

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: (teleconference)

Date: Friday, October 23, 2015

Work Order No.: NRC-1959

Pages 2404-2640

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ATOMIC SAFETY AND LICENSING BOARD PANEL

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SUPPLEMENTAL HEARING

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In the Matter of: : Docket No.
CROW BUTTE RESOURCES, : 40-8943-OLA
INC. : ASLBP No.
(License Renewal for : 08-867-02-OLA-BD01
the In-Situ Leach :
Facility, Crawford, :
Nebraska) :

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Friday, October 23, 2015

Nuclear Regulatory Commission
Hearing Room T-2 B45
11555 Rockville Pike
Rockville, Maryland

BEFORE:

MICHAEL M. GIBSON, Chair
DR. RICHARD E. WARDWELL, Administrative Judge
BRIAN K. HAJEK, Administrative Judge

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P R O C E E D I N G S

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10:02 a.m.

CHAIR GIBSON: Good morning. Mr. Welkie, is everybody connected and on?

MR. WELKIE: As far as I know.

CHAIR GIBSON: Okay, very well. Good morning. We are here today on Atomic Safety and Licensing Board Panel Docket Number 40-08943 concerning the United States Regulatory Commission's renewal of a source material's license to Crow Butte Resources, Inc. for its in-situ leach mining operation near Crawford, Nebraska.

First, let me introduce the Board that will be conducting this evidentiary hearing.

Seated to my right, your left, is Judge Richard Wardwell who holds a PhD in civil engineering and is a full-time Judge with the Atomic Safety and Licensing Board Panel.

To my left, your right, is Judge Brian Hajek, a retired faculty member in the nuclear engineering program at Ohio State University as well as a part-time Judge with the Atomic Safety and Licensing Board Panel.

I am Michael Gibson. I'm a lawyer and a full-time Judge with the Atomic Safety and Licensing

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1 Board Panel.

2 I am sad to say that Judge Alan Rosenthal
3 who served as a special assistant to the Board died
4 last month and we miss him terribly.

5 And next, I would like to have
6 announcements of counsel beginning first with Crow
7 Butte.

8 MR. SMITH: This is Tyson Smith, counsel
9 for Crow Butte.

10 CHAIR GIBSON: Counsel for the Nuclear
11 Regulatory Commission staff?

12 MS. SIMON: Good morning. This is Marsha
13 Simon for the NRC staff.

14 MR. CYLKOWSKI: David Cylkowski for the
15 NRC staff.

16 MS. MONTEITH: Emily Monteith for the NRC
17 staff.

18 CHAIR GIBSON: Okay. Counsel for the
19 Tribe?

20 MR. REID: Good morning. This is Andrew
21 Reid for the Oglala Sioux Tribe.

22 CHAIR GIBSON: Counsel for Consolidated
23 Intervenors?

24 MR. FRANKEL: Good morning. David
25 Frankel, counsel for Consolidated Intervenors.

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1 CHAIR GIBSON: Mr. Ballanco, I believe
2 you're on as well?

3 MR. BALLANCO: Yes, Your Honor, Tom
4 Ballanco for Consolidated Intervenors.

5 CHAIR GIBSON: Very well. Did I miss
6 anyone?

7 MR. ELLISON: And, Bruce Ellison for
8 Consolidated Intervenors.

9 CHAIR GIBSON: Very well. Thank you, Mr.
10 Ellison.

11 MR. ELLISON: Thank you, sir.

12 CHAIR GIBSON: Next, I would like to
13 introduce the Board's administrative staff.

14 First, we have two lawyers who serve as
15 our law clerks on this matter, Nick Sciretta And
16 Sachin Desai, also Sara Culler at the back of the room
17 there is our administrative assistant. She has ably
18 handled all of the arrangements in this matter.

19 Our IT coordinators for this trial are Joe
20 Deucher who is physically in the -- physically at
21 Chadron State College which is presented there on the
22 screen for those of you who can see it and Andy Welkie
23 who is physically here in the NRC court room in
24 Rockville, Maryland.

25 We also have a representative from the

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1 U.S. Nuclear Regulatory Commission's Office of Public
2 Affairs, Ms. Maureen Conley, hold up her hand there.
3 If there are any inquiries from the press of the
4 public, you can contact her at maureen.conley@nrc.gov
5 or by calling 301-415-8200.

6 Likewise, our Court Reporter today is
7 Brandon Paterson.

8 Finally, I would be remiss if I did not
9 acknowledge the hospitality of Chadron State College
10 which has graciously provided us with these use of its
11 Scottsbluff Room for this evidentiary hearing.

12 I would also note that weapons are
13 prohibited from entering these buildings.

14 One more thing, if you have a cell phone
15 and you're not using your cell phone to connect
16 yourself to this proceeding, please disable it and so
17 that we won't have any interruptions.

18 Here is a brief summary of why we are here
19 today.

20 On August 24 to 28 of this year, we held
21 five days of an evidentiary hearing on the nine
22 admitted contentions in this case. During the course
23 of those five days, it became clear that it would be
24 necessary to hold an additional day of hearing to
25 address some hydrology issues. Those hydrology issues

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1 are as follows.

2 First, whether the water levels in Brule
3 aquifer have lowered due to mining activities.

4 Second, what is the available head in the
5 Basal Chadron/Chamberlain Pass formation and the
6 maximum anticipated drawdown during Crow Butte's
7 operation and restoration of its mining facility?

8 Three, whether the results from four pump
9 tests demonstrate a hydraulic connection between the
10 Brule and Basal Chadron/Chamberlain Pass formations.

11 Four, whether the Basal
12 Chadron/Chamberlain Pass formation exists beneath the
13 Pine Ridge Reservation and its connection, if any, to
14 the Basal Chadron/Chamberlain Pass formation beneath
15 the license renewal area.

16 Six, to what degree, if any, do the
17 additional exhibits that were admitted after the
18 hearing commenced on August 24 affect the conclusions
19 regarding the structure of the White River feature and
20 the NRC staff's maximum likelihood modeling.

21 And, seven, to what degree, if any, do the
22 additional exhibits that were admitted after the
23 hearing commenced illustrate the groundwater flow
24 directions in the Arikaree and Brule aquifers
25 underlying the Pine Ridge Reservation and the license

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1 renewal area.

2 Once today's hearing concludes, the Board
3 will evaluate the evidence and issue its decision.
4 The Board certainly could conclude that the NRC staff
5 was correct in every respect and that the renewal of
6 the license does not pose significant environmental
7 impacts that are not adequately addressed in the
8 environmental assessment.

9 On the other hand, the Board could
10 conclude that there are environmental impacts not
11 addressed in the environmental assessment but that
12 those matters can be addressed by the insertion of
13 additional conditions in the license.

14 Or, that the evidence that has been
15 presented at this hearing adequately clarifies any
16 relatively insignificant errors or omissions in the
17 environmental assessment.

18 It is even possible if any errors are
19 significant enough that the Board could conclude that
20 the environmental assessment is deficient and that the
21 NRC staff needs to go back to the drawing board to
22 clear up those deficiencies.

23 All of these outcomes are possible.
24 Depending on the evidence that is adduced during the
25 five days we were in Crawford, Nebraska in August as

1 well as today.

2 Once we issue our decision, if one of the
3 parties does not like our ruling, that party can
4 petition the Commissioners to review our decision.

5 I should emphasize that this hearing is
6 essentially a trial. And that this Board and the
7 counsel and witnesses for the parties to this
8 proceeding will be the only folks with speaking parts.

9 If anyone arrived today hoping to talk
10 about your concerns with Crow Butte's mining
11 operation, I am sorry, but this is not the appropriate
12 forum for that.

13 However, under 10 CFR 2.328, this hearing
14 is open to the public. And so, those of you that are
15 in the audience are certainly welcome to be here to
16 view these proceedings.

17 As is obvious from those of you
18 participating and witnessing this, we are utilizing
19 some technology -- sounds like we're definitely using
20 some technology we hadn't expected there -- that will,
21 I hope, enable the Board and the parties to conduct
22 this hearing more effectively.

23 However, I want to apologize in advance
24 for any bugs we have not yet worked out of the system.
25 For example, we will have a bit of an audio delay so

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1 that what a speaker says may not track completely with
2 his or her lips. Our IT staff will do everything it
3 can to make this go as seamlessly as possible. But,
4 since we have a lot of moving parts, please be sure
5 when you do speak that you say your name and that you
6 speak into the microphone.

7 And, to keep things as fair and even as
8 possible, despite the fact that we have witnesses
9 today who are joining us through several different
10 methods, we would ask that witnesses refrain from
11 using the Internet while responding to the Board's
12 questions other, obviously, than to be connected via
13 the Internet to this proceeding.

14 Additionally, we will be transcribing this
15 proceeding and have established a mechanism for the
16 parties to correct the transcript of any errors.

17 As our September 24 Order explained, Crow
18 Butte shall circulate its proposed corrections to the
19 other parties by Wednesday, October 28, 2015.

20 Crow Butte shall then compile and jointly
21 file the complete list of proposed corrections from
22 all parties noting any disagreements by Monday,
23 November 9, 2015.

24 We have also set the schedule for the
25 post-hearing filings from the parties. Findings of

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1 fact and conclusions of law shall be due by Monday,
2 November 23, 2015. And, reply findings of fact and
3 conclusions of law shall be due by Friday, December
4 11, 2015.

5 We're using some display technology as
6 part of the evidentiary proceeding and you should be
7 able to see it on the display screens here in
8 Rockville and in Chadron and, hopefully, that's going
9 to make the information more accessible and
10 understandable.

11 Before we get into the examination of
12 witnesses, we need to go over a few housekeeping
13 matters.

14 While the Board itself will examine the
15 witnesses, many of the Board's questions will be based
16 on suggested questions that the parties have provided
17 to the Board through in-camera submissions.

18 At the conclusion of the Board's
19 examination today, we will also provide the parties
20 with an opportunity to draft additional questions they
21 would like to suggest for the Board to ask.

22 Of course, I know that counsel will be
23 diligent in this regard and will be jotting down any
24 proposed questions as we go along so that we won't
25 have to take a long break at the end of the day.

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1 And, counsel, no matter where you are
2 located, here, in Chadron or in your house or in a
3 hotel room, please be sure to send your proposed
4 questions via email to the clerks.

5 The Board may or may not ask those
6 additional questions but the parties will at least be
7 afforded an opportunity to submit them and they will
8 become part of the record, ultimately, in this case.

9 In questioning any particular witnesses or
10 group of witnesses, the Board is creating a record to
11 support a fair and reasonable determination of the
12 issues that are before us for decision.

13 We make our decisions based upon the
14 record of exhibits and testimony submitted by the
15 parties and developed in this hearing.

16 Before we go further, I assume no one has
17 anything further that requires the Board's attention?

18 Very well, hearing none, Mr. Smith, are
19 all of your witnesses present and prepared to testify?

20 MR. SMITH: Yes, Judge Gibson, they are.

21 CHAIR GIBSON: Ms. Simon, are all of your
22 witnesses present and prepared to testify?

23 MS. SIMON: Yes, they are, Your Honor.

24 CHAIR GIBSON: Mr. Frankel, are all of
25 your witnesses present and prepared to testify?

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1 MR. FRANKEL: Yes, Your Honor, although I
2 don't know about Dr. LaGarry, I can't see the staffing
3 room, but I assume he's there.

4 CHAIR GIBSON: I can see Dr. LaGarry and
5 he's waving his arms up, so yes, I think he's here
6 doing the wave.

7 So, I believe all your witnesses are
8 there, Mr. Frankel, correct?

9 MR. FRANKEL: As far as I know, yes, sir.

10 CHAIR GIBSON: Okay. Mr. Ballanco, I
11 guess you have the same witnesses and Mr. Frankel, so
12 all of them are present and accounted for?

