  
2 effects, too. So to have just the -- and it's going  
3 back to the same line it was on. So just to have that  
4 assume perfect balance to the amount of water coming  
5 in is equal to the amount of water going out, that  
6 just doesn't make conceptual sense.

7 JUDGE WARDWELL: Do you have any idea why  
8 Petrotek didn't explain it the way you explained it?  
9 They didn't present that hypothesis.

10 MR. BACK: It was ambiguous in their  
11 explanation, as was just said, so it was just a matter  
12 of what could cause that? An injection well could  
13 cause it. The wells being shut off could cause it.  
14 There could be other effects, too, that could cause a  
15 transient effect.

16 JUDGE WARDWELL: Crow Butte, do you have  
17 anything to offer in regards to explaining the  
18 difference between what was presented in the Petrotek  
19 report and what we're hearing here as the causal  
20 effects for this response?

21 MR. BEINS: The responses that we saw in  
22 these wells, Your Honor, are described in detail on  
23 Pages 7 and 8 of CBR Exhibit No. 12, which is the Pump  
24 Test No. 4 plan, I believe, for you to look at.

25 JUDGE WARDWELL: So you just -- that's

1 your cite for the reasons?

2 MR. BEINS: Yes.

3 JUDGE WARDWELL: Okay, thank you. INT  
4 069, Page 2, states that in some cases, only selected  
5 data were used in evaluating the aquifer test,  
6 effectively ignoring contradictory data which could  
7 indicate vertical communication of the ground water.  
8 Are you referring to the same 700-800-minute time  
9 period in regards to this diagram for that?

10 DR. KREAMER: There's two. That part of  
11 the data was ignored, but also the five tests in 2004  
12 and 2005 that were disregarded.

13 JUDGE WARDWELL: Thank you. In that  
14 light, I may have asked this earlier, but it's too  
15 late to read the transcript if I hadn't asked this.  
16 Do you have any contradictory comments in regards to  
17 their reasons why 1 through 5 acted like they did that  
18 were basically corrected by the leakage from  
19 associated perimeter wells and not the well itself  
20 that they were pumping for the leakage through the  
21 Chadron?

22 DR. KREAMER: CBR 013, the ARCADIS report,  
23 was vague. They didn't go into the detail that was  
24 gone in here. They said possible surface leakage. I  
25 was sort of surprised by that comment because there



1 was discussion about how the surface of these things  
2 were isolated for abandoned wells, how they were  
3 surface sealed, and how there was proper -- they also  
4 said it could have been abandoned wells, and they went  
5 through how they replugged some when they finally did  
6 another well. That was all not reported and  
7 unavailable. I did not independently verify that at  
8 all, so I really can't comment on that information.

9 JUDGE WARDWELL: Thank you. On CBR 045,  
10 Page 35, Answer 63, significant hydraulic boundary  
11 conditions would be apparent in operation water level  
12 and other data, as verified by frequent use of current  
13 ground water model. I guess I'm curious as to whether  
14 or not any of these water levels -- or how many of  
15 these water levels in the pump well and the  
16 observation wells are also monitored during your  
17 production pumping, if any.

18 MR. BEINS: Leading up to any pump test,  
19 we have a time period where we gather baseline data  
20 ahead of the test. We run the test then, and then we  
21 gather recovery data and get data following on after  
22 the test. That would be some of the data that would  
23 be available to look at to see the effects of  
24 operations on those particular observation wells.

25 JUDGE WARDWELL: When do you get this

1 data? When would any of these wells be monitored,  
2 including the water levels in the production wells?

3 MR. BEINS: The water levels are collected  
4 using down hole transducers, collecting data at a  
5 regular interval -- 30 seconds, I'm not sure what they  
6 use exactly -- but you would have that data over that  
7 time period. Those transducers are in each one of  
8 those observation wells.

9 JUDGE WARDWELL: The well you're speaking  
10 of is the production well in the mine unit, not the  
11 pump well used for the pump test, is that correct, or  
12 are those then transferred over to be a production  
13 well?

14 MR. BEINS: Those are the wells that we  
15 are doing the observation during the pumping test that  
16 we have those transducers in. Now eventually, as we  
17 get done with the pumping test, yes, we may be able to  
18 use some of those wells and transition them into a  
19 mining role versus an observation or pump test role.

20 JUDGE WARDWELL: I think I'm confusing  
21 you. During operations, when you're pumping out of a  
22 production well, is that well, that production well,  
23 one of the pump test wells? A better way to phrase it  
24 is is the pump test well then converted to a  
25 production well automatically, or is it not?

1 MR. BEINS: Not necessarily. However, we  
2 have done that with a very small --

3 JUDGE WARDWELL: Okay, but --  
4 (Simultaneous speaking)

5 JUDGE WARDWELL: Okay, fine. When you are  
6 pumping out of a production well, do you monitor the  
7 water levels in the old pump well casings and their  
8 associated observation wells that were used for a pump  
9 test?

10 MR. BEINS: No, sir.

11 JUDGE WARDWELL: Is there a reason you  
12 don't? I think that would be useful information.  
13 Wouldn't that give you a handle on how that aquifer's  
14 behaving under a very long pump test -- 20 years,  
15 right, or whatever?

16 MR. BEINS: Certainly. Part of it has to  
17 do with when you put your down hole equipment in the  
18 well, you've got the pump, the wire, the drop pipe,  
19 all of that. Certainly that apparatus is also present  
20 in the pumping well during the pump test, but we  
21 typically would not want to leave a transducer down a  
22 number of different production wells over a long  
23 period of time. It's just costly to install all  
24 those. The other thing is we do monitor the water  
25 levels across the mine site with our monitoring well

1 ring. Those wells are sampled every two weeks. They  
2 take water levels at that time, and they watch those  
3 water levels as they change over time.

4 JUDGE WARDWELL: When you say sample, you  
5 mean they were measured for water levels. You're not  
6 taking a water quality sample out of them?

7 MR. BEINS: Actually, we're doing both.  
8 We take a water level, and we take a water quality  
9 sample.

10 JUDGE WARDWELL: How often was that again?

11 MR. BEINS: Every two weeks. So  
12 essentially, across the mine site, as we create that  
13 inward hydraulic bleed and that cone of depression  
14 that helps us control our mining solution, we've  
15 lowered the Basal Chadron aquifer to some extent,  
16 roughly in the neighborhood of 40 foot from the  
17 pre-operational levels. With all of the shallow  
18 monitoring wells that we have across the mine unit,  
19 you could almost look at our operational data as being  
20 a further pumping test across the entire site.

21 The fact that we see drawdown in the Basal  
22 Chadron aquifer -- and I'd have to go back and look at  
23 the figures here, look the numbers up for you, but you  
24 can look at the water levels that are present. We  
25 show drawdown in the Basal Chadron, and yet there's

1 very little or no drawdown in the Brule aquifer that  
2 overlies it. So you could even look at that data and  
3 almost consider that as being a very long-term pump  
4 test.

5 JUDGE WARDWELL: Then again, we have a  
6 total of, what, four wells in the Brule to --

7 MR. BEINS: No, sir. We have shallow  
8 monitoring wells in the Brule, one located every four  
9 acres across the mine site. There's 203 --

10 JUDGE WARDWELL: And there's water-level  
11 data for that?

12 MR. BEINS: -- and we have water data and  
13 water levels for those 203 shallow monitoring wells.

14 JUDGE WARDWELL: Has that been presented  
15 in an exhibit or the license renewal application?

16 MR. BEINS: The water levels are presented  
17 as a figure for the potentiometric surface of the  
18 Brule.

19 JUDGE WARDWELL: Thank you.

20 JUDGE HAJEK: Excuse me. Mr. Beins, when  
21 you say you are using the monitoring wells, are these  
22 all of the monitoring wells for all 11 of the mine  
23 units, or only for the active mine units?

24 MR. BEINS: This is the monitoring ring  
25 that encircles the mining well field. It's not all of

1 the monitor wells that were installed for every  
2 individual mine unit. As we drill consecutive well  
3 fields, each well field -- the first well field had  
4 its own ring. Then as we installed the next nearby  
5 mine unit, the monitoring ring for that particular  
6 mine unit intersects the monitoring ring from the  
7 previous one. So it just shows the outlying boundary  
8 of the well field area. So it does encompass the  
9 restoration areas, as well, but -- I forget, there's  
10 150, roughly, monitoring wells in the Basal Chadron in  
11 that monitoring ring.

12 JUDGE HAJEK: For all of the mine units --  
13 I'm sorry, I'm a little confused.

14 MR. BEINS: Yes, it would be for all of  
15 the mine units.

16 JUDGE HAJEK: Okay, one every four acres  
17 in the Basal Chadron or in --

18 MR. BEINS: One every four acres in the  
19 Brule aquifer. Then it's the 300 foot out from the  
20 active mining well field around the perimeter of the  
21 well field itself.

22 JUDGE HAJEK: The well field, okay, thank  
23 you.

24 JUDGE WARDWELL: I believe you were going  
25 to get me information on the maximum drawdown in your

1 pump tests. Did I mention -- yes, I thought so.

2 MR. BEINS: Yes, sir.

3 JUDGE WARDWELL: Do you have any rough  
4 idea what that is compared to the drawdown that you  
5 get in the Chadron during operations -- during  
6 production? Production, I think, if I remember --  
7 we'll get to it, but I think it's 50 feet, about,  
8 something like that.

9 MR. LEWIS: Yes, Your Honor, Bob Lewis.  
10 The pump tests, if I recall, there's a very large head  
11 above the confined aquifer, several hundred feet. The  
12 pump tests themselves result in approximately 100 foot  
13 of drawdown or thereabouts, in some cases more. We're  
14 going to verify that for you. During the operations,  
15 there is a similar amount of drawdown produced as a  
16 result of the bleed that is produced throughout the  
17 mine unit, which Mr. Beins may be able to give you an  
18 idea of what the net bleed or the net pumping radius  
19 --

20 JUDGE WARDWELL: We'll get to that.

21 MR. LEWIS: -- in production.

22 JUDGE WARDWELL: Okay, thank you. But  
23 during your pump tests, you drew down the aquifer  
24 farther than what the net bleed versus injection would  
25 be than that net bleed really that you have during

1 production.

2 MR. LEWIS: I believe that's the case,  
3 Your Honor. In some cases, the well efficiency caused  
4 some additional drawdown in the pumped wells. That's  
5 why there's some variability in the overall pumping  
6 rates between the tests.

7 JUDGE WARDWELL: Thank you. Crow Butte  
8 045, Page 32, Footnote 2, you say that Aquifer Test  
9 No. 1 utilized an upper and lower Brule observation  
10 well and drawdown was not measured in either  
11 observation well. I just want to clarify that you did  
12 not bother measuring the drawdown, or you measured it  
13 and it was zero, by the statement, "Drawdown was not  
14 measured." I read that and that tells me you didn't  
15 bother measuring the drawdown.

16 MR. BEINS: Drawdown was not observed.

17 JUDGE WARDWELL: There was no -- the  
18 drawdown was zero?

19 MR. BEINS: The drawdown was zero, yes.

20 JUDGE WARDWELL: You did observe it, and  
21 it showed that it didn't move?

22 MR. BEINS: Yes, sir.

23 JUDGE WARDWELL: Good, that's what I  
24 wanted to make sure. I think they're saying -- I  
25 think I got -- there's another one, the same thing,



1 that the drawdown was, again, not observed, and yes,  
2 you did observe it, it was zero?

3 MR. BEINS: Yes, sir, we observed it. It  
4 was zero.

5 JUDGE WARDWELL: Bear me with here because  
6 we've covered some of these, so I don't want to repeat  
7 them. Hopefully it takes me less time to not look at  
8 it. Mr. Wireman, I think you may feel slighted today,  
9 so I want to move back to your testimony on Page 047,  
10 to make sure you feel useful today, where you state  
11 that on Page 2-161 of the license renewal application,  
12 "It is reported that the upper confining unit  
13 monitoring well for the aquifer test conducted in 1987  
14 showed a response to barometric pressure during the  
15 test. The conclusion needs to be further supported.

16 If it was truly an unconfined unit  
17 monitoring the well constructed in the lower Brule,  
18 upper Chadron, the hydraulic pressure (potentiometric  
19 surface) should not be significantly affected by  
20 barometric changes as the ground water in the upper  
21 confining unit is somewhat isolated from surface  
22 pressures." My question to you is on Page 161 of the  
23 license renewal application didn't really seem to show  
24 anything about barometric pressure as I looked at it.

25 I was wondering if you really meant Page

1 2-209, where Crow Butte states that, "The overlying  
2 confining layer piezometer, UCP-1, showed no response  
3 to the pumping from the Basal Chadron sandstone during  
4 the aquifer test. However, this piezometer did  
5 respond to rapid changes in the barometric pressure  
6 from the low-pressure weather front." Is that what  
7 you were referring to?

8 MR. WIREMAN: Yes, and I must confess this  
9 is a misstatement on my part.

10 JUDGE WARDWELL: Okay, so you just had the  
11 wrong cite for the page.

12 MR. WIREMAN: Not only did I have the  
13 wrong cite, I wish that's all, but my statement is  
14 confusing. In a well into a confined unit, that water  
15 level is connected and affected by barometric  
16 pressures, no question. Away from that well, out in  
17 the aquifer with no well, it's not. This statement,  
18 I apologize, is just simply not correct.

19 JUDGE WARDWELL: There are some plots we  
20 get to later on where the barometric pressure is  
21 shown. Do you have no issue with that?

22 MR. WIREMAN: I do not. That plot  
23 correctly shows that the water level in that well, in  
24 the UCU, is, in fact, affected by barometric pressure.

25 JUDGE WARDWELL: So we can skip over all

1 discussion of the barometric pressure, as far as  
2 you're concerned?

3 MR. WIREMAN: I apologize, Your Honor.  
4 That was my mistake.

5 JUDGE WARDWELL: No problem. It happens  
6 to all of us. Don't worry about it. We just want to  
7 make sure we get it corrected here, in regards to how  
8 it actually plays out. I fully understand the  
9 pressures that some clients put you under in regards  
10 to reading vast amounts of material in a short period  
11 of time. These clients you have are not good  
12 technical people. They are other types of specialties  
13 that we won't mention here.

14 MR. WIREMAN: I should have caught it  
15 myself.

16 JUDGE WARDWELL: I resemble that remark. I  
17 was waiting for someone, some counsel to make some  
18 reaction to my snide remark. Crow Butte Exhibit 045,  
19 Page 33, Answer 59, in regards to the magnitude and  
20 extent of the lower potentiometric surface that  
21 results from the production bleed, you state that,  
22 "Ground water levels in the confined aquifer would  
23 quickly recover once mining is complete." Just to  
24 confirm this, Crow Butte, do the potentiometric levels  
25 in both the Basal Chadron and the Brule always remain

1 above the physical elevation of the Basal Chadron, so  
2 that the Basal Chadron remains confined and saturated  
3 at all times during operations?

4 MR. BEINS: Yes, sir.

5 JUDGE WARDWELL: Is that true during  
6 restoration also?

7 MR. BEINS: Yes, sir.

8 JUDGE WARDWELL: Restoration and combined  
9 production -- at points, there are both production and  
10 restoration going on, correct, that both have a net  
11 withdrawal associated with removing water from the  
12 aquifer?

13 MR. BEINS: That's correct.

14 JUDGE WARDWELL: You say there's a quick  
15 recovery. What do you consider a quick recovery, or  
16 if you wish, what do you consider a slow recovery?

17 MR. LEWIS: Bob Lewis, Your Honor. The  
18 characteristic of the confined aquifer is rapid  
19 decline and recovery, general mirroring one another.  
20 So you have rapid drawdown, as you would see in the  
21 pump tests, and you have a similar rapid recovery, as  
22 apparent in the recovery data. So they generally  
23 approximately mirror one another in the confined  
24 system. So, when you say relatively rapidly,  
25 generally over a period of days you're going to see 90

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1 to 95 percent of the total response of the aquifer.  
2 I would expect over a long period of time, with the  
3 multiple mine units in operation, on the order of  
4 weeks you would see a nearly full recovery, on the  
5 order of greater than 90 percent.

6 JUDGE WARDWELL: What would your estimate  
7 be -- again, just a ballpark figure of what recovery  
8 would be if it was an unconfined aquifer?

9 MR. LEWIS: If it was unconfined aquifer  
10 --

11 JUDGE WARDWELL: Say we had a 72-hour pump  
12 test. Under your testimony, for a confined aquifer  
13 under a 72-hour pump test, it would take 72 hours for  
14 it to recover?

15 MR. LEWIS: Approximately, yes.

16 JUDGE WARDWELL: What would the same  
17 amount be if it was an unconfined aquifer?

18 MR. LEWIS: On an unconfined aquifer, you  
19 would probably need to pump on the order of seven days  
20 to get an equivalent response, and you would probably  
21 need to monitor similar recovery, depending on the  
22 storage characteristics aren't necessarily the same  
23 for drawdown in an unconfined aquifer as they are for  
24 recovery, but generally on the same order of seven  
25 days or more for recovery to occur in an unconfined

1 aquifer, assuming it's also going to get a similar  
2 recharge that it received over time.

3 JUDGE WARDWELL: Thank you. NRC, in your  
4 testimony -- your Exhibit 001, Page 92 to 93, Answer  
5 9.4, you state that, "As shown in Figure 7.12-2 to  
6 7.12-4," it's in the license renewal application, and  
7 that's CBR 011 at 7-43 to 7-46. If I might, Mr.  
8 Deucher, would you be able to pull those up? It is a  
9 license renewal application. I've pulled a fast one  
10 on you because I didn't highlight this as one that I  
11 would like to see, so we'll see how quick you are  
12 without being prepared for this.

13 Anyhow, I can go on while you're doing  
14 that. "The water levels will recover within ten feet  
15 of pre-operational values within five years after all  
16 extraction and injection have stopped." My question  
17 to the NRC is are these actual calculated values, or  
18 are they observed values?

19 MR. BACK: Your Honor, these are  
20 calculated values. We requested additional  
21 information from the Applicant, and they responded to  
22 our request. That request is an exhibit, and I could  
23 not find the number of it, if somebody has that. This  
24 is something that the Applicant actually calculated at  
25 the expected and anticipated consumptive use rate. It

1 did not -- they took some conservative assumptions,  
2 though. They did not include recharge. They used one  
3 of the lower storativity values that was observed in  
4 that aquifer test. So we would anticipate that it  
5 would recover more quickly, but we felt this was a  
6 conservative assumption.

7 JUDGE WARDWELL: So this figure right  
8 here, you believe, is a calculated value, right?

9 MR. BACK: Yes.

10 JUDGE WARDWELL: What it's showing is  
11 after 25 years, the water level rises at a much faster  
12 rate than any activity that was taking place before  
13 that. At that 25-year period, are all wells shut off  
14 at that point, is your understanding?

15 MR. BACK: Yes, Your Honor. That's  
16 another conservatism built into this because as you  
17 know, the mine units will be shut off one by one by  
18 one. This assumes that they're all shut off at the  
19 same time, so the drawdown would be a maximum.  
20 Through time, as restoration is completed with each  
21 mine unit, this recovery will begin.

22 JUDGE WARDWELL: Of course, I guess I  
23 really should be asking Crow Butte this, and maybe I  
24 will switch over. This was their response to your  
25 RAI, is that correct?

1 MR. BACK: Yes, Your Honor.

2 JUDGE WARDWELL: This is out of the  
3 license renewal application you pulled out that --  
4 okay, good. Let me ask Crow Butte. These values were  
5 calculated -- was it using your new modeling effort  
6 that you're using in regards to the restoration plan  
7 -- I believe it's the model-based restoration plan  
8 that you now use -- or were these done before that?

9 MR. LEWIS: We did not use the current  
10 numerical model for this analysis, Your Honor.

11 JUDGE WARDWELL: So this was just applying  
12 the storativity coefficients that you got from the  
13 pump tests and just the development of the mine, and  
14 then the shut off associated with it, is that correct?

15 MR. BEINS: I'm not sure which consultant  
16 generated this particular figure for us, sir. I'd  
17 have to look into that.

18 JUDGE WARDWELL: But it is a calculated  
19 value is the important thing.

20 MR. BEINS: Yes, sir.

21 JUDGE WARDWELL: It's using some selective  
22 storage coefficient.

23 MR. BEINS: Yes, sir.

24 JUDGE WARDWELL: It would seem logical it  
25 came from the pump test or some average value of the



1 pump test or something like that. That's always  
2 important.

3 MR. BEINS: Yes, sir.

4 JUDGE WARDWELL: With what the current  
5 information was, the recovery would take place -- or  
6 at least recovery up to the seven foot worth of  
7 drawdown -- within five years after shut down?

8 MR. BEINS: That's correct.

9 MR. BACK: Your Honor, may I make a  
10 correction?

11 JUDGE WARDWELL: Yes, you may.

12 MR. BACK: These recovery rates were based  
13 on a consumptive use rate of 105 gallons a minute. In  
14 actuality, the consumptive use rates will probably be  
15 higher than that, so they provided adjustments for the  
16 recovery rate. So this is actually a recovery rate  
17 that would be more -- quicker than had the more recent  
18 consumptive use rates be used. This work was done a  
19 long time ago with projected recovery rates. This  
20 work was probably done at least ten years ago.

21 JUDGE WARDWELL: You're saying it was  
22 based on the old -- what was it, in the neighborhood  
23 of 100 gallons per minute max rate that you  
24 anticipated to be the consumption use rate associated  
25 with these wells?

1 MR. BACK: Yes, Your Honor. So when the  
2 staff looked at this graph and projected our recovery  
3 times, we realized that this was an optimistic  
4 recovery in some consideration.

5 JUDGE WARDWELL: Is this showing the  
6 operation of the wells, in addition to the restoration  
7 of the units?

8 MR. BACK: Yes, Your Honor. There's a  
9 table in the RAI that steps through -- in the early  
10 time, they've actually gone through progressive steps  
11 of showing different consumptive use rates over  
12 different time periods within the operation of the  
13 mines. That's why things -- there are breaks in slope  
14 and such.

15 JUDGE WARDWELL: We have no such figures  
16 for the new consumptive rate that you believe will  
17 take place now?

18 MR. BACK: No, Your Honor, but what's nice  
19 about the mathematics is that a consumptive use rate  
20 twice the predicted consumptive use rate would  
21 basically extend things about twice as long. So when  
22 things are at steady state -- and they talk about this  
23 in the RAI, too. That's how we've extrapolated.

24 JUDGE WARDWELL: Has anyone slipped you a  
25 slip of paper that gives you the cite for that RAI, so

1 that I don't have to look it up when I'm reading the  
2 transcript?

3 MR. SMITH: It's Exhibit NRC 059.

4 JUDGE WARDWELL: Thank you, Mr. Smith. We  
5 know the source of all exhibits. Thank you. So  
6 you're saying, Mr. Back, that not only is it linear,  
7 as we'll understand later with the amount of drawdown,  
8 but it's also linear with relationship to time?

9 MR. BACK: That's right, Your Honor.

10 JUDGE WARDWELL: Mr. Kreamer, I think I  
11 will ask this question now, even though I'm not there  
12 yet, and I don't know when it is, but I will be asking  
13 it later, but we're touching upon it. They make the  
14 statement that -- do you remember reading anything  
15 about the fact that their maximum consumptive rate was  
16 going to be in the neighborhood of 100 gallons per  
17 minute, and they now anticipate it being closer to, I  
18 think, 210 -- and we'll get the actual figures when I  
19 get to that part of my notes -- and they make a  
20 statement that under steady-state conditions in a  
21 confined aquifer, you can pretty much judge that --  
22 it'll be a rule of thumb -- pretty linear, in regards  
23 to the differences in drawdown. Do you have any  
24 reason to not accept that premise?

25 DR. KREAMER: Well, it assumes that it's

1 a homogeneous aquifer.

2 JUDGE WARDWELL: Or it assumes that the  
3 same heterogeneity that they actually saw under 100  
4 would, in fact, take place in a linear fashion with a  
5 confined aquifer.

6 DR. KREAMER: You are correct, Your Honor,  
7 but it also assumes there's no vertical leakage. The  
8 difference in atmospheric pressure variations, the  
9 first figure of Appendix 1, is another indication that  
10 there is vertical leakage between the aquifers. The  
11 thing that's absent from all this is total water  
12 balance. Typically at a site --

13 JUDGE WARDWELL: Time out.

14 DR. KREAMER: Time out.

15 JUDGE WARDWELL: That's all good stuff  
16 where you're going. It ain't the stuff I want to hear  
17 right now.

18 DR. KREAMER: I will be silent.

19 JUDGE WARDWELL: Given whatever those  
20 were, without leakage and with leakage, you see a  
21 drawdown associated with what is currently, as I  
22 understand it, about 100 gallons a minute worth of  
23 bleed associated with it. They're making the  
24 statement that if they go to 200 gallons per minute,  
25 under the same conditions, whatever they happen to be,

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1 with a confined aquifer, you're going to see  
2 approximately the same amount of drawdown that we have  
3 seen with 100. Do you accept that rough estimate, or  
4 do you not is what I'm interested in.

5 DR. KREAMER: It'll be close. The  
6 calculations were not presented anywhere. The general  
7 shape of the figure that we have up here is correct,  
8 that you will have drawdown, and then the recovery  
9 will be quick at first, and then the recovery will  
10 slow down, so the generalized shape is correct. The  
11 details of how much drawdown, I think, have to do --  
12 the devil in the details -- what is the storativity,  
13 the things that you mentioned. I don't think I'm  
14 prepared to say what the effect would be.

15 JUDGE WARDWELL: Let me ask you it this  
16 way, then. If you had a drawdown curve with leakage  
17 taking place and you saw that drawdown curve, and it  
18 was under a certain amount of bleed that you knew was  
19 coming out of the aquifer, and someone asked you if I  
20 take out twice that amount, would you say even with  
21 the leakage -- with the observed drawdown including  
22 the effects of the leakage that was there -- that the  
23 drawdown would roughly be about twice of that with the  
24 steady-state conditions that seem to be established  
25 and the confined aquifer, or would you feel

1 uncomfortable doing that is my only question?

2 DR. KREAMER: I would be uncomfortable  
3 without the specifics.

4 JUDGE WARDWELL: That's fine. Thank you.  
5 Kind of wrapping up the pump test, before we move to  
6 modeling and probably take another quick break if  
7 people are getting a little antsy -- NRC Exhibit 076,  
8 Page 38-D14 states that the license renewal  
9 application "Test data specifically -- or, for  
10 example, laboratory tests of core samples confined  
11 unit piezometer responses and drawdown analysis of the  
12 Basal Chadron sandstone aquifer indicate an extremely  
13 small recharge from extensive stress applied to the  
14 confining unit during aquifer pump tests," but then  
15 goes on to state that, "All four aquifer pump tests  
16 show that no leakage occurs through the 200 to  
17 500-foot-thick overlying confining unit, and that no  
18 communication exists between the Basal Chadron aquifer  
19 and the overlying Brule aquifer."

20 My question to the NRC is what do you  
21 consider small recharge -- first of all, what is it?  
22 At one point, you were saying a small recharge, and  
23 then you're saying it's no recharge in those  
24 statements, in the same statement. I was curious on  
25 which is it?

1 DR. STRIZ: There were four aquifer tests  
2 conducted --

3 JUDGE WARDWELL: Sorry, I can't -- really  
4 get close and yell if you have to. Pull that sucker  
5 right up.

6 DR. STRIZ: There were four aquifer tests  
7 conducted. As we've described, there were piezometers  
8 in some of those aquifer tests. The leakage that was  
9 developed in those was miniscule and would not  
10 contribute in any significant manner to this huge  
11 Basal Chadron aquifer over the lifetime of the mine  
12 operations.

13 JUDGE WARDWELL: When you reviewed the  
14 pump test data, what gave you a warm feeling that the  
15 aquifer was stressed enough?

16 DR. STRIZ: The length of the tests, the  
17 drawdown of the tests, which they just described the  
18 maximum drawdowns, and that there was --

19 JUDGE WARDWELL: Do you remember it to be  
20 in the neighborhood of 100 feet, or can't you  
21 recollect?

22 DR. STRIZ: I actually have it written  
23 down what they were, the smax, but they were actually  
24 somewhere around 40 to 65 feet across the -- but as he  
25 described, it was 100 feet in the well. What you have

1 is a skin condition in the well that causes a greater  
2 drawdown because of turbulence effects and other  
3 effects that cause the well to have more of a  
4 frictional loss. So you see greater drawdown in the  
5 well. I think that's what he was referring to as  
6 being the 100 foot, but the smax that they actually  
7 calculated were in the range of 40 to 65 feet. Those  
8 pumping tests were conducted appropriately. They had  
9 homogeneous isotropic response, for the most part, and  
10 there was absolutely no response in the Brule.

11 JUDGE WARDWELL: Thank you.

12 DR. STRIZ: So we find -- we have  
13 reasonable assurance that this is a confining layer  
14 that does not transmit fluids across the entire  
15 license area.

16 JUDGE WARDWELL: I think we can take a  
17 quick break now. We're going to charge ahead. We  
18 aren't going to take a quick break, unless there's  
19 someone else that really needs a quick break. I must  
20 not if I'm doing this. Want to talk about some  
21 modeling. As I understand it, the NRC spent quite a  
22 bit of time modeling the White River feature, and Crow  
23 Butte did some geologic strata modeling and now have  
24 this model-based restoration plan. Starting off with  
25 the NRC and the White River feature -- I believe that



1 was a MODFLOW model -- Section 3.5.2.3 of the EA, the  
2 staff describes computer modeling that was performed  
3 to assess whether the White River structural feature  
4 is a fault or a fold. My first question, have you  
5 conducted any other modeling besides this modeling for  
6 the White River feature?

7 DR. STRIZ: No, we have not.

8 JUDGE WARDWELL: Just wanted to make sure  
9 of that. That's what I thought. In your testimony on  
10 Page 46, Answer D20, you make several statements. The  
11 first statement is that, "MODFLOW groundwater model  
12 and maximum likelihood analysis was developed to  
13 further validate -- to provide further validation of  
14 our conclusions about the White River structural  
15 feature."

16 You cite to NRC Exhibit 009 at 24. You  
17 also say that, "The model used geologic layers  
18 developed from bore hole data (geophysical logs) from  
19 the North Trend Expansion Area license amendment  
20 application because the White River structural feature  
21 is located along the southern license boundary of the  
22 North Trend Expansion Area."

23 The third statement you make is, "Model  
24 input included well boring log data, hydraulic  
25 properties of the geologic units down to the Pierre

1 Shale, water level data and boundary conditions," and  
2 again citing NRC Exhibit 009 at 25. Fourthly, you say  
3 that, "Because these models were developed for the  
4 North Trend Expansion Area, field data used for model  
5 development were obtained from the North Trend license  
6 amendment application." Again, that's NRC 009 at 25.  
7 Then lastly, "Site-specific data from the main CBR  
8 facility were not used in the model because they did  
9 not cover the area of the White River structure, which  
10 is two miles away from the north boundary of the main  
11 facility." I want to confirm with NRC that the sole  
12 purpose of this modeling was to assess whether the  
13 White River structure acted like a fold or a fault, is  
14 that correct?

15 DR. STRIZ: That's correct.

16 JUDGE WARDWELL: Did you model a layer  
17 cake strata with the interface of the layers based on  
18 the actual measured elevations from the outside  
19 borings and, therefore, not necessarily horizontal  
20 features, but incorporates the actual shape of each  
21 interface as designated by those boring logs?

22 DR. STRIZ: Yes, that is correct.

23 JUDGE WARDWELL: Do you have any idea how  
24 many of those boring logs were used in this model?

25 DR. STRIZ: No, but I could try to find

1 out.

2 JUDGE WARDWELL: Why don't you try to find  
3 it and get back to us later with that?

4 DR. STRIZ: Actually, I'd like to correct  
5 that, Your Honor. I believe that the boring logs that  
6 were used were the observation wells for the pumping  
7 test, now that I -- I recollect that, yes.

8 JUDGE WARDWELL: About how many of those  
9 were there?

10 DR. STRIZ: There was the pumping well,  
11 and there were five observation wells, so five boring  
12 logs were used.

13 JUDGE WARDWELL: For this analysis in the  
14 White River feature?

15 DR. STRIZ: That's correct.

16 JUDGE WARDWELL: That was the basis of  
17 your strata there?

18 DR. STRIZ: Yes.

19 JUDGE WARDWELL: Based on your review of  
20 Crow Butte's restoration plan, do you know if the same  
21 approach, i.e. using site-specific strata surfaces  
22 based on field measurements, were used in the MODFLOW  
23 model of CBR's model-based restoration plan?

24 DR. STRIZ: I have not had access to their  
25 groundwater model, so I've not been able to evaluate

1 the input parameters.

2 JUDGE WARDWELL: Okay. I'll get to that  
3 when I get to that aspect of it. You cite from the  
4 evidence to a table of the input parameters, such as  
5 the thicknesses, the hydraulic conductivity,  
6 gradients, whatever else, for each of the geologic  
7 strata and the plan view that shows a lateral extent  
8 of this model coverage for this effort that you did.

9 DR. STRIZ: Could you repeat the question?  
10 I didn't --

11 JUDGE WARDWELL: Yes, basically what I'm  
12 asking for is where is the information that was used  
13 as input to this model? What's the lateral extent of  
14 it in a plan view, and then likewise, what are the  
15 aquifer parameters that were inputted into this model?

16 DR. STRIZ: All that information is  
17 present in the electronic files that make up the  
18 groundwater modeling system numerical model. It's  
19 resident on a computer and files.

20 JUDGE WARDWELL: Is that in an exhibit --

21 DR. STRIZ: No, it is not.

22 JUDGE WARDWELL: -- in this hearing  
23 process? So we don't have access to that information?

24 DR. STRIZ: No.

25 JUDGE WARDWELL: Nor a plan view of the

1 size of the model?

2 DR. STRIZ: No.

3 CHAIR GIBSON: Has that information -- was  
4 that part of your disclosures in this case?

5 DR. STRIZ: No.

6 CHAIR GIBSON: Have Intervenors not seen  
7 that input?

8 DR. STRIZ: No, they have not.

9 CHAIR GIBSON: Okay.

10 JUDGE WARDWELL: Considering you discussed  
11 this in your testimony, isn't it strange it wasn't  
12 disclosed, or at least summarized in some sort of an  
13 exhibit?

14 DR. STRIZ: Modeling files are extremely  
15 hard to distribute, and the person who looks at them  
16 has to have a proprietary software, which is very  
17 expensive, the Groundwater Modeling System. So  
18 generally, we do not share these sort of file, but  
19 they could be made available. The Intervenors would  
20 need to have the proprietary software to look at them  
21 and access them.

22 JUDGE WARDWELL: Did you perform this in  
23 house, or was it outside contracted?

24 DR. STRIZ: Yes, it was performed in house  
25 by a colleague who has since left the NRC.

1 JUDGE WARDWELL: When you looked at it,  
2 didn't they prepare a table with a summary of the  
3 input parameters that were used like those types of  
4 things --

5 DR. STRIZ: No, they did not.

6 JUDGE WARDWELL: -- in a simplistic  
7 manner, like you might do for a report?

8 DR. STRIZ: No, they did not.

9 JUDGE WARDWELL: What expensive  
10 proprietary software is this? MODFLOW is public  
11 domain, isn't it?

12 DR. STRIZ: MODFLOW is a public domain  
13 model. However, there are graphical user interfaces  
14 that are developed by companies that are proprietary  
15 to make input of data easier through a graphical user  
16 interface and to look at the outputs easier in there.

17 JUDGE WARDWELL: Don't those same  
18 interfaces allow for nice summary tables of  
19 information that goes into and out of them, just to  
20 beat the dead horse some more?

21 DR. STRIZ: Yes, that would be possible.

22 JUDGE WARDWELL: I guess it still seems a  
23 little strange to me that if you're going to use it in  
24 your testimony, you wouldn't have provided at least  
25 some heads up that it's there and provided some

1 summary of it. Because it doesn't help us much if  
2 you're going to talk about what you have observed  
3 without us now being able to look at those parameters  
4 that were used and the size of the model that was  
5 used. It diminishes, if you will, the weight of this  
6 information in any assessments we make, as just a  
7 general comment from one person on this Board.

8 DR. STRIZ: Understood.

9 JUDGE WARDWELL: What did you use to  
10 calibrate the MODFLOW model? Did you use the actual  
11 water levels there and compare them to how this model  
12 was reacting?

13 DR. STRIZ: The model was calibrated to  
14 the pumping test.

15 JUDGE WARDWELL: Thank you. You also  
16 discuss a maximum likelihood analysis that was  
17 performed. Could you explain that a little bit and  
18 what did the results show in regards to the White  
19 River structural feature, and how did it support a  
20 fold versus a fault?