13 MR. BALLANCO: Yes, Your Honor.

14 CHAIR GIBSON: Good. Mr. Reid, to the
15 extent you have witnesses that are not shared with
16 them, I assume all of them are prepared to testify?

17 MR. REID: Yes, we're joining with the
18 Consolidated Intervenors today. Thank you.

19 CHAIR GIBSON: Thank you, Mr. Reid.

20 Mr. Reid, we can't really see you. We can
21 see the ceiling in that room. There you go, now
22 you're there. So, if you wanted to be seen, there you
23 go, you've got to do that. Perfect, thank you.

24 MR. REID: Your Honor, I have Mr. Ellison
25 here with me and -- well, I have to leave for -- about

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1 an hour for a previous commitment, but I will be
2 joining Consolidated Intervenor proceedings today, so
3 I'll take the same positions that they take in the
4 proceedings.

5 CHAIR GIBSON: Very well, thank you, Mr.
6 Reid.

7 MR. REID: Thank you.

8 CHAIR GIBSON: Now, all witnesses have
9 previously been sworn and we did not adjourn but
10 recessed at that time. And so, they will not need to
11 be sworn again except for Mr. Lancaster who was
12 excused because of a family crisis. And so, we will
13 need to swear him in.

14 But, the rest, everyone else, remains
15 under oath. Does anyone not understand that?

16 Very well.

17 Mr. Lancaster, let me swear you in. Would
18 you please stand and state your name?

19 MR. LANCASTER: Thomas Lancaster.

20 CHAIR GIBSON: Very well, Mr. Lancaster.
21 Would you please raise your right hand?

22 You do affirm that all testimony you are
23 about to give in the case now before this Board will
24 be the truth, the whole truth and nothing but the
25 truth, this you do affirm under the pains and

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1 penalties of perjury?

2 MR. LANCASTER: I do.

3 CHAIR GIBSON: Very well, thank you.

4 Before I yield the microphone to Judge
5 Wardwell who, for his examination of the witnesses, I
6 do have one question for you, Ms. Simon.

7 I want to close the loop on a question
8 about the modeling data that went unanswered during
9 the initial hearing back in August.

10 When it was discovered that the modeling
11 data had not been included in your disclosures, I
12 asked you if you knew who made the decision not to
13 disclose it and, at the time, you said you had no idea
14 how the decision was made, but you guessed it was
15 probably just an oversight.

16 Now that you've had a chance to look into
17 this further, can you confirm that this was just an
18 oversight and was not a conscious decision by the
19 staff?

20 MS. SIMON: Yes, Your Honor.

21 CHAIR GIBSON: Okay. What can you tell
22 us?

23 MS. SIMON: Well, I'll qualify that and
24 say to the best of my knowledge --

25 CHAIR GIBSON: Okay.

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1 MS. SIMON: That's my determination.

2 CHAIR GIBSON: Okay.

3 Okay, Judge Wardwell, I believe you have
4 some questions.

5 JUDGE WARDWELL: I do have a few here.

6 Welcome everyone, again. And, we'll pick
7 up where we left off, hoping you all remember comments
8 made before in regards to how this is run and how the
9 questions will be addressed and will display the same
10 cooperation that you did in Crawford because that went
11 really well.

12 So, starting with that, we're off and
13 running on issue one which basically states whether
14 the water levels in the Brule aquifer have lowered due
15 to the mining activities.

16 And, as part of that, the NRC in their
17 testimony, Exhibit 095 on page 3 in answer 1.2
18 reference Board Exhibit 008A as being at Figure 2.7-3A
19 which was also in the License Renewal Application,
20 Exhibit Crow Butte 011.

21 And that exhibit shows the water levels in
22 the Brule aquifer in the 1982 to 1982 period. And the
23 figure was annotated at the evidentiary hearing to
24 identify a pre-mining water level of 3,883.7 feet at
25 well number 11. I imagine that refreshes everyone's

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1 memory of that.

2 And, based on the data entries in Table
3 2.7-5 of the License Renewal Application, the NRC in
4 its testimony goes on to say that the annotated values
5 is incorrect and should be somewhere between 3,830 and
6 3,834 feet, referencing again, the License Renewal
7 Application on page 2-194 which is at Table 2.7-5.

8 Also, they go on to say that Crow Butte
9 Exhibit 063 is a hydrograph of the Brule water levels
10 as SM717 from 1999 to 2005.

11 And, as shown on the exhibit of the Board
12 008B, SM717 is one of the excursion monitoring wells
13 located nearest to well number 11.

14 And, I will just note that under Crow
15 Butte Exhibit 063 shows a water level of about 3,850
16 feet for that SM717.

17 Also, in NRC's testimony in answer 1.4,
18 they go on to say according to Table 2.7-5 of the
19 License Renewal Application, the 12 water level
20 measurements collected between January and December of
21 1982 varied between 3,830 and 3,834.

22 Therefore, the water level of 3,883.7 for
23 well number 11 shown in Figure 2.7-3A is most likely
24 a transcription error.

25 And so, I'll turn to the staff to start

1 with and whoever wishes to answer this question
2 amongst you three, I will just ask that if the value
3 of number 11 changed from 3,883.7 to 3,838.7 as one
4 possible transcript correction that was -- or
5 correction to the transcription that occurred, the
6 transposition that occurred, and that if the 1990
7 value is 3,850 as reflected in SM717, then the water
8 level in the Brule increased by almost 20 feet between
9 1983 and 1999 which is the next time we had a
10 measurement.

11 Do you have any reasons why that -- first
12 of all, do you agree with that rough estimate of what
13 happened in the Brule between the measurements made in
14 number 11 initially with the transcription error
15 corrected by one mechanism and the subsequent 2000
16 reading in 717 causing a 20 foot rise?

17 MR. BACK: Your Honor, this is David Back
18 for the staff.

19 So, just so that I can jot them down, can
20 you give me the numbers that you're saying if the
21 transcription error?

22 JUDGE WARDWELL: Sure. Number 11, if you
23 remember correctly, was posted as 3,883.7.

24 MR. BACK: Right.

25 JUDGE WARDWELL: And, do you believe

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1 that's an error? And so, if one was to correct the 8
2 and 3 that was in the tens and single digit values of
3 that particular number and transposed those, that
4 would make for an elevation of 3,838.7 for number 11
5 as one possible corrected value for the elevation.

6 If that was the elevation, then the next
7 elevation recording in SM717, which is near that well,
8 was 3,850 and if you took the assumption that that was
9 what 11 would be reading at this point in time, then
10 that meant there's a 20 foot rise about. Is that
11 correct?

12 MR. BACK: Yes, Your Honor.

13 JUDGE WARDWELL: And, do you have any
14 reasons why you might see that type of rise
15 considering especially since none of it has occurred
16 since then? Since the 1990s, it's been fairly level
17 in 717.

18 MR. BACK: Yes, Your Honor. In Table 2.7-
19 5, the double asterisks next to well 11 state, well
20 may have been pumped prior to water level reading.
21 So, that might have been artificially depressed by
22 your 20 feet prior to that reading because it had been
23 pumped and now, based on that reading, now that that
24 area has recovered since it's no longer being pumped,
25 it's closer to what we're seeing today.

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1 JUDGE WARDWELL: Okay, thank you.

2 Are the other -- staying with you if I
3 might, Mr. Back, are the other wells in this same
4 area, and I say, for example, at well 64, 17 and 25
5 also transcription errors because they show a higher
6 elevation closer to what the 3,383 would have had for
7 number 11 that you claim is a transcription error?

8 MR. BACK: I need to look at that exhibit
9 to see --

10 JUDGE WARDWELL: Is there an exhibit that
11 you'd like to call up that you're -- which one are you
12 looking for?

13 MR. BACK: Oh, I'm looking for the one
14 that has the original data posted to it. Oh, okay, I
15 think I found it.

16 And so, Your Honor, you're saying that now
17 which --

18 CHAIR GIBSON: Mr. Back, could you please
19 let us know what you're looking at just so we can
20 follow along?

21 MR. BACK: Your Honor, I'm looking at NRC
22 Exhibit 96 Revision 1.

23 CHAIR GIBSON: Thank you.

24 MR. BACK: Page 1, because I believe
25 that's what has the data that you're referring to.

1 JUDGE WARDWELL: Is this the figure you're
2 looking at right now?

3 MR. BACK: Yes, Your Honor.

4 JUDGE WARDWELL: Okay. And, I believe the
5 wells 64, 17 and 25 are in that same general area as
6 well 7 was in -- well 11 was in, is that correct?

7 MR. BACK: Yes, Your Honor.

8 JUDGE WARDWELL: And, there are some
9 posted values for those that are in the high 3,800s,
10 17 had 3,863, 25 had 3,870 -- 71 really. And, what
11 was the other one I mentioned? Sixty-four. Sixty-
12 four -- if you could just raise that up a bit? The
13 other way, Andy. There you go -- 3,880. Are those
14 transcription errors also do you believe?

15 MR. BACK: Your Honor, are you suggesting
16 that that data does not match what's in the table or
17 are you suggesting that these are high elevations
18 relative to some of the other elevations?

19 JUDGE WARDWELL: I'm just noting that 11
20 shows 3,883, really 3,884, and you claim that's a
21 transcription error, but yet the other wells that show
22 in the range of between 3,860 and 3,880 are very
23 similar to what the 3,887 is at 11 that you claim is
24 a transcription error.

25 And I'm just questioning, do you claim

1 that those other wells should be a transcription error
2 or do you believe those are valid numbers?

3 MR. BACK: Your Honor, the staff believes
4 those are valid numbers. The topography goes up in
5 that area and the Brule water levels follow the
6 topography and that explains why those are higher in
7 those wells as you move towards Pine Ridge.

8 JUDGE WARDWELL: And, do you know the
9 depth below the ground surface to the Brule aquifer in
10 this area?

11 MR. BACK: Your Honor, Crow Butte has a
12 cross section that they submitted in their testimony
13 of the depths to some of these contacts. I do not
14 know the exact depth, but it might be in that.

15 JUDGE WARDWELL: Okay, thank you.

16 Going back to that figure again of 96 or
17 -- yes, we can go right back to that same one, Andy,
18 rather than the one I have here in my notes.

19 But, do not the levels of 3,883.7 in
20 number 11 match the potentiometric contour levels
21 shown on the isopach map of those levels?

22 MR. BACK: Yes, Your Honor. And,
23 typically what is done is --

24 JUDGE WARDWELL: Wait just a minute.
25 Could you pull that up, Andy? The 96, the last one

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1 you had, just bring that back up again. That's NRC
2 096-R. No, we need the figure 096, Exhibit 096,
3 that's the License Renewal Application I believe.
4 There you go, that's it.

5 Now, just bring it over so we can see
6 those contours in the area. There we go.

7 So, my question is that number 11 that's
8 circled in red there, the 3,888, you know, matches
9 reasonably well with the potentiometric contours that
10 are shown here, does it not?

11 MR. BACK: Yes, Your Honor, the contours
12 would have been drawn after the well data was posted.
13 So, after the transcription error was made, the
14 contours would have been contoured to that data.

15 JUDGE WARDWELL: So, you believe these
16 contours are in error also?

17 MR. BACK: Yes, yes, Your Honor.

18 JUDGE WARDWELL: How would they --
19 approximately, how would the correct if, in fact, you
20 transcribed -- retransposed the number 11 to switch
21 the 8 and the 3 as the two numbers to make it a 38
22 instead of an 83 at the end of that number?