21 DR. STRIZ: There are two types of  
22 uncertainty in a groundwater flow model. The first  
23 type of uncertainty stems from the conceptual model.  
24 That is an understanding of how the groundwater flow  
25 moves through the system and what the structural

1 features are and the layering that controls that  
2 system. That's your first type of uncertainty.

3 JUDGE WARDWELL: Can I interrupt you  
4 quickly right there? By saying the uncertainty's in  
5 the model, it's not the algorithm of the MODFLOW model  
6 itself, it's really the input parameters and how you  
7 break up the physical situation into the numerical  
8 blocks that I believe MODFLOW's finite difference  
9 analysis uses. Is that what you mean by that?

10 DR. STRIZ: Yes, the major features, such  
11 as a fault, the recharge, the conductivity, all the  
12 major features.

13 JUDGE WARDWELL: All the major input  
14 parameters?

15 DR. STRIZ: Yes. As a modeler begins,  
16 they have to develop a conceptual site model to  
17 describe those because they control the groundwater  
18 flow system. It's a major source of uncertainty is  
19 how you set up the model. What the Bayesian maximum  
20 likelihood analysis is is to take several models with  
21 different controlling features, in this case  
22 particularly the structural feature -- so what you do  
23 is you look at different models, starting with a base  
24 model with nothing at the feature, and then there were  
25 additional models done defining the feature either as



1 a very low no-flow boundary, essentially, or a little  
2 bit higher no-flow boundary, and then as a slightly  
3 conductive fault or a very conductive fault. What you  
4 do is you run a parameter estimation with those models  
5 and you pick three parameters that you would like the  
6 models to calibrate to to the pumping test data. The  
7 three that were chosen were the hydraulic conductivity  
8 of the Basal Chadron layer, and also two different  
9 general head boundaries, which are boundaries at the  
10 edges of the model that control the flow in and out of  
11 the water. Those actual parameter estimations is what  
12 develops the calibration statistic.

13 A calibration statistic was described on  
14 Page 25 of the SER. It was the weighted sum of the  
15 square of the residuals, if you're familiar with that  
16 term -- so you take the difference between the heads,  
17 you square them, and you weight it. Those ended up,  
18 for the different models, being substantially  
19 different. Those have been put into Bayes theorem.  
20 Bayes theorem is, as we described on Page 26 of the  
21 SER, uses the probability of the model, which is  
22  $P(m_k)$ , times the probability of the model, given its  
23 calibration error, divided by the sum of all those  
24 terms for all the different models.

25 That gives you what is termed as the

1 posterior probability, which is essentially saying the  
2 most likely model, given its error. The calculations  
3 are rather complex. Did you want me to get into the  
4 details of the calculations? Essentially, what this  
5 particular modeler did was he assigned an equal  
6 probability to all the models so he would not bias the  
7 models. The  $P(m_k)$  term, the probability in the model,  
8 was set to .2, which was 20 percent likelihood for all  
9 of the models. The second term is the likelihood of  
10 the model, given its calibration error. Those were  
11 calculated.

12 Based on that, all this posterior  
13 probability was calculated for each of the models. It  
14 was determined that the most likely model would be the  
15 baseline model with nothing at the feature, no  
16 boundary condition at the feature, and that the least  
17 likely model would be that of a flowing fault. That's  
18 what the analysis was.

19 JUDGE WARDWELL: To put it on technical  
20 terms that this modeling showed that the flow regime  
21 that most likely is associated with --

22 DR. STRIZ: The fold.

23 JUDGE WARDWELL: -- the fold, that there's  
24 no flowing fault in there?

25 DR. STRIZ: That is correct.

1 JUDGE WARDWELL: What about a fault that  
2 didn't have a very high transmissivity? You wouldn't  
3 be able to tell the difference, would you,  
4 necessarily, between that and a fold?

5 DR. STRIZ: Actually, you are correct.  
6 The maximum likelihood analysis showed that there was  
7 also a high probability -- in the second simulation  
8 that it could be a ceiling fault with very low  
9 permeability. That is correct.

10 JUDGE WARDWELL: Thank you. In NRC 001 at  
11 47, Answer D-21, you state that, "Staff's modeling of  
12 the White River feature was conducted to provide  
13 support to the Staff's conclusion that no hydraulic  
14 connection likely exists to transfer any water between  
15 the Basal Chadron sandstone and the Brule aquifers,  
16 even outside of the LA." I thought the reason for  
17 this model was to determine whether the White River  
18 feature was a fold or a fault. This seems to say that  
19 it was used to make conclusions in regards to the  
20 hydraulic connection between the Basal Chadron and the  
21 Brule aquifers.

22 DR. STRIZ: I understand your point.

23 JUDGE WARDWELL: So what is it?

24 DR. STRIZ: It was done to determine if  
25 there was a flowing fault there.

1 JUDGE WARDWELL: Your statement answer in  
2 D-21 is not accurate?

3 DR. STRIZ: I would say it was to  
4 determine if there was a flowing fault.

5 JUDGE WARDWELL: Thank you. It was a  
6 misstatement, maybe, is a better word.

7 DR. STRIZ: Right.

8 JUDGE WARDWELL: I was trying to grasp for  
9 a better word. That's the softest I could come up  
10 with quickly. Let's call it a misstatement. Dr.  
11 Kreamer, on your testimony on Page 3, and that's  
12 Exhibit 046, you state that, "The EA notes  
13 discontinuities in the Brule formation and the lack of  
14 horizontal consistency of this water-bearing unit.  
15 Permeable regions of this formation are said to be of  
16 limited horizontal exist, although geophysical  
17 evidence to support this claim is not presented.

18 EA notes that the Basal Chadron, now  
19 called the Chamberlain Pass formation, varies in  
20 thickness from a minimum of 12 minutes, to doubling to  
21 24 meters in places, indicating inconsistent  
22 horizontal thicknesses. The depth of the mineralized  
23 zone also varies greatly. This indicates significant  
24 heterogeneity not considered in modeling efforts."  
25 That's what Kreamer said. How would you respond in

1        regards to how your model does handle any of these  
2        potentially heterogeneity in the geologic strata?

3                DR. STRIZ: Within the geological strata?  
4        It doesn't address that. This was specifically  
5        designed to address the large structural features that  
6        control the flow in the system, not to get into the  
7        homogeneous isotropic --

8                JUDGE WARDWELL: It truly looked at more  
9        homogeneous isotropic material when you inputted your  
10       parameters into MODFLOW?

11               DR. STRIZ: That is correct. That is how  
12       we built the aquifer response.

13               JUDGE WARDWELL: I would assume, Dr.  
14       Kreamer, you do not have any comments on this because  
15       you have had no information in regards to this  
16       modeling effort, or do you?

17               DR. KREAMER: I'm quite curious, Your  
18       Honor, as to how they calibrated a homogeneous pool  
19       aquifer, the observation wells not being there. The  
20       details of how they operated are not there,  
21       particularly things like the model domain, the grid  
22       spacing. All these things can affect it. There was  
23       no mention of validation and how it was validated.  
24       The sensitivity analysis was generally stated here,  
25       but it was unavailable to me. So in answer to your

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1 question, no, I'm very, very curious. MODFLOW was  
2 developed not for fractured media. It was developed  
3 for porous media. A lot of people bend MODFLOW to use  
4 it for fractures and to investigate fractures, but  
5 MODFLOW was made for porous media flow.

6 JUDGE WARDWELL: But likewise, you --  
7 again, we're back to the situation where could you not  
8 start off with MODFLOW under the assumption of  
9 homogeneity, but then find that in fact, you couldn't  
10 calibrate it to the water levels because of the  
11 non-homogeneity and isotropy at the site, and then  
12 switch gears to change your analysis techniques?  
13 Wouldn't that take place -- wouldn't that be possible,  
14 also?

15 DR. KREAMER: You're absolutely right.  
16 It's a good first step. Whatever their boundary  
17 conditions were, you could vary those. You could vary  
18 the hydraulic conductivities. You could then change  
19 it and use it as a way to investigate further, yes.

20 JUDGE WARDWELL: If, in fact, you ended up  
21 calibrating to the water levels, would that not be  
22 some sort of indication that whatever degree of  
23 non-homogeneity or anisotropy you incorporated into it  
24 was close to what might be there in a large-scale,  
25 average performance of the aquifer?

1 DR. KREAMER: Generally, if they had  
2 enough monitoring wells in the Brule, if there was  
3 sufficient data to populate the model, that would be  
4 true. I have not been able to inspect that, so it  
5 would be conjecture on my part.

6 JUDGE WARDWELL: NRC, how did you handle  
7 that in regards to the Brule? There was very few  
8 wells in the Brule, and none of them showed any  
9 drawdown, as far as I understood.

10 DR. STRIZ: This is a model that was used  
11 for stochastic purposes, to try to capture the effects  
12 of large structural features. This was not a model  
13 that was intended to be used for predictive  
14 determinations. If you're doing a predictive model,  
15 then I agree with Dr. Kreamer that you need  
16 substantial information on the parameters, and you  
17 need to do the sensitivity analysis, and you need to  
18 do a much more rigorous modeling effort. This is a  
19 very gross scale model to evaluate whether certain  
20 structural features were present and did not require  
21 the care that he is expressing for a model that would  
22 be used for deterministic predictions.

23 JUDGE WARDWELL: What would happen to your  
24 modeling result -- would your model be able to pick up  
25 this fold that was fractured because of the bending,

1 not the breaking, but just created enough cracks to  
2 transmit some impacts from the mining effort, but not  
3 associated with a fault? Would it be able to pick  
4 those up? It wouldn't see those, would it?

5 DR. STRIZ: Once again, this was a very  
6 gross scale to look at structural interpretations and  
7 do a likelihood analysis. It was not intended for  
8 that purpose.

9 JUDGE WARDWELL: So it provides no  
10 information in regards to the integrity of the fold in  
11 regards to the transmission of any potential impacts.  
12 Is that a fair assessment?

13 DR. STRIZ: No, it does not. That was not  
14 its intent.

15 JUDGE WARDWELL: Just to confirm, also,  
16 Dr. Kreamer, any of your criticisms of any of the  
17 modeling that either NRC did or Crow Butte in regards  
18 to the MODFLOW, you don't have a criticism of MODFLOW  
19 in and of itself. Your criticism is of the input  
20 parameters and how they tried to capture the physical  
21 situation and input it into that model. Is that a  
22 fair conclusion?

23 DR. KREAMER: MODFLOW's a good model.  
24 It's been used a lot. Like any model, it can be  
25 inappropriate for some situations. So the



1       appropriateness of MODFLOW usage, either in this case  
2       or in the restoration modeling, I was unable to  
3       evaluate.

4               JUDGE WARDWELL: Thank you. Now's a good  
5       time to take a break because now I'm going to go to  
6       Crow Butte and their two models.

7               CHAIR GIBSON: Okay, great. I'm curious,  
8       Ms. Striz -- is that how you say your name?

9               DR. STRIZ: Striz.

10              CHAIR GIBSON: Striz, okay, great. Were  
11       you the supervisor of this person that did the model?

12              DR. STRIZ: No, I was not.

13              CHAIR GIBSON: This was not done under  
14       your direction and control?

15              DR. STRIZ: No, it was not.

16              CHAIR GIBSON: Do you know who made the  
17       decision that this particular MODFLOW proprietary  
18       information would not be disclosed to the Intervenor?

19              MS. SIMON: Your Honor?

20              CHAIR GIBSON: Yes?

21              MS. SIMON: May I interrupt for a second?  
22       We are actually trying to check and see if they were,  
23       in fact, disclosed, so if we could maybe put that  
24       question off?

25              CHAIR GIBSON: Okay. Let me -- I take it,

1       though, you don't know, Ms. Striz, yourself?

2                   DR. STRIZ:   No.

3                   CHAIR GIBSON:   Okay, very well.   I would  
4       certainly be interested in knowing who made the  
5       decision not to produce this information, Ms. Simon.  
6       If it was produced, we'd also like to know that, as  
7       well, but it doesn't sound like they've seen it.  
8       Please let us know as soon as you can find that out,  
9       okay?

10                  Moving on to Crow Butte, I believe you did  
11       some modeling for the geologic strata at the site, and  
12       then also the model-based restoration plan, is that  
13       correct?

14                  MR. BEINS:   That's correct.

15                  JUDGE WARDWELL:   Start off with that  
16       geologic strata, CBR testimony, Exhibit 001, Page  
17       24-A51.   "The White River structure was evaluated  
18       using three-dimensional geologic modeling software  
19       utilizing geologic picks from hundreds of geophysical  
20       logs."   My question is while CBR 011, the license  
21       renewal application, on Page 2-135 mentions this  
22       modeling in regards to the White River feature, where  
23       is this model discussed in more detail in regards to  
24       the other geologic strata?

25                  MR. SPURLIN:   Your Honor, Matt Spurlin.

1 The modeling is discussed in detail in Exhibit CBR 13,  
2 which is the North Trend Aquifer Exemption Petition.  
3 There's a detailed discussion on the development of  
4 that model and the data that went into it.

5 JUDGE WARDWELL: Did you say it was mostly  
6 for the North Trend expansion area?

7 MR. SPURLIN: That's correct. The data  
8 used to model the stratigraphy in the vicinity of the  
9 structure occurs within the investigation network  
10 associated with the North Trend expansion area.

11 JUDGE WARDWELL: So this was also limited  
12 strictly to determine the White River structure, and  
13 not the elevations of the various aquifer interfaces  
14 within the license application?

15 MR. SPURLIN: Not for the current licensed  
16 area, no. This model was built to support Aquifer  
17 Exemption Petition for the North Trend expansion area.

18 JUDGE WARDWELL: In your Exhibit 045 of  
19 Crow Butte, Page 13-A32, within the permitted area, a  
20 total of 4,530 explorations and development holes have  
21 been completed. An additional 6,330 mining and  
22 monitoring wells have been installed. What permitted  
23 area are you talking about now? Is this now the  
24 license application -- the licensed area, or is it the  
25 North Trend area?

1 MR. SPURLIN: Those particular numbers of  
2 bore holes investigation locations pertain to the  
3 licensed area.

4 JUDGE WARDWELL: Were these the holes that  
5 were used in the geologic strata, or they weren't  
6 because you didn't use that modeling for that, is that  
7 correct?

8 MR. SPURLIN: They were not used for the  
9 modeling done for the structure because the structure  
10 is two miles to the northwest of the licensed area.

11 JUDGE WARDWELL: Did you use -- you  
12 testified you used geologic picks from hundreds of  
13 geophysical logs. Do you know how many hundreds? Do  
14 you know the number of borings that were made in that  
15 area for this modeling?

16 MR. SPURLIN: We would have to go back to  
17 pull an exact number, but the total number of bore  
18 hole picks that were available were several hundred.  
19 I know that we used at least 130 or so for the  
20 stratigraphic modeling to provide enough spatial  
21 distribution of the points to accurately model the  
22 stratigraphy.

23 JUDGE WARDWELL: We looked at  
24 cross-sections yesterday in regards to CBR 024, which  
25 was the fancier cross-sections, and then the ones in

1 the license renewal application, on Pages 2-111 and  
2 2-125, were these cross-sections drawn using results  
3 from these models, or were they just done by hand, not  
4 using any particular modeling?

5 MR. SPURLIN: The same data that was used  
6 in the stratigraphic model was used to draw the  
7 cross-sections. However, the cross-sections were not  
8 model output. They were drawn by hand.

9 JUDGE WARDWELL: You're saying the same  
10 number of -- those same number of borings were used to  
11 draw those by hand, is that correct? What was your  
12 first statement that you just made?

13 MR. SPURLIN: The available geologic picks  
14 were used for the site-wide stratigraphic modeling.  
15 The cross-section that you're referring to --

16 JUDGE WARDWELL: Let me pause you right  
17 there. When you said site-wide stratigraphic  
18 modeling, is this this geologic strata model we're  
19 talking about right now that's focused only towards  
20 the White River feature?

21 MR. SPURLIN: That's correct.

22 JUDGE WARDWELL: Okay. So it's not a  
23 full, certainly, site-wide geologic stratigraphy model  
24 for the licensed area?

25 MR. SPURLIN: It's for the North Trend

1 expansion area.

2 JUDGE WARDWELL: For the North Trend, in  
3 the area of -- it's not the whole North Trend either,  
4 is it? Is it strictly around the White River feature?

5 MR. SPURLIN: The three-dimensional  
6 geologic model applies to the entire North Trend  
7 expansion area.

8 JUDGE WARDWELL: But it really -- the only  
9 bearing it has on this proceeding is the degree to  
10 which it helps explain the fold versus the fault  
11 aspects of the feature?

12 MR. SPURLIN: That's correct, Your Honor.

13 JUDGE WARDWELL: Not in developing isopach  
14 maps of the thickness or the top elevations of any of  
15 the aquifers within the licensed area?

16 MR. SPURLIN: That's correct.

17 JUDGE WARDWELL: Okay, thank you. Moving  
18 on to the Model-Based Restoration Plan, Crow Butte  
19 045, Page 19, Answer 34, "For restoration planning and  
20 tracking, Crow Butte used calibrated, site-specific  
21 groundwater model, now called the Model-Based  
22 Restoration Plan, or MBRP." That is very robust. I  
23 know that MODFLOW is a part of this model-based  
24 restoration plan. Are there any other algorithms or  
25 blocks of algorithms or however else you want to

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1 describe other types of models -- again, when I use  
2 the phrase model, I usually mean the software, and not  
3 the input. I understand when you have a gathering of  
4 input, some people call that a model, as was expressed  
5 with NRC with theirs. But when I'm speaking of the  
6 models in the model-based restoration plan, I mean  
7 individual blocks of algorithms that calculate out  
8 different things. MODFLOW is one. Are there any  
9 other of those software-type packages or systems  
10 within that that are used to calculate out different  
11 things?

12 MR. LEWIS: Bob Lewis. Your Honor,  
13 MODFLOW is the code that's used on the site-wide  
14 model. There's no other groundwater flow model that  
15 is used, other than we use MODPATH to track particle  
16 movement through the system, to create stream lines  
17 for different types of analyses. We use a use  
18 pre-processor and a post-processing program that's  
19 commercially available, called Groundwater Vistas,  
20 just as an interface to help us with inputs and  
21 outputs processing.

22 JUDGE WARDWELL: Are you saying your DOS  
23 machines don't work anymore?

24 MR. LEWIS: I'm afraid not.

25 CHAIR GIBSON: Two people got the joke.

1 PARTICIPANT: I got the joke.

2 PARTICIPANT: Three people got the joke.

3 JUDGE WARDWELL: CBR License Renewal  
4 Application on 2-135 mentions this modeling in regards  
5 to the White River feature. I'm backing up a bit to  
6 the geologic strata again because I did miss one thing  
7 I did want to say about it. Is this model discussed  
8 in any more detail anywhere else in the license  
9 renewal application that you're aware of?

10 MR. SPURLIN: Aside from that document, it  
11 would just be the North Trend Aquifer Exemption  
12 petition.

13 JUDGE WARDWELL: Okay, thanks, just wanted  
14 to make sure of that. Now back to the model-based --  
15 CBR Exhibit 008, Page 20, Answer 33, you stated that,  
16 "The groundwater flow model was calibrated to  
17 pre-mining conditions using water level data collected  
18 prior to mining activities in January 1983, and  
19 subsequently has been validated through observations  
20 of site-wide aquifer response during production and  
21 restorations." I go back again. Has a description of  
22 this model, the algorithm, and a discussion of the  
23 results been made publicly available, and where would  
24 we see that description of the model and the results?

25 MR. LEWIS: I believe there's an exhibit



1 for the model-based restoration plan. There was a  
2 brief summary report that was written in 2009 that was  
3 prepared for the benefit of the NDEQ to describe how  
4 the modeling was done and the purpose for which it was  
5 to be used. Since that time, the model has evolved.  
6 It's been updated frequently. It's been calibrated to  
7 pumping tests and validated to additional pumping  
8 tests and the operations that have gone on. Those  
9 particular aspects have not been documented in any  
10 other report, since it's been done for operational  
11 purposes. There's been no driver, otherwise, to  
12 update reports and things.

13 JUDGE WARDWELL: Do you want to look at  
14 that yellow sheet to see if it elaborates on the  
15 exhibit number?

16 MR. LEWIS: The reference is CBR 41.

17 JUDGE WARDWELL: Thank you. I gather that  
18 the source of the 1983 pre-mining water levels, at  
19 least in regards to the Basal Chadron, is limited to  
20 those six wells or whatever they were that we saw  
21 yesterday on that one sheet, that one exhibit page  
22 number?

23 MR. LEWIS: I believe that's correct for  
24 the production aquifer. I believe the water levels  
25 for the Brule formation, since it is a

1 three-dimensional model, were also used to guide the  
2 boundary conditions for the upper aquifer layers, as  
3 well.

4 JUDGE WARDWELL: Were other wells  
5 incorporated into the model that were developed later  
6 on? The pre-operation level would be limited by  
7 strictly those wells that were in there that were  
8 pretty limited, but subsequent production wells would  
9 have more -- subsequent production well activity  
10 would, in fact, be able to be calibrated using the  
11 water levels in the wells that were read at the other  
12 time frames. Is that correct?

13 MR. LEWIS: Yes, Your Honor. The model  
14 was calibrated, following its initial steady-state  
15 calibration to pre-mining conditions; it was  
16 calibrated to the aquifer tests in the LRA. The  
17 initial two calibrations -- the final two aquifer test  
18 simulations were more validations than they were  
19 calibrations, since there was no changes to aquifer  
20 parameters that were needed to match observed  
21 conditions.

22 So I would consider the model validated,  
23 at that point. Since that time, the model's been  
24 used, on occasion, to verify site-wide flow conditions  
25 and containment. So we've imported almost 5,000

1 production and injection wells that are currently  
2 operating, and that model has been used to simulate  
3 the flow conditions on the site-wide basis, and we can  
4 compare the drawdowns in the monitor ring production  
5 wells that Mr. Beins had discussed as a general guide  
6 as to whether the model is, in fact, predicting the  
7 water levels properly.

8 JUDGE WARDWELL: In regards to these  
9 pre-mining water levels, Crow Butte Exhibit 012, Page  
10 27, which is Page 31 of the PDF, has an appendix in  
11 it, Appendix A, called, "Background Water Level Data."  
12 If you need to pull up the exhibit, we can do that,  
13 but if -- does that sound familiar to anyone in  
14 regards to what CBR 012 is? Why don't we pull that  
15 up, if we could, Mr. Deucher?

16 MR. BEINS: Yes, that'd be helpful, Your  
17 Honor.

18 JUDGE WARDWELL: The question I'm going to  
19 ask when we see this document in the appendix was that  
20 it's called -- it's a Petrotek report. That's what I  
21 thought. If you can go right to Appendix A, which  
22 would be Page 31 PDF, which makes it easy for you. It  
23 says, "Background water levels," there. Is that  
24 really background water levels, or is that the water  
25 levels that existed prior to Pump Test No. 4? This is

1 a report dealing with Pump Test No. 4. I believe this  
2 is -- I don't know what sheet it is of the appendix,  
3 but it's in the appendix anyhow.

4 MR. BEINS: I believe, Your Honor, that  
5 this is background water levels for about the four  
6 days leading up to Pump Test No. 4.

7 JUDGE WARDWELL: They're certainly not the  
8 '83 --

9 MR. BEINS: No, sir.

10 JUDGE WARDWELL: These are not background.

11 MR. BEINS: No.

12 JUDGE WARDWELL: These are operational  
13 water levels that existed prior to lighting off Pump  
14 Test 4?

15 MR. BEINS: Correct.

16 JUDGE WARDWELL: I wanted to just --

17 CHAIR GIBSON: Was this done in August of  
18 2002? Is that when that was done, August 16, 2002?

19 MR. BEINS: That's correct, I believe,  
20 sir.

21 CHAIR GIBSON: Very well.

22 JUDGE WARDWELL: Good catch, dude, good  
23 catch.

24 CHAIR GIBSON: Even a broken clock is  
25 right twice a day, Judge Wardwell.

1 JUDGE WARDWELL: Two weeks for this clock,  
2 though.

3 CHAIR GIBSON: It's all right.

4 JUDGE WARDWELL: Dr. Kreamer, on Page 7,  
5 you claim that the details of this model were not  
6 available. Did you get to review the exhibit that  
7 they talked about, or weren't you aware of it, or is  
8 that too de minimis a presentation to gain any  
9 information from?

10 DR. KREAMER: By this model, you mean the  
11 restoration model, and not what's on the screen.  
12 Because I did analyze that, and I think that shows  
13 vertical movement, the barometric pressure changes.  
14 But if you're talking about the rest --

15 JUDGE WARDWELL: Snuck that in, didn't  
16 you?

17 DR. KREAMER: I snuck that in because I  
18 think that's evidence that there's vertical movement.

19 JUDGE WARDWELL: Okay, let's just pause  
20 there. That's fine. Let's talk about this more there  
21 because I've got the questioning on this, I think,  
22 more later on, so I can cover it right now with you,  
23 considering you brought that up.

24 DR. KREAMER: Yes, sir.

25 JUDGE WARDWELL: Why do you say there's --

1 why does this show movement here? Explain what's your  
2 reasoning for that?

3 DR. KREAMER: What this shows on the  
4 screen is barometric --

5 JUDGE WARDWELL: We're talking about the  
6 same thing I mentioned before. It's the Petrotek  
7 report, Exhibit 012, Crow Butte. This is the appendix  
8 --

9 DR. KREAMER: It's the first page of the  
10 appendix, yes, sir. What it shows is the barometric  
11 pressure changes, which are the X little marks that go  
12 up and down. That's measured in the atmosphere. It  
13 shows daily fluctuations, usually, in pressure. You  
14 see it go up and down in night and day, due to  
15 temperature changes, and that's very common. The  
16 darker line that also has significant response, but a  
17 negative response to that, is the Brule well that  
18 they've measured before pumping. This is without  
19 pumping. You can see that there's a negative response  
20 when the barometric pressure goes --

21 JUDGE WARDWELL: Where do you see that?  
22 What line are you pointing to?

23 DR. KREAMER: If you look -- I'm sorry,  
24 let me switch glasses so I can actually -- at the  
25 bottom, there are -- if you look at point zero on the

1 Y axis -- yes, zero on the Y axis, a little higher,  
2 please, with the -- no, up to zero, keep going. No.

3 JUDGE WARDWELL: Zero zero, Joe.

4 DR. KREAMER: Zero zero. Go to zero zero.

5 JUDGE WARDWELL: Zero zero zero.

6 DR. KREAMER: The line that goes upward  
7 right away -- not the line that's flat, but the line  
8 that goes upward right away is the well response in  
9 the Brule.

10 JUDGE WARDWELL: Which well is that?  
11 Because the two keys that we have here, I gather this  
12 is a black-and-white of a color plot. Is that not  
13 correct, Crow Butte? Because both the symbols seem  
14 the same for both the wells, so it's hard to tell  
15 which well is which. Dr. Kreamer, do you -- let me  
16 finish off with Brule -- I mean with Crow Butte. Is  
17 this --

18 MR. BEINS: My guess, Your Honor, is that  
19 this chart was originally in color. Certainly the two  
20 symbols are the same. I would have to do a little  
21 more digging to figure out which curve is SM9-10 and  
22 which one is CPW2002.

23 JUDGE WARDWELL: Do you have any idea  
24 where those wells are located?

25 MR. BEINS: Those wells are located in

1 what we call Mine Unit 9. It would be towards the  
2 south end of the license area.

3 JUDGE WARDWELL: You don't know the depths  
4 of them, what strata they're in?

5 MR. BEINS: The SM9-10 well is probably in  
6 the neighborhood of about 200 feet deep.

7 JUDGE WARDWELL: What unit is it in? Is  
8 it in the Basal Chadron?

9 MR. BEINS: It would be in the Brule.

10 JUDGE WARDWELL: It'd be in the Brule?

11 MR. BEINS: SM9-10 would be in the Brule.  
12 CPW2002, that's the Chadron pumping well for that pump  
13 test, is in the Basal Chadron.

14 JUDGE WARDWELL: That's what -- the PW  
15 means a pump well?

16 MR. BEINS: Yes.

17 JUDGE WARDWELL: From looking at this,  
18 would you estimate that the pump well has the steadier  
19 level in it than the Brule?

20 MR. BEINS: That's likely. Again, we  
21 would need to verify that, sir.

22 JUDGE WARDWELL: Dr. Kreamer, what's your  
23 interpretation of these lines?

24 DR. KREAMER: The X line's very clear, and  
25 that's the barometric pressure. It's the opposite of



1 what they just said. If the large variation's in the  
2 Basal Chadron, they're in real trouble. What it says  
3 in the verbiage that accompanies this is that the --  
4 let's look at the two dark lines. The ones that goes  
5 up and down right at the beginning there, that is the  
6 Brule well. It has the most barometric response, and  
7 that's what verbally reported, and that's what makes  
8 sense. They then say there's no response in the Basal  
9 Chadron, which is the flatter line. I bought that, at  
10 first.

11 I thought, "Yes, it looks pretty flat."  
12 But then I noticed it's got the same periodicity as  
13 the line up above it. Now I'm not suggesting that it  
14 has a barometric response, but if the pressure in the  
15 Brule goes up and down even a couple inches, there  
16 seems to be a delayed and lagged response for the same  
17 periodicity down below. It's about maybe one fourth  
18 to one fifth of the response, if you look -- it's four  
19 tenths of an inch. But there are ways to calculate  
20 what the hydraulic conductivity connection would be  
21 vertically from this.

22 Bradehoeft, in the '60s, '70s, and '80s,  
23 he looked at how rivers go up and down, and how  
24 there's a lagged response in wells that's smaller in  
25 size and lagged in time. There's not enough

1 information to do a Bradehoeft, or I would have done  
2 it here. But what this indicates is that there seems  
3 to be some sort of lagged response to the pressure  
4 changes in the Brule, before pumping, in the Basal  
5 Chadron. I don't think this is conclusive evidence by  
6 any sense of the imagination. I think it's just one  
7 more stone on the scale that says that it looks like  
8 there's some evidence to suggest that there is  
9 vertical movement in the south part.

10 Coupled with Figure 7 that we saw that  
11 there was a recharge boundary with no documented wells  
12 shutting off, but with documented wells turning on,  
13 which brought that curve back down, which we discussed  
14 early, in that same region, it would indicate to me  
15 that there is a possibility of vertical movement due  
16 to the data presented by Petrotek.

17 JUDGE WARDWELL: If Chadron, between the  
18 Brule and the Chamberlain Pass/Basal Chadron, is all  
19 saturated, and you're stressing the top of the aquifer  
20 with barometric pressure, wouldn't there still be a  
21 tendency to pick up some of that just through the  
22 transmission of the pressure associated with that down  
23 in depth, although it would tend to diminish, even  
24 though there is no leakage, just because of  
25 interconnected water voids?

1 DR. KREAMER: If there was confinement, as  
2 was suggested, no, you would not see that. If there  
3 was some lesser confinement, you would see what we see  
4 here. So what this illustrates to me is lesser  
5 confinement. Again, I think the key is the magnitude  
6 is less. There is certainly not an open gusher  
7 between the two, but there is a response. That  
8 response has the same periodicity. Without the  
9 periodicity, I don't think it would be as compelling.

10 JUDGE WARDWELL: I'll start with Crow  
11 Butte. Why is that not a very logical hypothesis?

12 MR. LEWIS: Bob Lewis, Your Honor.  
13 Without any other information, and taking as truth  
14 that the symbols represent the wells that are being  
15 represented here, I would say --

16 JUDGE WARDWELL: It would be a little  
17 unusual for it to be the opposite way. The most  
18 logical conclusion is that that's the right  
19 interpretation, isn't it?

20 MR. LEWIS: When you say the right  
21 interpretation, you mean whose interpretation?

22 JUDGE WARDWELL: Can we collectively reach  
23 an agreement that the most logical interpretation of  
24 this map is that the black diamonds that create a  
25 curve that goes up and down, consistent with the up

1 and down of the barometric pressure represented by the  
2 crosses, is the SM9-10 well in the Brule, and that the  
3 flatter black diamonds that do show a very slight up  
4 and down, but cover near and around the zero change in  
5 head and feet on the other axis side, which doesn't  
6 relate to that plot -- let's just leave it at the zero  
7 level it seems to rotate around -- would be the  
8 CPW2002. Would you agree with that statement?

9 MR. LEWIS: Yes, I think that's  
10 reasonable. I do think that's reasonable.

11 JUDGE WARDWELL: You do agree with that?  
12 I'm sorry?

13 PARTICIPANT: We still didn't hear you.

14 MR. LEWIS: Yes, I think that's  
15 reasonable.

16 JUDGE WARDWELL: NRC, do you think that's  
17 reasonable?

18 MR. BACK: Yes, we think it's reasonable.

19 JUDGE WARDWELL: You've already said so,  
20 Dr. Kreamer, correct?

21 DR. KREAMER: Yes, sir.

22 JUDGE WARDWELL: So we collectively agree  
23 with the interpretation of this diagram, and if it is  
24 different, wow.

25 MR. LEWIS: My interpretation -- to answer

1 your first question, my interpretation of this would  
2 simply be that the barometric efficiency of the  
3 formations is different. You would expect formations  
4 to respond differently to barometric pressure  
5 fluctuations based on their barometric efficiencies.  
6 This doesn't surprise me that two different formations  
7 respond differently to barometric pressure changes,  
8 and that you can have lag times in some formations  
9 with lower barometric efficiencies. This doesn't  
10 surprise me in that regard. It certainly wouldn't  
11 stick out to me as something that proves leakage or  
12 communication between two aquifers.

13 JUDGE WARDWELL: Thank you. Mr. Back?

14 MR. BACK: The Staff agrees 100 percent.  
15 Just keep in mind that the Basal Chadron wells are  
16 open to the atmosphere, so they would be picking up a  
17 barometric effect.

18 JUDGE WARDWELL: Mr. Kreamer, I'll give  
19 you the last shot at countering their discussion.

20 DR. KREAMER: The details of the deep well  
21 being open to the atmosphere, you would expect a  
22 greater response. This is not a barometric efficiency  
23 thing if the well was closed, in fact. If the deep  
24 well were open to the atmosphere, you'd see a much  
25 stronger response than you're seeing, I would guess.

1 This is new information that the wells were open, in  
2 which case this test isn't as strong as they would  
3 conclude. But importantly, the deep response is not  
4 a response to barometric pressure. What it is a  
5 response to is the change in head above it, which is  
6 translated downward. In other words, the barometric  
7 surface response impacts the surface. It doesn't --  
8 it shouldn't impact these down-deep conclusions in the  
9 Chamberlain Pass formation, or the Basal Chadron.

10 Again, I don't think it's conclusive in  
11 and of itself. I think it's just one more weight on  
12 the scale, when combined with the diversion off the  
13 pumping test in the same region that showed a recharge  
14 boundary then brought back in by documented wells  
15 turning on, when there was no documentation of wells  
16 shutting off. I think that there is reason to believe  
17 that there's a potential for leakage vertically in  
18 this area.

19 JUDGE WARDWELL: Thank you. After the  
20 model-based restoration plan, CBR Exhibit 052, Pages  
21 6 through 7, Answer 15 elaborates that, "Crow Butte  
22 retained WorleyParsons to develop the site groundwater  
23 flow model to optimize flow rates and patterns,"  
24 citing CBR Exhibit 041, which I assume is the Parsons  
25 report or, in turn, would be the Aquavar or Aquatech

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1 because this work was continued by Aquavar and  
2 Aquatech. "The model takes into account  
3 heterogeneity, non-uniform thicknesses, and other  
4 conditions, as directly incorporated by the thousands  
5 of bore holes and wells at the site. The calibrated  
6 model has been refined and expanded as restoration has  
7 progressed." Does this model incorporate all those  
8 4,530 exploration holes and the 6,330 mining and  
9 monitoring well pieces of information in the  
10 development of the strata for the MODFLOW model?

11 MR. LEWIS: Bob Lewis, Your Honor. The  
12 model incorporated all of the exploration and  
13 production and injection well bore holes that had been  
14 installed as of 2009, when the model was originally  
15 developed. Since that time, we've tried to  
16 incorporate new bore holes as they've put some  
17 additional bore holes in since that time for the newer  
18 mine units. I can't guarantee that all of them have  
19 been incorporated, but there's well in excess of 5,000  
20 bore holes that were used to define the stratigraphy  
21 in the layering of the model.

22 JUDGE WARDWELL: Okay, but not the total  
23 of the other ones, previously older ones. It took  
24 what you had for your production wells and monitoring  
25 wells and used that information, and then incorporated

1 new ones as they evolved, after it was first  
2 developed. Is that what I heard you say?

3 MR. LEWIS: Yes, it used that, as well as  
4 some exploration bore hole control on a regional  
5 basis.

6 JUDGE WARDWELL: What did you use for --  
7 by doing that, then it's the data of where the picks  
8 actually occurred, and not any designated horizontal  
9 feature that is imposed upon the interfaces between  
10 the various geologic units. You used the actual shape  
11 as best you could determine it from those wells that  
12 we've just described that were used into the model.  
13 Is that correct?