23 MR. BACK: The contour interval 3860 would
24 move further to the southeast closer to Pine Ridge
25 Escarpment.

1 JUDGE WARDWELL: Okay, thank you.

2 CHAIR GIBSON: Excuse me just one second,
3 an administrative detail. I think we've got somebody
4 that doesn't sound like they're happy to be wherever
5 they are right now. And --

6 JUDGE WARDWELL: That's my inner child is
7 what it is.

8 CHAIR GIBSON: It's your inner child,
9 okay, Rich, I didn't realize that.

10 Well, anyway, if you could mute --

11 JUDGE WARDWELL: I will try to calm down
12 my inner child.

13 CHAIR GIBSON: If those of you that are
14 using GoToMeeting, if you could mute your mic when
15 you're not speaking, I think that might take care of
16 the issue with the -- wherever Rich's inner child is,
17 you know, speaking. So, thanks.

18 JUDGE WARDWELL: On that -- keeping with
19 096, there are other --

20 CHAIR GIBSON: The mic muted there.

21 JUDGE WARDWELL: Andy, if you could pull
22 up 096 again.

23 If there are other wells shown on this map
24 that had some pre-mining water levels shown to them,
25 I'm speaking specifically of 27, 29, 30, 40 and 66 and

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1 then the others in the North Trend Expansion Area
2 including well 743, 84, 89, 91, 95 and 101 and 102,
3 and I was wondering where did those water levels come
4 from?

5 Was there a -- the other ones you had a
6 table for and you referred to it in the License
7 Renewal Application. These other wells have values
8 posted for them on this diagram and I was wondering
9 where those levels came from?

10 MR. BACK: Your Honor, they were in the
11 original application back from 1983 I believe. And
12 so, to my knowledge, I don't know, I suspect that they
13 were just measured as part of the initial
14 environmental assessment.

15 JUDGE WARDWELL: Can you refer to a table
16 in the License Renewal Application where those values
17 might be tabulated?

18 MR. BACK: Your Honor, not off hand.

19 MS. SIMON: Your Honor, I'm sorry, Marsha
20 Simon.

21 Could I suggest that maybe Crow Butte
22 might be able to respond to that?

23 JUDGE WARDWELL: Does anyone from Crow
24 Butte happen to know where that might -- where those
25 levels might have been posted or tabulated or where

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1 did they come from?

2 MR. BEINS: Your Honor, Wade Bines at Crow
3 Butte.

4 I believe those water levels were part of
5 the initial License Application from the early '80s.
6 I'm not aware of those water levels being tabulated in
7 a table in the License Renewal, however.

8 JUDGE WARDWELL: And so, this is the first
9 and only time they show up is on this -- on the
10 various charts and maps that you prepared?

11 MR. BEINS: These particular water levels,
12 I believe, have been used in the original application
13 as well as the 1998 renewal that we went through. And
14 that data has just been carried forward from that 1982
15 time period.

16 JUDGE WARDWELL: Okay, thank you.

17 Why don't I just stay with Crow Butte. I
18 was with the staff because it was the staff's
19 testimony that I was asking on, but I think maybe they
20 would also be able to answer this next question
21 better.

22 And that is, why weren't the water levels
23 presented in Table 2.7-5, that's page 2-194 of the
24 License Renewal Application, for wells RA-2, RB-3, PM-
25 6, PM-7 shown on -- why weren't they shown on Figure

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1 2.7-3A the same way that the wells above on the top
2 part of the table, 11, 12, 13, 17, 24, 25, 31 and 64
3 were used and posted on that? Is there a reason why
4 those weren't used?

5 MR. BEINS: Judge Wardwell, Wade Beins,
6 Crow Butte.

7 Let me clarify your question, make sure
8 I'm understanding. You're wanting to know why those
9 particular wells were not shown on the 1982 map?

10 JUDGE WARDWELL: That's correct.

11 MR. BEINS: Or are you wanting to know why
12 those wells -- okay.

13 I am not certain of the date of
14 construction on some of those wells, particularly the
15 RBs and the PMs, the PM wells. They may have been
16 constructed after that 1982 time period that the other
17 samples were gathered.

18 JUDGE WARDWELL: Can you display the table
19 again, Andy, quickly?

20 But, yet, it shows that they have 1982
21 readings, don't they, unless I'm misreading this
22 table?

23 MR. BEINS: That is correct. Yes, I
24 retract my earlier statement there.

25 Why they were not included, I could not

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1 say.

2 JUDGE WARDWELL: Okay.

3 Let me follow up on a question I asked
4 earlier to the staff and that is, do you concur with
5 their rough estimate of how the potentiometric
6 contours would change if, in fact, the transcription
7 of well number 11 was made in regards to being 38
8 instead of 83 for the last two whole numbers in the
9 well reading? And, I believe their testimony was that
10 that upper contour would shift to the southeast, was
11 that correct, Mr. Back?

12 MR. BACK: Yes, Your Honor.

13 JUDGE WARDWELL: Do you agree with that
14 anyone from Crow Butte?

15 MR. BEINS: Yes, we would agree with that,
16 Your Honor. Wade Beins.

17 JUDGE WARDWELL: Thank you.

18 Intervenors testimony 082 rebuttal on page
19 3 states that NRC 096-R shows the water levels of
20 eight wells in the Brule aquifer pre-mining from 1982
21 to 1983 which exceed 3,834 feet above sea level.

22 And, I'll ask you, I guess, Mr. Wireman,
23 if you're the appropriate one or Dr. Kreamer if he
24 would like to answer this question.

25 But, what is your opinion of how those

1 contours would change if, in fact, the transcription
2 of the last two whole numbers went from 83 to 38 in
3 well number 11?

4 MR. WIREMAN: Mr. Wireman here, Judge.

5 Well, first of all, I would comment, as
6 you have already --

7 JUDGE WARDWELL: Can you speak as loud as
8 you can or get -- there you go.

9 MR. WIREMAN: Is this better?

10 JUDGE WARDWELL: Not much, but try to
11 yell, I guess.

12 MR. WIREMAN: Turn the volume up as much
13 as I can.

14 First of all, I would comment as you did
15 previously that there are a number of other water
16 levels in that southeast portion of the area that also
17 show water levels of 3,800. So --

18 JUDGE WARDWELL: Well, so, why don't I
19 interrupt you right there then and ask you, well, so
20 what? Could not that contour still shift to the
21 southeast with number 11 corrected to 38 and those
22 other wells still be valid that are above 3,880?

23 MR. WIREMAN: I think you'd have a very
24 strange looking potentiometric surface if you did that
25 with only one of those wells correct like 11 and the

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1 others remaining the same. I would go through that
2 exercise and recontour those. You would -- it would
3 be a bit of an odd shape for a regional potentiometric
4 surface.

5 JUDGE WARDWELL: Well, there's not a lot
6 of wells that this is based on, right, so it's rough
7 contours anyhow based on just the number of data
8 points we have.

9 If we can call up 96-R again, Mr. Welkie?

10 And so, isn't there -- if we look at the
11 3,860 contour, isn't that kind of warped now as it is?
12 It's kind of a strange looking contour, is it not,
13 compared to the others in order to -- in fact, it
14 looks like it was warped in order to get number 11 in
15 there? Wouldn't it just kind of straighten it out if
16 that was a 38 rather than an 83?

17 MR. WIREMAN: Well, 3,860 would have to
18 come quite a bit to the southeast based on water level
19 of 3,882, 3,870 that are already southeast of there,
20 just northwest of the 3,900 contour. It'd have to
21 come way down there and then the 3,900 contour would
22 either not move and have a very, very close contour
23 there which would suggest some steep gradient.

24 So, I'm concerned that a number of these
25 wells in the 1982, '83 map have incorrect water level

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1 elevations either transcription or whatever. You
2 know, there's uncertainty as to where they came from,
3 as to when those water levels were measured, whether
4 or not there was pumping.

5 The report from Crow Butte indicated
6 clearly that the data for these wells is suspect,
7 footnoted with both a star and a double star to that
8 effect.

9 These -- a number of these are pumping
10 wells, so you really have no idea what the pumping
11 regime of those wells does to these contours.

12 So, I suggest and believe that this 1982
13 map is simply inadequate to compare any previous
14 contour map to, the 2008 in particular. And that, we
15 simply don't have the data from pre-mining to really
16 compare post-mining or during-mining water levels in
17 the Brule.

18 JUDGE WARDWELL: Thank you, Mr. Wireman.

19 Does not the some sort of correction match
20 better with what's in the table, though, of 2.7-3A
21 rather than the 83 number that was used for number 11?

22 MR. WIREMAN: Yes, and Crow Butte is
23 correct, these contours were generated based on those
24 numbers in that table. But, if those numbers are not
25 correct then the contours are not correct.

1 JUDGE WARDWELL: Let me clarify for you,
2 I guess.

3 The number -- the raw number that's used
4 for number 11 on that contour map end in whole numbers
5 83. The table from which that came from doesn't have
6 any readings above 80 does it? In fact, I don't
7 believe it has any above really 60, does it?

8 MR. WIREMAN: Not in the table, but on the
9 maps there are readings above 3,800.

10 JUDGE WARDWELL: No, I'm talking only
11 about number 11 now, none of the other readings, just
12 looking at number 11 as an entity, isn't it a
13 reasonable explanation that the numbers were
14 transcribed when you look at the tableized values in
15 27-3A?

16 MR. WIREMAN: Yes.

17 JUDGE WARDWELL: So, 3,838 would be closer
18 to the average value shown for number 11 on the top
19 line of 2.7-5, I'm sorry, I think I was saying 3, but
20 2.7-5, isn't that correct?

21 MR. WIREMAN: That is correct.

22 JUDGE WARDWELL: So, isn't that kind of a
23 logical reason that -- and a valid reason for why that
24 number probably should be altered a bit then from what
25 they actually did use?

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1 MR. WIREMAN: For that individual well
2 number 11, yes.

3 JUDGE WARDWELL: Okay, thank you.

4 Staying with your rebuttal testimony at
5 the Intervenors' Exhibit 083 page 1, both CBR and NRC
6 staff in their supplemental direct testimony of
7 September 18, 2015 conclude that the 1982 to 1983 pre-
8 mining Brule formation water level elevation data is
9 inaccurate and cannot be used to help determine trends
10 in the Brule water level elevations.

11 And so, let me start with Crow Butte, if
12 I might, and I assume we'll stay with Mr. Beins, but
13 anyone else wish to take this, feel free to, of the
14 Crow Butte witnesses.

15 But, do you consider that all the pre-
16 mining Brule formation water elevation data is
17 inaccurate and cannot be trusted to estimate trends in
18 the Brule water level elevations? Or that only well
19 11 with the reading of 3,883.7 was transposed when
20 brought from the tables of values to this figure?

21 MR. BEINS: Your Honor, it's Crow Butte's
22 position that the water level shown for well number 11
23 is in error and that, you know, if we were to say that
24 well number was thrown out, that water level figure
25 was thrown out and not used to generate an additional

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1 data point there, we would still see water level
2 trends trending in the same direction as what's
3 presented on Figure 2.7-3A with a northwesterly flow
4 through that area.

5 JUDGE WARDWELL: And, that was Mr. Beins
6 speaking, is that correct?

7 MR. BEINS: Yes, sir.

8 JUDGE WARDWELL: Thank you.

9 MR. BEINS: My apologies.

10 JUDGE WARDWELL: No problem. Just have to
11 be a little more cognizant of that I think today
12 because we aren't all gathered together.