14 MR. LEWIS: Yes, Your Honor. The  
15 stratigraphic tops and bottoms of the Chadron  
16 formation, the Brule formation, were provided in  
17 Cameco's database. I used those picks directly to  
18 develop the layering, etc., of the model.

19 JUDGE WARDWELL: It is the measured data,  
20 not any set horizontal level. In turn, likewise, the  
21 thicknesses would not be homogeneous. They'd vary  
22 based on the best estimate of what the actual  
23 conditions are, as interpreted by the geologic data.  
24 Is that correct?

25 MR. LEWIS: That's correct.



1 JUDGE WARDWELL: How did you handle the  
2 hydraulic input parameters, whatever you happened to  
3 use in this, so there's storativity or hydraulic  
4 conductivity or such things as that in regards to  
5 heterogeneity and anisotropy?

6 MR. LEWIS: We used the values of  
7 transmissivity for the monitor wells from the pumping  
8 tests that have already been discussed as a starting  
9 point, and then we used a calibration process to  
10 adjust those values over a reasonable range of  
11 parameters to get the best fit between the  
12 observations and the model results. Generally, the  
13 conductivities don't range by a large degree. I would  
14 consider it relatively homogeneous. Within the  
15 production zone, conductivity's not varying more than  
16 a Factor 2-3 normally.

17 JUDGE WARDWELL: So the heterogeneity you  
18 used for the hydraulic conductivity was directly  
19 reflective of what was needed in order to obtain the  
20 water-level readings that existed at those in regards  
21 to a best fit between all the different pieces of  
22 data?

23 MR. LEWIS: Yes, the hydraulic  
24 conductivity and the thickness would vary, so we would  
25 take that into account within the model.

1 JUDGE WARDWELL: I assume you also  
2 incorporated a storage parameter of some aspect. Were  
3 those taken from the pump tests?

4 MR. LEWIS: We developed specific storage  
5 estimates from the storativity values from the pump  
6 test, as well. Those values were modified to some  
7 smaller and lesser degree as part of the calibration  
8 process.

9 JUDGE WARDWELL: When you did that, what  
10 about the anisotropy associated with variations in  
11 high conductivity in the vertical versus the  
12 horizontal direction? Likewise, did you incorporate  
13 any leakage rate whatsoever between the Basal  
14 Chadron/Chamberlain Pass and the upper-middle Chadron  
15 that exists over it?

16 MR. LEWIS: The primary vertical  
17 anisotropy would be between the production zone and  
18 the overlying upper confining unit. The lower  
19 confining unit was simulated as a no-flow boundary.  
20 The main anisotropy vertically is between the actual  
21 confining unit in the production zone. Within the  
22 production zone, vertical anisotropy is relatively  
23 negligible, and it's not assumed very greatly across  
24 the site.

25 JUDGE WARDWELL: In Crow Butte's

1 testimony, Pages 38 to 39, Answer 75 says, "Based on  
2 our experience, as well as groundwater modeling of the  
3 site, the movement of fluids at the edge of the  
4 operating well fields typically ranges from 5 to 15  
5 feet per month." Dr. Kreamer, did you submit any  
6 evidence or have any indication of anything different?

7 DR. KREAMER: I'm sorry; I'm having  
8 trouble hearing you, sir.

9 CHAIR GIBSON: You have to speak into your  
10 microphone, Judge Wardwell.

11 JUDGE WARDWELL: Aye aye, sir -- captain.  
12 CBR 01, Pages 38 to 39, Answer 75, "Based on our  
13 experience, as well as the groundwater modeling of the  
14 site, the movement of fluids at the edges of the  
15 operating well fields typically ranges from 5 to 15  
16 feet per month." My question to you is I was  
17 wondering whether you have any evidence to refute  
18 that, or is that a value you can accept?

19 DR. KREAMER: I don't have any evidence to  
20 refute it.

21 JUDGE WARDWELL: Okay, thank you. You  
22 state, on Page 7 of your testimony, the modeling  
23 approach is based -- that we've just been discussing,  
24 the model-based restoration plan, "Is based on MODFLOW  
25 2000, which is a USGS model that was developed for

1 flow in porous, unfractured media," and that, "It was  
2 designed for unconfined aquifers, not confined  
3 aquifers, such as the Basal Chadron." Is there no way  
4 that MODFLOW can be used for a confined aquifer?

5 DR. KREAMER: It absolutely can be, and it  
6 is used all the time for confined aquifers. It wasn't  
7 designed that way, but yes.

8 JUDGE WARDWELL: With the appropriate  
9 hydraulic parameters, it can and has been used for  
10 both confined and unconfined aquifers, do you agree?

11 DR. KREAMER: Yes, sir, I agree.

12 JUDGE WARDWELL: Thank you. Crow Butte,  
13 to fix again, there are no other transport models  
14 besides MODFLOW in there. There's no other  
15 geochemical type of solute transport or things like  
16 that incorporated into this restoration plan model.  
17 Is that correct?

18 MR. LEWIS: No, I did mention the use of  
19 MODPATH, which is --

20 JUDGE WARDWELL: Except for MODPATH.  
21 That's fairly --

22 MR. LEWIS: That's the only other model  
23 that was used.

24 JUDGE WARDWELL: That's fine. Dr.  
25 Kreamer's testimony, Page 7, says that, "Documentation

1 states that the MBRP," that we've been talking about,  
2 "Model is derived from a generalized lump parameter  
3 groundwater model, which was developed based on  
4 simultaneous water and solute balances for a phreatic  
5 aquifer. It is stated that this model is based on the  
6 batch mixing model of Gelhar and Wilson, 1974, which  
7 was designed for unconfined aquifers, not confined  
8 aquifer systems, such as the Chamberlain Pass of Basal  
9 Chadron." Dr. Kreamer, to what document are you  
10 referring when you talk about this documentation?  
11 What documentation were you referring to?

12 DR. KREAMER: I'll have to get back with  
13 you on that one. Due to my referencing abilities, I  
14 don't have that at my fingertips, but I will get that  
15 to you.

16 JUDGE WARDWELL: Back to Crow Butte. Is  
17 there any of this batch mixing model with Gelhar and  
18 Wilson -- that was really a module for optimizing  
19 pollutant capture schemes -- incorporated into your  
20 plan or not?

21 MR. LEWIS: Bob Lewis, Your Honor. Yes,  
22 there was a simple mixing model that was used to help  
23 calculate the approximate number of pour volumes  
24 needed to accomplish restoration. That is an entirely  
25 different exercise.

1 JUDGE WARDWELL: But that's part of your  
2 model, so there is --

3 MR. LEWIS: It's not part of the  
4 model-based restoration plan. It was a separate  
5 exercise.

6 JUDGE WARDWELL: Is that what was being  
7 described in regards to the mixing model, the Gelhar  
8 and Wilson?

9 MR. LEWIS: I believe that's what is being  
10 referred to, yes.

11 JUDGE WARDWELL: Does that make sense to  
12 you, Dr. Kreamer, in regards to that portion of that  
13 modeling not being the MODFLOW, but --

14 DR. KREAMER: It's not MODFLOW, but it's  
15 another way that the restoration was treated in a  
16 modeling sense.

17 JUDGE WARDWELL: Great. You got it.

18 CHAIR GIBSON: Okay, we're ready to  
19 recess. We will take our lunch recess. At 1:30,  
20 we'll start back again.

21 JUDGE WARDWELL: You can forget the  
22 ten-minute wait.

23 (Whereupon, the above-entitled hearing  
24 went off the record at 12:24 p.m. and resumed at 1:31  
25 p.m.)

1 A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

2 (1:31 p.m.)

3 CHAIR GIBSON: I think we can go back on  
4 the record.

5 A couple of housekeeping matters. We have  
6 the hard copies of the pump tests that we talked about  
7 earlier. These were pump tests that were performed in  
8 1987. There were three of them. Actually, one of  
9 them may have been performed in '96. I'm not sure.  
10 Is that right?

11 MR. SMITH: Yes.

12 CHAIR GIBSON: Okay.

13 MR. SMITH: It was different years.

14 CHAIR GIBSON: So what we'll do is we'll  
15 call these -- just for identification purposes we'll  
16 call this Board Exhibit 2. It's the three pump tests.  
17 And if we need to refer to them individually, the  
18 first aquifer test will be Board Exhibit 2A, the  
19 second aquifer test will be Board Exhibit 2B, and the  
20 third pump test will be Board Exhibit 2C.

21 (Whereupon, the above-referred to  
22 document was marked as Board Exhibit No.  
23 2 for identification.)

24 CHAIR GIBSON: Those will be submitted  
25 electronically through EIE once that becomes possible

1 and they'll be available on the Internet at that point  
2 in time.

3 JUDGE WARDWELL: Who are the authors of  
4 this and where did it come from? Certainly pump test  
5 3 is self-explanatory. Does anyone how who --

6 MR. BEINS: I believe, Your Honor, that  
7 the first two pump tests --

8 JUDGE WARDWELL: Are you lips moving?  
9 There you go.

10 MR. BEINS: Yes, they are. The first two  
11 pump tests were completed by RTG Technologies Group  
12 for Ferret Exploration. And then I believe the third  
13 pump test was -- and maybe fourth pump test were  
14 Petrotek.

15 JUDGE WARDWELL: And do you know where  
16 these were taken from, because it's not their report,  
17 it doesn't look like. It looks like it was pulled  
18 from something else. Maybe not, but it says 2.7A1 on  
19 the bottom of the first aquifer pump test and it's  
20 dated July 29th, 1987.

21 MR. SMITH: This is Tyson Smith for Crow  
22 Butte. I believe that's from the original license  
23 application or one of the original applications for  
24 Crow Butte, for at least that first one.

25 CHAIR GIBSON: All right. If we could,



1 we've got two copies up here. Can we provide this one  
2 to the Intervenor? Okay. This hard copy just in  
3 case they need it for some reason.

4 MR. SMITH: So I apologize to the parties.  
5 I was unable to secure an electronic copy over the  
6 lunch break. That was part of the reason for our  
7 delay. I will upload that and send an email with  
8 these to the parties as soon as I can after today's  
9 hearing.

10 CHAIR GIBSON: That's fine. Okay. Ms.  
11 Simon, were you able to determine whether the modeling  
12 information was in the disclosures?

13 MS. SIMON: Your Honor, yes, I was able to  
14 determine it and, no, they were not in the  
15 disclosures.

16 CHAIR GIBSON: Okay. Were you able to  
17 determine who made the decision not to disclose this  
18 information to the parties?

19 MS. SIMON: No, I have no idea why the  
20 decision was made. My guess is that it was probably  
21 just an oversight. But the documents are in ADAMS.  
22 They're in non-public ADAMS. And I would like to have  
23 the staff take a look at them, since they're non-  
24 public, this evening and find out if there's any  
25 reason why they can't be distributed to the parties

1 under the non-disclosure order. And then I could  
2 email them out.

3 CHAIR GIBSON: Yes, I mean, these experts  
4 have signed a non-disclosure agreement. It's not like  
5 we're disclosing uranium enrichment technology. I  
6 mean, these experts are familiar with this modeling  
7 program and they've signed non-disclosures, so I see  
8 no reason why there would be anything in there that  
9 could not be disclosed to them. So I would like you  
10 to get that done muy pronto.

11 MS. SIMON: Okay. I'm trying to take care  
12 of several things for you within the limitations of  
13 some technological issues --

14 CHAIR GIBSON: Okay.

15 MS. SIMON: -- with the computer and  
16 access to the Internet. So, I'll take care of that as  
17 soon as I can.

18 CHAIR GIBSON: Okay.

19 MS. SIMON: I can tell you that I had one  
20 of the staff witnesses take a quick look at one of the  
21 files over lunch and the staff believes that --

22 CHAIR GIBSON: Just a minute. Ms. Simon,  
23 could you speak into the mic --

24 MS. SIMON: I'm sorry. Yes.

25 CHAIR GIBSON: -- just a little more?

1 We're having trouble hearing you.

2 MS. SIMON: Sorry. Yes. The staff  
3 believes that these are input files from the final  
4 model runs that were performed for the modeling, and  
5 there are basically hundreds of pages of numbers that  
6 made no sense to me as an attorney, certainly, and it  
7 may be that someone who's familiar with the MODFLOW  
8 program can look at them and make some sense of them.

9 CHAIR GIBSON: Yes. Okay. That's great.  
10 I hope your office can find some way to use this as a  
11 teachable moment for the NRC staff that if someone has  
12 signed a non-disclosure agreement and it isn't  
13 something involving something like uranium enrichment  
14 technology that information needs to be disclosed.  
15 And obviously it's even been referenced in some of the  
16 documents that have been filed here and in testimony  
17 and it's very important that it be provided to these  
18 experts.

19 MS. SIMON: Yes, Your Honor. Let me just  
20 clarify though that I think the information that was  
21 cited in the testimony was the SER, not these  
22 documents in particular. If these documents in  
23 particular had been cited, they would have been  
24 provided as exhibits.

25 But that being said, clearly there was no

1 intent to not disclose them. It appears that they  
2 just were missed.

3 CHAIR GIBSON: Well, I'm certainly not  
4 suggesting you did anything wrong, Ms. Simon, but  
5 somebody did, and there's no excuse for this kind of  
6 information not to be disclosed.

7 MS. SIMON: Respectfully, Your Honor, I  
8 would disagree that someone did something wrong, but  
9 we'll leave it at that.

10 CHAIR GIBSON: Well, they didn't disclose  
11 it and that was wrong. Now perhaps they did not  
12 understand their obligations, but that in turn may be  
13 a reason why this is a teachable moment for OGC to get  
14 with the staff. Okay.

15 JUDGE WARDWELL: Okay.

16 CHAIR GIBSON: Oh, one more thing. The  
17 USGS 2014 study, we will make that Board Exhibit 3 as  
18 well once we get a copy of it.

19 (Whereupon, the above-referred to  
20 document was marked as Board Exhibit No.  
21 3 for identification.)

22 MS. SIMON: Okay. And just for your  
23 information, as soon as I get my computer rebooted I'm  
24 going to be sending that, the Souders and the Terry  
25 reports by email to the clerks and to the parties. I

1 understand the parties might not be able to access it  
2 until the evening, but I will provide that as soon as  
3 I can.

4 CHAIR GIBSON: Thank you, Ms. Simon.

5 MR. REID: This is counsel for the Tribe.  
6 Can I ask, there was an issue, there was a question  
7 about the source of the data for the USGS 2014 study.  
8 Is that being produced as well? Are we going to --

9 (Simultaneous speaking)

10 CHAIR GIBSON: That will become Board  
11 Exhibit 3. That is what she's going to provide to you  
12 an electronic copy of tonight, I understand.

13 MR. REID: All right.

14 CHAIR GIBSON: Is that correct, Ms. Simon?

15 MS. SIMON: Yes, just to clarify, what  
16 we're providing is the entire report. What was  
17 provided as NRC-026 is an excerpt. So the entire  
18 report has references and should be able to determine  
19 from that where the information came from.

20 MR. REID: Thank you.

21 CHAIR GIBSON: Okay. Judge Wardwell, I'm  
22 finished.

23 JUDGE WARDWELL: Okay. Referring to CBR's  
24 Exhibit 045, page 36, answer 64, where it states that,  
25 quote, "Crow Butte maintains a comprehensive

1 environmental monitoring program that includes surface  
2 water and groundwater sampling and sediment sampling  
3 at the mine site and at background locations and the  
4 surrounding area including the flood plains that drain  
5 into the White River." And I'd ask CBR are these  
6 flood plains ones associated with Squaw and English  
7 Creeks and White Clay Creek?

8 MR. TEAHON: Teahon for Crow Butte. Yes,  
9 they are.

10 JUDGE WARDWELL: So are you now the  
11 captain of the CBR ship?

12 MR. TEAHON: Well, you said water balance,  
13 and they got spooked and put me over here, so --

14 (Laughter)

15 JUDGE WARDWELL: Do you have an idea of  
16 how many wells are set in the various flood plains to  
17 each of these rivers and the White River also?

18 MR. TEAHON: We have two, the Squaw Creek  
19 drainage system and the English Creek go right through  
20 the mine site. And we do upstream sampling for  
21 background for both of those locations. And then we  
22 do on-site and where the streams leave the site  
23 sampling. Plus the impoundments that are on the site  
24 and then an impoundment that collects those drainages  
25 off the site for the surface water sampling.

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1 JUDGE WARDWELL: And what you just  
2 described is all surface water sampling?

3 MR. TEAHON: Yes, sir.

4 JUDGE WARDWELL: And do you have any wells  
5 in the alluvium of those creeks?

6 MR. TEAHON: Okay. We sample all of the  
7 private wells within one kilometer of an active mine  
8 unit. And those are all drilled with the exception of  
9 one well in the Brule formation. And we have one well  
10 that's northwest of Mine Unit 10 that's developed in  
11 the Chadron formation, Basal Chadron sands.

12 JUDGE WARDWELL: And back to my question,  
13 do you have anything in the alluvium of those creeks  
14 -- or let me rephrase it. Are any of those private  
15 wells in the alluvium of the creeks?

16 MR. TEAHON: No, they are not.

17 JUDGE WARDWELL: And you don't have any  
18 wells yourselves in those alluvium in the creeks?

19 MR. TEAHON: No, we do not.

20 JUDGE WARDWELL: Okay. Is that the same  
21 -- well, let me just broaden the question. What types  
22 of monitoring do you do along the White River?

23 MR. TEAHON: We sample quarterly for  
24 uranium and radium.

25 JUDGE WARDWELL: The river water itself?

1 MR. TEAHON: In the surface waters, yes,  
2 we do. And then annually we settle -- sample the  
3 sediments.

4 JUDGE WARDWELL: And do you sample  
5 sediments in the creeks running through that, or only  
6 in the White River?

7 MR. TEAHON: We do not directly sample the  
8 White River. We sample the drainages going into the  
9 White River; i.e., English Creek and Squaw Creek.

10 JUDGE WARDWELL: Okay. Thank you. The  
11 next set of questions deals with the water balance and  
12 drawdown analysis. NRC EA at -- again, that's Exhibit  
13 010, page 83, Section 4.6.2.3, states that the NRC  
14 performed a water balance analysis in Section 5.7.9.4  
15 of the SER. But I guess my question is I didn't see  
16 anything about that water balance in that section, and  
17 I just want to verify that -- is it more appropriate  
18 to say that the SER, which is Exhibit 009, refers to  
19 this water balance on pages 130 to 131?

20 DR. STRIZ: Your Honor, may I interject?

21 CHAIR GIBSON: Sure.

22 DR. STRIZ: That is an error in the EA  
23 with respect to the reference section. And I'm going  
24 to try and get to it.

25 CHAIR GIBSON: Can you be sure and speak



1 into the microphone?

2 DR. STRIZ: I apologize.

3 JUDGE WARDWELL: You might try pages 130  
4 to 131 for discussion of the water balance and see if  
5 that's what you'd like to correct the reference to.

6 DR. STRIZ: Please --

7 JUDGE WARDWELL: I'm sorry. I apologize.  
8 It's not apparent that it's on that page, which is  
9 Section 5.7.9.4. Where it is is in Section 3.1.3.5.4,  
10 pages 41 to 42, is it not?

11 DR. STRIZ: Yes, that is correct.

12 JUDGE WARDWELL: There we go.

13 DR. STRIZ: There we go.

14 JUDGE WARDWELL: Between the two of us  
15 we'll make enough mistakes that we'll get it right.

16 And is this the information from your  
17 water balance on those pages? And you might want to  
18 just keep those pages right there if you want to  
19 glance to it, but I believe this is. And if you need  
20 to glance, you can. But I think in that water balance  
21 you state that the production rate varies from 5,000  
22 to 9,000 gallons per minute.

23 DR. STRIZ: That's correct. This is the  
24 water balance for looking at their waste disposal  
25 capacity.

1 JUDGE WARDWELL: Right.

2 DR. STRIZ: Liquid waste disposal  
3 capacity.

4 JUDGE WARDWELL: Yes.

5 DR. STRIZ: It's not a plan in the water  
6 balance.

7 JUDGE WARDWELL: Right. Right.

8 DR. STRIZ: It's liquid waste.

9 JUDGE WARDWELL: No, this is a hydraulic  
10 water balance, if you will for us.

11 DR. STRIZ: Correct.

12 JUDGE WARDWELL: Yes, for our needs. Does  
13 this include the restoration rate also, or is it just  
14 the production rate, or is it a combination of both?

15 DR. STRIZ: It's both. It's the bleed and  
16 the restoration. Whatever goes to waste to the ponds  
17 or the deep disposal well.

18 JUDGE WARDWELL: That water balance also  
19 says the deep disposal well capacity is between 200  
20 and 400 gallons per minute. Do you see that there?

21 DR. STRIZ: Yes.

22 JUDGE WARDWELL: Now, historic disposal  
23 rates as summarized in the SER on Table 3.1-2 state  
24 that the semi-annual average historic flow rates to  
25 the evaporation ponds varied from 9 to 25 gallons per

1 minute.

2 DR. STRIZ: Correct.

3 JUDGE WARDWELL: And that the mean flow  
4 rate to the deep disposal well varied from 42 to 161  
5 gallons per minute --

6 DR. STRIZ: Correct.

7 JUDGE WARDWELL: -- with an arithmetic  
8 mean for the previous 10 years of 89 gallons per  
9 minute?

10 DR. STRIZ: Correct.

11 JUDGE WARDWELL: And the flow rates are  
12 expected to continue to increase in the near future?

13 DR. STRIZ: Potentially, yes.

14 JUDGE WARDWELL: And what is the cause for  
15 that potential increase?

16 DR. STRIZ: Our understanding is that  
17 they're going to be increasing their flow rates to  
18 accommodate restoration efforts.

19 JUDGE WARDWELL: Thank you. What's the  
20 total disposal capacity available at CBR?

21 DR. STRIZ: I don't have that number. I  
22 just have the waste disposal wells. The ponds I have  
23 not calculated, but I know that they're using roughly  
24 historically 25 gallons per minute.

25 JUDGE WARDWELL: CBR, do you know what

1 your disposal capacity is at your site?

2 MR. TEAHON: We have three commercial  
3 evaporation ponds and two deep disposal wells. The  
4 deep disposal wells handle approximately 200 to 250  
5 gallons a minute and the --

6 JUDGE WARDWELL: Total?

7 MR. TEAHON: Total. And the three  
8 commercial evaporation ponds have a capacity of  
9 somewhere around 40 million gallons, 40 to 24 million  
10 gallons each.

11 JUDGE WARDWELL: And what does that  
12 translate to in average gallons per minute that you  
13 can feed into that?

14 MR. TEAHON: Well, with evaporation in the  
15 summer time it exceeds 60 to 70 gallons a minute. We  
16 have enhanced sprays in there to increase the  
17 evaporation rate, which we actually draw down the  
18 ponds in the summer time to have holding capacity for  
19 those in the winter time.

20 JUDGE WARDWELL: What additional license  
21 amendments do you need, if any, to handle the  
22 increased flow rates that are anticipated in the near  
23 future?

24 MR. TEAHON: Our increased flow rates  
25 would be due to the restoration circuit. We've

1 doubled the capacity of that from 500 gallons a minute  
2 to 1,150 gallons a minute. And that helps us expedite  
3 the restoration process. Currently at our usage right  
4 now our deep disposal capacity in the evaporation  
5 ponds can handle that. If we couldn't, we have a  
6 third option which would be the NPDES Land Application  
7 Permit, which would be a lengthy process in order to  
8 get that up and running. We'd actually have to send  
9 in the construction plans to the NRC prior to that,  
10 include that in our surety bond and would take several  
11 months, if not years, to start that. And we have no  
12 intentions of doing that.

13 JUDGE WARDWELL: But you are licensed to  
14 do that?

15 MR. TEAHON: Yes, we currently have an  
16 NPDES license for land application.

17 JUDGE WARDWELL: And, staff, as being a  
18 licensed activity, did you include the potential of  
19 that activity taking place at the site when you  
20 assessed any impact from the site in your EA?

21 DR. STRIZ: Yes, we did.

22 JUDGE WARDWELL: Okay. So you assumed  
23 that's up and running and that's part of the impact  
24 analyses?

25 DR. STRIZ: Yes.

1 JUDGE WARDWELL: Okay.

2 DR. STRIZ: If it were to run, yes,  
3 they're licensed.

4 JUDGE WARDWELL: Thank you.

5 JUDGE HAJEK: I'm sorry. Let me jump in  
6 here. The EA states numerous times that the plant has  
7 no intent of doing land application.

8 DR. STRIZ: Correct.

9 JUDGE HAJEK: Quoting the plant.

10 DR. STRIZ: Correct.

11 JUDGE HAJEK: So how can you say you take  
12 credit for them doing land application in response to  
13 Judge Wardwell's question?

14 DR. STRIZ: That was not what I  
15 interpreted to say. I said that we evaluated the  
16 impacts of land application in the EA.

17 JUDGE HAJEK: You evaluated the impact of  
18 land application in what way in the EA?

19 DR. STRIZ: That there could be potential  
20 impacts from land application if they decide to put  
21 land application into use. They are licensed for the  
22 land application facility. They have not used it, but  
23 it has to be evaluated if they did use it.

24 JUDGE WARDWELL: So saying the question a  
25 different way, it's irrelevant, is it not, that they

1 haven't used it to date and you could actually leave  
2 that sentence out of your EA and not affect your EA?

3 DR. STRIZ: If we had assurance that they  
4 were not going to use it, yes.

5 JUDGE WARDWELL: No, no, I must have  
6 confused you. Your EA now says, gee, they've never  
7 used this or have any intent to use it. That didn't  
8 enter into your impact analysis whatsoever the fact  
9 that they say they aren't going to use it. You  
10 considered it in use because it is licensed to be  
11 used.

12 DR. STRIZ: I'm going to defer to Mr.  
13 Goodman --

14 JUDGE WARDWELL: Sure.

15 DR. STRIZ: -- who did the analysis.

16 MR. GOODMAN: Nathan Goodman. Yes, that's  
17 correct, Your Honor.

18 JUDGE WARDWELL: That was simple.

19 (Laughter)

20 DR. STRIZ: I should have passed off.

21 JUDGE WARDWELL: Anything else, Brian?

22 JUDGE HAJEK: No, we'll come back to land  
23 application options in a couple days, maybe next week  
24 if we keep going.

25 (Laughter)

1 MR. GOODMAN: Your Honor, next week would  
2 be slightly more problematic, but I'll make it work.

3 JUDGE HAJEK: Thank you.

4 JUDGE WARDWELL: I won't. Crow Butte, in  
5 regards to deep disposal injection, at what pressures  
6 do you do that and what analysis have you performed to  
7 ensure that no impacts occur from the aquifer  
8 transmissivity due to any excess pressures that you  
9 might develop in your injection of those deep wells?

10 MR. TEAHON: Okay. Your Honor, as part of  
11 the application to get a Class 1 UIC Permit we send  
12 those plans into NDEQ, who has primacy in the State of  
13 Nebraska for the UIC applications. Once that well is  
14 drilled, they have a pressure limitation put on it  
15 based on the geometry of the sands. And we have a  
16 limitation of 650 psi injection pressure. And that's  
17 set up so we don't fracture the zone.

18 JUDGE WARDWELL: And that's part of your  
19 license or a license conditions?

20 MR. TEAHON: Yes, it is. It's part of our  
21 Class 1 license.

22 JUDGE WARDWELL: That you get from the  
23 State of Nebraska?

24 MR. TEAHON: Yes, sir.

25 JUDGE WARDWELL: Okay. Thank you.



1 JUDGE HAJEK: I have a question on that.  
2 Can you clarify that 650? I think that I interpreted  
3 that to be a minimum pressure, but I'm understanding  
4 you to say that's a max --

5 MR. TEAHON: No, sir, that's a maximum  
6 pressure that --

7 JUDGE HAJEK: At the well --

8 (Simultaneous speaking)

9 MR. TEAHON: -- we can inject. Yes.

10 JUDGE HAJEK: Okay. What normally does it  
11 operate at?

12 MR. TEAHON: We have two every unique  
13 wells, Deep Well No. 1 operates under a vacuum, so the  
14 head pressure is zero. Deep Well No. 2, which is  
15 approximately a mile away, operates about 350 psi.

16 JUDGE HAJEK: Okay. Thank you.

17 MR. SMITH: Excuse me. I apologize. This  
18 is Tyson Smith for Crow Butte. As we've sort of edged  
19 into some of the restoration-related issues, we have  
20 an additional witness that has not been sworn in. And  
21 if it's okay with you, we'd like to swear him in so  
22 that he's available if he needs to sub in on some of  
23 these questions that you're asking. Thank you.

24 CHAIR GIBSON: If he's present, very well,  
25 let's go ahead and -- it's going to be pretty crowded

1 up there.

2 MR. PAVLICK: I'll take the second row.

3 CHAIR GIBSON: Okay. That will be fine.

4 I have a feeling you're not going to be peppered too  
5 badly today.

6 Okay. Would you please -- get my little  
7 card out here. I haven't got this memorized yet, no  
8 matter how long I've been doing this.

9 JUDGE WARDWELL: It's a pretty lengthy  
10 statement he has to do.

11 CHAIR GIBSON: Would you please state your  
12 full name, sir?

13 MR. PAVLICK: Doug Pavlick.

14 CHAIR GIBSON: Okay. You may have to pull  
15 the microphone up so you can talk into it. Would you  
16 state your name so we can all hear it, sir?

17 MR. PAVLICK: Doug Pavlick.

18 CHAIR GIBSON: You do affirm that all the  
19 testimony you're about to give in the case before this  
20 Board will be the truth, the whole truth and nothing  
21 but the truth? This you do affirm under the pains and  
22 penalties of perjury?

23 MR. PAVLICK: I do.

24 CHAIR GIBSON: Very well. You may be  
25 seated, sir. Thank you.

1 JUDGE WARDWELL: NRC Exhibit 001  
2 testimony, page 87, answer 6A, you state that, quote,  
3 "NRC staff concluded from the water balance analysis  
4 that long-term consumptive use would be higher than  
5 the historic average of 105 gallons per minute. This  
6 understanding was used in conjunction with the  
7 drawdown analysis discussed below in answer A6.9 to  
8 estimate drawdown at higher consumptive rates."

9 And just to verify with staff that this  
10 water balance and the drawdown analysis is  
11 incorporated into your assessment of the impacts for  
12 the mining in your EA?

13 MR. BACK: Yes, Your Honor.

14 JUDGE WARDWELL: Okay. Thank you. And  
15 where in the EA is the best place for this water  
16 balance and drawdown analysis discussion in details  
17 and associated with it?

18 MR. BACK: May I have a minute to find the  
19 exact location?

20 JUDGE WARDWELL: It's mostly the impacts.  
21 And if they are still on that section we talked about  
22 before, Section 3.1.3.5.4, pages 41 to 42, that's  
23 fine. Just verify that that's what it is.

24 MR. BACK: It's -- you know, I had this  
25 highlighted, Your Honor, and now it's -- of course

1 when I need it, it's gone.

2 JUDGE WARDWELL: Yes, and it wouldn't be  
3 what I previously described, because that was quoted  
4 in the SER. Well, why don't you just get back to us  
5 on that just so you don't --

6 MR. BACK: Okay. Very good.

7 JUDGE WARDWELL: I can beads of sweat on  
8 your palms from here that -- we don't want to get you  
9 stressed out here.

10 How much higher do you estimate the  
11 consumptive use will exceed the historic value of 105?

12 MR. BACK: We estimated that even at a  
13 consumptive use of 210 a minute we would still not see  
14 more than moderate impacts. And so, we did not  
15 believe, the staff did not believe that we would see  
16 a doubling of the consumptive use. However, that's  
17 the number that we used conservatively to estimate  
18 impacts.

19 JUDGE WARDWELL: You say that your total  
20 consumptive use will be less than 210, but that's the  
21 number that you used in your impact analysis?

22 MR. BACK: Your Honor, that is the number  
23 that we used in our impact analysis, but that number  
24 could go quite a bit higher before we would get beyond  
25 moderate impacts.

1 JUDGE WARDWELL: So you're saying that  
2 with this number you've concluded that there's  
3 moderate impacts?

4 MR. BACK: Yes, Your Honor.

5 JUDGE WARDWELL: And that's moderate  
6 impacts from what category? What's that called, water  
7 usage? Water impacts?

8 MR. BACK: It's water quantity impacts.

9 JUDGE WARDWELL: Okay. Good.

10 MR. BACK: Your Honor, it was also tied to  
11 the water quality impacts because since the aquifer is  
12 confined, we don't see a detrimental effect to say  
13 wetlands or stream recharge. And so, it's tied to  
14 that also.

15 JUDGE WARDWELL: Was there a derivation of  
16 that 210 gallons per minute and what was included in  
17 that? Was it both production water, for instance,  
18 bleed and restoration water bleed? And if so, what  
19 types of parameters in the restoration and production  
20 are associated with that in regards to mine units  
21 still open, mine units closing, pore volumes used for  
22 restoration, the bleed from restoration, etcetera?

23 MR. BACK: Yes, Your Honor. As you're  
24 aware that the mines -- the operator can only have  
25 five mines in operation and five mines in restoration

1 at the same time. And so, looking at historical  
2 pumping rates that up to now it's been about 105  
3 gallons per minute increasing over the last few years.  
4 And so, we felt that that would probably be a bound,  
5 that the 210 would probably be an upper bound. Now,  
6 the number of pore volumes really doesn't come into  
7 play since those pumping rates would be sustainable  
8 indefinitely. And that's what that curve was showing  
9 to where we talked about how if the rate doubled, the  
10 drawdown would double. So, it's really a function of  
11 the pumping rate rather than the number of pore  
12 volumes with respect to the consumptive use impacts.

13 JUDGE WARDWELL: With pore volumes just  
14 being the multiplication of the pumping rate times the  
15 time you leave it on and times the porosity of the  
16 unit that you have.

17 MR. BACK: Absolutely, but it did not come  
18 into our impact analysis in that way.

19 JUDGE WARDWELL: Because you would just  
20 again pump it longer to get more pore volumes out of  
21 it?

22 MR. BACK: Exactly.

23 JUDGE WARDWELL: It would be a timing  
24 issue?

25 MR. BACK: Exactly, Your Honor. And since

1 we're under the sustainable yield of the aquifer it  
2 would not.

3 JUDGE WARDWELL: But wouldn't that also  
4 mean that whatever impacts are encountered would be  
5 encountered over a longer time frame, would it not?

6 MR. BACK: Absolutely, Your Honor.

7 JUDGE WARDWELL: And so, doesn't that  
8 increase the overall level of impact so that it has a  
9 possibility of raising the qualitative name you give  
10 to the level of impact?

11 MR. BACK: Yes, Your Honor, it would have  
12 an impact on the --

13 (Simultaneous speaking)

14 JUDGE WARDWELL: And right now you say  
15 it's at moderate?

16 MR. BACK: Yes, Your Honor.

17 JUDGE WARDWELL: How did you arrive at  
18 that conclusion? Why wasn't it small or why wasn't it  
19 -- whatever is greater than moderate? Extreme or --  
20 I forgot what the word is.

21 MR. BACK: NUREG-1748 provides some  
22 guidance in terms of how to rank small, moderate or  
23 large. Now, it's pretty qualitative, and so it allows  
24 professional judgment as well as case history, some of  
25 these other factors that feed into this. And so, the

1 staff looked at NUREG-1910 to see what the potential  
2 impacts were for other operating facilities in order  
3 to at least get an estimate of whether we would expect  
4 less or greater impacts. And so NUREG-1910, because  
5 we're talking about production and the restoration,  
6 assumes that the impacts would be moderate and would  
7 not destabilize the resource. Because once we go to  
8 large, a large is destabilizing the resource.  
9 Moderate is noticeable, but not destabilizing the  
10 resource. And then small is essentially unnoticeable.

11 And so, we felt that with the pumping  
12 rates we were looking at the aquifer would still  
13 remain saturated. We calculated back to the envelope  
14 that we would have to do at least 900 gallons a minute  
15 based on our assumptions of how high the  
16 potentiometric surface was above the top of the  
17 aquifer. And so, we went through these calculations  
18 and felt that we would never begin to desaturate the  
19 aquifer. We'd always keep a saturated aquifer. The  
20 impacts with distance would decrease.

21 The types of impacts that we would be  
22 looking at would be if individuals had wells that were  
23 flowing at one time, that they would no longer flow.  
24 There are very few wells in the Basal Chadron though  
25 and they're livestock wells and we have not heard any



1 reports of poor performance on the Basal Chadron  
2 wells. And so, we knew that there would not be any  
3 impact to surface water. And so, that was really in  
4 a nutshell the foundation of our analysis.