13 MR. BEINS: Yes, Your Honor.

14 JUDGE WARDWELL: Although this is working
15 remarkably well I might add. Oops, I just jinxed us.

16 Staff, Mr. Back, do you believe that -- do
17 you consider that all the pre-mining Brule water level
18 elevation data is inaccurate and cannot be used to
19 estimate the levels in pre-mining?

20 MR. BACK: Your Honor, no, the staff
21 agrees with what Mr. Beins said he said something that
22 needs to be pointed out which is this water level data
23 was -- we're predicting groundwater flow directions
24 primarily, not for assessing future impacts.

25 And so, for its purpose, this water level

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1 data, the staff feels is fine.

2 JUDGE WARDWELL: What about using it in
3 order to help estimate whether or not we're getting
4 any drawdown from the Brule into the Basal/Chadron
5 Chamberlain pass formation?

6 MR. BACK: Your Honor, some of it could be
7 useful, but when we see double asterisks and data is
8 suspect, well may be pumped, that's why the staff
9 relied far more heavily on the actual monitoring wells
10 designed to monitor drawdown through time as the
11 mining activities are initiated.

12 JUDGE WARDWELL: Thank you.

13 Well, let me ask this, we had Table 2.7-5
14 that showed pre-mining water level data. We have
15 other data points plotted on the contour map from
16 other wells. Is there any other pre-mining water
17 level data, and I'll address this to Crow Butte, that
18 is available that hasn't come to our attention? Or is
19 that the universe of the pre-mining water level data
20 that's available in the area?

21 MR. BEINS: Wade Beins with Crow Butte,
22 Your Honor.

23 To our knowledge, the data set that's
24 presented in the License Application is the complete
25 set.

1 JUDGE WARDWELL: Well, what do you mean by
2 the data set? You're speaking of both --

3 MR. BEINS: The data that's --

4 JUDGE WARDWELL: -- the table value and
5 those that are shown on that figure?

6 MR. BEINS: That's correct.

7 JUDGE WARDWELL: Okay, thank you.

8 Let me go back to Mr. Back for staff that,
9 given this somewhat less than overwhelming amount of
10 baseline water level data, pre-mining water level data
11 in the Brule aquifer, how are you reaching a
12 conclusion that the mining operations have not lowered
13 the water levels in the Brule without more of that
14 pre-mining level data?

15 MR. BACK: Your Honor, there were a few
16 data points, additional data points that were not
17 discussed which were from the aquifer test data where
18 the water levels were measured in the Brule above the
19 actual pumping well. And so, that provided a few
20 additional points.

21 However, that wasn't what we primarily
22 relied upon.

23 Looking at the trends, the longer term
24 trends of the Brule monitoring wells, one can
25 determine that there is not leakage due to the mining.

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1 And, quite honestly, the initial -- after looking at
2 20 years of data, the initial water levels, they
3 weren't that important, quite honestly, for making
4 that assessment. It could be qualitative which is
5 what we looked at. We looked at maybe an average of
6 about 57 feet of drawdown in the Basal Chadron, none
7 in the Brule based on the information that we had.

8 JUDGE WARDWELL: We'll get into that in a
9 little bit more detail, but thank you for that.

10 Have you done anything else besides those
11 other points to help approximate any historic pre-
12 mining water level data or is about what's been
13 described here as far as the database what you've gone
14 on for whatever use you're using it for?

15 MR. BACK: Your Honor, that's the data
16 that we've used.

17 JUDGE WARDWELL: Thank you.

18 In NRC's testimony, Exhibit 095, page 4,
19 answer 1.2, Exhibit NRC 096 contains our annotations
20 of Board Exhibit 008A and Board Exhibit 008B, and
21 these are the annotations identified the vicinity of
22 well 27 and the approximate locations of wells PM-6
23 and PM-7.

24 You also go on in answer 1.3 that Exhibits
25 Crow Butte 063 and 064 are hydrographs of the Brule

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1 water level measurements -- there you go -- measured
2 biweekly from 1999 to 2015.

3 Hydrographs for both of the wells indicate
4 that the water levels in the Brule aquifer are
5 relatively stable with time and do not show decreasing
6 trends that would suggest impacts from the mining
7 activities.

8 And, this gets back to about what you were
9 just saying now and, Mr. Back, how do you know that
10 the water levels haven't dropped prior to 1999 which
11 was when the first readings were for the Exhibits 063
12 and 064, I believe, such that by the time 1999 rolled
13 around, we were pretty much in steady state conditions
14 and you wouldn't see much of a drawdown as the
15 Intervenors hypothesized?

16 MR. BACK: Your Honor, we have 1983 data
17 for PM-6 and PM-7 so we know what those water levels
18 were. They're located basically in the vicinity of
19 where the mining started and we would have expected
20 the influence -- the impact to be in that area the
21 most based on, you know, timing sequences.

22 We also know what the water level was
23 around MW-27 based on another aquifer pumping test
24 that where the data was collected back in 1983.

25 And so, those data points kind of confirm

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1 what we would expect.

2 The other thing is, is something else you
3 said which is things get into steady state conditions
4 and you don't see very much.

5 If you have leaky conditions, that's not
6 the case. You're not going to reach -- you're going
7 to reach a steady state drawdown, but you're not going
8 to just reach to where you get enough water coming in
9 to where you won't see any impact.

10 And so, the way these wells go in, they go
11 in with the mines. The wells are taking data. The
12 mines start. And so, we are capturing that initial
13 mine turn-on time for their monitoring network in the
14 Brule.

15 JUDGE WARDWELL: Thank you.

16 Mr. Wireman, do you have any knowledge to
17 indicate that the wells that were just described had
18 any -- were not, in fact, measuring pre-mining water
19 conditions prior to any activity out there at the site
20 in regards to developing the mine units?

21 MR. WIREMAN: Which wells are we referring
22 to?

23 JUDGE WARDWELL: Mr. Back, could you
24 repeat those wells that you described that you said
25 you were counting on?

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1 MR. BACK: Your Honor, PM-6 and PM-7.

2 MR. WIREMAN: Yes, they indicate that
3 there's --

4 JUDGE WARDWELL: And, what about 27?

5 MR. BACK: Your Honor?

6 JUDGE WARDWELL: And what about 27?

7 MR. BACK: And a well in the vicinity of
8 27.

9 DR. KREAMER: Your Honor, this is Dr.
10 Kreamer, I can address that if you would like.

11 JUDGE WARDWELL: If Mr. Wireman would turn
12 over the floor to him, then it would be fine.

13 MR. WIREMAN: Happy to do so.

14 JUDGE WARDWELL: Okay.

15 DR. KREAMER: Can you hear me all right?

16 JUDGE WARDWELL: Yes.

17 DR. KREAMER: Okay. Firstly, PM-6 and 7
18 were Brule wells in pump test one. If you look at the
19 map associated with pump test one, it indicates that
20 PM-6 and 7 are about a quarter mile west of Squaw
21 Creek Road where Squaw Creek Road runs north and
22 south.

23 The only place that Squaw Creek Road runs
24 north and south is very distant from where it's
25 indicated by NRC.

1 Assuming that the road that's listed was
2 not Squaw Creek Road in the maps, and we can pull up
3 the first pumping test map which doesn't have much
4 information at all, but the only indicator is Squaw
5 Creek Road.

6 Assuming that they got the name of the
7 road wrong or the name of the road changed, a quarter
8 mile does put it in the center of mining activity from
9 mine unit one. But, it also puts it within just a
10 couple of feet of Squaw Creek which floats and has
11 water in it.

12 So, you have an impact of a surface water
13 feature. If you go to Google Maps, you can see that
14 Squaw Creek goes right next to where PM-6 and PM-7
15 are.

16 Also, the Brule formation has been shown
17 to be heterogeneous. If those wells were located in
18 a place where there was low hydraulic conductivity,
19 they would not be indicative of changes in the Chadron
20 down below and they would not really be good monitors
21 anyway.

22 If you look at the pump test one
23 information, one of the Chadron --

24 JUDGE WARDWELL: Before -- I'd like to
25 interrupt you, Dr. Kreamer, if I might. We will get

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1 to the pump test in detail.

2 I was -- most of this questioning is
3 dealing with pre-mining conditions only and those
4 wells were --

5 DR. KREAMER: Okay, let me just say one
6 last thing on that.

7 JUDGE WARDWELL: -- put in for a pump test
8 but that's not why we're really discussing them right
9 now. So, I'd like hold off on that --

10 DR. KREAMER: I brought in that
11 information because of the location of PM-6 and 7 and
12 the only indication of where those are is in the map
13 for pump test one.

14 JUDGE WARDWELL: I understand. And, do
15 you have any knowledge that there's anything wrong
16 with the pre-mining water level reading?

17 DR. KREAMER: Well, first --

18 JUDGE WARDWELL: Do you have any evidence
19 to show that?

20 DR. KREAMER: Firstly, if those wells were
21 put correctly in the right place on the map by the NRC
22 staff, it's very close to a potential recharge source.

23 JUDGE WARDWELL: That's not my -- my
24 question is --

25 DR. KREAMER: And, secondly, a major

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1 discrepancy between 1982 and 2008 water levels were to
2 the southeast of that area. And so, even though
3 they're close, they're not in the area of the major
4 discrepancy.

5 JUDGE WARDWELL: Would you like to answer
6 my question now? Do you have any knowledge that
7 there's anything inherently wrong with the pre-mining
8 water elevation that came from those two wells, those
9 two individual wells sitting out there in a field
10 somewhere, i.e., that someone has pumped them? Do you
11 have any evidence that someone has done anything to
12 them? Do you have any reason to believe those numbers
13 aren't indicative of that pre-mining water elevation
14 at the location they happen to be placed?

15 DR. KREAMER: Other than the fact that
16 they might be influenced by the stream, no.

17 MR. WIREMAN: Your Honor, this is Mr.
18 Wireman, may I add one sentence to that answer --

19 JUDGE WARDWELL: Sure.

20 MR. WIREMAN: -- directly to your
21 question?

22 Those are one data point, that's it.
23 They're one measurement made in 1983. There is, at
24 least I've seen no trend data for those two wells.
25 It's always difficult to know how accurate a single

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1 data is.

2 JUDGE WARDWELL: Thank you.

3 Turning to Crow Butte's Exhibit 067, page
4 5, answer 18, Crow Butte provided two exhibits during
5 the hearing, Crow Butte's 063 and 064, again, that
6 show the long-term water level trends from 1999 to the
7 present for two shallow Brule monitoring wells, SM717
8 and SM722.

9 Neither exhibit shows a long-term decline
10 in water levels that would suggest an impact from Crow
11 Butte's mining operations. Instead, the relatively
12 narrow band of water levels, plus or minus several
13 feet, are consistent with seasonal and annual weather
14 patterns, for example, droughts and wet years in the
15 area.

16 And so, I'll turn to Crow Butte, if I
17 might. Why couldn't, again, as I said to the staff,
18 a drop occur between the initial installation of those
19 and prior to the pumping in the Basal
20 Chadron/Chamberlain pass formation and the steady rise
21 -- why couldn't the drop be between --

22 Let me rephrase the question again.

23 Why couldn't the drop between 2006 and
24 2008 shown in those exhibits be related to pumping in
25 the Basal Chadron/Chamberlain pass formation and the

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1 steady rise be associated with recovery from
2 terminating pumping from the Basal Chadron/Chamberlain
3 pass formation as alleged by Mr. Wireman and his
4 testimony on Exhibit 081, page 3?

5 MR. BEINS: Your Honor, Wade Beins with
6 Crow Butte.

7 The hydrographs that were presented at the
8 August hearings, CBR063 and 64, I believe, were the
9 numbers for SM7-15 and 7-22, they only represent that
10 period of time that mine unit 7 has been in operation.