5 JUDGE WARDWELL: So if I heard you  
6 correctly, it would jump to large if in fact you  
7 started to desaturate the confined aquifer? You would  
8 lower the potentiometric surface below the top of the  
9 aquifer?

10 MR. BACK: Your Honor, not necessarily,  
11 because once it lowered -- there are ISL facilities  
12 running in unconfined systems. Once it gets below the  
13 top of the confining unit, now actually you could draw  
14 a lot more water out per unit drop. However, the  
15 applicants have strong motivation never to let that  
16 happen because they'll start losing control of their  
17 mine fluids because now they would have to pump so  
18 much more water to keep the radius of influence going.  
19 And so, it becomes more than just a factor of what the  
20 impact would be. It would affect the entire operation  
21 of the mine.

22 JUDGE WARDWELL: True, but that's not the  
23 concern of the EA, is it? I mean --

24 MR. BACK: It's not a concern, but it is  
25 a factor that we considered because not only are we

1 looking over the applicant, but the applicant has a  
2 motivating factor to make sure they stay within  
3 operating bounds that we've considered within the  
4 impact analysis.

5 JUDGE WARDWELL: Okay. Well, then I guess  
6 so what you're saying that in fact that level, the top  
7 of the aquifer matching the potentiometric surface, is  
8 not a criteria necessarily for going from one level to  
9 the other, from moderate to large?

10 MR. BACK: No, it's not, because actually,  
11 Your Honor, you could start pumping the same amount of  
12 water from the Basal Chadron and if you did have  
13 enough inflow from around the sides recharging, you  
14 could potentially stabilize the Basal Chadron without  
15 dewatering it further at these rates. Since the water  
16 is coming out of storage when it's confined, you get  
17 far less water out for -- of the aquifer for that drop  
18 in head.

19 JUDGE WARDWELL: So then as I remember  
20 your answer, you also then stated, or implied at least  
21 to my hearing, that if you destabilize a resource,  
22 that would be the criteria for jumping up to large.

23 MR. BACK: Yes, Your Honor.

24 JUDGE WARDWELL: And what causes this  
25 particular resource to be destabilized?

1 MR. BACK: Your Honor, if they were to  
2 drop the head below the top of the confining unit in  
3 the Basal Chadron and started pumping that aquifer at  
4 a rate that it could sustain beyond its sustainable  
5 yield and essentially be mining the water, that would  
6 be a destabilization of the resource.

7 JUDGE WARDWELL: Thank you.

8 CHAIR GIBSON: While you're looking for  
9 your next question, Judge Wardwell, we have just  
10 received word that the USGS 2014 study has been  
11 received. So it has been emailed successfully, Ms.  
12 Simon. Thank you. Which is Board Exhibit 3.

13 JUDGE WARDWELL: Back to this 900, did you  
14 say that at the 900 it would destabilize?

15 MR. BACK: No, Your Honor. Let me be  
16 perfectly clear on that. At 900 it would reach the  
17 top of the confining unit, so it would be down at the  
18 top of the Basal Chadron. And at that point we would  
19 move from a confined system to an unconfined system.

20 JUDGE WARDWELL: Over just the center.  
21 The whole drawdown curve wouldn't be under unconfined  
22 conditions --

23 MR. BACK: No.

24 JUDGE WARDWELL: -- at that point? It  
25 would be --

1 MR. BACK: No. No, but since it's a well  
2 field and it's a large area, it would --

3 JUDGE WARDWELL: Pretty much the same?

4 MR. BACK: Yes.

5 JUDGE WARDWELL: It's pretty flat.

6 MR. BACK: Yes.

7 JUDGE WARDWELL: Okay. Dr. Kreamer, in  
8 your testimony on page 2 of INT Exhibit 046 you state  
9 that large pulses of infiltrating precipitation from  
10 increase storm activity is not adequately addressed.  
11 Do you have any evidence of these large impulses of  
12 groundwater infiltration due to precipitation from  
13 intense storms?

14 DR. KREAMER: Before we start, you asked  
15 for some information which is really quick and I can  
16 give it to you, or do you want me to answer first?

17 JUDGE WARDWELL: I'm sorry. Say again?

18 DR. KREAMER: You asked me about the  
19 modeling references for Zeng et al and Gerhart and  
20 Wilson, 74. And those are from CBR 038. And I just  
21 before I answer.

22 JUDGE WARDWELL: Thank you.

23 DR. KREAMER: In answer to your question,  
24 I do not. A complete water balance was not done on  
25 either the Brule or the Basal Chadron/Chamberlain

1 Pass, to my knowledge.

2 JUDGE WARDWELL: Okay. Thank you. Back  
3 to NRC and your testimony, 001, page 87, answer to  
4 6.9, drawdown analysis. How as the analysis conducted  
5 and where is it referenced in the evidence submitted  
6 for this hearing in regards to the details of this  
7 drawdown analysis? I guess that's one I had you going  
8 on before, didn't I? So again, you'll get back to us  
9 on that one.

10 Under the SER, NRC 009, page 43,  
11 3.1.3.5.6, you stated that based upon a comparison of  
12 the recent water levels to the limited 1982-1983 Basal  
13 Chadron water level data depicting static pre-  
14 operational potentiometric surfaces drawdown with the  
15 mine units over this period is estimated by the staff  
16 to be approximately 47 feet. This drawdown agrees  
17 with the value of 40 to 60 feet which was estimated by  
18 the applicant for the Basal Chadron aquifer across the  
19 permit area during operations.

20 And I've probably asked this before, but  
21 I'll ask it again. Is there anywhere where there's a  
22 plot of these drawdown curves plotted out for the  
23 radius of influence?

24 MR. BACK: Your Honor, there are  
25 potentiometric surfaces --

1 JUDGE WARDWELL: Yes.

2 MR. BACK: -- and so the difference  
3 between -- and I'll have to look and see what the  
4 exhibit number is, but we do provide those. And so,  
5 there are potentiometric surfaces for both the Basal  
6 Chadron and the overlying Brule. And just to look at  
7 these numbers, we just took wells that were in close  
8 proximity to look to see about what the differences  
9 were.

10 JUDGE WARDWELL: Okay. So you didn't have  
11 a drawdown curve or anything around -- you didn't plot  
12 anything, the distance from the well, etcetera?

13 MR. BACK: No, Your Honor, but as part of  
14 the RAI that we referenced earlier the staff had asked  
15 Crow Butte Resources to compare their predictions to  
16 the actual measured values. And so, we posted those  
17 on a map. And we had looked at those before obviously  
18 as part of the RAI to ensure that their predictions  
19 were not underestimating by significant amounts what  
20 the potential drawdown would be with distance. And  
21 what we found out was that in almost all cases their  
22 model had been conservative and that the drawdown was  
23 actually less as a function of distance.

24 JUDGE WARDWELL: I think you actually  
25 referenced them as drawdown curves. And I went to the

1 reference number and they're actually just points,  
2 elevations at points or differences in elevation.

3 MR. BACK: Yes, Your Honor, I apologize  
4 for that oversight.

5 JUDGE WARDWELL: That's fine.

6 MR. BACK: It might have been the drawdown  
7 curve that we based that data off of, which we'd  
8 looked at earlier in the day.

9 JUDGE WARDWELL: Yes, and that could have  
10 been for what you expected and then you plotted over  
11 what you had. But could not that -- and in those  
12 cases the drawdown was less. The points I looked at  
13 certainly were all less, but doesn't that raise  
14 another question that couldn't that possibly be due to  
15 the leaking aquifer during long-term pumping rather  
16 than just a variation in the differences between the  
17 transmissivity and storage coefficient between what  
18 was measured for the shorter-term pump tests and the  
19 long-term production wells?

20 MR. BACK: Your Honor, the earlier work  
21 that was discussed how the Brule, all of the Brule  
22 overlying monitoring wells are monitoring water levels  
23 monthly, and the Basal Chadron heads don't suggest  
24 that that's occurring. If anything, some of these  
25 wells are actually pumped. They did classify those as

1 static conditions, but whether they had recharged  
2 completely is a question. So if anything, I think  
3 those wells would probably actually be higher  
4 elevations than what was measured.

5 JUDGE WARDWELL: Thank you. In the SER;  
6 that's Exhibit 009, page 43, 3.1.3.5.6, you state that  
7 the applicant reported that the original Basal Chadron  
8 water levels provided a water column height of  
9 approximately 300 to 500 feet of water above the ore  
10 zone. The original water column height translated  
11 into water levels 10 to 15 feet above the ground  
12 surface in the license area.

13 I thought we said yesterday that there  
14 were no artesian flow wells in the license area. Did  
15 I misinterpret that?

16 MR. BACK: Your Honor, it's my  
17 understanding that this was before the mine actually  
18 started. And so, the Basal Chadron potentiometric  
19 surface has been dropped by the mining activities.  
20 And that's my understanding of what that is from.

21 JUDGE WARDWELL: So the response yesterday  
22 in regards to the question of whether there's artesian  
23 flow in the license area and me thinking I heard none,  
24 which is let's assume that's what I did hear, but that  
25 was based on today's situation with the mine



1 operating?

2 MR. BACK: Your Honor, that's my  
3 understanding.

4 JUDGE WARDWELL: Crow Butte, under the  
5 pre-mining condition those six wells we've got for the  
6 pre-mining condition, were any of those under artesian  
7 flow in the license area?

8 MR. BEINS: I'm not sure, Your Honor, that  
9 we had a artesian flowing well located within the  
10 license area. I believe all of the flowing wells were  
11 located to the north of the license boundary, however,  
12 I would agree, yes, the potentiometric surface pre-  
13 mining had potential. Should a well have been  
14 installed at that far north end of the license area it  
15 would have had potential to flow.

16 JUDGE WARDWELL: Wouldn't you just look on  
17 that map we looked at, because didn't it have both the  
18 -- that would have the pre-mining elevation. Then  
19 whether or not you could find the -- yes, and the  
20 ground surface elevation is all you needed to  
21 determine whether or not there's artesian flow there.

22 MR. BEINS: That would be possible, Your  
23 Honor. I don't believe the pre-mining Basal Chadron  
24 potentiometric surface map however had contours on it.

25 JUDGE WARDWELL: Right, it didn't. Just

1       you'd have to take --

2                   MR. BEINS: We would have to contour that  
3       and then --

4                   JUDGE WARDWELL: -- those points and check  
5       those points out at least.

6                   MR. BEINS: Certainly. We'd have to  
7       contour that data and then make that comparison.

8                   JUDGE WARDWELL: So how did you report to  
9       the NRC, as they claim you did, that the water column  
10      height was 300 to 500 feet above the ore zone, which  
11      would have translated into water levels 10 to 15 feet  
12      above the ground surface? That's a minimal amount of  
13      artesian flow, I wouldn't think.

14                  MR. BEINS: I would imagine, Your Honor,  
15      that based off regional water levels that were taken  
16      at that time someone had done that analysis and made  
17      those calculations at that point.

18                  JUDGE WARDWELL: So it's your testimony  
19      you believe the license area was under artesian flow  
20      prior to mining?

21                  MR. BEINS: Only the far north end of it,  
22      sir.

23                  JUDGE WARDWELL: Dr. Lagarry or any of  
24      your associates who would like to respond to what you  
25      anticipate to be happening in the license area prior

1 to any mining in regard to artesian flow, if you have  
2 any feelings at all on this.

3 MR. WIREMAN: Yes, my reading of this is  
4 that prior to mining the Basal Chadron potentiometric  
5 surface was in fact above the ground and there were --

6 JUDGE WARDWELL: Was above the ground?

7 MR. WIREMAN: Was in fact above the ground  
8 surface.

9 JUDGE WARDWELL: Okay.

10 MR. WIREMAN: And there were some flowing  
11 wells in the area. I have heard anecdotally only that  
12 some of those wells have now ceased to flow, which  
13 would make sense. As has been indicated, it's very  
14 easy to lower a potentiometric surface because of the  
15 storage coefficient. And so, that would be expected.  
16 You're dropping this potentiometric surface 50-60  
17 feet. That puts you below the ground surface.

18 JUDGE WARDWELL: And, NRC, did you  
19 incorporate the loss of that water resource to those  
20 people who were counting on artesian flow that might  
21 now not have flow or even worse, go below what might  
22 be a shallow well so that they can't even drop a pump  
23 into the well and have to drill a new well in order to  
24 still get water?

25 MR. WIREMAN: Yes, Your Honor, in a

1 qualitative way in the sense that we understood that  
2 the mine operations would decompress the aquifer, but  
3 the number of Basal Chadron wells are so few and far  
4 between out there, their livestock wells, and we've  
5 never received any correspondence from any individual  
6 indicating that their well is no longer pumping water  
7 at the same rate.

8 JUDGE WARDWELL: Are there any of the  
9 private wells that you've been sampling -- and you  
10 have -- I'm sorry, let me go to Crow Butte. Crow  
11 Butte, of the private wells you are sampling within  
12 what was it a mile or whatever from the project area  
13 or --

14 MR. TEAHON: One kilometer.

15 JUDGE WARDWELL: Kilometer. There you go.  
16 Do you know if all of them are set in the Brule or --

17 MR. TEAHON: All but one, sir.

18 JUDGE WARDWELL: All but one?

19 MR. TEAHON: The northwest one here by the  
20 edge of town is developed down in the Basal Chadron  
21 sands and we've not seen any impacts on that in our  
22 sampling.

23 JUDGE WARDWELL: How about in just water  
24 levels? Has that dropped?

25 MR. TEAHON: We don't take water levels

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1 when we take our water samples from those wells.

2 JUDGE WARDWELL: Okay. Were any of the  
3 wells in the Brule artesian flow?

4 MR. TEAHON: No, sir.

5 JUDGE WARDWELL: Enough on the impacts.  
6 In the license renewal application, CBR 011, calling  
7 up figure 2.6-4 on page 210 and figure 2.6-10 on page  
8 2-123, cross-section AA' and DD' indicate the  
9 potentiometric level is below the ground surface in  
10 the license area. And given that A' and D' are just  
11 in the northwest corner of the LA, doesn't that  
12 conflict with this artesian flow situation? And  
13 here's the DD prime. We looked at it yesterday  
14 showing the potentiometric surface below the ground  
15 surface. And then they don't bother drawing it  
16 across, but there's no indication that it's rising  
17 above that. Is there a reason for that?

18 MR. BACK: Your Honor, I don't know. I  
19 didn't make these figures. My assumption would be  
20 that the Basal Chadron sandstone is so much deeper,  
21 that it's more confined, but I don't know. I don't  
22 know the answer to that. It didn't come into our  
23 analysis.

24 JUDGE WARDWELL: Okay. Crow Butte, can  
25 you explain why the potentiometric surface is shown

1 below the ground surface when there are indications  
2 that at least at the northern end there's flow above  
3 the ground surface?

4 MR. LEWIS: Your Honor, Bob Lewis, Crow  
5 Butte. And correct me if I'm wrong here, Wade, but  
6 that depiction is post-operational. And so, at the  
7 current time the water levels in the Basal Chadron are  
8 below the ground surface everywhere so they should in  
9 fact reflect that there is no flowing condition  
10 anywhere on the site at this time. And that's my  
11 interpretation of that.

12 JUDGE WARDWELL: So you believe that's a  
13 -- I can't find -- maybe that's what you're looking  
14 for is the date of which this cross-section applies.  
15 But your speculation is that this applies during some  
16 dewatering associated with production as it occurred.  
17 It wasn't an 82 to 83 potentiometric surface level?

18 MR. LEWIS: Yes, Your Honor, but the pre-  
19 mining conditions in the north of the -- or south of  
20 the current license area would have been below the  
21 ground surface even in a pre-mining condition.

22 JUDGE WARDWELL: But isn't this for the  
23 pre-mining condition --

24 MR. LEWIS: This is --

25 JUDGE WARDWELL: -- right at the north end

1 heading to the south end of the license application?  
2 I thought that the DD' cross-section went from the  
3 North Trend Expansion Area through the north end of  
4 the license area and down towards the south.

5 MR. BEINS: That's correct, Your Honor.  
6 This particular potentiometric water level shown on  
7 this cross-section is during operational time periods  
8 here. It's from the 2010 time frame.

9 JUDGE WARDWELL: Enough said. Yes, thank  
10 you.

11 JUDGE HAJEK: Can you tell us on this  
12 drawing where the boundaries are for the site, please?

13 MR. BEINS: I believe, Your Honor -- let  
14 me take a look real quick at the --

15 JUDGE WARDWELL: I can show the White  
16 River is shown on there.

17 JUDGE HAJEK: At the bottom center of the  
18 drawing it indicates that there should be boundaries  
19 some place here for the North Trend Expansion Area and  
20 the current -- or CSA, the current study area. Is  
21 that what that stands for?

22 MR. BEINS: I believe, Your Honor, yes, at  
23 the top of the page. It's kind of blurred out on this  
24 particular --

25 JUDGE HAJEK: Yes, I can't see it real

1 well.

2 MR. BEINS: -- figure, but you can see  
3 there's a smudge at the upper -- right there. That  
4 shows the North Trend boundary, or permit area. And  
5 then if you scroll over to the right. Right. Keep  
6 going.

7 JUDGE WARDWELL: Keep going. There it is.

8 MR. BEINS: There you go. There would be  
9 the representative boundary of the north end of the  
10 current license area.

11 JUDGE HAJEK: So the north end of the  
12 current license area is just barely to the left of the  
13 D111 --

14 MR. BEINS: That's correct.

15 JUDGE HAJEK: -- bore hole?

16 MR. BEINS: That's correct.

17 JUDGE HAJEK: And then does it go all the  
18 way to the south end, or --

19 MR. BEINS: This particular cross-section  
20 does not run the entire length of the current license  
21 area. It only runs in perhaps half a mile or so.

22 JUDGE WARDWELL: Joe, could you flip down  
23 a couple pages, because I think there's a plan view  
24 showing where this -- no, the other way -- where this  
25 cross-section is? And you might go to a full page.



1 Yes, there you go. Yes, probably quite a few. It's  
2 before any of these cross-sections.

3 MR. TEAHON: Sir, figure 2.6-3 shows the  
4 area.

5 JUDGE WARDWELL: There we go. Now, if we  
6 zoom in on that, we should be able to see the DD',  
7 AA'. If you go up a little higher to get to the start  
8 of D. Go on up. Yes, there we go. There's the start  
9 of D. That's the bulk of D coming across. And then  
10 you can see the A down below.

11 JUDGE HAJEK: Yes, I see the As and the  
12 Ds, but I'm having a hard time conceptually relating  
13 this back to the previous figure that we had because  
14 the A and the D at the top or both North Trend. And  
15 on this drawing that's up right now this is north at  
16 the top and south at the bottom, is that correct?

17 MR. BEINS: That's correct.

18 MR. BACK:

19 JUDGE WARDWELL: So we have the North  
20 Trend A and Delta, Alpha Delta. And then what about  
21 the current study area, relating that back to the  
22 previous figure?

23 MR. BEINS: The cross-section D to D prime  
24 is the cross-section showing the area between the  
25 North Trend Expansion Area and the current license

1 area.

2 JUDGE WARDWELL: And there's an AA prime  
3 one also.

4 (Simultaneous speaking)

5 MR. BEINS: -- also does the same thing,  
6 just along a different transect of wells or of drill  
7 holes.

8 JUDGE HAJEK: So you're only showing now  
9 on that map barely at the north end of the current  
10 study area, or the current --

11 (Simultaneous speaking)

12 MR. BEINS: Barely at the north end of the  
13 current study area and showing the structure back to  
14 the north towards North Trend, yes.

15 JUDGE HAJEK: The LRA is for the current  
16 site?

17 MR. BEINS: That's correct.

18 JUDGE HAJEK: This drawing that Judge  
19 Wardwell looked at just a --

20 (Simultaneous speaking)

21 MR. BEINS: This was all included, sir, to  
22 help explain the White River fold structure -- is why  
23 it's included in the license renewal application.

24 JUDGE HAJEK: I see.

25 CHAIR GIBSON: Okay. Before we get back

1 to wherever you needed to go, I just wanted to also  
2 make a note Ms. Simon -- the Souders 2004 and Terry  
3 1998 have also been emailed and received. So again,  
4 we thank you for getting on that right away.

5 So those are not Exhibits at this point,  
6 is that correct, for anyone?

7 MS. SIMON: I believe that's correct, Your  
8 Honor.

9 CHAIR GIBSON: Okay. Then what we will do  
10 just to keep this going, the Souders 2004 will be  
11 Board Exhibit 4.

12 (Whereupon, the above-referred to  
13 document was marked as Board Exhibit No.  
14 4 for identification.)

15 CHAIR GIBSON: And Terry will be Board  
16 Exhibit 5.

17 (Whereupon, the above-referred to  
18 document was marked as Board Exhibit No.  
19 5 for identification.)

20 JUDGE WARDWELL: Okay. Moving along, Mr.  
21 Wireman, in your testimony, 047, page 6, you state  
22 that there should be a BC monitoring well; and I  
23 assume you mean a Basal Chadron monitoring well,  
24 located near Chadron to monitor the decline as the  
25 lowering of the potentiometric surface will affect

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1 well yields and the data should be reported in the EA.

2 Does the Basal Chadron even extend  
3 underneath and beneath Chadron, do you know?

4 MR. WIREMAN: No, that's a typo. That  
5 should be Crawford.

6 JUDGE WARDWELL: Crawford? Okay.

7 MR. WIREMAN: Yes. I apologize. That's  
8 a typo.

9 JUDGE WARDWELL: Okay.

10 MR. WIREMAN: The rest of the statement I  
11 stand by, but that should be Crawford.

12 JUDGE WARDWELL: Okay. And what is your  
13 reasoning for having that well there?

14 MR. WIREMAN: The Basal Chadron extends to  
15 the north. We've already seen that in the license  
16 area except for the far northern part of it. The  
17 potentiometric surface has been lowered below the  
18 ground surface. It's anticipated that will happen to  
19 the north in the North Trend and in between the two.  
20 And it seems to me that monitoring that head decline  
21 is a very good idea, and Crawford is a good place to  
22 do that.

23 And one additional quick point: The  
24 discharge in the Basal Chadron is somewhere to the  
25 northwest pre-mine. A concern that I have raised is

1 that by pumping this water and having consumptive use  
2 you are reducing the amount of discharge from this  
3 Basal Chadron wherever that happens. And it's very  
4 unclear to me where that happens. There hasn't been  
5 much discussion of that. So that's the reason to have  
6 a real monitoring well, four-and-a-half-inch well, and  
7 be able to monitor the decline in the potentiometric  
8 surface.

9 JUDGE WARDWELL: What's your estimate of  
10 the amount of total flow that's going through the  
11 Basal Chadron beneath the license area and the  
12 additional width of the Basal Chadron under the  
13 license area that's not covered by the mining  
14 operations?

15 MR. WIREMAN: I have not calculated that,  
16 though it would be easily calculated using Darcy's  
17 law. I mean, that's fairly easily --

18 JUDGE WARDWELL: You hadn't done that?

19 MR. WIREMAN: No, I have not done that.

20 JUDGE WARDWELL: So you don't have any  
21 feeling for what the relative magnitude of the water  
22 being removed from the Chadron is compared to the  
23 total flow?

24 MR. WIREMAN: I do not. I know that  
25 they've pumped this Basal Chadron at 40, 50 gallons a

1 minute. They've had what I would consider to not be  
2 a great amount of drawdown compared to what's there  
3 available to be drawn down. Drawdowns are in the 30,  
4 40, 50 feet range. And you've got 400 feet of water  
5 above this, so that's not a whole lot of water that's  
6 been drawn down pumping 50 gpm. That's a qualitative  
7 indication of the productivity of this aquifer. But  
8 I have not calculated that total flow.

9 JUDGE WARDWELL: And that's really not a  
10 water drawdown per se, correct? It's reduced  
11 pressure. It's --

12 MR. WIREMAN: As long as it --

13 (Simultaneous speaking)

14 JUDGE WARDWELL: -- confined layer --

15 (Simultaneous speaking)

16 MR. WIREMAN: That's right. As long as  
17 it's confined, you're not taking water out of storage.  
18 That's right.

19 JUDGE WARDWELL: Thank you. Crow Butte,  
20 do any of the private wells that you're monitoring  
21 exist within the Crawford area?

22 MR. TEAHON: No, the one kilometer ring  
23 comes just to the edge of town.

24 JUDGE WARDWELL: Okay. And you do not  
25 have any wells in the Crawford area that you're

1 monitoring?

2 MR. TEAHON: Just the one on the edge of  
3 town that I referred to earlier that's developed in  
4 the Basal Chadron sands.

5 JUDGE WARDWELL: And that one isn't  
6 monitored for water level readings. It's only  
7 monitored for --

8 (Simultaneous speaking)

9 MR. TEAHON: Uranium and radium. Due to  
10 the design of the well, a residential well, we'd have  
11 to pretty much dismantle it to get a water level  
12 reading.

13 JUDGE WARDWELL: I understand with the  
14 hardware that's in there now and capped it. Got you.

15 All right. To your knowledge what are the  
16 water usages here in Crawford in regards to the  
17 various aquifers? Do you have any knowledge of that?

18 MR. TEAHON: Crawford gets their water  
19 from some springs over by the fort and through surface  
20 water on Dead Man Creek. They have no municipal wells  
21 to my knowledge in town that they use based on our  
22 water user survey.

23 JUDGE WARDWELL: Do you know if there's a  
24 reasonable population here that does obtain water on  
25 their own from the aquifer as opposed to using town

1 water?

2 MR. TEAHON: No, sir. In our water user  
3 survey we've only identified two wells in that zone  
4 within the one kilometer area, and the one well is in-  
5 operational right now. And the land owners have  
6 indicated to us that once that's put back into  
7 operation, then we'll start sampling it. And it's  
8 near the other well that we sample here on the edge of  
9 town.

10 JUDGE WARDWELL: Could you explain a  
11 little bit more about this in-operational -- was that  
12 caused by the mining activity, or is that that they  
13 just haven't bothered rehabilitating it and when they  
14 do they'll get back at you?

15 MR. TEAHON: It's broke down and they're  
16 not using it.

17 JUDGE WARDWELL: Crow Butte, Exhibit 045,  
18 page 34, answer 60 states that regional monitoring  
19 data is conducted by the Nebraska Water Resources  
20 District and that the Basal Chadron is not present for  
21 miles east of the mine site as the sandstone channel  
22 pinches out east of the deposit and as such is not  
23 continuous to Chadron.

24 NRC 076, page 65, answer 6.7 the NRC  
25 states that the City of Chadron is separated from the



1 LA by a distance of almost 20 miles. As discussed in  
2 answer D.4 of our initial testimony for Contention  
3 D, the Basal Chadron pinches out and is not present  
4 beyond five miles north and east of Crawford between  
5 CBR license area and the City of Chadron. Therefore,  
6 it is not possible nor necessary to place a monitoring  
7 well in this aquifer near the City of Chadron.

8 And I guess my question for staff is even  
9 given that did you ever consider requesting the  
10 applicant to install a well in Chadron and/or more  
11 probably relevant in Crawford as an indicator of the  
12 impacts from the mining on the potential water sources  
13 in those two towns?

14 DR. STRIZ: No, Your Honor, we did not.

15 JUDGE WARDWELL: Thank you. Is there a  
16 reason you did not?

17 DR. STRIZ: Yes, there is a reason.

18 NRC --

19 JUDGE WARDWELL: Would you like to explain  
20 the reason?

21 DR. STRIZ: Yes, I would. In their  
22 licensing actions NRC only requires what is necessary  
23 to demonstrate the safety and evaluate the  
24 environmental impacts. We take great caution to not  
25 ask for all the things that we may like to have, but

1 we ask for the things that are required in the  
2 guidance. And to make all these exceptional requests  
3 we do not feel it's necessary to establish reasonable  
4 assurance of the safety or to evaluate the  
5 environmental impacts.

6 JUDGE WARDWELL: And the group of  
7 contentions that we're dealing with, what types of  
8 contentions are they?

9 DR. STRIZ: These contentions are related  
10 to the environmental impacts of the facility.

11 JUDGE WARDWELL: And what's the criteria  
12 for evaluating the impacts associated with that and  
13 the requirements on the applicant to meet those  
14 requirements?

15 DR. STRIZ: I'd like to defer to Nathan  
16 Goodman for that answer.

17 MR. GOODMAN: Your Honor, Nathan Goodman.  
18 Mostly in NUREG-1748.

19 JUDGE WARDWELL: Not having memorized it  
20 nor having my pocket version of that NUREG in my  
21 possession right at the moment, would you care to  
22 amplify basically what you are looking for when you're  
23 evaluating and assessing whether or not there are  
24 reasonable environmental impacts or not caused by an  
25 applicant?

1 MR. GOODMAN: Your Honor, many different  
2 resource areas would be considered a part of NUREG-  
3 1748. It's a very long document. And so are you  
4 specifically referring to one resource area?

5 JUDGE WARDWELL: No, I'm trying to get  
6 handle on what is required for an applicant to -- let  
7 me rephrase that. What is required by you in your  
8 making your assessments? What do you require of the  
9 applicant that allows you to make the decisions you  
10 have to make in regards to assessing the magnitude of  
11 the environmental impacts associated with a project?

12 MR. GOODMAN: We would require, Your  
13 Honor, an environmental report submitted with the  
14 license renewal application from the applicant. But  
15 I would just like to clarify that would just be one  
16 step in the NRC's independent review process. We use  
17 that as a starting point, but that is not the only  
18 thing that staff would rely on.

19 JUDGE WARDWELL: And then once you've  
20 evaluated that and any information you have on the  
21 site, what guides you in assessing the magnitude of  
22 the impacts?

23 MR. GOODMAN: Several things, Your Honor.  
24 Again, NUREG-1748, NUREG-1569 and both in-house and if  
25 we're using contractor experts for each individual

1 resource area would dictate what specifically we would  
2 be looking for and we would use to complete our  
3 analysis.

4 JUDGE WARDWELL: In engineering design of  
5 structures generally people look at safety factors  
6 that they want the design to be X magnitude more safe  
7 than what failure would indicate. Is that the type of  
8 evaluation that you do with environmental assessments?

9 MR. GOODMAN: Maybe in a specific  
10 resource area we would look at that. The National  
11 Environmental Policy Act, no, I mean, it would be more  
12 general.

13 JUDGE WARDWELL: And to what level of  
14 standard are you help to determine whether or not  
15 you've evaluated the impacts correctly?

16 MS. SIMON: Your Honor, excuse me, this is  
17 Marcia Simon. That sounds a little more like a legal  
18 question and this is --

19 JUDGE WARDWELL: And that's why I've been  
20 trying not to make it a legal question and still get  
21 the answer. I'll give up.

22 Okay. We've covered that. CBR, on 001,  
23 page 42 to 43, answer 82, Crow Butte has demonstrated  
24 that Basal Chadron sandstone is confined such that  
25 there is no upward migration of mining fluid into the

1 Brule aquifer.

2 I guess that statement doesn't make much  
3 sense to me. Just because an aquifer is confined, how  
4 does that result necessarily in no upward migration of  
5 mining fluid into the upper aquifers?

6 MR. BEINS: The confinement's been proven  
7 out by our successful pumping tests that we've done  
8 and the aquifer testing.

9 JUDGE WARDWELL: Yes, okay. So given that  
10 we all agree it's confined; and I don't think anyone  
11 argues that the Basal Chadron is not confined, but the  
12 mere fact it's confined doesn't necessarily mean that  
13 there's no upward migration. You could still have  
14 fractures there that allows some transmission of stuff  
15 even though it's a confined aquifer.

16 MR. BEINS: The number of shallow  
17 monitoring wells that we have in the overlying aquifer  
18 would show or demonstrate that we do not have upward  
19 movement of the water. We have different water levels  
20 between the Basal Chadron and the Brule formation  
21 aquifers.

22 (Simultaneous speaking)

23 JUDGE WARDWELL: -- important more than  
24 its confinement is the fact that the difference in the  
25 water levels associated with that?

1 MR. BEINS: Yes, sir.

2 JUDGE WARDWELL: And the gradients caused  
3 by them. Isn't that more indicative of the lack of  
4 migration than just the mere confinement of it?

5 MR. BEINS: Yes, sir.

6 JUDGE WARDWELL: Okay. I just wanted to  
7 make sure that's clarified.

8 MR. BEINS: Yes, sir. The downward  
9 hydraulic gradient.

10 JUDGE WARDWELL: Mr. Wireman, on page 8 of  
11 your testimony in 047 you state that CBR currently  
12 includes 19 domestic water supply wells in groundwater  
13 monitoring program and these wells are reportedly  
14 sampled quarterly for uranium and radium-226 only.  
15 Neither the LRA nor the SER include any information on  
16 location, depth and screen intervals for these wells.  
17 Is that your statement there? Is that a correct  
18 representation of your statement?

19 MR. WIREMAN: That's what the statement  
20 says.

21 JUDGE WARDWELL: And what is your interest  
22 in regards to the specific location, depth and screen  
23 intervals for these wells?

24 MR. WIREMAN: These wells, as I understand  
25 it, are used as part of an off-site monitoring program

1 not related to excursions, but related to the  
2 potential for contamination of domestic wells offsite.  
3 As I understand they're required to look at wells that  
4 are within, I believe, one kilometer of the boundary.

5 I view this a little differently. I think  
6 monitoring offsite in the locations of those  
7 monitoring wells should be based on the flow system  
8 and not on what's there. It's important to monitor  
9 those wells because people drink the water. But if  
10 you're trying to really look to see if there's  
11 migration of any plume down gradient, particularly in  
12 a post-closure scenario, you have to have wells  
13 located where the groundwater is flowing. And so, I  
14 do not believe those wells make an adequate monitoring  
15 program for offsite. And there should be some  
16 dedicated wells that are located based on the  
17 knowledge of the groundwater flow system.

18 JUDGE WARDWELL: Thank you, Mr. Wireman.

19 Crow Butte, in your testimony, page 2,847,  
20 you state that water quality samples are regularly  
21 collected from private wells located between Crow  
22 Butte and the White River with no evidence of  
23 contamination to date.

24 Does Mr. Wireman have the approximate  
25 number of those wells correct?

1 MR. TEAHON: Yes, sir.

2 JUDGE WARDWELL: I don't know whether you  
3 said it, but --

4 MR. TEAHON: Yes, sir.

5 JUDGE WARDWELL: -- I just want to verify.  
6 Okay. So there's no disagreement with that.

7 What is the basis of your conclusions for  
8 no evidence to date?

9 MR. TEAHON: The pre-mining, pre-baseline  
10 water sampling that we've conducted on those wells  
11 pre-operational. The water quality hasn't changed  
12 during our operation since the pre-operational  
13 baseline sampling was collected.

14 JUDGE WARDWELL: You used two phrases  
15 there I think I picked up. You used baseline and then  
16 pre-operational. Aren't those two different things?

17 MR. TEAHON: No, prior to mining we have  
18 to do a baseline sampling of all the wells in the area  
19 of review.

20 JUDGE WARDWELL: And you have done that?

21 MR. TEAHON: Yes, sir, we have.

22 JUDGE WARDWELL: So it was in the 1983  
23 period?

24 MR. TEAHON: Yes, sir. Plus we conducted  
25 a water user survey and the information on the wells



1 as they're included in the water user survey.

2 JUDGE WARDWELL: And where are the results  
3 of that sampling documented in any of the testimony  
4 for this proceeding?

5 MR. TEAHON: The original license  
6 condition, the original license that was submitted in  
7 the '80s would have the baseline sampling results on  
8 those wells. And what was the other question?

9 JUDGE WARDWELL: Okay. And then where are  
10 the subsequent monitoring data for that, if one wanted  
11 to look at it?

12 MR. TEAHON: We present that in the semi-  
13 annual report that's done twice a year, the water  
14 quality of those wells.

15 JUDGE WARDWELL: And is any of that  
16 information in one of the exhibits here, or is it not  
17 included in the documentation?

18 MR. TEAHON: An example of the semi-annual  
19 report would be CBR 18, Exhibit 18.

20 JUDGE WARDWELL: What leads you to the  
21 conclusion that nothing has changed? I mean, were the  
22 numbers exactly the same in regards to the  
23 concentrations? And it's only uranium and radium-226,  
24 is that correct?

25 MR. TEAHON: They're not exactly the same.

1 You see a slight variation, but not substantial. And  
2 most of the time they're non-detect values.

3 JUDGE WARDWELL: Have you performed any  
4 trend analysis to back up your, if I might say, ocular  
5 interpretation of the consistency of those  
6 concentrations?

7 MR. TEAHON: No, sir, I haven't.

8 JUDGE WARDWELL: And are the details of  
9 the well constructions documented anywhere within the  
10 evidence of this proceeding?

11 MR. TEAHON: The water user survey. It's  
12 CBR 11.

13 JUDGE WARDWELL: That will give things  
14 like the depth of the wells and --

15 (Simultaneous speaking)

16 MR. TEAHON: Yes, based on an interview  
17 with the land owner and a review of the well  
18 registrations that they're registered. Some of these  
19 wells are put in prior to being required to be  
20 registered. So a lot of that's based on the  
21 institutional knowledge of the land owner.

22 JUDGE WARDWELL: That's fine, but it is  
23 documented somewhere if someone wished to --

24 (Simultaneous speaking)

25 MR. TEAHON: Yes, sir, in the water user

1 survey.

2 JUDGE WARDWELL: Great. Thanks. Is there  
3 a reason why you didn't test those wells for exclusion  
4 parameters? I mean, yes, the excursion monitoring  
5 parameters of I believe it's chloride alkalinity and  
6 conductivity to not so -- well, I mean, there are  
7 three other parameters that have to be tested for, but  
8 certainly nothing that would --

9 (Simultaneous speaking)

10 MR. TEAHON: We have on all of the wells  
11 what we call Guideline 8 samples. It's the common  
12 metals, ions and radiometrics, 30-plus parameters that  
13 all have baseline samples collected on them. The  
14 regulatory requirement that we operate under is that  
15 we're required to do the uranium and radium sampling.

16 JUDGE WARDWELL: But you don't do those  
17 other criteria for these private wells, is that  
18 correct?

19 MR. TEAHON: No, we do not.

20 JUDGE WARDWELL: And you don't chloride  
21 alkalinity and conductivity for excursion parameters?

22 MR. TEAHON: No, sir.

23 JUDGE WARDWELL: And is there a reason  
24 beyond the fact that you're not regulatory required  
25 to?

1 MR. TEAHON: Pardon me?

2 JUDGE WARDWELL: Is there a reason beyond  
3 that the regulations don't require you to that you  
4 didn't? Is there a reason?

5 MR. TEAHON: Well, we collect that on the  
6 numerous monitor wells that we have in the license  
7 area and would not see it being necessary that we do  
8 that outside there. I do need to stand corrected.  
9 There are three wells in the Chadron formation. If  
10 you go to table 2.9-3 it has a list of the wells.

11 JUDGE WARDWELL: This is your license  
12 application?

13 MR. TEAHON: Yes, sir.

14 JUDGE WARDWELL: Okay.

15 MR. TEAHON: There are three wells in the  
16 Chardon formation. I stand corrected. I said one.

17 JUDGE WARDWELL: And that's 3 of the 19?

18 MR. TEAHON: Yes, sir.

19 JUDGE WARDWELL: Okay. Great.

20 JUDGE HAJEK: What was the figure number  
21 again, please?

22 MR. TEAHON: It's 2.9-3. There have been  
23 additional wells added to this since this table was  
24 submitted as new wells are drilled within that area,  
25 and we've had two in the last several years that's

1 added to the list that wouldn't show up on here. They  
2 would have a higher number. Would be in the triple-  
3 digit numbers.

4 JUDGE HAJEK: Okay. Thank you.

5 JUDGE WARDWELL: NRC, do you know of any  
6 reason why it wouldn't make good sense to get the  
7 excursion parameters on these private wells also?  
8 That doesn't seem like just a wishful nice to thing to  
9 have. It seems like that's what you're using to  
10 determine immediately if there's a problem. Why  
11 wouldn't you do it with the private wells for what I  
12 would consider to be fairly routine parameters?

13 DR.STRIZ: The monitoring of the private  
14 wells around the license area is conducted according  
15 to Reg Guide 4.14, Environmental Monitoring, to  
16 evaluate dose. It's not done to evaluate non-  
17 radiological parameters, therefore, we do not request  
18 that the licensee conduct this. And as CBR has  
19 stated, there are numerous perimeter wells around the  
20 facility that every two weeks are measured for the  
21 excursion indicators and we consider that sufficient  
22 to demonstrate that there has not been movement away  
23 from the site to impact the private wells.

24 JUDGE WARDWELL: Thank you. Mr. Wireman,  
25 in your testimony, page 8, you go on to claim that in

1 regards to the sampling of 19 wells trend data should  
2 be presented for these and other monitoring wells and  
3 there should be a more complete analyte list that  
4 includes metals, TDS, selected anions. You also go on  
5 to state that, quote, "The NRC plans to add this  
6 sampling via a condition in the renewed license."

7 And I was just wondering to what license  
8 condition are you referring to?

9 MR. WIREMAN: That's a good question, and  
10 I'm not sure I can answer it. I saw that somewhere in  
11 the LRA, and that's all I can tell you in terms of the  
12 license condition.

13 I also know that with sub-part 192 coming  
14 down the road that that requires sampling of at least  
15 13 parameters. So I suspect that that statement comes  
16 from my knowledge of that.

17 JUDGE WARDWELL: And what's that coming  
18 down the road again that you cited?

19 MR. WIREMAN: Sub-part 192 to UMTRA, the  
20 new reg that is out on the street from EPA.

21 JUDGE WARDWELL: Okay. And is that an  
22 adopted reg or a proposed reg, a draft reg?

23 MR. WIREMAN: It's beyond the proposed  
24 reg, but I don't know that it's final yet. The last  
25 I heard I think it was still in the final public

1 comment.

2 CHAIR GIBSON: This is an EPA Safe  
3 Drinking Water Act regulation?

4 MR. WIREMAN: No, UMTRA, Uranium Mine --

5 CHAIR GIBSON: Okay.

6 MR. WIREMAN: Yes.

7 JUDGE WARDWELL: Mine Tailings  
8 Remediation --

9 (Simultaneous speaking)

10 MR. WIREMAN: Reclamation, yes. I don't  
11 remember exactly what the acronym stands for, but in  
12 that new rule 13 specific parameters are included  
13 which now have to be monitored, not necessarily in the  
14 off-site wells, as I've demonstrated, but in the post-  
15 closure compliance.

16 CHAIR GIBSON: All right. Thank you.

17 MR. WIREMAN: And so, my statement has to  
18 do with also what we've just discussed. Uranium and  
19 radium-226 in my opinion alone aren't definitive in  
20 terms of whether or not some change has occurred to  
21 the water quality in those domestic wells, that a  
22 change could cause a change in concentration of some  
23 parameter. So I'm always of the mind that a little  
24 more is better, particularly as you said these are not  
25 expensive parameters. They're fairly cheap.

1 JUDGE WARDWELL: NRC, do you know of any  
2 license condition where you're planning to add  
3 additional analytes?

4 DR.STRIZ: Yes, License Condition 11.12 in  
5 the license renewal. Would you like to elaborate?

6 JUDGE WARDWELL: Sure. You bet. Thanks.

7 DR.STRIZ: If an overlying aquifer  
8 monitoring well in Mine Unit 6 or Mine Unit 8 is  
9 placed on excursion status per License Condition 11.5,  
10 the licensee shall test it weekly for natural uranium  
11 in addition to the required indicators of alkalinity,  
12 conductivity and chloride. Would you like me to  
13 continue?

14 JUDGE WARDWELL: And that's for what  
15 wells?

16 DR.STRIZ: Any aquifer monitoring well in  
17 Mine Unit 6 or Mine Unit 8 in the overlying aquifer.

18 JUDGE WARDWELL: Okay. So those would  
19 only be if there were monitoring wells in that and  
20 if --

21 DR.STRIZ: And they --

22 (Simultaneous speaking)

23 JUDGE WARDWELL: -- there were private  
24 wells that would also -- but it would --

25 DR.STRIZ: No, not private wells. Only



1 the excursion monitoring wells. If an overlying  
2 aquifer monitoring well in Mine Unit 6 or 8 is placed  
3 on excursion status; that means that an excursion was  
4 identified, that they shall test it weekly for natural  
5 uranium in addition to the parameters.

6 JUDGE WARDWELL: Okay. Great. Thanks.

7 JUDGE HAJEK: Okay. But you specified  
8 they're Mine Units 6 and 8.

9 DR.STRIZ: Yes.

10 JUDGE HAJEK: Is that correct?

11 DR.STRIZ: Specifically Mine Units 6 and  
12 8.

13 JUDGE HAJEK: And there was a specific  
14 reason that those two mine units were selected, is  
15 that correct?

16 DR.STRIZ: That's correct.

17 JUDGE HAJEK: Can you elaborate on what  
18 that reason for those -- only those two having been  
19 selected and placed in the license?

20 DR.STRIZ: Yes, I can elaborate. Mine  
21 Units 6 and 8 in the overlying aquifer continue to  
22 experience many excursions. And this has been going  
23 on since about 2000. I could verify what that is.  
24 And it seems to be the same wells. It seems to be in  
25 response to precipitation events. Crow Butte has

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1       stated to the NRC that these are due to natural  
2       fluctuations in the water quality in these mine units.  
3       NRC has not been able to establish that this is true,  
4       therefore, we are requesting that they also monitor  
5       uranium so that we can make an assessment of whether  
6       or not there is some other source besides natural  
7       fluctuations of the water levels in response to  
8       precipitation events in these mine units. So it's  
9       additional scrutiny to establish a source, a potential  
10      source.

11               JUDGE HAJEK:   Okay.   So as I understand  
12      what you said, 6 and 8, because they're undergoing  
13      continual excursions are the only two for which this  
14      additional monitoring for uranium specifically --

15               DR.STRIZ:   Correct.

16               JUDGE HAJEK:   -- needs to be done?   No  
17      other mine units need to be monitored specifically for  
18      uranium?

19               DR.STRIZ:   That is correct.

20               JUDGE HAJEK:   Okay.   And there are no  
21      other NRC requirements to monitor specifically for  
22      uranium, is that correct?

23               DR.STRIZ:   With the exception of the  
24      private wells.

25               JUDGE HAJEK:   With the exception of the

1 private wells? Okay. Thank you.

2 JUDGE WARDWELL: Along these lines; we  
3 might as well finish this topic -- we probably won't  
4 finish it, but I do remember some questions I have  
5 some later on in regards to this very subject, but the  
6 very basic one I have is how did you reach a  
7 conclusion of the impact level associated with the  
8 mining without resolving whether or not these  
9 excursions are actually vertical migrations upward  
10 into the Brule as opposed to some type of either  
11 seasonal variations or surface water impacts? As you  
12 hypothesized and you stated that you don't really know  
13 the answer, I just wonder how you can reach any  
14 conclusions in your EA in regards to those potential  
15 impacts without first having resolved what was  
16 happening at 6 and 8.

17 DR.STRIZ: Based on the record of  
18 excursion monitoring and the fact that these  
19 excursions are quickly resolved in these mine units,  
20 we did not feel that that added to significant impact  
21 in this mine unit without resolving that issue and  
22 that it would be possible to go into the next license  
23 renewal period to make that evaluation and see if  
24 there is an additional impact.

25 JUDGE WARDWELL: But isn't that argument

1 really supportive of doing something here because  
2 these excursion parameters have not been resolved in  
3 these two? So we don't know whether or not it's  
4 quickly because maybe it isn't. Maybe it is  
5 associated with an excursion without knowing.

6 DR.STRIZ: We have to have the data to  
7 make that evaluation. Until we do we accept the  
8 licensee's explanation for these excursions and base  
9 it on the fact that they're very quickly resolved and  
10 their signature does not appear to be coming from the  
11 production. So we're just seeking the potential for  
12 another source.

13 JUDGE WARDWELL: So another way to say it  
14 is because you're on an ongoing investigation to  
15 determine whether or not these are excursions --

16 DR.STRIZ: Correct.

17 JUDGE WARDWELL: -- any future action  
18 would depend upon the resolution of that --

19 DR.STRIZ: Absolutely.

20 JUDGE WARDWELL: -- excursion evaluation.

21 DR.STRIZ: Innocent until proven guilty.

22 JUDGE WARDWELL: Great. Thanks. Yes,  
23 appreciate it.

24 CHAIR GIBSON: We'll be in recess for 10  
25 minutes just as soon as we get out of the restrooms.

1 (Whereupon, the above-entitled matter went  
2 off the record at 3:01 p.m. and resumed at 3:17 p.m.)

3 CHAIR GIBSON: On the record. Before we  
4 return to Judge Wardwell's questioning, I wanted you  
5 all to know we have tried to turn the temperature  
6 down. I know it's getting rather warm. If you all  
7 feel that it's just too hot, it's okay to take your  
8 sport coat off or whatever.

9 It's a little warm in here. So it's fine.  
10 We won't be upset with the improper decorum.

11 JUDGE HAJEK: Can I set an example?

12 CHAIR GIBSON: You do whatever you need  
13 to, Judge Hajek.

14 In the meantime, however, let's go ahead  
15 and get back. We've got a lot of ground to cover.  
16 Thank you.

17 JUDGE WARDWELL: Mr. Kreamer, a follow-up  
18 from discussions between lunch and this last break.  
19 Would you mind offering your opinion on whether or not  
20 you agree with staff's interpretation that it is in  
21 the best interest of the Applicant not to drop the  
22 water level below the top of the Basal Chadron because  
23 of the excess water that would be developed in this  
24 process? It is in their best interest to keep that  
25 piezometric level up into the confined state of higher

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1 than the top of the aquifer.

2 DR. KREAMER: That makes sense. Yes, Your  
3 Honor.

4 JUDGE WARDWELL: Say it again.

5 DR. KREAMER: I would agree.

6 JUDGE WARDWELL: You would agree that  
7 makes sense that it's in their best interest.

8 DR. KREAMER: Yes, Your Honor.

9 JUDGE WARDWELL: Thank you.

10 Intervenors, 013 and I believe my goodness  
11 we're back to Dr. Lagarry.

12 DR. LAGARRY: Hot diggity.

13 (Laughter)

14 JUDGE WARDWELL: And I see you've taken  
15 your sport coat off and I think that's good. On page  
16 two, you state that there are three principal pathways  
17 through which contaminated water could migrate away  
18 from the uranium-bearing strata through adjacent  
19 confining layers. And you describe it in detail  
20 below.

21 One is the secondary porosity in the form  
22 of joints and faults. Two is the thinning or pinching  
23 out of the confined layers. And three is perforations  
24 made by improperly cased or capped wells.

25 I was just curious. Couldn't poor

1 operations also be an excursion cause?

2 DR. LAGARRY: Yes, Your Honor, it could.  
3 But I didn't want to assume poor operations was  
4 normal. But those were the three apart from some sort  
5 of human failure that I would envision as being the  
6 main avenues.

7 JUDGE WARDWELL: Okay. Thank you.

8 NRC, in your testimony 001, page 47 of 48,  
9 staff concluded that impacts on groundwater quality  
10 from CBR operations would be small. And then you list  
11 a number of reasons for this, why it would be small.  
12 And we can maybe just look on those pages of 47 to 48.

13 You also in your Exhibit 079, page 44,  
14 answer D.18 state that the groundwater flow model  
15 described in the staff's SER and EA is not an  
16 essential piece of evidence supporting confinement in  
17 the CBR license application in the license area  
18 particularly because the White River structural  
19 feature is approximately two miles from the license  
20 area. Then you go on to say that "As we explained in  
21 AD3 and AD21 of our initial testimony we consider our  
22 groundwater flow model to be one more line of evidence  
23 in addition to several other lines of evidence  
24 demonstrating confinement."

25 And for NRC, again the flow model was only

1 used, if I remember correctly, to evaluate the full  
2 versus the fault feature of the White River.

3 DR. STRIZ: That is correct.

4 JUDGE WARDWELL: So those statements would  
5 seem to jive with that.

6 Dr. Kreamer, in all that the staff has  
7 done in this earlier pages 47 to 48 with their  
8 reaching the conclusions that the impacts are small,  
9 is there any area where you could point to that you  
10 felt that staff had not taken a required hard look at  
11 the geology associated with the potential impacts from  
12 the mining operation?

13 DR. KREAMER: Your Honor, if your term  
14 geology includes the data including the things we were  
15 just given on the aquifer testing --

16 JUDGE WARDWELL: Why don't I go ahead and  
17 list them? I wasn't going to read them, but I'll list  
18 the ones that they say under here. I think this might  
19 help focus the question a little bit better.

20 DR. KREAMER: Yes.

21 JUDGE WARDWELL: I'd originally skipped it  
22 because I thought it was extraneous. But maybe it  
23 isn't. Their conclusion is based on the vertical  
24 confinement that we've been talking about and they  
25 referenced AD3 for that; the ability to maintain



1 lateral confinement and they had referenced D4 for  
2 more answers. But then they go on and talk about the  
3 controls and procedures to prevent and contain spills  
4 and leaks which we will talk a bit more about when we  
5 get to Contention C and the procedures to present over  
6 20 years of operational monitoring data showing no  
7 impacts from excursions, spills or daily operations.

8 I think we've covered the vertical and  
9 lateral confinement enough. We don't need repetition  
10 on those aspects of it.

11 I think what I would like to spend more  
12 time here is initiating the discussion of the  
13 controls, spills and leaks in the 20 years of  
14 operational monitoring data. And I'd like to just  
15 start off with your general comments on the  
16 consolidation intervenors, OST intervenors, whoever of  
17 your three or five would want to pick that up in  
18 regards to those two aspects.

19 DR. KREAMER: There is additional  
20 information on the vertical, just so you know. And in  
21 a quick perusal you can see other recharge boundaries  
22 in the leakage.

23 JUDGE WARDWELL: Okay. Stop for just a  
24 minute. Talk a little slower because it was all  
25 getting garbled with your rapidity and the way it was

1 coming out.

2 DR. KREAMER: Okay. Perhaps I'm too  
3 close.

4 JUDGE WARDWELL: There was feedback. I  
5 want to hear that. Just go ahead and slow down. And  
6 we'll let you say this.

7 DR. KREAMER: We just received pump tests  
8 one, two and three. In a really preliminary and  
9 perfunctory look at this, there are apparently more  
10 recharged boundaries that were available in 1982 and  
11 1987. And I can reference exactly what those are.

12 They reference vertical leakage in the  
13 pump test number two. They say there is at least 1.4  
14 percent of the water that was supplied to the pumping  
15 test was from above. That doesn't include the idea of  
16 vertical fractures.

17 So there's additional information. And I  
18 can list specifically if you would like what figures  
19 and what tables indicate that and just a quick perusal  
20 of the information we've just been supplied.

21 I think although information was given to  
22 us that every single abandoned well has been properly  
23 sealed I have questions as to whether those  
24 exploratory wells were cased. What was described to  
25 us if the wells were not properly -- if the annular

1 space outside the casing, if they were cased, was not  
2 filled, that would just be an open vertical conduit  
3 for all these. Even though they follow the  
4 regulations, cased wells, the EPA regulation is that  
5 you pierce the casing and you inject grout, whether it  
6 be bentonite or cement, directly into the annular  
7 space.

8 I guess I haven't investigated enough  
9 whether or not there are other non-natural vertical  
10 recharge boundaries as well. But there seems to be  
11 additional evidence for the vertical movement.

12 I'm concerned that during operations that  
13 might be some effect on the Brule and some effect on  
14 the surface springs. They mentioned that springs  
15 supply Crawford's wells or Crawford's water.  
16 Actually, there's some wells that they didn't mention.  
17 They're about 100 feet deep in Crawford that also  
18 supply water in the shallow aquifer.

19 JUDGE WARDWELL: And could you point to  
20 your testimony on where you refer to those and where  
21 they're located and what their depths are?

22 DR. KREAMER: They're not in my testimony.  
23 That's information from the Nebraska DEQ.

24 JUDGE WARDWELL: But is it evidence before  
25 us?

1 DR. KREAMER: I guess it is in the  
2 evidence. CBR 26. Excuse me. CBR 19, page 26.

3 JUDGE WARDWELL: Thank you.

4 DR. KREAMER: It indicates that the wells  
5 are 100 feet deep approximately. There's two wells in  
6 Crawford and not just springs as was mentioned before  
7 and in infiltration gallery.

8 Even if there were just springs, the idea  
9 that springs are not being monitored is of concern to  
10 me. As I said in my testimony, I looked at Google  
11 Earth for the area and the reservoirs, Squawk Creek  
12 Reservoir, has reduced in size from 1993 to 2010. So  
13 whether or not the pumping has an impact on ecosystems  
14 is also something we haven't discussed which is a  
15 concern of mine.

16 When I say that Google Earth shows that,  
17 there are probably about 10 different shots. It shows  
18 progressively the lake getting smaller, but with a  
19 proviso that those are snapshots. There could have  
20 been times of the year when it was larger and it just  
21 is an artificially looking diminishment of the lake  
22 aerial distance.

23 But there are considerable problems with  
24 the Brule being diminished during mining operations.  
25 And then when the mines stop, there might be a

1 reversal and there might be movement after closure of  
2 water upward through the mine area into the Brule and  
3 into the aquifer that's used by people.

4 JUDGE WARDWELL: And do you have any  
5 indication that that has taken place in the last 20  
6 years in regards to any impact to the Brule that you  
7 can give us to say that points to that potential?

8 DR. KREAMER: The springs have not been  
9 monitored whether for quality or whether for  
10 groundwater dating techniques, whether for stable  
11 isotopes, to my knowledge. The indication for Google  
12 Earth that Squawk, the reservoir, has gotten smaller  
13 is probably the only surface I have. I know that  
14 Sunday when we drove around the site the surface flows  
15 off the mine property were flowing, but I don't know  
16 what the ecosystem response to monitoring that's going  
17 on at this site. That was unavailable to me.

18 JUDGE WARDWELL: Thank you. After all the  
19 things that we've already covered, this is probably  
20 going to be repetitive. But I've got it here. And I  
21 want to make sure I've covered it extensively enough.

22 Crow Butte, I'd like to go back to this  
23 draw down versus 105 gallons per minute of consumptive  
24 use and the increase to 2010 specifically, in  
25 relationship to any restoration efforts. I guess I'm

1 still unclear of what is your best estimate of the  
2 maximum consumption rate that you anticipate through  
3 your remaining operations and the restoration.

4 MR. TEAHON: As I told you earlier, we  
5 increased our OR capacity and with that running at  
6 full speed and an 80/20 percent efficiency rate we  
7 would be getting approximately 230 gallons per minute  
8 of brine. Our production circuit at end of day, our  
9 flows are going down as we're becoming mined out if  
10 you take an average of 5,000 gallons a minute. We  
11 have a permitted flow of 9,000 gallons a minute.  
12 We're not there yet and we won't. We're in the final  
13 stages of production.

14 So you take a half percent bleed there.  
15 And at 5,000 gallons a minute, that would be 50. And  
16 half of that would be 25. So maximum 255 gallons a  
17 minute.

18 JUDGE WARDWELL: Why are we looking at 210  
19 gallons a minute of consumption use?

20 MR. TEAHON: I don't know.

21 JUDGE WARDWELL: NRC, was that your  
22 assumption in your EA?

23 MR. BACK: Your Honor, that was the  
24 staff's assumption based on historical use. We did  
25 not have the advantage of having the accepted new

1 injection rates that are allowed now. But we knew  
2 that even with the 210, we had built ample  
3 conservatisms into the water use rates.

4 JUDGE WARDWELL: In regards to only the  
5 water use rates and the draw down, Dr. Kreamer, of the  
6 94 feet of draw down at the 2,010 level that is used  
7 as an estimate to evaluate the NEPA environmental  
8 assessment, do you have any issue necessarily with  
9 that draw down and at the associated rate of 210  
10 gallons a minute being a moderate impact? And you did  
11 have it at a moderate impact, is that correct, for the  
12 staff?

13 MR. BACK: Yes, Your Honor.

14 JUDGE WARDWELL: Do you have any evidence  
15 to refute that that's not a reasonable conclusion to  
16 reach while taking a look at it and that's a  
17 sufficiently hard look at what the draw down would be  
18 in just this category, not the others, but just the  
19 category of quantity usage?

20 DR. KREAMER: If we're allowing time  
21 scales that are not only associated with the mine but  
22 maybe a decade or two in advance, it's not a question  
23 of if the confining layer is leaking. It's how much.  
24 Even the estimates that the mine puts forward says  
25 that it is leaking.

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1           The models say there is no vertical  
2 anisotropy in the upper layer, in the confining layer.  
3 And there's evidence that there's fractures and it  
4 might be moving a little bit faster. We've gone  
5 through some of that evidence.

6           If you take 210 gallons, that's four 55-  
7 gallon drums. If you assume up in the Brule, what  
8 would have? About 20 percent porosity. That would be  
9 the evacuated space in the Brule if there was an  
10 effect on the Brule. If it leaked down if you lower  
11 the piezometric surface, that would mean five times  
12 that.

13          So you would have probably instead of four  
14 55-gallon drums five times that or 20 drums. We could  
15 stack them up to the ceiling here. And that's per  
16 minute. That's the gallons per minute.

17          If you do that for a day then, you  
18 probably multiply it times 60 and 24 and you would  
19 fill up the front with a day of draw down. That's the  
20 space that would be evacuated. And if you put that  
21 through a week then or a month, this whole room would  
22 be evacuated space.

23                 JUDGE WARDWELL: But to save time, I guess  
24 your answer is --

25                 DR. KREAMER: Yes.



1 JUDGE WARDWELL: -- that you believe the  
2 impacts associated with that draw down on the Brule  
3 because of the leaking would in fact result in a  
4 higher impact rating.

5 DR. KREAMER: And also perhaps --

6 JUDGE WARDWELL: Is that a yes or no?

7 DR. KREAMER: Yes, and the springs as  
8 well.

9 JUDGE WARDWELL: Go ahead. I just wanted  
10 to make sure you said yes to that.

11 DR. KREAMER: Yes. Thank you for  
12 shortening my lengthy answer. I'm a professor. I go  
13 on sometimes.

14 JUDGE WARDWELL: Yes, you do. You don't  
15 have 50 minutes for each answer.

16 DR. KREAMER: I understand and I don't  
17 have a blackboard either. Also if the Brule is  
18 affected, obviously surface water systems and surface  
19 water interactions could be affected as well and water  
20 quality effects could occur as well.

21 JUDGE WARDWELL: Thank you.

22 JUDGE HAJEK: Dr. Kreamer, if the mine is  
23 not here --

24 DR. KREAMER: Pardon?

25 JUDGE HAJEK: If the mine were not here,

1 is the Brule going to be leaky?

2 DR. KREAMER: Yes, probably. It depends  
3 on the discharges and --

4 JUDGE HAJEK: All your 55 gallon drums are  
5 going to fill up whether the mine is here or not here.

6 DR. KREAMER: It's my understanding that  
7 the Brule had a very high piezometric surface before  
8 pumping began as did the Basal Chadron. It was  
9 considerably higher. If you lower one and you have a  
10 lower hydraulic head, you're going to change the  
11 direction flow during that time.

12 Then when the mines go out of operation,  
13 that head will come back up and you'll reverse the  
14 flow in the other direction with contaminated water  
15 perhaps moving upward. During the mine operations you  
16 might have downward vertical movement from the Brule  
17 to the Chadron and Pass.

18 Then after the mining operations, if it  
19 returns to a normal recharge/discharge water balance,  
20 you would have a potential for water that's been  
21 exposed to the oxidating conditions of the processes  
22 to move up. Does that answer your question?

23 JUDGE HAJEK: You answered my question,  
24 yes, in less than 52 minutes.

25 JUDGE WARDWELL: Staff, did you evaluate

1 the impacts on the Brule also with this quantity  
2 estimates of the draw down, etc.? And if so, what  
3 leaky? Or did you assume it was non-leaky entirely?

4 MR. BACK: Your Honor, we absolutely  
5 looked at that. And we looked at the pre-mining  
6 conditions. The water levels in the Brule have not  
7 appreciably changed from pre to post mining  
8 conditions. So that statement is in error. So the  
9 water level surface has essentially been very stable  
10 through time.

11 JUDGE WARDWELL: And where would we see  
12 that data in any of the testimony before in this  
13 proceeding?

14 MR. BACK: In the environmental assessment  
15 we reference how the Brule water levels have not  
16 appreciably changed to support our contention that it  
17 hasn't been leaking to the Basal Chadron.

18 JUDGE WARDWELL: Dr. Kreamer, to the  
19 degree that it hasn't been leaking as indicated by the  
20 lack of change in that water level with the stress  
21 imposed upon it by the operations of the mine, do you  
22 still believe it would somehow accelerate this leakage  
23 through the restoration period as the flows merely  
24 doubled?

25 DR. KREAMER: The data that was available

1 to it hasn't appreciably changed it I have not seen.  
2 And so when people make comments like it hasn't  
3 appreciably changed, a couple of times people have  
4 said there's no appreciable vertical leakage without  
5 quantitated, quantifiable terms is something that it's  
6 difficult for me to evaluate. If it hasn't change at  
7 all, then I probably would revise my position.

8 JUDGE WARDWELL: And in your license  
9 application, NRC, did you provide the data for the  
10 Brule for someone to also look at to see if they  
11 agreed with your assessment of that?

12 MR. BACK: Your Honor, it's in the  
13 Applicant's license application. But you also have to  
14 keep in mind that the area has been going through a  
15 drought. And so they haven't change appreciably, but  
16 if we did see a change it's probably due to the  
17 drought rather than any pumping from the Basal  
18 Chadron.

19 However, we don't see a change. The  
20 license application also we confirmed their  
21 conclusions that there wasn't a appreciable change  
22 through time. Of course, you'll have oscillations.  
23 But to lose that kind of water to the Basal Chadron,  
24 you would see it. Over 20 years of pumping, you would  
25 see it.

1 JUDGE WARDWELL: And, Crow Butte, do you  
2 have a tabalized documentation of the Brule levels or  
3 some other evidence that some else could look at that  
4 would be able to be reviewed to comfort themselves in  
5 regards to what appreciable changes or not changes  
6 have occurred over the last 20 years?

7 MR. BEINS: Yes, Your Honor. Probably the  
8 best place to reference those particular water levels  
9 would be to look at the pre-operational Brule  
10 potentiometric surface maps and then compare those  
11 with the more recent Brule water level maps that were  
12 completed I believe in 2008 or 2009 and make a  
13 comparison with their Figure, CBR Exhibit 11, number  
14 2.7-3A and Figure 2.7-3B.

15 JUDGE WARDWELL: Dr. Kreamer, do you  
16 remember seeing those figures and what did you  
17 conclude from them?

18 DR. KREAMER: I do not remember seeing  
19 those figures.

20 JUDGE WARDWELL: Thank you.

21 DR. KREAMER: If I can add, nor do I  
22 remember what the changes were that were not  
23 appreciable.

24 JUDGE WARDWELL: All right. Who's  
25 talking?

1 DR. KREAMER: Dr. Kreamer again. I just  
2 wanted to follow up.

3 JUDGE WARDWELL: Okay.

4 DR. KREAMER: Nor do I remember what the  
5 changes in the levels were that were not appreciable.

6 JUDGE WARDWELL: Thank you.

7 I'm almost pretty sure you answered this,  
8 staff, but bear with me because many is a time I  
9 thought I asked this and I looked through the  
10 transcript and people purposefully leave out lots of  
11 stuff I ask from the transcripts, believe it or not,  
12 at least by my memory.

13 Anyhow, you concluded that there was  
14 moderate impacts to water quantity. And I think I  
15 asked you what would bring it up to extreme impact.  
16 And I believe you said that it would be de-stabilizing  
17 the resource. Is that correct?

18 MR. BACK: Yes, Your Honor.

19 JUDGE WARDWELL: I thought so. I just  
20 wanted to -- and we talked about what that would mean  
21 -- make sure I didn't dream that.

22 NRC, in your testimony on page 93 you  
23 stated that because consumptive rate now estimated to  
24 be 210 gallons per unit will incur a theoretical draw  
25 down roughly twice that estimated by the CBR. In

1 figure 7.12-2 through 7.12-5 of the license renewal  
2 application, again that's CBR Exhibit 11, pages 743-  
3 746, the water level recovery will take longer to  
4 approach the pre-operational levels.

5 I think we discussed this also before.  
6 But, NRC, about how much longer would that be? I  
7 believe it was also linear.

8 MR. BACK: It is linear, Your Honor. But  
9 keep in mind that that analysis was done with  
10 conservative assumptions on storativity, no recharge  
11 for another. We consider that kind of an outer bound  
12 in terms of how quickly things would recover.

13 JUDGE WARDWELL: So then it would be about  
14 10 years as opposed to the five years that we saw on  
15 the previous figure for the recovery back to water  
16 levels.

17 MR. BACK: Yes, Your Honor. But as I  
18 testified before the mines will be getting shut off  
19 sequentially and this analysis assumes that all of  
20 that activity is going right up until the end of when  
21 it gets shut off. So we know that the consumptive use  
22 rate will start to decrease with time while the mine  
23 is still opened because mines will be restored.

24 JUDGE WARDWELL: You go on in that same  
25 area to state that "Because recovery would still

1 occur, the overall long-term impact from groundwater  
2 consumptive use would still be small." And I thought  
3 you said it was moderate. So what does this small  
4 refer to?

5 MR. BACK: The long-term impact would be  
6 small because eventually the water level, the  
7 potentiometric surface would come back to where it  
8 was.

9 JUDGE WARDWELL: So your moderate delta is  
10 only with short-term impacts.

11 MR. BACK: That's exactly right, Your  
12 Honor.

13 JUDGE WARDWELL: Thank you.

14 I think I will go through this now and  
15 then we'll get into the contentions. But NRC's  
16 testimony at 001, page 22 to 23, and that's answer C-  
17 6, staff testifies that the staff has found no  
18 evidence of faults or fractures at the CBR site which  
19 could act as permeable pathways between the Basal  
20 Chadron, sandstone aquifer and the White River  
21 alluvium or the overlying Brule aquifer.

22 Staff goes on to state that the CBR has  
23 demonstrated vertical hydrological confinement of the  
24 Basal Chadron/Chamberlain Pass formation. They did it  
25 in the license area and they did it through several

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1 pieces of evidence.

2 And we've been through ones like this  
3 before applied to other conditions. But this is an  
4 overall evaluation.

5 I think it's worthwhile to go through and  
6 get your comments from the Intervenors, whoever would  
7 like to take each one of these and if you have a  
8 comment, again keep it brief, not repetitive. But  
9 just refresh your own memories or add whatever new  
10 you'd like to add to this. They state that the Basal  
11 Chadron is confined for (1) at the results of four  
12 separate aquifer pumping tests in the license area as  
13 section 3.5.2.3.1. of the EA which showed no hydraulic  
14 connection between the Basal Chadron aquifer and the  
15 overall Brule aquifer.

16 I guess I would just ask, first of all,  
17 staff. It's true that you still have limited data in  
18 the Brule to defend that as far as actual  
19 measurements. Is that not correct? There is only a  
20 minimum amount of wells in the Brule that are used for  
21 water level readings.

22 DR. STRIZ: No, that's not true.

23 JUDGE WARDWELL: Okay.

24 DR. STRIZ: The excursion monitoring wells  
25 in the Brule I think they said there were 220 of them.

1 JUDGE WARDWELL: Two hundred and three.

2 DR. STRIZ: Okay. So those are all  
3 monitored for water levels.

4 JUDGE WARDWELL: Great. And it was only  
5 the pump test that had just one in the Brule.

6 DR. STRIZ: Had a single one, yes.

7 JUDGE WARDWELL: Thank you.

8 Now, anyone from the Intervenor tables,  
9 and I'll elect a captain, Captain Lagarry chooses a  
10 victim.

11 DR. LAGARRY: I have one brief comment.  
12 Not having had the benefit of being able to work in  
13 the license area, we recognize based on lineaments  
14 observable from space, on the ground and low flying  
15 aircraft that fault and joints entirely surround the  
16 license area. Thank you.

17 MR. WIREMAN: I would just add to that  
18 that we agree that the Basal Chadron is confined. We  
19 don't agree that there is evidence that there are no  
20 faults or fractures that allow movement up through the  
21 upper confined unit.

22 JUDGE WARDWELL: And what evidence can you  
23 point to in regards to that besides what just Dr.  
24 Lagarry mentioned?

25 DR. KREAMER: Dr. Dave Kreamer. The

1 evidence that we just received that would be on page  
2 2.7 in the first document for the first pumping test,  
3 page 2.7a-18 and a-19. There are Tyce curves that  
4 show recharge.

5 CHAIR GIBSON: That's in Board Exhibit 2A.

6 DR. KREAMER: Board Exhibit 2A. And as  
7 was Board Exhibit 2A, 27-40 shows a Jacob Cooper Curve  
8 that has a recharge actually more profound than the  
9 one we showed here, a recharge boundary that occurs.  
10 And then there's an impermeable boundary that's shown  
11 in the third test on a Jacob Cooper plot.

12 CHAIR GIBSON: Which is Board Exhibit 3C.

13 DR. KREAMER: Thank you.

14 JUDGE WARDWELL: Thank you. To the  
15 presence of thick clay and mud stone layers of the  
16 upper Chadron and the lower Brule formations that  
17 isolate the Basal Chadron sandstone aquifer from the  
18 overlying Brule aquifer, they reference section  
19 3.5.2.3.2 of the EA. Let's start with Dr. Lagarry and  
20 then you pass it on.