11 And so, we have other data going back to
12 the start of the mine, in fact, that demonstrates that
13 we have not seen any sort of declines in the Brule
14 aquifer as a result of mining in the Basal Chadron.

15 And so, as we look at those different
16 hydrographs and all, which I'm sure we'll get to here,
17 we're going to see a startup period for each mine
18 unit. And, we did not see any corresponding declines
19 in the Brule as those mine units are started.

20 JUDGE WARDWELL: But, again, I ask, where
21 is that data tabulated and available for us in the
22 documents that have been presented in this proceeding?

23 And my understanding was we had no other
24 pre-mining water level data and those hydrographs only
25 start after the mining unit in that area, I believe,

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1 was initiated and I'm getting back to trying to
2 address what the Intervenors had said is that the drop
3 occurred prior to 1999?

4 And, is there any data that shows that it
5 isn't that you can point to? And, again, the
6 testimony that's been provided or the evidence that's
7 been submitted to date?

8 MR. BEINS: Yes, Your Honor. And, what I
9 guess I spoke poorly or unclearly on is we have data
10 going back to 1991 when we started mine unit 1, the
11 very first mine unit on the project would have been
12 located back to the northeast of these two particular
13 mine unit 7 wells.

14 And so, when we started our mining
15 operation, at that very point in time, we would have
16 started gathering water level data from the Brule
17 aquifer in the monitoring wells, the shallowing
18 monitoring wells for mine unit 1.

19 Now, some of that data is older data that
20 we do not have in electronic format and I believe we
21 included a hydrograph for one of the -- on unit 1
22 shallow monitor wells. But, that data does not go
23 clear back to 1991.

24 JUDGE WARDWELL: Well, we, as a Board,
25 have none of that data, is that correct, in this

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1 proceeding -- in the record of this proceeding that
2 you're aware of?

3 MR. BEINS: You have in the hydrographs.
4 We don't have any table of the individual water levels
5 for those particular wells that are presented here in
6 the license renewal.

7 JUDGE WARDWELL: Well, while I've got you
8 on the line here, could you clarify where you state
9 the location for is it PM-6 and 7 in regards to the
10 relation at Squaw Creek Road?

11 MR. BEINS: Yes, Your Honor. Wade Beins,
12 Crow Butte.

13 If you take a look at page number 2 of NRC
14 Exhibit 96-R, I don't know if you want to pull that
15 up.

16 JUDGE WARDWELL: Hang on a second, we'll
17 pull that up. Let's us pull it -- let's go ahead and
18 pull that up. And you want to go to page 2?

19 MR. BEINS: Yes.

20 JUDGE WARDWELL: Yes.

21 MR. BEINS: Right there, yes, Your Honor.
22 The information for PM-6 and PM-7 is shown over on the
23 right hand side of the figure with an arrow pointing
24 to a circle in the northwest quarter of the southeast
25 quarter of section 19, that is the location of PM-6

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1 and PM-7.

2 Squaw Creek Road is the road along the
3 section line immediately to the east there of that
4 location for PM-6 and PM-7.

5 JUDGE WARDWELL: Just to get us oriented
6 to the section line a little bit better possibly, is
7 the section line that north/south running darker gray
8 line that then turns into the green portion of the
9 license area off to the east of 6 and 7?

10 MR. BEINS: Yes, the license boundary.

11 JUDGE WARDWELL: Yes. Okay.

12 MR. BEINS: That's correct, that gray line
13 through the southeast portion of the section and then
14 it turns into the permit boundary line going on north
15 from there. That is the location of Squaw Creek Road.

16 JUDGE WARDWELL: And, Mr. Welkie, if you
17 could slide the exhibit to the right? Okay, that's
18 good. Just tried to get it out of the middle of your
19 nose, Mr. Beins, where this place -- location was at
20 the time.

21 About -- can you describe about, if you
22 can, were Squaw Creek is itself? Are these wells
23 really close to it and adjacent to it?

24 MR. BEINS: I'm going to say, based on the
25 surface contours that are shown on the map, you should

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1 be able to kind of take a look there. Squaw Creek
2 itself enters section 19 and crosses under Squaw Creek
3 Road just to the south of where the permit boundary
4 line, that darker line, turns and heads east in the
5 section 25. It enters the section there and flows to
6 the west/northwest and it probably passes within, I'm
7 going to say, two to three hundred feet of the
8 location for PM-6 and PM-7.

9 JUDGE WARDWELL: Thank you.

10 MR. BEINS: And, that's a rough guess.

11 JUDGE WARDWELL: Yes, thank you.

12 MR. BEINS: And then exits the section
13 going northwesterly.

14 JUDGE WARDWELL: So, I believe it was Dr.
15 Kreamer who was talking about this, is that correct?
16 Do you have any disagreements with what Mr. Beins just
17 said?

18 DR. KREAMER: I do.

19 JUDGE WARDWELL: And what are those
20 disagreements?

21 DR. KREAMER: Google Earth shows the road
22 that was indicated as Squaw Creek Road as Crow Butte
23 Road and not Squaw Creek Road. That may just be a
24 difference in Google Earth.

25 And, assuming that what Google Earth calls

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1 Crow Butte Road is what they're referring to as Squaw
2 Creek Road, that puts it in the general ballpark.
3 But, there is no indication on the map from pumping
4 test one for PM-6 and 7 is the exact location relative
5 to Squaw Creek.

6 JUDGE WARDWELL: And do you have --
7 likewise, you don't have any -- well, do you have any
8 contradictory data or evidence that shows that the
9 location of PM-6 and 7 as shown on that page 2 of 096
10 is incorrect?

11 Sorry, you muted yourself, I think.

12 DR. KREAMER: Okay, sorry.

13 If you take the location that's in the map
14 of pump test one and you get out your ruler and you
15 put it as close as you can, you're pretty much smack
16 in the middle of Squaw Creek.

17 I'm fairly certain they didn't put the
18 well in the well in the middle of -- PM-6 and PM-7 in
19 the middle of Squaw Creek, but it's extremely close.
20 Exactly where it is, I do not have information on
21 that, Your Honor.

22 JUDGE WARDWELL: Okay, thank you.

23 Crow Butte testimony 067, page 6, answer
24 19 states that our conclusion that water levels in the
25 Brule have not been affected by mining activities --

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1 scratch that, we've covered it.

2 Intervenor testimony 081, page 1, Table
3 2.7-3 which is in the License Renewal Application on
4 page 2-145, presents 1982 pre-mining and 1993 Brule
5 water level data for eight domestic wells and four
6 Brule monitoring wells.

7 And, I guess it'd be Mr. Wireman might be
8 the best because I believe you prepared 081. But,
9 Table 2.7-3 to which you cite, if you go to the
10 License Renewal Application, I think it says it's
11 historic White River water quality data 1968 through
12 '94.

13 And then, likewise, page 2-145 which is
14 what you cite as the location, the Table 2.6-3 is
15 earthquakes in Nebraska. Did you really mean that you
16 were trying to refer to Table 2.7-5 on page 2-194 on
17 page 1 of your Exhibit 081?

18 MR. WIREMAN: Your Honor, I noticed the
19 same exact thing you did yesterday. And, I apparently
20 have a version of the LRA that is older because, on my
21 version, the water level data for these wells is in
22 Table 2.7-3 on page 2-145.

23 JUDGE WARDWELL: Okay, we'll trust that
24 you weren't trying to deceive us here, but do you
25 agree that what you meant to say in regards to what's

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1 here is that Table 2.7-5 on page 2-194 of the License
2 Renewal Application?

3 MR. WIREMAN: That's correct.

4 JUDGE WARDWELL: Thank you. Just want to
5 make sure and clarify so the record's correct.

6 CHAIR GIBSON: Why don't we take a ten
7 minute recess and we'll be right back on the record in
8 ten minutes.

9 Thank you.

10 (Whereupon, the above-entitled matter went
11 off the record at 11:13 a.m. and resumed at 11:22
12 a.m.)

13 CHAIR GIBSON: Okay, back on the record.

14 Just for planning purposes, I think we'll
15 probably break about 1:00 our time here which will be
16 11:00 your time in Chadron. And, we'll take like a 30
17 minute lunch break and then we'll get back on.

18 So, very well.

19 JUDGE WARDWELL: Okay, back at it.

20 Intervenors Exhibit 081, page 2 states
21 that the License Renewal Application did not include
22 data on how many and which wells were used to
23 construct the 2008 water level contour map.

24 The transcript from the hearings at 1085,
25 page 1085, Mr. Beins, for Crow Butte's testimony

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1 stated that all the mine unit wells, approximately 175
2 wells, were used to plot the 2008 potentiometric
3 surfaces shown on the Figure 2.7-4B24D.

4 And so, if I might ask, are the dots on
5 Figure 2.7-3 of the License Renewal Application, which
6 I believe are the same as the Board Exhibit 008B well
7 and were these the wells that were used in your
8 monitoring program to depict the 2008 Brule water
9 level elevation contours for the Class 3 permit area?

10 So, if we can expand that a little bit,
11 Mr. Welkie, to -- yes, zoom in a bit.

12 Are all these black dots we see here your
13 monitoring wells?

14 MR. BEINS: Your Honor, Wade Beins with
15 Crow Butte.

16 The black dots that are shown on the
17 figure that's on the screen right now are the shallow
18 monitoring wells that were used to generate the Brule
19 water level map that you see there.

20 JUDGE WARDWELL: And, do you have more
21 wells in your monitoring program than these wells?

22 So, were these the wells that were used to
23 generate this figure?

24 MR. BEINS: Those are the wells that were
25 used to generate the figure. We do have additional

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1 monitoring wells on the site, but they are the deeper
2 commercial monitoring wells that are in the Basal
3 Chadrons.

4 JUDGE WARDWELL: Approximately how many of
5 these wells are there on this map? How many black
6 dots are there that you use to generate this map there
7 approximately?

8 MR. BEINS: Approximately 175 total wells
9 on that, Your Honor.

10 JUDGE WARDWELL: In your overall
11 monitoring program to date, how many wells are you
12 currently monitoring for water levels and what is the
13 frequency of that monitoring?

14 MR. BEINS: In the Brule aquifer, Your
15 Honor -- again, Wade Beins, Crow Butte.

16 In the Brule aquifer, we've got about 205
17 shallow monitoring wells to monitor that particular
18 aquifer and we do that every two weeks.

19 JUDGE WARDWELL: Thank you.

20 Intervenors Exhibit 081, page 3, the
21 hydraulic gradient on the Brule water table surface
22 also increased significantly from 0.012 in 1982 to a
23 range of 0.25 to 0.43 in 2008.

24 This deepening could result from increased
25 discharge from the Brule aquifer via induced downward

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1 leakage caused by pumping the underlying Basal
2 Chadron/Chamberlain pass formation.

3 And, I guess I'll ask Mr. Wireman, did you
4 do these calculations for the hydraulic gradients that
5 occurred in well both 1982 and 2008?

6 MR. WIREMAN: No, Your Honor. Those come
7 from the SER page 22 that are reported there.

8 JUDGE WARDWELL: What was the first?

9 MR. WIREMAN: The SER.

10 JUDGE WARDWELL: Oh, SER, okay. I thought
11 you said FDR.

12 MR. WIREMAN: Page 22.

13 JUDGE WARDWELL: Okay, great, thanks.

14 So, if they're in the SER, I guess I'll
15 ask staff, Mr. Back or anyone else there, did you
16 calculate these gradients or was it -- do I end up
17 going back to Crow Butte?