21 DR. LAGARRY: I'm going to pass it on.

22 JUDGE WARDWELL: Okay. That's fine.

23 DR. KREAMER: The pumping test two says  
24 that there's a leakage of 1.4 percent not counting any  
25 fractures or recharge areas.

1 JUDGE WARDWELL: What says that? I'm  
2 sorry.

3 DR. KREAMER: The pumping test two.

4 CHAIR GIBSON: Which is Board Exhibit 3B.

5 DR. KREAMER: Thank you. That shows or  
6 specifically states that in the pumping test there was  
7 1.4 percent of the water came from above. The  
8 modeling testimony that we've heard says that and the  
9 restoration modeling they have an impermeable lower  
10 boundary. But they assume that the upper boundary is  
11 vertical anisotropy which means it leaks. And it  
12 doesn't account for vertical fractures. Then there's  
13 other evidence of faults in the data we've just  
14 received.

15 CHAIR GIBSON: I stand corrected. I said  
16 3A, B and C. It's 2A, B and C. I'm sorry. Thank  
17 you.

18 JUDGE WARDWELL: Thank you, Dr. Kreamer.

19 The third one is the substantial and  
20 continued difference in potentiometric head between  
21 the Basal Chadron aquifer and the overlying Brule  
22 aquifer and continued artesian pressure in the Basal  
23 Chadron sandstone before and during operations as  
24 referenced in 4.6.2.2.1 of the EA.

25 MR. WIREMAN: The difference in head, Mike

1 Wireman, after closure, the potentiometric surface  
2 will rise over time and the head on the Basal Chadron  
3 will be higher than the head in the Brule. And that  
4 is a potential for upper movement of what will then be  
5 more contaminated water than exists now.

6 JUDGE WARDWELL: Okay. Thank you. The  
7 operational groundwater and surface water monitoring  
8 record of CBR site during more than 20 years of  
9 operation has not and does not to date show any  
10 evidence of contamination of the surrounding or  
11 overlying aquifers from the mining operations that  
12 would be expected if fault or fracture pathways  
13 existed as discussed in 3.5.2.3.2 of the EA.

14 MR. WIREMAN: Mike Wireman again. I think  
15 the sampling of the offsite wells has not been  
16 complete. And just using iridium and uranium might  
17 not provide data to indicate an impact. And, then  
18 secondly, there have been many excursions and some of  
19 them have not been explained. They have been  
20 controlled and pulled back, but difficult in  
21 explaining them.

22 So the question has to be asked. Are  
23 those continued excursions due to some heterogeneities  
24 that are not known.

25 JUDGE WARDWELL: Thank you.

1 CHAIR GIBSON: You were just saying that  
2 the uranium may not be an adequate measure of this  
3 movement. I'm just curious. Are you suggesting that  
4 these other parameters would be better measurements of  
5 that?

6 MR. WIREMAN: Not necessarily better. But  
7 if you see changes in other parameters, particularly  
8 metals that can be oxidized and mobilized as a result,  
9 like lixiviant, an increase in another dissolved  
10 metal, that might be an indication of mobilization  
11 dues to the oxidation from the lixiviant.

12 CHAIR GIBSON: And it's for that reason  
13 you think that they should have tested for these other  
14 parameters. Is that correct?

15 MR. WIREMAN: That's one of the reasons I  
16 think they should have tested at least periodically,  
17 not necessarily every time they sample.

18 CHAIR GIBSON: Okay. Thank you.

19 JUDGE WARDWELL: The next one is none of  
20 the vertical excursions which have been detected to  
21 date have been attributed to a lack of integrity of  
22 the confining layer. And they reference the Exhibit  
23 NRC 010, at page 38.

24 DR. KREAMER: Dr. Dave Kreamer. I was  
25 actually going to just add to the last question, the

1 monitoring well array. The actual construction of the  
2 offsite wells are not EPA standard. EPA has asked me  
3 in '90s to explain around the nation what their  
4 standards were. I'm very familiar with that. So the  
5 offsite monitoring is likely to miss things.

6 And not only have a lot of the wells  
7 failed mechanical integrity tests, but there's also  
8 been leakage from the ponds that we've talked about.  
9 We've discussed the ponds that will hold these things.  
10 But pond one, pond three, pond four there's been  
11 leakage detected from these ponds and reported in the  
12 last 10 years. There's been about six, seven, eight  
13 pond leakages with the liner material. That's another  
14 surface concern from the Brule.

15 JUDGE WARDWELL: Thank you.

16 Does anyone want to comment on the last  
17 one I read that none of the vertical excursions have  
18 been detected to date that have been attributed to the  
19 lack of integrity of the confining layer.

20 MR. WIREMAN: The only comment I would  
21 have is that some of the excursions have yet to be  
22 explained as to why they continue to occur. And I  
23 really can't say much beyond that.

24 JUDGE WARDWELL: Thank you.

25 And then the last was monitoring results

1 from private Brule wells within one kilometer of a  
2 well field have shown no discernible trends and remain  
3 at pre-operational levels referencing NRC Exhibit 010  
4 at 81.

5 MR. WIREMAN: No trend data has been put  
6 together as far as I know. So I haven't seen any  
7 trend data.

8 JUDGE WARDWELL: Thank you.

9 Bear with us for just a minute.

10 (Pause)

11 Okay. I'm happy to report I am through  
12 all the introductory general hydrogeologic questions.  
13 So we can get into the meat of this which are the  
14 contentions. Hot damn. Now we get somewhere instead  
15 of just talking dribble, right. At least, that's what  
16 everyone thinks except that table and myself. They  
17 think we've been talking dribble here.

18 Moving into Contention A, I just have a  
19 little paragraph of synopsis of what it is and I think  
20 I'll read that before we get into it. There is no  
21 evidence base science for the NRC staff's conclusion  
22 that ISL mining has "no non-radiological health  
23 impacts or that non-radiological impacts for possible  
24 excursions or spills are small."

25 Limited by the Board and possibly by the



1 Board as some people have interpreted it and certainly  
2 by the Commission, that this contention states that  
3 CBR's spill contingency plan inadequately addresses  
4 non radiological contaminants, specifically claiming  
5 that the monitoring frequency for contaminants is  
6 inadequate and that there is no real valid reason to  
7 exclude uranium from the list of excursion monitoring  
8 parameters.

9 Starting off with talking about Pine Ridge  
10 Reservation impacts, according to two USGS reports --  
11 and I'm looking at NRC Exhibit 026 at two and NRC  
12 Exhibit 025 at seven and 026 at two which are both  
13 USGS reports by the way -- NRC 026 at two states that  
14 "the Ogalala and the Arikaree aquifers are the largest  
15 sources of groundwater on the Pine Ridge Indian  
16 Reservation and are used exclusively for irrigation  
17 and public and domestic water supplies."

18 025 at seven says "the White River group  
19 which is the Chadron and the Brule formation beneath  
20 the reservation is generally too impermeable to serve  
21 as a source of groundwater."

22 My questions I guess would be to Dr.  
23 Lagarry to state or to offer if you have any evidence  
24 to dispute what the USGS reports say. Or do you agree  
25 with those statements?

1 DR. LAGARRY: Yes, Your Honor. First of  
2 all, in South Dakota where the Pine Ridge Reservation  
3 is, the White River Group consists of the Chamberlain  
4 Pass Chaldron and Brule formations. This is in Terry  
5 1998 which was recently distributed to all parties  
6 involved.

7 In addition in collaboration with the  
8 University of Wisconsin-Whitewater, the Oglala Sioux  
9 Tribe National Resources Regulation Agency and also  
10 with my Nebraska State Map collaborators, we published  
11 several abstracts recording the discovery of the  
12 Chamberlain Pass formation at various places along the  
13 Pine Ridge Reservation.

14 In addition, in 2012, along with my  
15 student, Elisha Yellow Thunder, we presented data that  
16 shows where the Chamberlain Pass formation is with  
17 respect to various communities located on the Pine  
18 Ridge Reservation. In the data, we show that if the  
19 community or the residents was below the Pine Ridge  
20 Escarpment as Crawford is when residential and  
21 domestic wells were drilled downward, the only  
22 available aquifer between the aquitard of the Chadron  
23 and Brule formations and the aquiclude of the  
24 underlying Piece Shale is the Chamberlain Pass  
25 formation in between them. It is an aquifer used for

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1 both domestic and residential use.

2 When NRC staff categorically denied that  
3 the Chamberlain Pass formation occurred on the Pine  
4 Ridge Reservation, I provided my counsel this morning  
5 with a flash drive containing these references which  
6 we can then provide to you. Some of them are -- All  
7 of the abstracts, all of the reports that I was  
8 responsible for I have referred to in my three  
9 opinions in this case. However, I have them included  
10 on the flash drive on the off chance that they were  
11 overlooked.

12 JUDGE WARDWELL: And you mentioned  
13 Crawford in your statement. What was the -- I got  
14 confused when you said below the Pine Ridge  
15 Escarpment. If it's below the Pine Ridge Escarpment  
16 as is Crawford I think was your statement.

17 DR. LAGARRY: Right. The Pine Ridge  
18 Escarpment are these cliffs and buttes that we see  
19 around us. If you live on top of that and you drill  
20 downward, you hit the High Plains Aquifer and you have  
21 potable water. If you're located on the landscape  
22 below the sandstone cliffs and below the High Plains  
23 Aquifer and you drill down, the only aquifer within  
24 reach of your drilling is in fact the Chamberlain Pass  
25 formation which is a local aquifer containing large

1 amounts of radionuclides.

2 JUDGE WARDWELL: And is the Pine Ridge  
3 Reservation above or below that Pine Ridge Escarpment?

4 DR. LAGARRY: There are communities. Most  
5 of the communities in the Pine Ridge Reservation,  
6 they're listed in that abstract. But they include the  
7 communities of Pine Ridge, Calico, Oglala, Manderson,  
8 Wounded Knee, Kyle. Those communities are all below  
9 the Pine Ridge Escarpment.

10 Only the southwest corner of the  
11 reservation, the communities of Allen, Batesland,  
12 Wanblee and Martin, if you include Bennett County in  
13 the greater boundaries of the reservation which is  
14 typically done, then those communities sit above the  
15 Pine Ridge Escarpment. They get their water from  
16 uncontaminated sources.

17 JUDGE WARDWELL: The ones below get it  
18 from --

19 DR. LAGARRY: The Chamberlain Pass  
20 formation.

21 JUDGE WARDWELL: -- the Chamberlain Pass  
22 formation.

23 DR. LAGARRY: Or from a shallow alluvium  
24 in direct contact with the Chamberlain Pass formation.

25 JUDGE WARDWELL: And are there any other

1 public water supplies on the Pine Ridge Reservation  
2 that are being used?

3 DR. LAGARRY: Those public water supplies,  
4 I mean the Mni Wiconi Pipeline has recently been  
5 installed and has replaced most municipal water  
6 supplies, although not all. To the best of my  
7 knowledge, the pipeline has reached Pine Ridge. I'm  
8 not entirely sure that Oglala has made the switch yet.

9 So the municipal water supplies have  
10 relief. The pipeline is not the best for a number of  
11 reasons I can articulate if you want. The residential  
12 and agricultural wells, however, are still vulnerable.

13 JUDGE WARDWELL: Are still what? I'm  
14 sorry.

15 DR. LAGARRY: Vulnerable to contamination.

16 JUDGE WARDWELL: Okay. No, I got the  
17 vulnerable. I didn't know to what. Thank you on  
18 that.

19 I guess we are fortunate enough to now get  
20 to Ms. White Face this afternoon after all. I have a  
21 series of questions for you and maybe we can even get  
22 through with most of your efforts today.

23 In your testimony on OST 001, pages 7 to  
24 8, you state that the results of tests of domestic  
25 water from the deep wells into the Arikaree aquifer

1 combined with the direction of flow within the  
2 Arikaree aquifer and the number of excursions from the  
3 Crow Butte Resources Operation, the secondary porosity  
4 and the physical pull from the wells lead to the  
5 conclusion that Crow Butte Resources is polluting the  
6 Arikaree aquifer with radioactive contaminants.

7 I think before I get to you, Ms. White  
8 Face, I think I will go back to Dr. Lagarry just for  
9 completeness in regards to his last discussion and  
10 have him comment on that statement of yours in regards  
11 to how it relates to his now understanding of it.

12 Ms. White Face seems to be talking about  
13 wells in the Arikaree. Is it really some other  
14 aquifer or is it the Arikaree also that is a potential  
15 water source in the Pine Ridge Reservation?

16 DR. LAGARRY: There are people who do have  
17 wells in the Arikaree. But it depends entirely on  
18 where your house is. So the land on the reservation  
19 is allotted to family units and it's largely the luck  
20 of the draw.

21 It's entirely possible that in the way the  
22 land allotment system works that one child of the  
23 original landholder can have some land be given to  
24 them in a Badlands area and have contaminated water.  
25 It's also likely that it happens that at the other

1 side of the property, typically the eastern side of  
2 the property, they're up higher on the ridge. Then  
3 they have high plains aquifer water. The communities  
4 --

5 JUDGE WARDWELL: Can I quickly interrupt  
6 you there?

7 DR. LAGARRY: Okay.

8 JUDGE WARDWELL: And by high plains water,  
9 do you mean the Arikaree?

10 DR. LAGARRY: Yes.

11 JUDGE WARDWELL: And when you said the  
12 contaminated water, you were referring to the  
13 Chamberlain Pass.

14 DR. LAGARRY: In that particular  
15 statement, yes.

16 JUDGE WARDWELL: Okay. Continue. Sorry.

17 DR. LAGARRY: For example, Your Honor, the  
18 primary escarpment behind us beyond these cliffs, that  
19 body of rock typically yields uncontaminated water.  
20 So the local towns in northwestern Nebraska that get  
21 their water from a center pivot well up on the table  
22 behind the escarpment get water from the Arikaree  
23 which is the lower part of the high plains aquifer and  
24 that water is fine.

25 My understanding of Charmaine's comments

1 is that what should be pure water like leaks from  
2 springs here it's equivalent on the reservation is in  
3 fact contaminated. So how could that be?

4 Earlier in the discussion we had on the  
5 hydrologic and geological properties of the area, we  
6 talked about how the White River alluvium comes in  
7 contact in its riverbed with Chamberlain Pass  
8 formation at the land surface north of here. This  
9 alluvium is a continuous river of sediment or  
10 continuous body of sediment that goes northeast across  
11 the reservation.

12 As this body of sediment goes northeast  
13 across the reservation, it comes in contact with other  
14 rocks. It comes in contact with the Chamberlain Pass  
15 formation. It comes in contact with the Brule  
16 formation. And it comes in contact with the Arikaree  
17 group.

18 While in my view based on the testimony I  
19 have presented, it is plausible, although not  
20 confirmed by my own work, that contaminants have found  
21 their way into the White River alluvium, found their  
22 way to the reservation directly downstream and somehow  
23 come in contact with either the well pulls water and  
24 draws it out of the alluvium or perhaps through a  
25 fault or something. But it is possible that that

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1 could happen.

2           There is contaminated water on the  
3 reservation. The state of research on the reservation  
4 is far less than it is here. A lot of the science  
5 that's driven here in this part of Nebraska is driven  
6 by agricultural needs for water, for mining needs for  
7 water and for stratigraphy and geology and for faults  
8 and all those things that go with proceedings like  
9 this. That kind of basic work hasn't been done there  
10 which is why in the data in the publications I  
11 provided to counsel to rebut the assertion that  
12 there's no Chamberlain Pass on the reservation.  
13 That's why it's such a preliminary state in existent  
14 abstracts instead of in a lot of recent papers.  
15 That's my take on the situation and the potential for  
16 contamination.

17           The White River alluvium crosses the  
18 reservation from southwest to northeast and comes in  
19 contact with virtually every geological unit available  
20 to land surface except the sandhills.

21           JUDGE WARDWELL: Do you have any idea of  
22 the estimated time it would take for a drop of water  
23 leaving the centroid of the license area moving  
24 towards the northwest, encountering the alluvium and  
25 then transversing the 20 miles to the Pine Ridge

1 Reservation that it would take for it to travel that  
2 distance?

3 DR. LAGARRY: To the best of my knowledge,  
4 there's not data. There are no monitoring wells to  
5 investigate either the spread of contaminants or the  
6 movement of individual bits of water. To the best of  
7 my knowledge, that data doesn't exist yet.

8 JUDGE WARDWELL: Okay. And in your  
9 discussion just to make sure it's clear, you're  
10 referring to the water in the alluvium. You're not  
11 referring to the water in the river itself.

12 DR. LAGARRY: The water in the river  
13 itself basically goes through in a pulse in the  
14 springtime. So, zoop and it's gone. The water in the  
15 alluvium that soaks in is protected from evaporation.  
16 Some of it exists in little perched aquifers and  
17 little shallow bits. So the water in the alluvium  
18 hangs around and can persist.

19 But the White River through many of its  
20 stretches especially in recent years it was mentioned  
21 that we're in a drought. It's pretty dry pretty  
22 often.

23 JUDGE WARDWELL: Thank you. And one last  
24 question for you.

25 DR. LAGARRY: Sure.

1 JUDGE WARDWELL: In regards to the  
2 contaminated water that you talk about in the Pine  
3 Ridge Reservation, is there any evidence that you have  
4 that it did come from the Crow Butte area? Or is it  
5 just you're giving one plausible pathway that it  
6 might? Is there any definitive communication that it  
7 did come from these mining operations?

8 DR. LAGARRY: No, not yet. However, we're  
9 investigating it.

10 JUDGE WARDWELL: Thanks.

11 Now, Ms. White Face, back to you. Yes, do  
12 you want to just add something to that before I ask  
13 other questions?

14 MS. WHITE FACE: Yes, I do. I just wanted  
15 to -- I came about this by accident because I was just  
16 trying to help Red Shirt Village a couple years ago.  
17 They're in the Madison aquifer situation and their  
18 water is polluted by the abandon uranium mines by  
19 Edgemont. And I came into this really by accident.

20 I took a water test from the place in Red  
21 Shirt Village and found out through the --

22 JUDGE WARDWELL: What year was this about?

23 MS. WHITE FACE: This was -- I've got it  
24 right here and it's in the information I gave you.  
25 May 30, 2014.

1 JUDGE WARDWELL: Okay. So last year.

2 MS. WHITE FACE: Yes, last year. When I  
3 did this, I noticed that -- The only reason that I did  
4 this wasn't to try to find fault with anybody, but we  
5 wanted to help Red Shirt Village so they could have  
6 some clean water. There's a foundation that said that  
7 they would put filters in their water system so that  
8 they could have clean water.

9 I found out that their water comes from  
10 Kyle. And I also found out from the Oglala Sioux Rail  
11 Water Supply System that the Mni Wiconi Pipeline only  
12 comes to the eastern part of the reservation. But  
13 there are five deep wells that provide the water to  
14 the pipeline system to the majority of the  
15 reservation. Red Shirt Village, their water is  
16 provided by the Kyle well.

17 And I've been doing this for a number of  
18 years getting water studies and usually of surface  
19 water, not necessarily wells. It's through this  
20 organization that I coordinated. It's a nonprofit  
21 environmental organization called Defenders of the  
22 Black Hills. And plus I'm a physical scientist and I  
23 also have a mentor from the University of Michigan who  
24 is a nuclear physics professor.

25 What I usually ask for is I ask for the

1 isotopes of uranium because that will let me know  
2 where this is coming from. Is it naturally occurring  
3 or is it mine uranium? That's one of the things I ask  
4 for.

5 And I also want to ask for the uranium  
6 totals as well as any others radionuclides. In this  
7 case, there were two things that really surprised me  
8 about the water coming from the Kyle well. That was  
9 that the amount of uranium-234 is almost double the  
10 amount of uranium-238. Now 238 is a naturally  
11 occurring uranium. Uranium-234 is caused by mining.

12 I thought where is the nearest mine. But  
13 that wasn't my purpose in the beginning.

14 JUDGE WARDWELL: Ms. White Face, can we  
15 talk about that for a minute?

16 MS. WHITE FACE: Yes.

17 JUDGE WARDWELL: If I can interrupt you so  
18 we don't have to come back to this. Are you claiming  
19 that 234 never exists in natural conditions?

20 MS. WHITE FACE: No, it does exist in  
21 natural conditions, but the amount is so minuscule in  
22 natural conditions. Natural conditions, uranium-238  
23 is naturally is 99.9 percent. Uranium-234 is 00.005  
24 percent.

25 JUDGE WARDWELL: And what's that

1 percentage of?

2 MS. WHITE FACE: Percentage of whatever  
3 amount you have right there, what you're taking, what  
4 you're testing.

5 JUDGE WARDWELL: The concentration.

6 MS. WHITE FACE: Yes, the concentration.  
7 And so when this concentration from the Kyle well  
8 showed up so high that disturbed me as well as the  
9 amount of thorium-234.

10 JUDGE WARDWELL: What disturbed you now?

11 MS. WHITE FACE: Thorium.

12 JUDGE WARDWELL: No, before in regards to  
13 the ratio. What was it?

14 MS. WHITE FACE: The ratio disturbed me  
15 because the amount of uranium-234 is twice as much as  
16 uranium-238.

17 JUDGE WARDWELL: What is that based on?

18 MS. WHITE FACE: These are based on  
19 laboratory results which I have given to you in my  
20 statement.

21 JUDGE WARDWELL: What were the units of  
22 that result?

23 MS. WHITE FACE: The uranium-234 is  
24 picocuries per liter.

25 JUDGE WARDWELL: And I'm sorry. The two

1 to one was based on what now?

2 MS. WHITE FACE: The uranium-234.

3 JUDGE WARDWELL: That ratio, what's that  
4 based on?

5 MS. WHITE FACE: Yes, the ratio.

6 JUDGE WARDWELL: Was that based on the  
7 activity of the uranium?

8 MS. WHITE FACE: The ratio of U-234 to U-  
9 238. The uranium and --

10 JUDGE WARDWELL: Based on it.

11 MS. WHITE FACE: And that should be  
12 something that is in monitoring wells.

13 JUDGE WARDWELL: Did you provide with the  
14 numbers that created the two to one ratio?

15 MS. WHITE FACE: Yes, it's in here. And  
16 it's in the information I gave you. Hold on. I'll  
17 get it.

18 JUDGE WARDWELL: No problem.

19 MS. WHITE FACE: Do you want the citation  
20 of where this is at, the percentages?

21 JUDGE WARDWELL: If you could, just read  
22 off two of the numbers that you claim have this two to  
23 one ratio associated of 234 to 238.

24 MS. WHITE FACE: I have -- Well,  
25 eventually I tested all five deep wells. So the Kyle

1 well is 7.0 picocuries per liter with U-238 at 3.4.  
2 Pine Ridge well is at 7.8 U-234 with U-238 at 4.1.  
3 The Oglala well --

4 JUDGE WARDWELL: Wait. 4.1.

5 MS. WHITE FACE: 4.1.

6 JUDGE WARDWELL: What's the units on it?

7 MS. WHITE FACE: Picocuries per liter.

8 JUDGE WARDWELL: Okay.

9 MS. WHITE FACE: And the Oglala well has  
10 uranium-234 at 8.0 picocuries per liter with U-238 at  
11 4.5 picocuries per liter. And I just in the last two  
12 weeks was able to get the results back from my other  
13 two tests for Manderson and Porcupine. And in  
14 Manderson, it's 15.2 picocuries per liter of U-234  
15 versus 8.1 picocuries per liter of U-238. And at  
16 Porcupine, it is U-234 at 8.7 and U-238 at 3.7.

17 JUDGE WARDWELL: And what are picocuries?

18 MS. WHITE FACE: Picocuries are the energy  
19 levels.

20 JUDGE WARDWELL: It's an activity. Is  
21 that the way you say it?

22 MS. WHITE FACE: Right.

23 JUDGE WARDWELL: That's not a  
24 concentration, is it? It's an activity.

25 MS. WHITE FACE: It's an activity. But



1 when you have so much double activity of something  
2 that should be 0.005 percent, something is going  
3 crazy.

4 JUDGE WARDWELL: But when you look at the  
5 percentage of 238 being at as you said I think 99  
6 percent.

7 MS. WHITE FACE: Right.

8 JUDGE WARDWELL: That's based on a  
9 concentration. Isn't it not on an activity? I think  
10 you said it was earlier.

11 MS. WHITE FACE: Yes.

12 JUDGE WARDWELL: So I was just confirming  
13 it.

14 MS. WHITE FACE: Yes, concentration.

15 JUDGE WARDWELL: Likewise, the 0.005 for  
16 234 is a concentration also. Is it not?

17 MS. WHITE FACE: Yes.

18 JUDGE WARDWELL: And such the ratio is  
19 0.005 to one in regards to concentration. Is not 234  
20 more active than 238?

21 MS. WHITE FACE: It depends on what they  
22 release, whether it's an alpha, beta or gamma  
23 releaser.

24 JUDGE WARDWELL: But isn't the total  
25 activity from 234 much higher than 238?

1 MS. WHITE FACE: Not necessarily.

2 JUDGE WARDWELL: Such that the point that

3 --

4 MS. WHITE FACE: They're both --

5 JUDGE WARDWELL: Can you not compare the  
6 ratio of concentrations at the two to one that we have  
7 associated with a concentration of 238 to 234 to the  
8 activity? When we're dealing with different -- When  
9 we're looking at concentrations of one and activity of  
10 the other ratio, we can't use the same ratio, can we?

11 MS. WHITE FACE: Both of them are alpha,  
12 beta and gamma emitters. Both of them are.

13 JUDGE WARDWELL: And the activity of one  
14 is different than the other. Is it not?

15 MS. WHITE FACE: Not necessarily. The  
16 only difference would be the half-lives. And the  
17 uranium-234 half-life is half of uranium-238. But  
18 that's 4.5 times ten to the 9th. And uranium-234 is  
19 2.44 times ten to the 5th.

20 JUDGE WARDWELL: So it's your testimony  
21 that there's no activity difference between 234 and  
22 238.

23 MS. WHITE FACE: Right.

24 JUDGE WARDWELL: Okay. Thank you. Go  
25 ahead.

1 MS. WHITE FACE: The other part that  
2 bothered me initially was the thorium levels. And  
3 with the lixiviant in there disturbing all of the  
4 elements, would this also disturb thorium? Thorium is  
5 the first step in the decay process of uranium-238.  
6 It only has a half-life of 24 days, but the thorium  
7 levels were so high in all of the tests, it just  
8 really bothered me.

9 JUDGE WARDWELL: And what were those  
10 levels?

11 MS. WHITE FACE: The thorium for Kyle was  
12 205 picocuries per liter. I've got it right here.

13 MR. REID: Your Honor, perhaps we could  
14 pull up OST 1. It has those attachments to it on the  
15 screen.

16 JUDGE WARDWELL: We can if you want, but  
17 we'll get off this soon.

18 MS. WHITE FACE: At Pine Ridge, it 252  
19 picocuries per liter and at Oglala it was 312  
20 picocuries per liter of thorium. But the reason that  
21 it bothered me so much was when I talked to Oglala  
22 Super of Water Supply System, they do not monitor or  
23 regulate thorium because EPA does not require it. EPA  
24 does not require monitoring or regulating of naturally  
25 occurring data or photon emitters which thorium is.

1 And so they had no record. They don't  
2 regulate it. And yet this is a very, very highly  
3 radioactive element.

4 JUDGE WARDWELL: On page six of your  
5 testimony in regards to this thorium, this was a  
6 statement that I saw in regards to what were you  
7 concerned about because that was your testimony. You  
8 state that "Another interesting and disturbing fact  
9 from the water test results from the Oglala well is  
10 the amount of thorium-234 at a minimum detection  
11 concentration of 90 picocuries per liter." Why is  
12 that a concern to you?

13 MS. WHITE FACE: The minimum detectable  
14 concentration is 90. And yet I have --

15 JUDGE WARDWELL: What does that mean?  
16 What does the minimum detection concentration mean?

17 MS. WHITE FACE: It should mean that  
18 that's the minimum detectable concentration that as  
19 low down as the laboratory can test it. Okay.

20 JUDGE WARDWELL: So that's what the lab --  
21 That has nothing to do with the field though. That's  
22 just what the lab can give you for results, right?

23 MS. WHITE FACE: Right.

24 JUDGE WARDWELL: Okay.

25 MS. WHITE FACE: But my results are way

1 higher than that. For the Red Shirt one at 205  
2 picocuries per liter, the minimum detectable  
3 concentration is 179. And yet it's still higher than  
4 the minimum detectable.

5 JUDGE WARDWELL: So your concern is the  
6 concentration, not the minimum detection level.

7 MS. WHITE FACE: No.

8 JUDGE WARDWELL: The minimum detection  
9 level doesn't have anything to do with it.

10 MS. WHITE FACE: Right.

11 JUDGE WARDWELL: Okay. I just wanted to  
12 make sure that's correct.

13 If I could go back to some of my other  
14 questions for you, again I stated what you said in  
15 regards to that. The results from the test of  
16 domestic water from the deep wells in the Arikaree  
17 combined with the directional flow and the pulling of  
18 that into the aquifer with radioactive contaminants is  
19 your concern.

20 And is it true that it's basically your  
21 position that both the underground and surface waters  
22 from Crow Butte facility are in communication with the  
23 ground and surface water at the Pine Ridge Reservation  
24 that's creating this existence of contamination and no  
25 water is used by the residents on the reservation?

1 MS. WHITE FACE: Yes, it is.

2 JUDGE WARDWELL: And do you have any  
3 evidence that shows that at these elevated levels of  
4 uranium and thorium of your concern have come from the  
5 Basal Chadron in the license area?

6 MS. WHITE FACE: In the license area, I  
7 don't know from the license area.

8 JUDGE WARDWELL: Okay. You stated that  
9 thorium has a very quick half-life.

10 MS. WHITE FACE: Yes.

11 JUDGE WARDWELL: Wouldn't you logically  
12 think that if the thorium came from here at the  
13 license area it would take quite a long time before it  
14 got to the Pine Ridge Reservation based on just the  
15 horizontal separation of 20 miles that would seem  
16 unlikely that the thorium came from the license area?

17 MS. WHITE FACE: No, I don't.

18 JUDGE WARDWELL: You don't think that's  
19 strange.

20 MS. WHITE FACE: The reason why I said  
21 that was because of something that Dr. Lagarry had  
22 said in his expert testimony where he stated that "I  
23 cited research on the transmission of water along  
24 secondary porosity, faults and joints in the Brule  
25 formation of up to 1500 feet per day." And knowingly

1       how long Crow Butte has been mining, 20 plus years,  
2       that no. I don't think that it would take that long  
3       for an excursion coming from here to reach over there.

4               The potentiometric surface according to  
5       USGS and which is in my statement shows that it flows  
6       from here to the north and the east up there  
7       underneath the reservation.

8               JUDGE WARDWELL: And while I understand  
9       your expertise in the health and safety field of  
10      nuclear stuff, what is your expertise in the  
11      hydrogeologic aspects of this? Or are you just  
12      repeating what you've heard from other individuals?

13              MS. WHITE FACE: I'm not an expert on  
14      hydrogeology. I'm a biologist and physical scientist.

15              JUDGE WARDWELL: Thank you. Do you happen  
16      to know what is the total pumping rates that's used in  
17      the Arikaree at the Pine Ridge Reservation?

18              MS. WHITE FACE: No, I don't.

19              JUDGE WARDWELL: Do you have any idea, Dr.  
20      Lagarry, at all?

21              DR. LAGARRY: No.

22              JUDGE WARDWELL: That's not surprising.  
23      It's not something you'd have necessarily.

24              On page three of your testimony, Ms. White  
25      Face, you state that OST has been collecting drinking

1 water samples for a number of years. You started  
2 yours last year. How long a database -- How long ago  
3 did this database start of the water quality  
4 parameters at the reservation in your possession do  
5 you have?

6 MS. WHITE FACE: Pine Ridge?

7 JUDGE WARDWELL: How far back do the --  
8 When do you have your first sample analysis and  
9 results?

10 MS. WHITE FACE: 2004 maybe.

11 JUDGE WARDWELL: And did you present that  
12 to us in your testimony?

13 MS. WHITE FACE: No.

14 JUDGE WARDWELL: Or did you only present  
15 -- Okay. Thank you.

16 MS. WHITE FACE: No, because it was on  
17 surface. My other tests were primarily on surface  
18 water and that was on the Cheyenne River which is not  
19 in this.

20 JUDGE WARDWELL: But if I understand your  
21 testimony correctly someone on the reservation has  
22 been taking samples for a long number of years back to  
23 what you said was '92. Or I forgot what you said in  
24 regards to when it first started.

25 MS. WHITE FACE: I don't know about the



1 Water Department. But I do know that we did take one  
2 from a private well earlier and it's in here in 2009.  
3 In 2009 we took a number of water samples from the  
4 residents --

5 JUDGE WARDWELL: And who is we? Is this  
6 you or?

7 MS. WHITE FACE: My organization,  
8 Defenders of the Black Hills, usually I'm the one that  
9 does it. Anyway, we had a number of cancer cluster  
10 north of Sharps Corner and the residents asked us if  
11 we would test the water. So we did. We did about  
12 four or five. And these are very expensive.

13 And we are an all-volunteer organization.  
14 We get our money to pay for these tests through small  
15 grants or donations. So we did take a number of tests  
16 just from that one area when I found out that his well  
17 is private just like Dr. Lagarry said that some of  
18 them are going to private. And his well was private.  
19 I only included one of the results in here and it's  
20 Exhibit 10, LS Paragon (phonetic) Report dated March  
21 23, 2009.

22 JUDGE WARDWELL: Okay. That's sufficient.  
23 And I'm sorry. You weren't here yesterday I don't  
24 believe. But I will interrupt you just for the sake  
25 of time that we have here in order to get the

1 questions that I have and you've answered that. And  
2 so don't feel I'm being rude. It's just we have a  
3 finite time and I want to make sure we stay focused on  
4 the questions that we as a Board have to make sure  
5 we've got the record we need to make a decision.

6 And in regards to that, there's one, that  
7 one, and then the one you did last year. Are there  
8 any other sampling episodes that you can refer to in  
9 regards to groundwater monitoring sampling results  
10 that might be available in the database?

11 MS. WHITE FACE: We did that first one at  
12 Kyle and then we did all five wells, all five of the  
13 deep wells.

14 JUDGE WARDWELL: Yes, I'm interested in  
15 the different episodes with time. We've got the one  
16 from last year. And then you've got the one from the  
17 '90s.

18 MS. WHITE FACE: As far as my testing of  
19 these deep wells, this has only occurred the five of  
20 them in this past year.

21 JUDGE WARDWELL: Okay. Thank you.

22 MR. REID: Your Honor, at this time she  
23 mentioned that --

24 JUDGE WARDWELL: I'm sorry. Who's  
25 talking?

1 MR. REID: Andrew Reid from the tribe.

2 JUDGE WARDWELL: Okay.

3 MR. REID: She mentioned the two recent  
4 tests that she did. We've distributed that to counsel  
5 for the other parties and I believe you have it in  
6 front of you.

7 JUDGE WARDWELL: Right.

8 MR. REID: Those were obtained after she  
9 prepared a report. I'd just like to offer them since  
10 she's testified to them.

11 CHAIR GIBSON: Very well. Have you  
12 provided these to counsel for the parties?

13 MR. REID: Yes.

14 CHAIR GIBSON: Let me just ask. Mr.  
15 Smith, do you have any objection to these?

16 MR. SMITH: We do not.

17 CHAIR GIBSON: Okay. Staff?

18 MS. SIMON: No, we don't, Your Honor. But  
19 I would just like to ask for Ms. White Face to clarify  
20 which. I believe she said they were from two places.  
21 If she could clarify which is from which place that  
22 would be helpful.

23 CHAIR GIBSON: Okay. The two exhibits  
24 have been offered and will be marked. They have been  
25 marked -- Do we have numbers for these, Mr. Reid?

1 (Whereupon, the above-referred  
2 to documents were marked as  
3 Exhibits OST002 and OST003 for  
4 identification.)

5 MR. REID: It would be OST002 and OST003.

6 CHAIR GIBSON: OST002 and OST003.

7 MR. REID: OST002 would be the August 3,  
8 2015.

9 CHAIR GIBSON: Very well.

10 MR. REID: And the OST003 would be August  
11 6, 2015.

12 CHAIR GIBSON: And you will have these  
13 filed with the EIE through the EIE so that we'll have  
14 these in electronic form as well.

15 MR. REID: I can do that when I get back  
16 to my office.

17 CHAIR GIBSON: Thank you. We need those  
18 on the internet so that all people will have a chance  
19 to see it. Okay. Very well.

20 JUDGE WARDWELL: And on page three of  
21 OST001 of your testimony and I quote "Crow Butte  
22 Resources pumps dissolving lixiviant into the Arikaree  
23 aquifer at the in situ uranium mines in Crawford,  
24 Nebraska near the Pine Ridge Reservation. The USGS  
25 potentiometric map of the direction of flow of the

1 Arikaree aquifer flows that the water flows to the  
2 north and east of Crawford into the Pine Ridge  
3 Reservation." And you reference Exhibit 4 of the USGS  
4 and OST001 of page 15 on the PDF. There is the  
5 Exhibit 4.