18 DR. STRIZ: Your Honor, I calculated those
19 gradients.

20 JUDGE WARDWELL: Okay. And, it seems to
21 me, comparing figures 2.7-3A which is on page 2-173 of
22 the License Renewal Application with Figure 2.7-3B
23 looking at page 2-175, it doesn't seem just by looking
24 at that that there is that increase in gradient
25 indicated by your figures when you're looking over at

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1 least the full range of contour maps.

2 DR. STRIZ: That is correct. It's not
3 over the full range. Those were localized gradients
4 that were calculated based on the increased number of
5 points available to do that sort of analysis.

6 JUDGE WARDWELL: Okay. And, do you know
7 about where on the map you would have selected the --
8 and which map -- contour map would you like us to pull
9 up, the 173 or the 175 -- page 173 or page 175?

10 DR. STRIZ: It's 2.7-3B that I used and
11 it's for Board Exhibit 008B.

12 JUDGE WARDWELL: Okay.

13 DR. STRIZ: And I think that the one that
14 had the higher gradient was in the northwest, but I
15 can't completely recollect.

16 JUDGE WARDWELL: So, it was just in
17 selected areas, not the overall general contours that
18 have increased, is that correct?

19 DR. STRIZ: That is correct.

20 JUDGE WARDWELL: The gradients have
21 increased? Did you conclude in doing this that there
22 was some reason for why they increased where they did?
23 Did you have any, as you were assessing the
24 application, reach any conclusions in regards to the
25 increase in gradients at those locations?

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1 DR. STRIZ: I believe in the SER it was
2 stated that it was considered to be an artifact of
3 having more points available to do the gradient
4 calculation instead of the paucity of points that were
5 available in the 1982 and '83 water level
6 measurements. So, more points gives you more accurate
7 ability to calculate a gradient in the local area.

8 JUDGE WARDWELL: But, that doesn't
9 necessarily mean it'll come out steeper.

10 DR. STRIZ: One cannot prejudge which way
11 it might come out --

12 JUDGE WARDWELL: Right.

13 DR. STRIZ: -- when you have more points.
14 It just did, so I reported that it did look steeper
15 and I said that the SER reports that it was an
16 artifact of having more points available to do the
17 calculation.

18 JUDGE WARDWELL: But, that implies that
19 the steepness was generated by the number of points
20 rather than the values of those points.

21 DR. STRIZ: No, no, by the values of those
22 points, just that you have more points with more
23 values so you can get the better calculation on the
24 gradient in those locations as opposed to the lack of
25 data that were in that region in 1982 and 1983.

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1 JUDGE WARDWELL: Okay, thank you.

2 I'll turn to Mr. Wireman, considering this
3 was your testimony, do you have any evidence of what
4 might have caused the increase at individual locations
5 of this gradient, any physical causal relationship
6 that might have created these steeper gradients at
7 points and/or comment in regards to what staff has
8 said in regards to their analysis in the SER?

9 MR. WIREMAN: Yes, Your Honor. First of
10 all, the number of data points used can obviously have
11 an effect on the gradient that's calculated. It
12 doesn't mean that the gradient that was calculated
13 based on fewer data points is incorrect. It could
14 just simply mean a local steepening.

15 But, a local steepening also needs to be
16 explained because it doesn't really fit with the rest
17 of the gradient from the southeast all the way to the
18 northwest.

19 So, I was looking for an explanation and
20 the one that I think should be at least entertained is
21 that it was caused by leakage from the Brule downward
22 and that caused the steepening of gradient because it
23 caused a decline in the water level in the Brule.

24 And, I didn't see any discussion of what
25 might cause that other than the artifact of the number

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1 of points. But it doesn't mean that that gradient
2 calculation is incorrect for that length.

3 JUDGE WARDWELL: Okay, going back to
4 staff, Dr. Striz, if, as I think about how you
5 explained it in the SER, that would leave one to
6 extrapolate that all of the area is at that steeper of
7 gradient, is that your position based on how you
8 explained it as being an artifact of the number of
9 points would mean that find if we had the same number
10 of points throughout the whole planned view of the
11 licensed area, then it would all show that same steep
12 gradient?

13 DR. STRIZ: No, because the gradient is
14 dependent on the values at the points. It could be a
15 lesser gradient, it could be a steeper gradient, it
16 could be no change in gradient depending on the values
17 of those points.

18 And, we could not have known in 1982
19 because of the lack of data what those gradients were.
20 However, they became clear once we had the number of
21 points to be able to do those very close calculations
22 because those wells were like 200 feet apart.

23 So, that enabled us to really understand
24 what the gradients were in the Brule with that number
25 of points as opposed to not being able to do that

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1 before. So, there's no way, like I testified, that
2 you could presuppose which way those gradients would
3 be. You had to have the points.

4 JUDGE WARDWELL: Well, based on your
5 calculations, you believe that your best information,
6 there's nothing to contradict your position at the
7 0.25 to 0.43 for the gradient is the gradient in the
8 Brule in 2008?

9 DR. STRIZ: For the localized areas where
10 I did those calculations, and I'm sorry, I can't
11 recall, I can try to go back and look at my notes if
12 I have any. However, we did recalculate the gradients
13 in our testimony and found that they did not change
14 over the license area across the entire extent of the
15 license area.

16 JUDGE WARDWELL: Okay, thank you.

17 Intervenors Exhibit 081, page 3, the
18 testimony discussed the uncertainty in the flow
19 directions as indication of inadequate data to
20 quantify trends referencing the License Renewal
21 Application 2-140 to 2-153. They also reference the
22 SER and Souders 2004.

23 I'll start with Crow Butte I guess. Do
24 you agree that the -- I believe you testified in our
25 previous hearing that you agree that the flow in the

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1 Brule is to the northwest, is that correct?

2 MR. BEINS: That is correct, Your Honor.

3 And, Wade Beins, Crow Butte.

4 JUDGE WARDWELL: Thank you.

5 And, staff, do you agree with that
6 statement also?

7 DR. STRIZ: Yes, Your Honor.

8 JUDGE WARDWELL: Thank you.

9 And, again, I guess I'll go to Mr. Wireman
10 and your referenced page numbers are a bit off because
11 of the difference and we understand that and I think
12 we know where you're referring in the License Renewal
13 Application, but in regards to the numbering system
14 that I think the rest of us are using, doesn't the LRA
15 and page 2-171 reference northwest flow in the Brule?

16 MR. WIREMAN: I would have to look. In my
17 version of the LRA, page 2-171 is Table --

18 JUDGE WARDWELL: Yes, you don't want to
19 look at that page number, you have to do your
20 corresponding correction for your exhibit you have
21 there that you happen to be using.

22 MR. WIREMAN: I'm not sure if, you know,
23 how to find what you're referring to.

24 JUDGE WARDWELL: Well, I don't either
25 unless you have the correct -- I don't know where you

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1 got that version of the License Renewal Application
2 that has these unusual page numbers. But, so I guess
3 you can't answer it, is that correct?

4 MR. WIREMAN: Well, I don't doubt, if I
5 understand correctly, you're saying that in a new
6 version of the LRA, it is northwest flow is reported
7 and I don't doubt that.

8 JUDGE WARDWELL: Okay, you don't have any
9 reason to doubt that? And, doesn't also Souders,
10 doesn't the LRA also reference Souders 2004 in regards
11 to the overall water table configuration trends?

12 MR. WIREMAN: Yes, and I have no
13 disagreement with an overall northwest direction --
14 regional flow in this aquifer, I don't dispute that.

15 JUDGE WARDWELL: But, when Souders refers
16 to a north northeast flow, was not that reference
17 referring to an overall water table configuration and
18 didn't really specify any reference to the Brule? Did
19 Souders reference the Brule in your knowledge?

20 MR. WIREMAN: I think it was an overall
21 flow direction.

22 JUDGE WARDWELL: So, in summary, there
23 really isn't any uncertainty, is there, in Brule flow
24 because all the references that talk about flow
25 directly in the Brule are all agree that it's to the

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1 northwest?

2 MR. WIREMAN: I'm not sure I agree with
3 that. I think overall, the northwest flow direction
4 is correct on a directional basis, but on a local
5 basis, clearly, that direction can change.

6 And, the question is, are those local
7 changes in flow direction a result of mining?

8 JUDGE WARDWELL: Thank you.

9 In your testimony on 81, page 3-4, no long
10 trend data from dedicated monitoring locations on
11 these creeks have been presented by Crow Butte.
12 Without this type of data, it is not possible to
13 determine if there has been a reduction in groundwater
14 discharge to streams and, if so, is it related to the
15 lowering of the Brule water table from pumping the
16 underlying Basal Chadron/Chamberlain pass formation?

17 And, Mr. Wireman, would you not agree that
18 water level readings from the Brule are a bit more
19 responsive in monitoring drawdown in the Brule than
20 attempting to quantify changes in groundwater
21 discharge to streams?

22 MR. WIREMAN: Not necessarily, it depends
23 on where the well is located, where it is streamed
24 versus which reach of the stream one is attempting to
25 monitor.

1 But, clearly, a result of lowering the
2 water levels in the Brule would be a reduction in
3 discharge from the Brule to these streams to which it
4 is connected.

5 And so, that is a standard monitoring
6 requirement in most mine sites to look at nearby
7 streams and see if it impacts the curve. And, there
8 is simply no trend data for any of these streams in
9 the upper reaches that are reported to be connected to
10 the Brule and that makes sense in a hydrologic sense.

11 So, my statement stands. There simply is
12 no data for the streams to see if there have been
13 changes over the life of this mine.

14 JUDGE WARDWELL: Doesn't it make a little
15 hard to monitor discharge from an aquifer into a
16 stream and then correlate it with necessarily a drop
17 in the Brule as opposed to inner flow that occurs at
18 the shallow surfaces that inner discharge into a
19 stream and direct flow into the stream itself and a
20 number of other factors that are hard to separate out?

21 MR. WIREMAN: There are a number of
22 factors and there are a number of pipes in the waters
23 that may enter a stream and inner flow is clearly one.
24 But, yes, they can be separated out. There are
25 methods to do that.

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1 We know when inner flow occurs on a
2 seasonal basis and a long-term trend on a stream would
3 clearly be helpful. At least would show do you have
4 declines or not and, if you do, then you can start to
5 ask the question why are those declines occurring?

6 JUDGE WARDWELL: How -- do you know how
7 deep the water table, the phreatic surfaces in the
8 Brule below the ground surface?

9 MR. WIREMAN: I would have to go look. My
10 recollection is ten feet and it will vary, of course.

11 JUDGE WARDWELL: Thank you.

12 Crow Butte, do you have any idea how deep
13 the water level phreatic surface in the Brule is below
14 the ground surface?

15 MR. BEINS: Your Honor, Wade Beins with
16 Crow Butte.

17 That level varies greatly depending upon
18 the surface topography. There are places on the mine
19 site, mine unit 6, mine unit 8, that it's as shallow
20 as ten feet but over the majority of the mine area,
21 we're looking at water depths at least 100 and up to
22 200 feet deep as you get on to the south end of the
23 mine where you've got a lot more surface topography.

24 JUDGE WARDWELL: Do you believe that all
25 the streams are interconnected with the phreatic -

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1 intercept the phreatic surface of the Brule in the
2 license area?

3 MR. BEINS: In the license area, no, Your
4 Honor, we do not believe that's so.

5 JUDGE WARDWELL: And, why do you not
6 believe that?

7 MR. BEINS: The Brule formation has a
8 number of perched clays, things like that and so, you
9 have these lenses of sand channels, that sort of
10 thing, that not all of those particular sand channels
11 and perched water tables interact with the surface
12 waters of English Creek.