6 DR. LAGARRY: Your Honor, that needs to be  
7 rotated 90 degrees to the right.

8 CHAIR GIBSON: Is that working?

9 DR. LAGARRY: That's correct.

10 JUDGE WARDWELL: Okay. And was that you,  
11 Dr. Lagarry?

12 DR. LAGARRY: That was me, Dr. Lagarry.  
13 Yes. Thank you.

14 JUDGE WARDWELL: So why don't I ask you to  
15 orient ourselves. Is that the Nebraska border there  
16 to the north?

17 DR. LAGARRY: The Nebraska border is to  
18 the south. I believe -- Let me look at this just to  
19 make sure I'm not misspeaking.

20 JUDGE WARDWELL: Sure, which is which.  
21 This is the Pine Ridge South Dakota we're looking at.

22 DR. LAGARRY: Okay. If this is the Pine  
23 Ridge Reservation then we're looking at the Nebraska  
24 border to the south.

25 JUDGE WARDWELL: Good.

1 DR. LAGARRY: We're looking at the Fall  
2 River County border to the west or left. And the Todd  
3 County border to the east or to the right. And our  
4 present location is about 30 miles southwest of the  
5 bottom left corner.

6 JUDGE WARDWELL: Okay. Thank you.

7 Question for Ms. White Face. I almost  
8 said Flint. Ms. White Face. Does not CBR limit its  
9 pumping activities to the Basal Chadron aquifer though  
10 as referenced by for instance NRC076, page 45, answer  
11 D20 that they limit their lixiviant injection to the  
12 Basal Chadron? Do they not?

13 MS. WHITE FACE: A limit to that, but it  
14 has excursion.

15 JUDGE WARDWELL: Sorry. Could you speak  
16 into the mike? Get it real close to you so we can  
17 hear you.

18 MS. WHITE FACE: Yes, they limit it to  
19 that, but the excursions and how many excursions and  
20 where are they going.

21 JUDGE WARDWELL: So your statement in your  
22 testimony that there are pumps dissolving lixiviant  
23 into the Arikaree aquifer, what you really mean is  
24 that the lixiviant that is injected into the ground  
25 eventually makes its way to the Arikaree and not being

1 directly injected. Is that what you mean?

2 MS. WHITE FACE: Right.

3 JUDGE WARDWELL: And can you point to us  
4 or if Dr. Lagarry wishes to demonstrate Exhibit 4  
5 where the water flows from CBR to the Pine Ridge  
6 Reservation? I see a lot of arrows going in a lot of  
7 different directions. And I look at and would say if  
8 someone asked me "Where was the flow in the Arikaree"  
9 I would say, "Where would you like it to be?"

10 DR. LAGARRY: This is Dr. Lagarry.  
11 Charmaine indicated to me just now that she's focusing  
12 on the lefthand third of the map towards the right  
13 part of that. On the lefthand side you can see sort  
14 of a pale orange or pale brown color. I interpret  
15 that to be the Badlands areas where it's principally  
16 an aquitard.

17 So the colorless or white areas to the  
18 right are the aquifer, the Arikaree aquifer. And  
19 along the bottom edge of the map as soon as you enter  
20 that white area, yes, there's a hand cursor there. I  
21 see an arrow going left. But to the immediate right  
22 of the arrow going left there's an arrow going up.

23 It looks like -- Go to the right, Mr.  
24 Cursor Hand. Go to the right a little bit. A little  
25 farther, Mr. Cursor Hand. Yeah, there you go. That's

1 the upward pointing arrow that Charmaine indicated to  
2 me.

3 JUDGE WARDWELL: Just below the hand.

4 DR. LAGARRY: Just below the hand, yes.

5 JUDGE WARDWELL: Gotcha.

6 CHAIR GIBSON: Judge Wardwell, would you  
7 like Dr. Lagarry to mark this on the map since we  
8 haven't annotated an exhibit yet with this high tech  
9 stuff?

10 JUDGE WARDWELL: And you really want to.  
11 I think it would be a great idea.

12 CHAIR GIBSON: Okay. Good.

13 JUDGE WARDWELL: Circle that arrow.

14 CHAIR GIBSON: Great.

15 (Simultaneous speaking)

16 JUDGE WARDWELL: The pressure in on now.

17 CHAIR GIBSON: I knew you'd make my day.

18 JUDGE WARDWELL: The Chair has offered  
19 this.

20 JUDGE HAJEK: Is this actually an excuse  
21 to use the technology you brought with you?

22 CHAIR GIBSON: Yes, something like that.

23 DR. LAGARRY: If you don't use it, they'll  
24 take it back.

25 JUDGE WARDWELL: We can charge our client



1 more money for the use of this. The problem is we  
2 don't have a client.

3 DR. LAGARRY: It may take some  
4 experimentation, but I'll give it my best shot.

5 JUDGE WARDWELL: We'll see how good or how  
6 shaky your hand is.

7 DR. LAGARRY: So my stated goal is to  
8 create an oral encompassing the three arrows. What's  
9 going to happen?

10 For those of you under the age of 50,  
11 you'll understand when you get bifocals. Okay. So  
12 there's drawing tools up here to the right. Let's  
13 see.

14 JUDGE WARDWELL: You make it and then you  
15 can move it.

16 DR. LAGARRY: Ah, yes. That's entirely  
17 satisfying. I could do this for you all day. NRC  
18 staff, if you could think of a reason to keep me on  
19 this, I will be your friend. A little bit more. How  
20 does that look, Charmaine? Am I approximately what it  
21 is you're intending to talk about?

22 MS. WHITE FACE: Yes, that's good.

23 DR. LAGARRY: Awesome. I don't know about  
24 these goobers over here. Maybe those will go away.

25 Now, the longer I look at this map the

1 more I would like to -- because there's also that  
2 goober there. And there's also some of these goobers  
3 up here. Okay. That's the ticket.

4 JUDGE WARDWELL: Some of these what?

5 DR. LAGARRY: Any unknown linear figure is  
6 a goober.

7 JUDGE HAJEK: And where are we on this  
8 map?

9 DR. LAGARRY: We're not on this map.  
10 We're 30 miles off the southwest corner of this map.

11 JUDGE HAJEK: How many inches is 30 miles  
12 off the southeast corner?

13 DR. LAGARRY: That's correct. This image  
14 that we're looking at is about the size of the state  
15 of Connecticut or the country of Belgium. Thirty  
16 miles at the scale it's currently at is about six  
17 inches of the bottom left corner.

18 JUDGE WARDWELL: Could you expand to the  
19 full document, either Mr. Deucher or yourself, so we  
20 can see the whole map again?

21 DR. LAGARRY: You bet.

22 JUDGE WARDWELL: Just click the right  
23 square, Joe. Don't do that. Go over right. This  
24 square right up here. Right on the icon. See that  
25 icon up there? Over to the right. Further to the

1 right. Furthest right. Your other right. That one.

2 DR. LAGARRY: That one.

3 JUDGE WARDWELL: There you go. That's  
4 what I want. Here we are on the full scale now on the  
5 whole reservation. Right?

6 DR. LAGARRY: That's right.

7 JUDGE WARDWELL: Can you just kind of  
8 point where we are, not necessarily whether in scale  
9 but what direction off the bottom of this?

10 DR. LAGARRY: The bottom lefthand corner  
11 diagonally.

12 JUDGE WARDWELL: Okay.

13 DR. LAGARRY: If you're following Mr.  
14 Cursor Hand, the White River comes through here and  
15 goes this way. Yeah, more or less like this. It's  
16 this Arikaree here, it's to the left of that. So it  
17 follows the hand this way. That's the White River.

18 JUDGE WARDWELL: Okay. And we are off  
19 that far point.

20 DR. LAGARRY: We're off down in here  
21 somewhere.

22 JUDGE WARDWELL: Right. Twenty miles.

23 DR. LAGARRY: Closer to 30.

24 JUDGE WARDWELL: Great. All right. Thank  
25 you.

1 DR. LAGARRY: That was awesome. Thank  
2 you.

3 CHAIR GIBSON: Now we have this marked as  
4 Exhibit OST004. What should we call it? Mr. Reid, do  
5 you have a suggestion?

6 MR. REID: OST004 please.

7 CHAIR GIBSON: OST004.

8 JUDGE WARDWELL: Wait a minute. This was  
9 in the original testimony, wasn't it?

10 CHAIR GIBSON: It was, but it's been  
11 marked up.

12 JUDGE WARDWELL: Oh, we've got it marked  
13 up. Gotcha.

14 CHAIR GIBSON: I thought we'd have it  
15 separate. We'll just call this OST004 just so we can  
16 all know what we were talking about. Any objection,  
17 Mr. Smith?

18 MR. SMITH: To calling it OST004?

19 CHAIR GIBSON: Okay. You're okay with  
20 that?

21 MR. SMITH: I'm okay with calling it  
22 OST004.

23 MR. SMITH: I'm not sure what the  
24 significance of it is yet.

25 CHAIR GIBSON: I understand that. I just

1 want to be sure we're all okay with marking it there.  
2 Okay.

3 OST004, you're okay with that.

4 MS. SIMON: Yes, Your Honor.

5 CHAIR GIBSON: Okay. Thank you.

6 (Whereupon, the above-referred  
7 to document was marked as  
8 Exhibit OST004 for  
9 identification.)

10 JUDGE WARDWELL: Okay. In your testimony,  
11 Ms. White Face, on page three you said, "Most of the  
12 drinking water at the Pine Ridge Reservation is drawn  
13 from five deep wells drilled into the Arikaree  
14 aquifer." NRC075, pages 47 to 48, answer D22 states  
15 in their reply to your testimony, Ms. White Face, that  
16 Ms. White has identified the locations of three of the  
17 give Arikaree wells as Oglala, South Dakota, Pine  
18 Ridge, South Dakota and Kyle, South Dakota and that  
19 the closest of these to the CBR facility is the well  
20 in Oglala, South Dakota which is approximately 49  
21 miles from the nearest Crow Butte license area  
22 boundary.

23 And my question to you is is this a  
24 correct summary of the Pine Ridge locations and where  
25 would the other two wells be located.

1 MS. WHITE FACE: The other two wells that  
2 are in this report are, one is at Oglala which is the  
3 closest. The other one is at Pine Ridge near Pine  
4 Ridge Village which is about 20 miles east of Oglala.

5 JUDGE WARDWELL: Okay.

6 MS. WHITE FACE: And then the other one  
7 would be at Kyle. And that's way up north about  
8 straight across about 60 miles from Pine Ridge  
9 Village, closer to the center.

10 JUDGE WARDWELL: You say there are five  
11 wells, correct, in Arikaree.

12 MS. WHITE FACE: Yes.

13 JUDGE WARDWELL: We have one in Oglala or  
14 two?

15 MS. WHITE FACE: One at Oglala.

16 JUDGE WARDWELL: Okay. We've got one at  
17 Pine Ridge.

18 MS. WHITE FACE: Yes.

19 JUDGE WARDWELL: We have one at Kyle.

20 MS. WHITE FACE: Yes.

21 JUDGE WARDWELL: Where are the other two?

22 MS. WHITE FACE: One at Manderson.

23 JUDGE WARDWELL: Manderson.

24 MS. WHITE FACE: And one at Porcupine.  
25 Porcupine.

1 JUDGE WARDWELL: Thank you. And where  
2 those particular communities or locations  
3 approximately from Pine Ridge?

4 MS. WHITE FACE: Pine Ridge, they're both  
5 north. Let's see. Manderson and Porcupine are closer  
6 again to the center. They're north about -- Manderson  
7 is about 25 miles and Porcupine both. They're about  
8 25 miles north of Pine Ridge Village.

9 JUDGE WARDWELL: Thank you. Do you have  
10 any idea what the pumping rates are out of those five  
11 wells?

12 MS. WHITE FACE: I don't.

13 JUDGE WARDWELL: Okay. That's fine. Do  
14 you have any evidence that these wells have been  
15 impacted by the Pine Ridge Reservation pumping such  
16 that the drawing from the Pine Ridge Reservation is  
17 now influencing these particular wells?

18 MS. WHITE FACE: That was my assumption.

19 JUDGE WARDWELL: Thank you.

20 MS. WHITE FACE: My assumption was that it  
21 was pulling more, putting more pressure on pulling the  
22 lixiviant and dissolved elements.

23 JUDGE WARDWELL: NRC Exhibit 076, page 46,  
24 D21, staff states that "As explained in answer to F.4  
25 of our initial testimony, the Arikaree formation is

1 present only in the far southeastern corner of the  
2 site" -- That's the license area site -- "and forms  
3 the Pine Ridge Escarpment located south and southeast  
4 of the license area as described in their answer to D3  
5 and furthermore according to USGS formation map that  
6 Ms. White Face provided the Arikaree aquifer is absent  
7 in northeastern Dawes County," referencing OST001 at  
8 14.

9 "The absence of the Arikaree aquifer is  
10 also evident by comparing the USGS formation map" --  
11 that again is OST001 at 14 -- "with a potentiometric  
12 map that Ms. White Face provided" -- and that's OST001  
13 at 15. And finally "a close examination of the  
14 potentiometric map" -- and that is OST001 at 15 -- Is  
15 Exhibit 4 that map? Okay. That is OST001 at 15,  
16 Exhibit 4 -- "indicates a groundwater flow direction  
17 in the Arikaree at its southwestern edges as primarily  
18 west and northwest away from the reservation" which is  
19 just the physical nearest location to the Crow Butte  
20 facility.

21 I was just curious whether, Ms. White  
22 Face, you had any evidence to refute those statements  
23 made by the staff in their rebuttal testimony. Okay.  
24 And you're nodding your head no.

25 MS. WHITE FACE: No.



1 CHAIR GIBSON: It's very important to say  
2 yes or no rather than shake your head because the  
3 court reporter can't really pick up what you're  
4 saying, ma'am. Okay?

5 MS. WHITE FACE: Yes.

6 CHAIR GIBSON: Thank you.

7 JUDGE WARDWELL: In your testimony on  
8 pages five to six, you state that "When naturally  
9 occurring uranium is disturbed" we've been through  
10 that. We don't have to cover that.

11 And we've been through that. Okay. Now  
12 I have I think just one question for Ms. White Plume.  
13 Is she still here or is she around or can we -- Okay.  
14 Great.

15 Thank you, Ms. White Face. That's all the  
16 questions I have. I appreciate your coming here and  
17 the information you've provided in your testimony.

18 DR. LAGARRY: She came down from Rapid  
19 City today. Can she be excused after today? Is that  
20 alright?

21 CHAIR GIBSON: My only reservation about  
22 that for the rest of the day, yes. But there may be  
23 some additional questions that someone has that we'll  
24 have to ask her tomorrow morning.

25 DR. LAGARRY: Okay. Thank you.

1 CHAIR GIBSON: Or some time.

2 DR. LAGARRY: All right.

3 CHAIR GIBSON: Fair enough. While she's  
4 getting seated, Dr. Lagarry, I'm curious. Ms. White  
5 Face just mentioned the places where the sampling was  
6 done. Are all of those or any of those in the oval?  
7 And, if so, which ones? The oval that you just drew?

8 DR. LAGARRY: May I have the oval back?

9 CHAIR GIBSON: Okay.

10 DR. LAGARRY: Communities aren't marked on  
11 the map. But based on what I can see, possibly Pine  
12 Ridge, Manderson and Porcupine, but neither Kyle nor  
13 Oglala.

14 CHAIR GIBSON: Thank you.

15 JUDGE WARDWELL: Welcome, Ms. White Plume.  
16 In your testimony that's INT Exhibit021, page one, you  
17 state that all over the reservation we have to hook up  
18 to the rural water supply system funded by the United  
19 States to pipe in drinking water from the Missouri  
20 River at Pierre, South Dakota because our groundwater  
21 tests reveal high amounts of radioactivity and arsenic  
22 and other contaminants. Do you have any evidence that  
23 indicates that that radioactivity and the arsenic and  
24 the other contaminants have come from Crow Butte  
25 facility here?

1 MS. WHITE PLUME: I don't have the  
2 evidence that everybody else has in terms of western  
3 science.

4 JUDGE WARDWELL: Okay. Thank you.

5 MS. WHITE PLUME: I just know what I know.

6 JUDGE WARDWELL: Okay. And do you have  
7 any idea over what periods of years the groundwater  
8 beneath the reservation has been tested?

9 MS. WHITE PLUME: It's been tested since  
10 the mid '80s that I know of.

11 JUDGE WARDWELL: Any idea of how many  
12 separate times the water was tested from the 1980s to  
13 the present? Was it one? Was it 10? Was it 100  
14 different times? Just an order of magnitude to get a  
15 feeling for that.

16 MS. WHITE PLUME: My our tribe it's tested  
17 four times a year.

18 JUDGE WARDWELL: Okay.

19 MS. WHITE PLUME: By the Mni Wiconi Tribal  
20 Water Department. That is supervised by the EPA.

21 JUDGE WARDWELL: Thank you. And is it  
22 true that all the community wells around the  
23 reservation are now no longer used or are they still  
24 used to some degree to your knowledge?

25 MS. WHITE PLUME: Rarely do we find a home

1 getting water from a deep well. They require us to  
2 hook up to Mni Wiconi and they're mixing groundwater  
3 with Missouri River water and then pumping it into our  
4 homes.

5 JUDGE WARDWELL: And who is they?

6 MS. WHITE PLUME: The Sioux Tribe real  
7 water system and it's also known by Mni Wiconi.

8 JUDGE WARDWELL: Okay. Thank you.

9 MS. WHITE PLUME: We did our own water  
10 samples as well. A few years ago, the organization I  
11 belong to Owe Aku, Bring Back the Way, we tested 11  
12 wells. I didn't submit anything as evidence, but all  
13 of those wells were high in arsenic above the legal  
14 MCLs and uranium and other alpha emitters as well.

15 JUDGE WARDWELL: Thank you, Ms. White  
16 Plume. I think that's all the questions I have for  
17 you. Appreciate you coming here today.

18 Moving on to the adequacy of the spill  
19 contingency plan. Again you're welcome to stay there.

20 CHAIR GIBSON: There may be some questions  
21 that are raised by her examination that we may need to  
22 be asking tomorrow. So if you could come back  
23 tomorrow, there will be parties maybe submitting  
24 additional questions to ask you, ma'am, if it's  
25 possible and not too much of an inconvenience. Thank

1       you, ma'am.

2                   JUDGE WARDWELL:  You don't have to leave  
3       us either if you don't want to.  I mean the more the  
4       merrier.  But you're smart.  Get when you can.

5                   The Intervenor's Exhibit 046, page three,  
6       Dr. Kreamer, opines that "the surface spills or  
7       contaminants that are transmitted through faulted  
8       regions or from surface expressions of the Basal  
9       Chadron sandstone/Chamberlain Pass formation would  
10      have the potential to reach and infiltrate the  
11      alluvium."

12                   NRC's testimony on Exhibit 001, pages 27  
13      to 33, answer D3 to D4, staff's EA discusses the spill  
14      control and management program in sections 4.6.1.2 and  
15      4.6.2.2.2 through .4.  It also looks at the lack of  
16      transmission through the mine aquifer in sections  
17      3.5.2.3.1 to .2 and 4.6.2.1.

18                   The EA also looks at the lack of  
19      transmissions through the faults at 3.5.2.3.1.  And  
20      the EA discusses that the White Water structural  
21      feature which is approximately two miles north of the  
22      license area does not affect the hydraulic confinement  
23      of the Basal Chadron aquifer as discussed in  
24      3.5.2.3.3.

25                   Exclusive of this hydraulic confinement

1 which we don't need to discuss anymore, does not this  
2 discussion and the previous impacts showing no impacts  
3 from excursions, spills or daily operations address  
4 your concerns or alleviate any impacts associated with  
5 the spills of contaminants, not the movement from  
6 aquifers, but just the pure spills?

7 DR. KREAMER: Thank you, Your Honor. Are  
8 you talking about surface spills as well?

9 JUDGE WARDWELL: Yes, that's what we're  
10 talking about.

11 DR. KREAMER: Okay.

12 JUDGE WARDWELL: Either surface spills or  
13 leaks from pipes which we'll talk about specifically.  
14 But just a general -- What I'm really asking is in  
15 your review of the overall spill contingency plan  
16 which I basically just described as where it's  
17 presented in the EA where do you see the deficits in  
18 that plan and how would you improve it?

19 DR. KREAMER: Sure. There have been  
20 spills you know. There's a 300,000 gallon spill which  
21 only 100,000 gallons were recovered.

22 JUDGE WARDWELL: I will get some  
23 documentation on that also to talk. So we will know  
24 the spills.

25 DR. KREAMER: But let's just talk about

1 pipeline monitoring. The pipeline monitoring is  
2 basically due to pressure drops. And that doesn't  
3 sound too sophisticated. And in fact it does not work  
4 for small chronic leaks. I know this for a fact. I  
5 published a paper on it.

6 The Grand Canyon Pipeline takes water from  
7 the North Rim to the South Rim, changing isotopic  
8 ratio of a spring, unrecognized by the Park Service.  
9 There was no pressure drop in the pipeline. And when  
10 we found the change in the spring isotopic ratio they  
11 looked and found a pinhole leak that had dug a hole  
12 nine feet deep. It has been a chronic leak. And it  
13 supplied about half of the spring's water.

14 So pressure drop testing in pipes is good  
15 if you have a massive leak. You can catch it and you  
16 can stop it. But if you have a chronic slow leak in  
17 a gasket you could have perpetual leak going on. I  
18 find that to be a drawback to the current monitoring  
19 system.

20 The surface impoundments have shown that  
21 the leak detection system that they have which I'm not  
22 sure how robust it is, but they do have a leak  
23 detection system that has detected leaks in pond one,  
24 pond three, pond four about once a year with one or  
25 two years missing in the last ten years. So the ponds

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1 are leaking.

2 The amount of leak and the remediation for  
3 that, I'm unclear on what the industry and how they're  
4 going to assess whether it's gotten away from them or  
5 not in the surface area for the impoundments.

6 Some of the impoundments in the area that  
7 are cattle feeds have become discolored in the last  
8 few years. That might just be climate or algae. And  
9 as I mentioned before, there seems to be a change in  
10 some of the surface reservoirs.

11 But as far as their monitoring system goes  
12 for surface spills and leaks, I understand that there  
13 was a truck leak that was close to one of the small  
14 springs. They're not monitoring the springs in the  
15 area.

16 I guess if you look at the EA the EA talks  
17 about White River and the fish and the endangered fox  
18 and eagle. And they restrict their discussion to the  
19 White River, whereas they don't talk about all the  
20 small drainages which as I say were flowing a few days  
21 ago, how perennial they are, what the water quality  
22 is, what a leak would do to impact wildlife and  
23 anybody down gradient who might use the reservoirs or  
24 any cattle that might use the impoundments down below.  
25 That lack of monitoring I think is a drawback to the

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1 current system.

2 JUDGE WARDWELL: Thank you. Crow Butte  
3 testimony 001, pages 45 to 46, answer 86, "Crow Butte  
4 performed pre-operational water quality sampling and  
5 conducts quarterly sampling of Squaw and English  
6 Creeks, both upstream for background and downstream of  
7 the mine site. This data does not indicate impacts  
8 from the Crow Butte operations on water quality in  
9 either of the water bodies."

10 Why aren't these steps sufficient to  
11 assure some surface water for monitoring protection?

12 DR. LAGARRY: Someone coughed in the  
13 middle of you reading that. So I didn't quite hear  
14 everything. But I think you were talking about  
15 upstream and downstream monitoring on English Creek.

16 JUDGE WARDWELL: And Squaw Creek.

17 DR. LAGARRY: And Squaw Creek. Yes, there  
18 are several others, West Ash Creek, several unnamed  
19 creeks. There's White Clay Creek. And these issue  
20 water from the area. By going upstream and  
21 downstream, you might have a contaminant that might be  
22 diluted and therefore you would miss it. I don't know  
23 the specifics of how often this is done, how rigorous  
24 the testing is, what water quality parameters are  
25 looked at, those particularly that might be sensitive

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1 for wildlife, selenium and others.

2 So the adequacy of the sampling regime for  
3 surface water is certainly with a huge amount of  
4 rigor. Again, having not seen all the data associated  
5 with the frequency, I should not comment on the  
6 adequacy of that. But generally when I do studies for  
7 spring sustainability in the National Parks, we're a  
8 little more rigorous than just one upstream/downstream  
9 on one tributary and not all of them.

10 JUDGE WARDWELL: Thank you. Crow Butte's  
11 testimony on -- No, submittals in their license  
12 renewal application and that's again Exhibit 011, page  
13 5-29, "Spills can take two forms within an in situ to  
14 uranium mining facilities. Surface spills such as  
15 ponds leaks, pipe ruptures, transportation accidents,  
16 etc. and subsurface releases such as well excursion in  
17 which process chemicals migrate beyond the well field  
18 or pond liner leak resulting in the release of waste  
19 solutions." I think that coincides with some of your  
20 statements, Dr. Kreamer. And they're aware of that.

21 They go on to testify on 001, page 44,  
22 answer 83, "The most common form of surface release  
23 from in situ mining operations occurs from breaks,  
24 leaks or separations within the piping that transfer  
25 mining fluids between the processing plant and the

1 well field."

2 CBR, my first question is what type of  
3 pipe is used in the field and how is it exposed to  
4 damage?

5 MR. TEAHON: In the early mine units two,  
6 three, four, we used PVC gasketed jointed pipe. Since  
7 then we've went to high density polyethylene fusion  
8 welded pipe.

9 JUDGE WARDWELL: And how is the PVC  
10 welded?

11 MR. TEAHON: Well, the PVC was gasketed,  
12 jointed pipe.

13 JUDGE WARDWELL: And what are the causes  
14 of what you state are breaks, leaks or separations?  
15 Is there any specific accident that happens that  
16 causes them or is it just deterioration of the  
17 pipeline? How do they happen to separate?

18 MR. TEAHON: We document of all of the  
19 spills that we have onsite and assess them. They can  
20 be anything from a bleeder valve that's been left open  
21 on an injection well to bleed out the air or it could  
22 be a fusion weld. It could be a joint leak.

23 JUDGE WARDWELL: I'm focusing now on the  
24 pipelines and the breaks, leaks or separation from the  
25 pipeline only.

1 MR. TEAHON: Okay. On the pipelines  
2 themselves, it would be a failed fusion weld or a  
3 failed gasketed joint.

4 JUDGE WARDWELL: Thank you. And do you  
5 have an idea of what percentage of your pipe on the  
6 site is either buried or underground? And I don't  
7 know if you -- When I speak of underground as opposed  
8 to buried, buried I'm referring to pipes that have  
9 soil around it. Underground pipes are pipes that are  
10 underground, but don't have soil around it. They're  
11 in some type of a chamber or whatever. It has a soil  
12 wall wrapped around it.

13 MR. TEAHON: So all the trunk lines and  
14 the piping going from the well house to well heads are  
15 all buried less than four foot below the surface.

16 JUDGE WARDWELL: So what percentage of  
17 that is buried of your total piping? Ninety-nine?

18 MR. TEAHON: 99.9 percent.

19 JUDGE WARDWELL: Okay. Virtually, all  
20 your pipe is buried.

21 MR. TEAHON: Yes, sir.

22 JUDGE WARDWELL: And do you do that for  
23 what reason?

24 MR. TEAHON: Protection.

25 JUDGE WARDWELL: And then how are the

1 leaks observed from the buried pipes?

2 MR. TEAHON: How are they observed?

3 JUDGE WARDWELL: I assume there's no  
4 underground pipes.

5 MR. TEAHON: They're buried four foot or  
6 less.

7 JUDGE WARDWELL: They're buried. There is  
8 none that are underground. My definition of  
9 underground, beneath the surface of the ground but in  
10 a chamber, a casket or something like that.

11 MR. TEAHON: No. Multiple ways. We do  
12 field observations of the well field twice daily.  
13 Each shift change does a visual observation of the  
14 wells.

15 JUDGE WARDWELL: And if they're buried,  
16 how do you see anything?

17 MR. TEAHON: Water to the surface.

18 JUDGE WARDWELL: Okay.

19 MR. TEAHON: Secondly, the pressure on the  
20 trunk lines is monitored continuously. So you would  
21 see a drop in pressure if a trunk line broke.

22 And thirdly each well has its own flow  
23 meter, injection well and production well. And they  
24 have limits set on those. So if those flows changed,  
25 an alarm sets off and then an operator would be

1       dispatched to check that well.

2               JUDGE WARDWELL:  And wouldn't it take it  
3       seems to me a fairly large leak before you would  
4       detect a pressure drop or a drop in the flow rate  
5       before that would be picked up?  Do you have any idea  
6       what size leak you need before that would be picked  
7       up?

8               MR. TEAHON:  I couldn't answer that, sir.  
9       I don't know.

10              JUDGE WARDWELL:  Are there not slow leaks  
11       that could occur that wouldn't be picked up by that?

12              MR. TEAHON:  We have not found any in our  
13       operation to date.

14              JUDGE WARDWELL:  But isn't it feasible  
15       that -- in fact, I've seen some PVC pipe where the  
16       gasket leaks and it's just spraying out slowly.  Would  
17       that necessarily be picked up?  And wouldn't that be  
18       a long term issue then because you wouldn't be able to  
19       detect it?

20              MR. TEAHON:  You would see it in the  
21       wintertime.  There wouldn't be any frost there.  You'd  
22       see moisture on the surface.

23              JUDGE WARDWELL:  I'm sorry.  There  
24       wouldn't be any what?

25              MR. TEAHON:  Any frost on the ground

1       there.

2                   JUDGE WARDWELL:   Okay.

3                   MR. TEAHON:   You would see that.

4                   JUDGE WARDWELL:   So you're saying that the  
5       maximum would be 12 months that it would go if it  
6       happened right when the spring thaw or less than that.  
7       Say, around here, when does the frost get in the  
8       ground?   Another month?

9                   MR. TEAHON:   Yeah, hopefully.   Yes, sir.  
10       You would see that on the surface.

11                  JUDGE WARDWELL:   Okay.   Intervenors'  
12       testimony 069, page eight, Dr. Kreamer raises the  
13       issue that chronic leaks and pipes would not be caught  
14       similar to the line of questioning I was just driving.  
15       And they state that they could be quite sizable and he  
16       states that it could be quite sizable in the long  
17       term.   And I think you've already addressed that in  
18       regards to the question I just asked you which was  
19       essentially the same one I believe.

20                  MR. TEAHON:   Yes, sir.

21                  JUDGE WARDWELL:   Crow Butte, in your  
22       testimony page 44A, 83, one section of underground  
23       piping that passes beneath Squaw Creek is double  
24       contained for additional protection.   My first  
25       question is is there a leak detection system

1 associated with this double containment of this pipe.

2 MR. TEAHON: Yes, sir. There is.

3 JUDGE WARDWELL: And could you explain for  
4 us how this double containment occurs and how does the  
5 leak detection system work also?

6 MR. TEAHON: It's a pipe inside of a pipe  
7 going underneath Squaw Creek. And there is just bare  
8 wires in there. So if there was moisture that  
9 contacted those wires it would set off an alarm. That  
10 is tested monthly to make sure that it's working. And  
11 to date we haven't had anything --

12 JUDGE WARDWELL: There is just one set of  
13 bare wires or is there a series of them?

14 MR. TEAHON: One on each end of the pipe  
15 going into the creek.

16 JUDGE WARDWELL: So this pipe is  
17 underground. How does that get to the surface, the  
18 wires? They just come out from the -- You've got a  
19 larger pipe which the production pipe goes through and  
20 under Squaw Creek and then comes back out. And all of  
21 that's buried, correct?

22 MR. TEAHON: Yes, sir.

23 JUDGE WARDWELL: So then your leads from  
24 the outlets of the pipes, the larger pipe, then comes  
25 up to the ground surface. Or how is that handled?



1 And introduce yourself when you first talk because a  
2 new witness at this point.

3 MR. PAVLICK: Yes, sir.

4 JUDGE WARDWELL: If you are the one that's  
5 nestling up to the mike that's going to speak next.

6 MR. PAVLICK: Doug Pavlick, CBR. The  
7 outer plate is capped at both ends or sealed around  
8 the inner pipe. There are stand pipes on each end. So  
9 each side of the creek, that's where the wires are  
10 cropped into the annular space between the two pipes.  
11 That's where the contacts are. So if there's a wet --

12 If they become wet, they make contact.  
13 That initiates the alarm to the control room. And the  
14 operators are dispatched to deal with that. They  
15 will shut down the pipeline and that's how it's  
16 communicated and addressed.

17 JUDGE WARDWELL: And then you would dig it  
18 all up and.

19 MR. PAVLICK: Yes, if necessary. Shut it  
20 down, drain it, dig it up, prepare it, pressure test  
21 it, put it back in service.

22 JUDGE WARDWELL: And where you're testing  
23 this at the outlets to the pipe itself and the large  
24 pipe, right, where the stand pipes are?

25 MR. PAVLICK: Yes. So it's well away from

1 the stream bed on either side. Yes.

2 JUDGE WARDWELL: And is the pipe deep  
3 enough to start with that there's not much of a bend  
4 as it goes down or does it in fact have a U shape as  
5 it goes down underneath the Squaw Creek?

6 MR. PAVLICK: It's got a little bend to  
7 it. So what probably comes up the sides of the stream  
8 bank may be a few feet like three feet, five feet,  
9 something like that.

10 JUDGE WARDWELL: And you're testing it at  
11 that three or five foot level. So in fact you're not  
12 testing the lowest point of this where the water would  
13 first accumulate. Is that it?

14 MR. PAVLICK: No, but the annular space  
15 that we're talking about between the two pipes is very  
16 few gallons maybe. There might be 50 gallons of  
17 actual volume there. So it wouldn't take long to  
18 occur that.

19 JUDGE WARDWELL: And what's the total  
20 length of this?

21 MR. PAVLICK: So where we cross -- Well,  
22 there's a couple of creek crossing. So they're  
23 probably less than 100 feet for this double wall  
24 containment.

25 JUDGE WARDWELL: Your testimony -- Sorry.

1 In the license renewal application on page 531, Crow  
2 Butte, and that's Exhibit 011, "In regards to seepage  
3 of solutions from evaporation ponds, construction and  
4 operational safeguards have been implemented to ensure  
5 maximum competency of the synthetic liner and earthen  
6 embankments and an under drain leak detection system  
7 installed to allow for sampling that would detect a  
8 leak in pond monitoring wells that are also located  
9 downstream of the evaporation ponds to detect leaks in  
10 the uppermost aquifer into the lowermost aquifer."

11 Do you do the same thing with explaining  
12 how the liner system is designed and leak detection  
13 system is for these evaporation ponds?

14 MR. PAVLICK: Yes, it's a double walled  
15 system, a double liner system, with a geotextile  
16 membrane between the two liners. If you think of it,  
17 it's like a sandwich with an open space of  
18 approximately a quarter inch and that's the area where  
19 water collects if there's a leak in the upper liner or  
20 the liner that's in contact with the fluid.

21 JUDGE WARDWELL: Is that open space  
22 associated with the geotextile?

23 MR. PAVLICK: Yes. And that's just to  
24 hold space open so water can flow to the collection  
25 points. There is some slope towards either end of the

1 pond that water would collect in stand pipes where  
2 leak detection equipment is placed. Again, it's a  
3 probe that detects the presence of water. And it's  
4 also a way to evacuate water if it found between the  
5 liners.

6 JUDGE WARDWELL: And does that give an  
7 alarm or is that looked at on a regular basis?

8 MR. PAVLICK: It's monitored on a regular  
9 basis.

10 JUDGE WARDWELL: And what is that regular  
11 basis?

12 MR. PAVLICK: Weekly.

13 MR. TEAHON: Weekly, sir.

14 JUDGE HAJEK: What maintains the quarter  
15 inch in between the two liners?

16 MR. PAVLICK: The geotextile membrane is  
17 basically a mesh, an HDPE mesh. So it's like an open  
18 spaced screen.

19 JUDGE WARDWELL: So you've got a  
20 geotextile membrane. That's what you're calling a  
21 geotextile -- It's really a grid type. It's a  
22 drainage net, isn't it, in actuality?

23 MR. PAVLICK: Yes.

24 JUDGE WARDWELL: Yes. And then another  
25 membrane.

1 MR. PAVLICK: A 60 mil liner on top this  
2 drainage fabric, 40 mil liner on the bottom I believe  
3 and then the whole system is surrounded by guard wells  
4 or monitor wells. If both of the liner were to leak,  
5 it would be detected by the monitoring wells.

6 A point of clarification, the leaks that  
7 are referred to in the testimony are leaks to the  
8 upper liner. They've been caught and that leak fluid  
9 has been captured in the interstitial space between  
10 the two liners and pumped to an adjacent pond. The  
11 fluid hasn't been lost.

12 JUDGE WARDWELL: And then are the leaks  
13 detected and repaired or?

14 MR. PAVLICK: Yes, there's active  
15 monitoring on the pond. So we're checking the lead  
16 detection system for fluid. We also have guidelines  
17 if there's a rapid drop in the pond level. Whatever  
18 initiates the thought that there is a leak present, we  
19 pump the fluid out of the pond until the leak stops,  
20 until we stop collecting fluid in that interstitial  
21 space. That determines for us that the leak is above  
22 the water line because the leak stopped collecting  
23 water in the sumps basically in the pond.

24 Then we initiate a maintenance plan to  
25 determine where the leak is in the liner and repair

1 it. Then we return the pond to service, check to  
2 verify that the leak has been addressed and continue.

3 JUDGE WARDWELL: And how do you detect  
4 this leak? Is it relatively apparent or? I think  
5 some of them would be pretty small and you wouldn't be  
6 able to find them.

7 MR. PAVLICK: Yes, they can be small. But  
8 there is basically a visual process. So they manifest  
9 themselves along a seam for instance. So we check  
10 seams first. And so it's a process where we look  
11 until we find what we're looking for which is a hole  
12 in the fabric.

13 JUDGE WARDWELL: It's only looking for a  
14 leak. There's no testing device that you use for the  
15 seams or the main part of the membrane itself.

16 MR. PAVLICK: We can check the repair on  
17 the leak with vacuum box to verify that it's  
18 completely sealed. But basically our process is  
19 visual to identify the leaks in the first place.

20 JUDGE WARDWELL: Thank you.

21 JUDGE HAJEK: Let me just ask one more  
22 question. You stated that if a leak is detected by  
23 the leak detection system, you pump the water out of  
24 the pond into an adjacent pond. Is that correct?

25 MR. PAVLICK: That's correct.

1 JUDGE HAJEK: And the pond has sludge and  
2 other stuff at the bottom. Is that correct?

3 MR. PAVLICK: There's very little sludge  
4 in the pond. It's mostly high concentration salt  
5 solution.

6 JUDGE HAJEK: Of what solution?

7 MR. PAVLICK: Salt, sodium chloride.

8 JUDGE HAJEK: And what do you do with  
9 that? You're required to keep that moist. Is that  
10 not correct?

11 MR. PAVLICK: We're not pumping the  
12 sludge. We're pumping water off the pond and then not  
13 a lot of sludge present. So we drop the level of the  
14 pond to the level where the leak stops. The leaks in  
15 my experience -- that's eight years of operations at  
16 that site -- are always near the upper water line on  
17 the pond. We don't have leaks in the bottom of the  
18 pond.

19 In that case, we would have an issue of  
20 having to pump all the contents of the pond out, deal  
21 with a little bit of sludge on the bottom. If that  
22 were the need, then we would do that.

23 JUDGE HAJEK: As I understand, then you're  
24 pumping the water down a foot typically.

25 MR. PAVLICK: That's pretty common, yes.

1 JUDGE HAJEK: And so you're maintaining  
2 your requirement to keep the salt or the brine at the  
3 bottom wet.

4 MR. PAVLICK: That's correct, yes.

5 JUDGE HAJEK: Thank you.

6 JUDGE WARDWELL: And what are your slopes  
7 of your ponds, side slopes?

8 MR. PAVLICK: Two to one.

9 JUDGE WARDWELL: Those are where the  
10 repairs are taking place. Isn't that correct? They  
11 drop a foot or whatever it is. That's all.

12 MR. PAVLICK: Generally speaking, yes. We  
13 have to put operations in the rubber raft and they may  
14 have to float down there or descend down the side wall  
15 with a rope and address it.

16 JUDGE WARDWELL: How deep are these ponds?

17 MR. PAVLICK: They're 15 foot from the top  
18 to bottom.

19 JUDGE WARDWELL: I had another question,  
20 but I lost it. I may get back to it. I may be back  
21 to you in a second if I remember.

22 Ms. McLean, you've been very patient with  
23 us.

24 MS. MCLEAN: I assume that I was maybe  
25 clear enough that you wouldn't ask me any questions.



1 JUDGE WARDWELL: I can barely see you, but  
2 at least I see your glasses. We can go from there.

3 MS. McLEAN: Okay.

4 JUDGE WARDWELL: No, leave them on.

5 CHAIR GIBSON: No, put your glasses on.  
6 He was saying he couldn't see you over the monitor.

7 JUDGE WARDWELL: I can't see you over the  
8 monitor.

9 MS. McLEAN: I see. Okay.

10 JUDGE WARDWELL: All I could see where  
11 your glasses.

12 MS. McLEAN: All right.

13 JUDGE WARDWELL: It's what just shows  
14 above the top of the monitor. In your testimony, it's  
15 INT Exhibit 048, page 24, you state that the warranty  
16 by the manufacturer is only one year for polypropylene  
17 and two years for polyethylene and that the project is  
18 supposed to last 20 years and that the strips of the  
19 plastics will be bonded together by seams of heat  
20 and/or glue and that these have been shown in other  
21 EPA tests to leak.

22 In your experience, does this warranty by  
23 the manufacturer have any relationship to the  
24 serviceable life?

25 MS. McLEAN: Yes, that's the one to two

1 years and it's two years for polyethylene and this is  
2 an HDPE, which is a polyethylene. And that is pretty  
3 much determines the integrity of the plastics. It  
4 does not consider the high oxidative activity of  
5 something like these hazardous waste ponds. So I  
6 would expect that the true life of these things and  
7 the true life with integrity of these plastics would  
8 be much less.

9 The counterbalancing for that would be the  
10 thickness of the things. That helps when you have a  
11 60 mil ply thing. But still the plastic is the same.  
12 The chemistry of the plastics is the same. So it  
13 doesn't matter if you put food in it or whatever. The  
14 integrity of the thing just sitting out like I made an  
15 example of a milk jug on the side of the road is going  
16 to decay because those things internally decay anyway.  
17 That's just part of their natural degradation.

18 JUDGE WARDWELL: Mr. Deucher, I'm going to  
19 need that monitor moved. To impolite not to. Thank  
20 you, Joe.

21 Would just repeat everything? No, I'm  
22 kidding.

23 (Laughter)

24 MS. McLEAN: I will if you want me to.

25 JUDGE WARDWELL: But a manufacturer

1 wouldn't warranty a product for half or its full  
2 serviceable life, would it? I mean your car doesn't  
3 get warrantied for its whole life.

4 MS. McLEAN: No.

5 JUDGE WARDWELL: Your car goes longer than  
6 its warrantied, doesn't it?

7 MS. McLEAN: That's true.

8 JUDGE WARDWELL: As does almost  
9 everything.

10 MS. McLEAN: This has to do not with the  
11 service of the plastic, let's say, or what the plastic  
12 is exposed to whether it's going to be a milk jug or  
13 whether it's going to be water bottle or anything like  
14 that. It has to do with measuring the true integrity  
15 of the product, how long will it be functional doing  
16 nothing essentially.

17 So they won't warranty a product for a  
18 particular thing like a pond liner. You won't see a  
19 warranty for that. But this is just the integrity of  
20 the product and how it decays upon itself.

21 JUDGE WARDWELL: So it's your testimony  
22 that manufacturers believe their HDPE membrane will  
23 only last one year to two years.

24 MS. McLEAN: The integrity of it will last  
25 a year, two years. Two years for polyethylene, one

1 year for polypropylene.

2 JUDGE WARDWELL: And that's your testimony  
3 of what manufacturers believe these membranes will  
4 last.

5 MS. McLEAN: Yes. The integrity, the  
6 plastics integrity of the things.

7 JUDGE WARDWELL: Do you have any evidence  
8 that indicates that the leaks that EPA discusses  
9 relate to deterioration of the lining material itself?

10 MS. McLEAN: Do I have any -- Pardon me.

11 JUDGE WARDWELL: Evidence that the leaks  
12 that EPA discusses relate to the deterioration of the  
13 lining material as opposed to either construction  
14 activity either in regards to the seaming or  
15 construction equipment damaging the liner in the  
16 process of installing it.

17 MS. McLEAN: I don't know about damage in  
18 installing. But they've already commented that  
19 they've had leaks along the seams. And that indicates  
20 an improper fusion or a break in the seam somewhere.  
21 These things are what? Twenty to 30 feet wide.

22 JUDGE WARDWELL: Right. And that's my  
23 question.

24 MS. McLEAN: Yes.

25 JUDGE WARDWELL: Isn't EPA focusing on

1 that when it's talking about leaks and not the  
2 material itself in regards to a previous comment in  
3 dealing with the warranty?

4 MS. McLEAN: I don't know about the EPA,  
5 but you would expect that of the very first leak in  
6 pond one which I expect to be the oldest pond, the  
7 first pond they put up. That thing has continual  
8 leaks. In the first description of the leaks they  
9 said it had pinhole leaks. That's exactly what you  
10 would expect to find with the degradation and  
11 integrity of the plastic.

12 JUDGE WARDWELL: And you don't believe  
13 those pinholes are associated with the initial  
14 manufacturer.

15 MS. McLEAN: I don't think so.

16 JUDGE WARDWELL: Initial manufacturing.

17 MS. McLEAN: I would doubt that because  
18 it's a 60 ply. It's a 60 mil. It's very, very thick.  
19 So I would doubt that.

20 You would expect to get pinhole leaks when  
21 you expose these kinds of plastics to highly oxidative  
22 substances or acids. That's how the chemistry of the  
23 stuff, the integrity of the stuff, breaks down. You  
24 get pinhole leaks.

25 JUDGE WARDWELL: Thank you.

1 MS. McLEAN: Plus it's a mesh.

2 JUDGE WARDWELL: Plus what now?

3 MS. McLEAN: It's a mesh.

4 JUDGE WARDWELL: I'm sorry. I still  
5 didn't hear you.

6 MS. McLEAN: It's a mesh.

7 JUDGE WARDWELL: Okay. Thank you. It's  
8 a mesh, but the mesh is only between the two liners.  
9 Is it not?

10 MS. McLEAN: That's right.

11 JUDGE WARDWELL: And that's not intended  
12 to leak. That's intended to capture water, is it not?

13 MS. McLEAN: No, actually there's a --  
14 From what I have seen of the different manufacturers,  
15 they have some sort of a fabric, be it rayon or  
16 something like that, that's actually a fiber that is  
17 then coated on both sides with plastic, the HDPE.

18 JUDGE WARDWELL: Crow Butte, let's start  
19 with resolving the mesh between it. Is that an HDPE  
20 mesh or is it a coated fiber, geotex style mesh?

21 MR. PAVLICK: It's an HDPE mesh.

22 JUDGE WARDWELL: That is manufactured from  
23 the same plastic that's used for the membrane.

24 MR. PAVLICK: I believe so, yes.

25 JUDGE WARDWELL: Do you test these liners

1 after construction prior to filling it both in regards  
2 to seam testing and also the material in between for  
3 pinhole leaks either with some type of testing method  
4 or just a visual inspection, or whatever you do?

5 MR. PAVLICK: All the seams are tested  
6 upon construction and prior to filling with fluid.

7 JUDGE WARDWELL: And that's tested how?

8 MR. PAVLICK: Vacuum box.

9 JUDGE WARDWELL: Okay.

10 MR. PAVLICK: I'm sorry. What was the  
11 rest of your question?

12 JUDGE WARDWELL: What efforts do you do to  
13 look for an pinhole leaks that might be there or  
14 defects in the material either caused by construction  
15 equipment or just accidents that happen after it's  
16 manufactured and before it even gets to you?

17 MR. PAVLICK: Upon the completion of  
18 construction, the seams are tested. Any issues,  
19 visible issues, with the rest of the liner are usually  
20 due to equipment damage from installation. So there's  
21 a visual inspection of the entire system. There are  
22 repairs made if necessary. Again any repair is tested  
23 with the vacuum box. And upon that, it's basically  
24 ready for service.

25 JUDGE WARDWELL: I think you said this and

1 I want to verify that you said this in regard to the  
2 leak detection layer. It's called a drainage net. Is  
3 that correct? Did you say that? Or is that something  
4 I was dreaming here as the day gets long?

5 MR. PAVLICK: It's merely a material  
6 probably a sixteenth of an inch thick that's there to  
7 allow fluid from a leak to drain to collection points  
8 due to the sloping of the pond where it reports to a  
9 sump type area where the leak detection is present to  
10 identify it quickly and deal with it.

11 JUDGE WARDWELL: I understand that. I  
12 guess my question is unless you have a sample of that  
13 in your pocket I was wondering if you could give me a  
14 name that the manufacturer uses to label these types  
15 of geosynthetics that one could then look up on the  
16 internet to just see what it looks like if they wanted  
17 to. And if you don't know one, that's fine.

18 MR. PAVLICK: You're kind of using the  
19 term that -- So I have this actual drawing of the  
20 ponds in my office and it's referred to as geotextile  
21 membrane. It's a honeycomb looking material.

22 JUDGE WARDWELL: Okay.

23 MR. PAVLICK: And I'm sure that we can  
24 provide the exact ASTM designation report.

25 JUDGE WARDWELL: I think that's fine.



1 MS. McLEAN: Your Honor, I gave you a link  
2 to a manufacturer there and what they said in my  
3 testimony. There's a link in there.

4 JUDGE WARDWELL: Okay. But all I was  
5 after was to visually see, have an opportunity for  
6 people to visually see, what this was in regards to  
7 the geomembrane, not to what manufacturers say about  
8 it. But thank you for that, too, because that's in  
9 another area and we appreciate that link.

10 You do state on page 24 of your testimony  
11 that "when the plasticizers are leeched from the  
12 plastics, the plastics become brittle and will break  
13 and then leak. I would expect leaks fairly quickly in  
14 these ponds because of the contact with these highly  
15 active, oxidative, chemical waste water facilitating  
16 that leeching of plasticizers and degradation."

17 How long would you estimate that these  
18 leaks form when you use a phrase "fairly quickly in  
19 the pond"?

20 MS. McLEAN: Sooner than one year.

21 JUDGE WARDWELL: Thank you.

22 MS. McLEAN: They're brittle.

23 JUDGE WARDWELL: The one thing I've  
24 encountered that comes closest to your description to  
25 me is a bottle of Chlorox. And I believe the one I

1 saw that I had was HDPE.

2 MS. McLEAN: I don't know that. I don't  
3 buy Chlorox.

4 JUDGE WARDWELL: If it wasn't, it was less  
5 rigorous than HDPE. Would you agree that HDPE, high  
6 density polyethylene, is one of the stronger of the  
7 geomembranes compared to some of the lower density  
8 ones?

9 MS. McLEAN: Yes.

10 JUDGE WARDWELL: And certainly some of the  
11 PVC liners, etc.?

12 MS. McLEAN: Yes.

13 JUDGE WARDWELL: Okay. And wouldn't  
14 something as nasty as Chlorox -- now I'm going to get  
15 sued for sure. Who makes Chlorox? -- anyhow.

16 CHAIR GIBSON: Maybe you could think of  
17 another word than nasty, Judge Wardwell.

18 JUDGE WARDWELL: Yes, maybe I should.  
19 Ambitious oxidizing abilities of Chlorox, would they  
20 not degrade that bottle of Chlorox such that they  
21 start springing leaks in your closet when you don't  
22 use it as infrequently as I do?

23 In fact, I only use it to clean certain  
24 things and not laundry. But yet that bottle sits  
25 there for years. I've had one for 15 years.

1 JUDGE WARDWELL: That depends on the other  
2 exposures that are going on, too, because you've got  
3 sunshine and wind. And if you see the pictures that  
4 I submitted on my rebuttal, you'll see that one of  
5 those pond is essentially dry. And we're at elevation  
6 here. So we have high levels to UV light that also  
7 compounds the problem because you've got UV light  
8 going through and being magnified by the water. And  
9 that's an oxidizer as well.

10 So you have combinations. Plus you've got  
11 freeze/thaw. That makes a difference. Weathering,  
12 freeze/thaw, and the sunlight. You don't get that  
13 with your Chlorox in the water.

14 Plus you don't have the other metals  
15 either. The metals are highly attractive ionically.  
16 And they will help to pull out those plasticizers even  
17 faster than Chlorox will.

18 JUDGE WARDWELL: But isn't HDPE fairly UV  
19 resistant? And I thought that was one of the reasons  
20 why people use it often.

21 MS. McLEAN: It just depends on how you  
22 treat it and what it's being exposed to. Chlorox  
23 doesn't have a lot of metals in it. And like I said,  
24 the metals in these things are highly attractive to  
25 these other organic compounds that are the

1 plasticizers.

2 JUDGE WARDWELL: In your testimony when  
3 you talked about the plasticizers leeching from these  
4 and the plastics becoming brittle fairly quickly, it's  
5 more than just the oxidative chemical waste that  
6 you're talking about.

7 MS. McLEAN: Yes.

8 JUDGE WARDWELL: Even though you didn't  
9 state that in your sentence.

10 MS. McLEAN: There's actually a chemical  
11 reaction along with that, yes.

12 JUDGE WARDWELL: Thank you.

13 Crow Butte, in your testimony -- let me  
14 just -- I'm not going to offer to excuse you because  
15 I just have a couple more questions, although I don't  
16 have any more for you.

17 MS. McLEAN: Thank you.

18 JUDGE WARDWELL: Like right now, you can  
19 leave, but we'd like all the company we can have  
20 around here. You're welcome to stay, but I don't have  
21 any more questions for you for today.

22 MS. McLEAN: Questions tomorrow?

23 JUDGE WARDWELL: And I only have a couple  
24 more questions.

25 CHAIR GIBSON: Yes, you'll have some

1 tomorrow certainly from Judge Hajek.

2 JUDGE WARDWELL: And I only have a couple  
3 other questions for other people. And then we're  
4 probably going to adjourn or recess for the night.  
5 Feel free to stay around if you wish.

6 Crow Butte, in your testimony 001, page  
7 45, answer 84, "Crow Butte's spill control programs  
8 have been very effective at limiting surface releases  
9 from mining operations. Crow Butte has never had a  
10 spill that was reportable under 10 CFR Part 20. All  
11 spills are analyzed for root causes and contributing  
12 factors."

13 What is the definition of a reportable  
14 spill?

15 MR. TEAHON: We have multiple  
16 requirements. If the spill enters the streams of the  
17 state, it's reportable. If a spill goes down or pools  
18 around a shallow monitor well, it's reportable. And  
19 if it goes outside the monitor well ring, it's  
20 reportable.

21 Then there are two radiological reporting  
22 requirements. Should we have to restrict access to  
23 the area for 24 hours due to the radionuclides in the  
24 area, that's reportable. If it exceeds or is five  
25 times greater than the allowable intake, it's

1 reportable.

2 JUDGE WARDWELL: I'm sorry. What's that?  
3 I don't understand that last one.

4 MR. TEAHON: It's 10 CFR 40.60(b)(1).  
5 That's the guidance for reporting. And it's the  
6 calculated activity of natural uranium released by the  
7 spill. If the spill involves a quantity of material  
8 greater than five times the lowest ALI (annual limits  
9 on intake) listed in Appendix B of 10 CFR 20, then the  
10 spill may be reportable under subpart M. And we  
11 calculate that on each step.

12 JUDGE WARDWELL: So it's based on some  
13 release of iridium concentrations that we don't fully  
14 understand.

15 MR. TEAHON: It's based on the parts per  
16 million in the fluid and the volume. So that's  
17 calculated in our spill report.

18 JUDGE WARDWELL: Thank you. And how many?  
19 You say you have never had a reportable spill.

20 MR. TEAHON: That's not true. We've had  
21 a reportable spill. We've put water into the streams  
22 of the state.

23 JUDGE WARDWELL: But in your testimony on  
24 this page I thought that was --

25 MR. TEAHON: Not reportable to the NRC.

1 Reportable to NDEQ.

2 JUDGE WARDWELL: Here's what I've got for  
3 a quote if I've got it right off of answer 84. "Crow  
4 Butte has never had a spill that was reportable under  
5 10 CFR Part 20."

6 MR. TEAHON: That's true.

7 JUDGE WARDWELL: Okay.

8 MR. TEAHON: That's true.

9 JUDGE WARDWELL: So some of the criteria  
10 you listed weren't under Part 20.

11 MR. TEAHON: That's true.

12 JUDGE WARDWELL: And that's why it was  
13 reportable for some of these -- one of these criteria.

14 MR. TEAHON: Yes, sir. Reportable to NDEQ  
15 3.

16 JUDGE WARDWELL: And how many of those  
17 have you had?

18 MR. TEAHON: Three.

19 JUDGE WARDWELL: Three of them. And much  
20 volume was associated with each spill of those three?

21 MR. TEAHON: Total volume.

22 JUDGE WARDWELL: No, each one if you  
23 could.

24 MR. TEAHON: Well, 4,000 to 40,000.

25 JUDGE WARDWELL: Cubic feet?

1 MR. TEAHON: Gallons.

2 JUDGE WARDWELL: Okay. What about other  
3 spills, non-reportable spills? How many of those do  
4 you have that you end up repairing or dealing with in  
5 a given year?

6 MR. TEAHON: How many total spills have we  
7 had onsite or how do we handle them?

8 JUDGE WARDWELL: How many total have you  
9 had that you had to do something about?

10 MR. TEAHON: Like I said, on every spill  
11 we go out and we assess the area. We map it out.

12 JUDGE WARDWELL: I know how you do it. I  
13 want to know the number that you have.

14 MR. TEAHON: Three hundred and fifty-  
15 eight.

16 JUDGE WARDWELL: Total?

17 MR. TEAHON: Since operations began.

18 JUDGE WARDWELL: Okay, 358 in the 20  
19 years.

20 MR. TEAHON: In volumes as small as one  
21 gallon to 40,000 gallons.

22 JUDGE WARDWELL: Thank you. What was the  
23 largest spill you ever had?

24 MR. TEAHON: Forty thousand gallons.

25 JUDGE WARDWELL: And then approximately



1       how much of that was recovered? Do you have any idea?

2               MR. TEAHON: Not off the top of my head.  
3       I don't know. But we calculate that and it's part of  
4       our spill report.

5               JUDGE WARDWELL: Thank you. And I assume  
6       the rest was infiltrated. Or where did this occur and  
7       how did it occur and where did the --

8               MR. TEAHON: I don't know the exact  
9       location. That's documented in detail and kept onsite  
10      for the decommissioning records. What we do after, we  
11      go in and remediate, get the spill stopped, get it  
12      cleaned up. As soon as the area dries out, we go in  
13      and do a gamma survey with a GPS unit. So it marks  
14      out and gets the gamma readings of the area.

15              If the readings are such that the soil  
16      needs to be removed, we'll remove the soil. We have  
17      not had to do that ever. And then that information is  
18      part of the spill report and it's put into our  
19      decommissioning plan. And then upon decommissioning,  
20      those areas will go back and soil samples will be  
21      collected to make sure it meets the release criteria.

22              JUDGE WARDWELL: Thank you. INT 069, page  
23      two states that "there is inadequate information  
24      provided on the existence or the methods of sediment  
25      retention on the CBR site, such as silt fences which

1 would inhibit offsite movement." And, for Crow Butte,  
2 could you summarize your efforts at assessing sediment  
3 impacts and the justifications for its efficiency?

4 MR. TEAHON: Sediment erosion control?

5 JUDGE WARDWELL: Yes.

6 MR. TEAHON: That's handled under our  
7 SPCC, spill prevention control and containment and our  
8 best management practice. When we're actively  
9 drilling we put our drill pits downstream so that if  
10 any water comes out of the pits it doesn't move  
11 downhill. We don't use silt fences. DEQ doesn't  
12 require us to do that.

13 Once the area has been impacted and we're  
14 done disturbing it, then it's reseated. And the DEQ  
15 inspects that and then signs off on it.

16 JUDGE WARDWELL: And what did you say that  
17 you put downstream? I missed that.

18 MR. TEAHON: When we're digging our  
19 drilling pits, we put the spoil pile downstream. If  
20 any fluids come up out of the pits, it won't allow it  
21 to run downhill.

22 JUDGE WARDWELL: So you make a small berm.

23 MR. TEAHON: Yes. And we have a berm  
24 system around our entire mine site for the water  
25 areas, the live stream at Squaw Creek that goes

1 through there and English Creek's berm. And then we  
2 have secondary and tertiary berms throughout the well  
3 fields and three impoundment dams. If we did have a  
4 spill, we would keep it from going into those areas.

5 JUDGE WARDWELL: And can you describe the  
6 berms that are along the creeks and are they the full  
7 length of the creek that's within the mining area?  
8 The description of them meaning how high are they,  
9 what are the slopes, what are they composed of?

10 MR. TEAHON: Yes, sir. They're probably  
11 two to three foot high, grassed over.

12 JUDGE WARDWELL: Earthen berms.

13 MR. TEAHON: Earthen berms that we put in  
14 with a motor grader or front-end loader. They're  
15 inspected twice a year for their integrity. And any  
16 animal trails or such, any erosion issues, then are  
17 reported and fixed.

18 JUDGE WARDWELL: And now these secondary  
19 and tertiary, what are they surrounding and what's the  
20 purpose of those?

21 MR. TEAHON: When we start up a new well  
22 house, we do what we call a SERP. The Safety and  
23 Environmental Review Panel meets to go over the notice  
24 of intent that's submitted to the Nebraska Department  
25 of Environmental Quality. And part of that

1 inspection, part of the panel's review, is to make  
2 sure there are secondary and tertiary berms and the  
3 primary berms are installed prior to putting that well  
4 field or that well house into operation.

5 JUDGE WARDWELL: And these impoundments  
6 you're talking about, what volume of water are they  
7 downstream from that they're trying to retain to make  
8 sure it doesn't go any further?

9 MR. TEAHON: They're on the large drainage  
10 systems that go through the mine site. And I couldn't  
11 give you a volume. Sizeable. When it rains, it  
12 collects in there. We go out. We do a conductivity  
13 measurement to make sure it is rainwater and not  
14 mining solution. And then they're released.

15 JUDGE WARDWELL: And you just pump them  
16 out. You don't have a gate or anything.

17 MR. TEAHON: No, we have gates on them.  
18 We open the gates.

19 JUDGE WARDWELL: Okay.

20 I'll turn to Dr. Kreamer to see if he had  
21 any comments on things that he's heard in regards to  
22 the spill prevention program.

23 DR. KREAMER: Thank you, Your Honor. When  
24 there is a surface spill they said there were 358 of  
25 them up to 40,000 gallons. They said that their

1 criterion for whether or not to dig up soil was to do  
2 a gamma survey.

3 That I guess presupposes that no liquid  
4 got away and moved into the subsurface to the vadose  
5 zone to the Brule. And remediating just the soil if  
6 liquid did get away would not address that problem.  
7 I guess --

8 JUDGE WARDWELL: Could I just ask you a  
9 question on that?

10 DR. KREAMER: Certainly.

11 JUDGE WARDWELL: If water contains uranium  
12 in it or any radioactivity and it started to  
13 infiltrate, wouldn't there be residual water left  
14 behind due to that infiltration and wouldn't that be  
15 picked up by a gammameter?

16 DR. KREAMER: Not necessarily if all the  
17 water infiltrated. The one advantage is that uranium  
18 does absorb readily and so there's a good chance that  
19 it wouldn't migrate too far. So the method may work.  
20 But if there were any contaminants in the water  
21 associated with a spill that were not absorbable they  
22 would get legs and move.

23 MR. WIREMAN: May I add just one thing?  
24 In CBR 109, page 23, there's a discussion of a 300,000  
25 gallon leak that apparently happened in an injection

1 well 1-196 in March of 1996. And it describes the  
2 300,000 gallon leak out of this injection well, some  
3 of which went into the Brule and describes the  
4 remediation that was taken. And it was remediated as  
5 I see this under the authority of NDEQ.

6 JUDGE WARDWELL: Under the what? I'm  
7 sorry.

8 MR. WIREMAN: The authority of NDEQ. So I  
9 just point out that this is a 300,000 gallon escape of  
10 lixiviant.

11 DR. KREAMER: And in addition to that, it  
12 states that only about 100,000 gallons were cleaned up  
13 or about one-third.

14 JUDGE WARDWELL: Is it quick? Or I'll  
15 wait and get back to you. I don't have to go right  
16 now.

17 MS. McLEAN: It's quick. When you have a  
18 spill of that magnitude or any magnitude, you have all  
19 those heavy metals. Those can actually be as toxic or  
20 even more toxic than the original uranium. And the  
21 reason is because they're subject to organification by  
22 microorganisms either in the stream, in the bottom of  
23 the streams or the sediments or in the dirt. And that  
24 magnifies their toxicity in orders of magnitude. It's  
25 huge.

1           So those things really need to be cleaned  
2 up, not just the stuff that has the gamma rays. Once  
3 those metals are organified by microorganisms, then  
4 they quickly bioaccumulate up the food chain.

5           JUDGE WARDWELL: Thank you, Ms. McLean.

6           Comments on both the metals and these  
7 spills and the 300,000?

8           MR. TEAHON: The I-196, what I explained  
9 to you were surface spills. I-196 was an injection  
10 well in mine unit two that upon doing a mechanical  
11 integrity test on it found that there is a joint that  
12 had failed in the upper Brule formation.

13           So the Nebraska Department of  
14 Environmental Quality handles that like that they  
15 would a leaky underground storage tank. We went in  
16 and did delineation drilling. We put in 16 wells that  
17 impacts about 100 foot radius area. And from those 16  
18 wells, we started the recovery process.

19           What's missed on this is we calculated  
20 that there was a potential of 300,000 gallons that  
21 went down this well from the time it been mechanically  
22 integrity tested before until the time that we found  
23 that it had failed.

24           That doesn't mean 300,000 gallons went out  
25 into the formation. We know that it took around

1 100,000 gallons to restore that aquifer back to its  
2 baseline condition.

3 JUDGE WARDWELL: Thank you.

4 Any comments you want to add in regards to  
5 the metal content of any of the spills or water that  
6 you release from your programs?

7 MR. TEAHON: Other than the fact that we  
8 don't see a lot of heavy metals in our baseline  
9 sampling, that's just speculation, I don't know.

10 JUDGE WARDWELL: Thank you. That's good.  
11 We'll pick up tomorrow dealing with monitoring for  
12 excursions.

13 CHAIR GIBSON: We have some housekeeping  
14 matters we need to deal with. First of all, we've  
15 made the executive decision here to change what was  
16 OST004. We're going to change that to Board Exhibit  
17 006 being the oval that was written on that map  
18 because Judge Wardwell asked some questions about it  
19 to try to clarify what that exhibit is. So that will  
20 no longer be OST 004. It will be Board Exhibit 006.

21 (Whereupon, the above-referred  
22 to document marked as OST  
23 Exhibit 004 was changed to  
24 Board Exhibit 006 for  
25 identification.)



1 Dr. Lagarry, we asked you about where  
2 those particular samples were taken. You weren't  
3 sure. We would like for you to try to get an answer  
4 for us tomorrow on which of the samples were taken  
5 within the oval on what is now Board Exhibit 006.

6 And, counsel for Intervenor, Dr. Lagarry  
7 mentioned during his testimony that he gave you all a  
8 thumb drive with a bunch of publications on it. I  
9 assume you're not going to just -- Those are not just  
10 going to show up.

11 I hope that you all will spend tonight  
12 trying to figure out if something in there that he  
13 referenced in his testimony that we need a copy of,  
14 sort of like we did with Terry and Souder. If you do,  
15 please be sure and let us know that so that we can get  
16 that in.

17 Finally, we are going to be starting  
18 tomorrow instead of 9:00 a.m. at 8:30 a.m. As far as  
19 the proposed questions that you all are going to be  
20 preparing tonight for matters that did not get  
21 addressed satisfactorily during today, you have the  
22 option of emailing copies of those to Nick Sciretta  
23 and Sachin Desai as you did in the past with other  
24 things.

25 But we also would like you to give us a

1 hard copy before we start at 8:30 a.m. maybe. You  
2 don't have to be here at 8:00 a.m. though is my only  
3 point. If you'll get those to them, you can drop a  
4 hard copy off at like 8:20 a.m.

5 I believe that's everything we needed to  
6 cover for tomorrow. Fair warning, we may end up  
7 needing to go later tomorrow night. We have a lot of  
8 ground to cover. I don't know if we're -- If we don't  
9 finish on Friday, we're going to have to go into  
10 Saturday. So we've just got to keep pushing. I just  
11 want you all to know we will get started and do  
12 everything we can to try to get this thing finished by  
13 Friday night.

14 MR. REID: This is Andrew Reid.

15 CHAIR GIBSON: Yes, sir.

16 MR. REID: Do you have any -- And maybe I  
17 should ask this tomorrow, but I need to tell my  
18 contention one witnesses when to be here. I told them  
19 Thursday afternoon or Friday. Does that still sound  
20 about right?

21 CHAIR GIBSON: Your contention one  
22 witnesses will need to be here Thursday and Friday.  
23 We'll know -- We're going to have to get started on  
24 that Thursday. I know that Judge Hajek will go  
25 quickly through his questions just as Judge Wardwell

1 has.

2 MR. REID: All right. Thank you.

3 CHAIR GIBSON: However, you know we do  
4 have quite a lot of ground to cover there. So we'll  
5 give you our best estimate. Right now, I would say  
6 they'll need to be here Thursday morning.

7 MR. REID: Thank you.

8 CHAIR GIBSON: Right now. I think that's  
9 everything we have to cover. We will stand in recess  
10 until 8:30 a.m.

11 MR. BALLANCO: Your Honor.

12 CHAIR GIBSON: Yes.

13 MR. BALLANCO: Excuse me. Tom Ballanco.

14 CHAIR GIBSON: Yes, sir.

15 MR. BALLANCO: Just two quick matters. I  
16 know that the three pump tests that were handed out  
17 that are Board Exhibits 2A, B and C.

18 CHAIR GIBSON: Yes, sir.

19 MR. BALLANCO: We did touch on them  
20 slightly this afternoon. But again our experts only  
21 had a brief opportunity to review them. Will we  
22 return to those tomorrow?

23 CHAIR GIBSON: What I would suggest is  
24 this, Mr. Ballanco, I would suggest that you review  
25 those with your experts tonight. And to the extent

1 that you believe that they raise matters that need to  
2 be addressed I would suggest that you propose  
3 questions for the Board to ask tomorrow.

4 MR. BALLANCO: Thank you, Your Honor.

5 CHAIR GIBSON: Fair enough. That was your  
6 first matter. What is your second, sir?

7 MR. BALLANCO: The second, Your Honor, is  
8 this thumb drive I have from Dr. Lagarry.

9 CHAIR GIBSON: Yes.

10 MR. BALLANCO: Essentially there was some  
11 factual dispute yesterday between whether the  
12 Chamberlain Pass in fact existed under the Pine Ridge  
13 Reservation.

14 CHAIR GIBSON: Right.

15 MR. BALLANCO: This is documentation  
16 supporting the fact that it does. I can make copies  
17 or email to the parties and yourselves if you'd like.

18 CHAIR GIBSON: Definitely. Whatever it is  
19 you need to go through there and figure out what it is  
20 you want us to see and you want the other parties to  
21 see. And you need to get copies to the other parties.  
22 And then we can address how we're doing to deal with  
23 it after that. Okay. But the important thing is we  
24 can't do anything unless you've given a copy to the  
25 other parties and they've had a chance to look at it.

1 MR. BALLANCO: Understand.

2 CHAIR GIBSON: Fair enough. Is there  
3 anything else?

4 MS. SIMON: Your Honor, Marcia Simon.

5 CHAIR GIBSON: Ms. Simon.

6 MS. SIMON: I'm assuming you still want us  
7 to -- We're planning to send out those modeling files  
8 tonight as well.

9 CHAIR GIBSON: Absolutely. Thank you, Ms.  
10 Simon. And in case you guys thought you weren't going  
11 to have anything to do tonight hopefully you'll be  
12 getting some modeling information and you'll have a  
13 chance to work with that.

14 DR. STRIZ: Excuse me, Your Honor. I just  
15 want to caution that I have looked at these files and  
16 they will require someone who is a very sophisticated  
17 MONFLOW 2000 modeler to be able to be able to  
18 interpret them.

19 CHAIR GIBSON: Okay. Well, I believe that  
20 Dr. Kreamer is familiar with the modeling at least.  
21 So how sophisticated is I suspect will be a function  
22 of how well -- which raises another question, of  
23 course. And that is to the extent that that modeling  
24 raises new questions you may want to try to propose  
25 those as well in what you send to Mr. Sorretta and Mr.

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1 Desi and that you bring in hard copy to us.

2 Very well, we will see you all at 8:30  
3 a.m. We stand in recess until then.

4 (Whereupon, at 5:58 p.m., the above-  
5 entitled matter was recessed until 8:30 a.m. on  
6 Wednesday, August 26, 2015.)

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