13 JUDGE WARDWELL: You cut out. We lost
14 you.

15 CHAIR GIBSON: We lost the audio, Mr.
16 Deucher. We cannot hear.

17 MR. BEINS: I think we got it back on.

18 CHAIR GIBSON: Okay.

19 JUDGE WARDWELL: You don't have to repeat
20 that.

21 MR. BEINS: My apologies.

22 JUDGE WARDWELL: No problem. I don't
23 think you did anything, did you? It just seemed to --
24 unless your --

25 MR. BEINS: I apologize, that was --

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1 JUDGE WARDWELL: -- vocal cords cut out.
2 You know, your mouth was moving, so I thought you were
3 speaking.

4 MR. SMITH: Your Honor, this is Tyson
5 Smith, that was my fault. There's a microphone on my
6 table that I thought I was turning but apparently,
7 they're both connected.

8 JUDGE WARDWELL: I won't even say it.

9 Is it your --

10 MR. BEINS: Yes, Your Honor, and I guess
11 what I was --

12 JUDGE WARDWELL: It's your position, is
13 it, Mr. Beins, that the Brule does not contribute any
14 significant water to the flow in the local streams
15 within the license area?

16 MR. BEINS: There are some springs that
17 contribute to those stream flows but the regional
18 water table is different than what we see in some of
19 those perched water tables that has a contributing
20 factor to it.

21 JUDGE WARDWELL: So, maybe I'll rephrase
22 it again another way. Then you're claiming that
23 really there's several levels of water that phreatic
24 surfaces that exist in the Brule based on some perched
25 water tables as opposed to the full water table of the

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1 Brule that comes from the interface between that and
2 the upper confining unit of the Chadron? Is that a
3 fair assessment?

4 MR. BEINS: Yes, Your Honor. In mine unit
5 6 and 8, we feel that there is a perched water table
6 that is acting and contributing to those springs or
7 seeps that we see along the headwaters of English
8 Creek. And they act separately from the regional
9 water table in the Brule.

10 JUDGE WARDWELL: Okay, thank you.

11 In Intervenors Exhibit 083, page 2 and in
12 Intervenors Exhibit 081 on page 4, you're stating that
13 during 2008 in a northwest part of the Class 3 permit
14 area a potentiometric surface elevation in the Basal
15 Chadron which is about 3,645 in the vicinity of well
16 CM10-15 is lower than the water table elevation in the
17 Brule aquifer which is at elevation 3,715.

18 This indicates a downward vertical
19 gradient that would facilitate flow from the Brule
20 downward.

21 And, you're citing Crow Butte's Exhibit
22 62, Figure 2.7-4D and which I believe is the same
23 exhibit as the Board 008B, Figure 2.73B.

24 And let me start with you, well I won't
25 start with you in regards to the Intervenors because

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1 you've just stated that's your position. I'll go to
2 Crow Butte and say, do you dispute the downward
3 gradients in the northwest area of the license area?

4 MR. BEINS: No, Your Honor. In fact, we
5 think that the downward flow gradient is a god thing
6 and that --

7 JUDGE WARDWELL: That wasn't my question.

8 MR. BEINS: -- it's going to prevent any
9 --

10 JUDGE WARDWELL: That wasn't my question.

11 MR. BEINS: -- upward --

12 JUDGE WARDWELL: Sir, that wasn't my
13 question.

14 I said, you don't dispute that there's a
15 downward gradient, is that correct?

16 MR. BEINS: That is correct.

17 JUDGE WARDWELL: Thank you.

18 And, staff, do you dispute that?

19 MR. BACK: No, sir.

20 JUDGE WARDWELL: Okay, thank you.

21 Mr. Wireman, do you know or did you check
22 to see whether downward gradients existed in the pre-
23 mining 1983 as well as the 2008 through 2009 in this
24 northwest area?

25 MR. WIREMAN: That was not really possible

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1 to do from the information I had.

2 JUDGE WARDWELL: Okay, so you didn't do
3 the -- you didn't answer -- sorry, you didn't check
4 that?

5 MR. WIREMAN: No.

6 JUDGE WARDWELL: Okay, fine.

7 Isn't the important thing not so much the
8 downward gradients in that northwest area as it is
9 looking for a potential drop in the Brule that
10 corresponds with a drop in the Basal
11 Chadron/Chamberlain pass formation? Isn't that the
12 critical parameter that we're really interested in,
13 Mr. Wireman?

14 MR. WIREMAN: That would be a critical
15 parameter if there are wells suitably located to
16 determine that.

17 JUDGE WARDWELL: And, in fact, don't the
18 levels between the Brule and Basal Chadron/Chamberlain
19 pass formation indicate no direct hydraulic
20 connection, that is that there's at least some
21 restriction to flow that would not be present if there
22 was pervasive fracturing as some might hypothesize in
23 the Brule and the upper confining -- and the -- not
24 the Brule so much as the confining units between the
25 Brule and the Basal Chadron/Chamberlain pass

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1 formation?

2 MR. WIREMAN: And, one of the issues here,
3 Your Honor, is the issue of whether or not flow
4 through the confining unit occurs in highly
5 preferential pathways that are related to structures
6 or whether it occurs over the entire formation.

7 We have raised the issue more than once
8 that there are potential preferential flow paths that
9 can transport water.

10 If that is the case and if you are moving
11 water from the Brule to the Chadron and reducing that
12 downward movement, then -- and that happens on highly
13 preferential flow paths, that could be very easily
14 missed by many, many of these monitoring wells that
15 are kind of assuming the homogenous Darcy-type flow
16 across this unit.

17 So, I think the potentiometric surface
18 difference there only indicates that there's a
19 potential now for downward flow, but there has to be
20 a pathway before that flow can occur.

21 And, we just simply don't know enough
22 about this lower Brule to indicate if there are
23 significant secondary pathways, especially as you get
24 closer to whatever the structure is off to the
25 northwest.

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1 JUDGE WARDWELL: And so, I understand your
2 desire for the additional information in regards to
3 quantifying things at the site but, overall though,
4 would you agree with how I was interrupting Mr. Beins
5 in that this downward gradient, if it did actually
6 exist, would, in fact, be somewhat protective of the
7 Brule, wouldn't it?

8 MR. WIREMAN: What it would mean was that
9 the potential for flow would be downward, so there
10 would be no potential for flow from the Basal Chadron
11 up into the confining unit. That's what that means.

12 JUDGE WARDWELL: And, that would be a good
13 thing, wouldn't it, if there was an excursion that
14 took place in that area?

15 MR. WIREMAN: If it occurs throughout the
16 entire mining unit, yes, it would be.

17 JUDGE WARDWELL: Right.

18 MR. WIREMAN: Correct.

19 JUDGE WARDWELL: Thank you.

20 Testimony -- Intervenor testimony 082,
21 page 1, Crow Butte has consistently inferred that the
22 dominate cause of water table fluctuations in the
23 Brule are correlated to precipitation, but it provided
24 no statistical or numerical support for this claim.

25 You go on to state that in Board Exhibit

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1 010L, Brule water levels in the last figure, that's
2 SM08-006, which is on page 8 of -- and that's be the
3 pdf page 8 because it's actually listed, I think, as
4 4 of 4, show a steady or rising water level of two
5 feet in the period of November 2013 through March of
6 2014, which, conversely, were drier months than usual.

7 November's 2014 recorded precipitation was
8 59 percent of the normal average. December 2014
9 precipitation was 46 percent of the average. And,
10 January had no precipitation, a monthly average of
11 0.59 where the monthly average is 0.59 inches.
12 February had 95 percent of the average and March 2014
13 had 41 percent of the average precipitation.

14 You conclude your statement with saying
15 that these dry conditions were not reflected in the
16 steady or rising water tables.

17 And, I will just note also that on that
18 same exhibit on page 2, that's Exhibit 082, you
19 provide additional examples pointing a no correlation
20 of precipitation with groundwater levels in that
21 exhibit.

22 And so, for the Intervenors, I'd like to
23 ask that where did you see these rising levels during
24 this period , especially during March on that exhibit?
25 I don't know who wants to entertain this.

1 DR. KREAMER: That would be Dr. Kreamer.
2 That would be me, sir.

3 JUDGE WARDWELL: Okay.

4 DR. KREAMER: Could we put the figure back
5 up?

6 JUDGE WARDWELL: Sure.

7 DR. KREAMER: That's not the --

8 JUDGE WARDWELL: No, they just did the --
9 yes, go to 4 of 4. There it is.

10 DR. KREAMER: So, let's make sure we're on
11 the same page here. This is -- I'm sorry, but some of
12 the pictures here block -- the pictures in the
13 courtroom block the figure. Now we're better, okay.

14 JUDGE WARDWELL: Slide it down just a bit,
15 Mr. Welkie, and we'll see the SM, it'll give the
16 figure number. Here's -- that was -- it just said
17 page 4 or 4 and there's the SM08006 to which you refer
18 in your testimony on page 1.

19 DR. KREAMER: Okay. Yes, these water
20 levels -- yes, these water levels are water levels
21 below surface, I believe, is that correct?

22 JUDGE WARDWELL: I don't --

23 DR. KREAMER: These are water levels below
24 surface, I believe, sir.

25 JUDGE WARDWELL: Okay.

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1 DR. KREAMER: And so, the general trend,
2 although it looks downward, is upward.

3 JUDGE WARDWELL: And, I will go to Crow
4 Butte to verify that. I think you are the creator of
5 this document?

6 MR. BEINS: Wade Beins with Crow Butte,
7 Your Honor.

8 I believe that is correct that that's the
9 depth to the water level from the surface.

10 JUDGE WARDWELL: Okay. So, those are the
11 rising water levels you're referring to are showing up
12 on this figure as decreasing values, is that correct,
13 Dr. Kreamer?

14 DR. KREAMER: That is correct, Your Honor.

15 JUDGE WARDWELL: Okay, thank you.

16 And, what document that we have in the
17 record of this proceeding are you citing to in regards
18 to the weather statistics? Where'd you get your
19 weather data from?

20 DR. KREAMER: There was no data in the
21 record. I had to go online, I list that in my
22 testimony the source of that is the monthly averages
23 for Crawford and the statement was made three times in
24 the correlation and so I wanted to check that.

25 JUDGE WARDWELL: Okay, thank you.

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1 And, do you include both rainfall and
2 snowfall events in your values for the precipitation?

3 DR. KREAMER: Those were overall rainfall
4 events that were recorded, not snowfall.

5 JUDGE WARDWELL: So, snowfall isn't in
6 there?

7 DR. KREAMER: The overall precipitation
8 averages over a long periods of time were listed and
9 there's no correlation that I saw there either, Your
10 Honor.

11 JUDGE WARDWELL: Okay, so there wasn't
12 anything -- you didn't include snowfall in your values
13 for the relative precipitation events during the --

14 DR. KREAMER: Not for the ones you read
15 and I cited, but overall, I did look at snowfall and
16 there was no correlation.

17 JUDGE WARDWELL: What do you mean by no
18 correlation? Maybe I'm not asking the question right.

19 When you were stating something in regards
20 to the amount of precipitation that occurred in a
21 month, did that include snow melt, the moisture in the
22 -- the equivalent inches of precipitation associated
23 with the snow that occurred, any snowfall that would
24 occur in the area?

25 DR. KREAMER: I would have to go back to

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1 that reference. I did look at snowfall but I'm not
2 sure in those numbers that I presented there that that
3 was included. That may have just been rainfall, but
4 I believe it might have been overall precipitation.
5 I can check that, Your Honor.

6 JUDGE WARDWELL: Okay, thank you.

7 Crow Butte, do you have any comments in
8 regards to the Intervenors hydrologic statements
9 related to this comparison of the amount of
10 precipitation with the response of the wells in the
11 water table elevations?

12 MR. LEWIS: Your Honor, this is Bob Lewis
13 with Crow Butte.

14 I have a couple of comments regarding the
15 response of the wells to precipitation and recharge.

16 My first comment is, the difference
17 between precipitation and recharge, precipitation
18 rainfall can take quite a long time to percolate
19 through the soil into the underlying aquifer on the
20 order of months and years.

21 Many of the wells at Crow Butte are tens
22 and hundreds of feet deep, so you don't expect to see
23 immediate response to precipitation in wells that have
24 any significant depth whatsoever. There's going to be
25 a significant lag or delay associated with the

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1 precipitation event and the recharge event with
2 respect to precipitation actually reaching the water
3 table.

4 So, there's a delay there so you don't
5 necessarily expect to see a one to one correlation
6 between a rainfall event and an immediate response in
7 the underlying water table.

8 The recharge area --

9 JUDGE WARDWELL: Don't you -- excuse me,
10 could I just ask a question there?

11 In regards to that, don't you have enough
12 data to somewhat get an idea of the response of each
13 well to precipitation events just by comparing them
14 over these years with the amount of wells that you
15 monitor out there?

16 MR. LEWIS: Well, there's a significant
17 difference based on the depth of the wells, in my
18 experience. If you have a very shallow well,
19 obviously, the response to a precipitation event would
20 be more observable than a very deep well which is more
21 muted and has a more regional response to recharge.

22 The regional recharge area for the Brule
23 is miles to the south in the uplands where, not only
24 is the recharge different than the climate stations
25 that are being used significantly, it basically, the

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1 response in the recharge area, there's a substantial
2 lag to long-term recharge that's overprinted by these
3 little precipitation events locally.

4 And, you cannot see in the deeper wells
5 out here an immediate response to precipitation events
6 is my main point. There's always a lag or delay
7 associated with that type of event.

8 You know, the clay layers in the
9 subsurface are numerous, so in a well that's ten to 50
10 feet deep, the delay in precipitation reaching the
11 water table can be weeks and months and years in some
12 cases.

13 So, you're going to see a very broad range
14 of responses in the Brule wells, depending on where
15 you are at the site, the depth of the wells, how far
16 you are from the regional recharge areas as well as
17 the climate stations not reflecting the recharge or
18 the precipitation necessarily that's at the site given
19 that they're miles removed from where these wells are
20 located.

21 JUDGE WARDWELL: So, as I hear your
22 testimony now, it seems to me that you are able to use
23 precipitation as a -- and variations in the recharge
24 as a reason for any change in water levels that might
25 be observed and we, as a Board, have nothing to be

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1 able to discriminate between that and actual being
2 drawn down by the Basal Chadron or impacted by the
3 pumping in the Basal Chadron in regards to finding
4 whether there's a connection between the Brule and the
5 Basal Chadron, is that a fair assumption?

6 MR. LEWIS: No, Your Honor, I don't think
7 that's a completely fair statement. I would said
8 that, again, that the deeper the monitoring well, the
9 more muted the response and that, in particularly, in
10 the deeper wells in the Brule which are the majority
11 of the wells, if you were having a leakage event, you
12 would see long-term trends that are downward,
13 overprinted on these seasonal variations which are
14 typically two to three feet every year.

15 And so, if you have significant leakage
16 events, it is difficult to separate from seasonal
17 variations but it would be observable in my opinion.

18 JUDGE WARDWELL: Okay, thank you.

19 Excuse me.

20 In your 082, page 1, this testimony states
21 that Crow Butte also claims that water level changes
22 in the Brule are not significant, providing Exhibits
23 063 and 064 again, which show the water level changes
24 in the monitoring well 722 and 717 which we've
25 discussed before from that --

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1 DR. KREAMER: Your Honor, your audio is
2 going out here.

3 JUDGE WARDWELL: Okay, I may not be close
4 enough to it.

5 But, 717 from 1999 to 2015, but not water
6 level changes in the critical period between 1991 when
7 operations began in 1999.

8 And we can strike that whole question
9 because we just covered it, sorry about that, that was
10 a page flip that I couldn't see ahead where I was
11 going. So, we don't have to worry about that
12 question.

13 Intervenors testimony --

14 DR. KREAMER: Your Honor, I have clarified
15 a previous question you had. You asked if --

16 JUDGE WARDWELL: Who's speaking?

17 DR. KREAMER: -- the snowfall was
18 included. I listed the --

19 JUDGE WARDWELL: Who's speaking?

20 DR. KREAMER: -- source --

21 JUDGE WARDWELL: Excuse me, who's
22 speaking?

23 DR. KREAMER: -- the total precipitation,
24 so the snowfall apparently was included in that
25 analysis.

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1 JUDGE WARDWELL: Okay, could you repeat
2 that again, I was interrupting you?

3 DR. KREAMER: I'm sorry to have
4 interrupted you. I would just follow up on your
5 previous question as to whether the data on climate
6 and weather changes and precipitation included total
7 precipitation and it's listed in my source as total
8 precipitation. So, the water equivalent and the snow
9 pack apparently was included in that precipitation
10 amount.

11 JUDGE WARDWELL: Okay, thank you very
12 much.

13 And while I've got you here, I think this
14 is your question, we'll find out.

15 Exhibit 082, page 3, it's stated that the
16 initial period of pumping of these mining operations
17 where head gradients are expected to change most
18 rapidly and induce leakage is expected to be the
19 greatest is crucial but unreported by Crow Butte and
20 unevaluated by the NRC.

21 And so, I guess I'd ask you, with the
22 upper confining unit being at least 200 to 300 feet in
23 aquitard thickness, and I think that was referenced
24 before in the License Renewal Application Exhibit Crow
25 Butte 011, Figure 2.6-2, page 2-107.

1 I would ask you, Dr. Kreamer, would you
2 expect to see a rapid drawdown at the initiation of
3 pumping in the Basal Chadron/Chamberlain pass
4 formation in the middle to upper Brule aquifer or
5 would much of this rapid drop be leveled off the thick
6 aquitard to a more gradual steady lowering of the
7 potentiometric surface similar to the usual responses
8 from observation wells located a long distant -- a
9 long horizontal distance from a pump well?

10 DR. KREAMER: A great question, Your
11 Honor.

12 JUDGE WARDWELL: Thank you.

13 DR. KREAMER: The time period we're
14 talking about is in years, where years of pumping
15 before these monitoring wells kicked in.

16 And so, that would be sufficient time for
17 a quasi-steady state to be established. That, coupled
18 with the fact that's in previous testimony, some of
19 the reservoirs have been shown in Google Earth that
20 have reduced in size and dried up along the creeks in
21 the area. I think that there's indications that at
22 least connection is possible.

23 JUDGE WARDWELL: Did you do any studies or
24 anything to quantify or determine any direct
25 relationship between the overall precipitation and the

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1 drying up of these reservoirs that you talk about or
2 do you just throw it out as another potential thing
3 that might be out there?

4 DR. KREAMER: I did a brief analysis of
5 that and I saw no --

6 JUDGE WARDWELL: Did you refer to it in
7 your testimony anywhere?

8 DR. KREAMER: No, not in my testimony,
9 sir.

10 JUDGE WARDWELL: Okay, thank you.

11 DR. KREAMER: But, I did look at it and
12 there was no correlation that I could see between
13 precipitation and the reduced size of reservoirs in
14 the area.

15 JUDGE WARDWELL: Thank you.

16 NRC's Exhibit 095, page 5, answer 1.4
17 states that in demonstration of no drawdown in the
18 Brule, staff states that the pre-mining water level
19 for well 27 was 3,808, and it's referencing the
20 Exhibit 096 again at 1.

21 And, contours of the 2008 water level data
22 showing post-mining water levels indicate a water
23 level between 3,805 and 3,815, again, using 096 at 2.

24 But, the Intervenors state in Intervenor
25 Exhibit 082, page 3, that this location is over seven

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1 miles down gradient of the mining area under
2 consideration and could not have been affected by the
3 mining activities.

4 And so, I'll turn to the Intervenors and
5 ask what did you really consider when you used the
6 phrase "mining area under consideration," because as
7 a License Renewal, isn't all of the license area under
8 consideration?

9 DR. KREAMER: Your Honor, that was my
10 statement. This is Dr. Kreamer.

11 And, that was a false statement. The
12 seven miles is not correct. The north trend area in
13 one of the early maps was outlined in green and I
14 assumed that that's where the staff had indicated the
15 location. That was incorrect. I revised my testimony
16 based on that mistake and that was presented.

17 But, the main mining area in the 1991 to
18 1999 area was mine unit 1, 2, 3 and the major
19 discrepancy in the '82 to 2000 water levels occurs to
20 the southeast of that area.

21 JUDGE WARDWELL: So, you are now
22 acknowledging that the seven miles down gradient is
23 incorrect, is that what you're saying?

24 DR. KREAMER: I acknowledge that and I
25 made those corrections, sir.

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1 JUDGE WARDWELL: Okay, thank you, I missed
2 that. Thank you.

3 NRC Exhibit 095, page 5, answer 1.4 states
4 that additional evidence demonstrating that water
5 levels in the Brule aquifer have not been impacted by
6 mining activities as provided by the pre-pumping water
7 levels collected in PM-6 and PM-7 during the first
8 aquifer test.

9 Of particular significance is that the
10 1983 water level elevations for these wells are very
11 similar to the elevations measured in the Brule
12 aquifer in 2008.

13 But, the Intervenors state that in 082 --
14 Intervenors Exhibit 082, page 4, they state that what
15 the NRC does not mention are that these wells are,
16 again, considerably down gradient from major areas of
17 mining activity and are where the major discrepancies
18 exist between pre-mining water levels in 1982 to 1983
19 and post-mining elevations in 2008.

20 And, I guess, Dr. Kreamer, again, what
21 examples do you have of any location in the license
22 area where the 2008 elevations are significantly
23 different than the pre-mining elevations in 1983? Do
24 you have any that you can --

25 DR. KREAMER: It seems to be obvious from

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1 what you've read, you didn't get my corrections to
2 that area, Your Honor. Again, this is Dr. Dave
3 Kreamer.

4 I guess for about three or four sentences
5 describe in corrections what I meant to say. I'd be
6 happy to read that to you. I have it in front of me
7 or I could just describe this --

8 JUDGE WARDWELL: No, the fact that you
9 mentioned that you've corrected it and you are
10 correct, that I -- the length of time I had available
11 to prepare all my questions did not give me the luxury
12 of going back with all subsequent submittals of
13 corrections. So, as long as that's in the record,
14 that's all I need and you've sufficed by that, I'll be
15 able to look that up.

16 DR. KREAMER: And, it's in the record,
17 sir. It's been struck out and the --

18 JUDGE WARDWELL: Sure.

19 DR. KREAMER: -- corrections have been put
20 in red.

21 JUDGE WARDWELL: And, I'll apologize now
22 if this happens later on today because I'm liable to
23 have more of these that I just didn't pick up on in
24 regards to --

25 DR. KREAMER: This is the only mistake.

1 I guess I didn't have the little green square and the
2 little red circle available to me when I put in my
3 initial response and that was the only correction that
4 I made, Your Honor.

5 JUDGE WARDWELL: Thank you.

6 DR. KREAMER: I can address your question,
7 though, with some of my response if you want it now.

8 JUDGE WARDWELL: Sure, go ahead.

9 DR. KREAMER: All right.

10 JUDGE WARDWELL: Quickly.

11 DR. KREAMER: I think it's already --

12 JUDGE WARDWELL: Succinctly, go ahead.

13 DR. KREAMER: Succinctly, okay.

14 Confirmatory water levels from many Brule
15 wells were not included, including wells 19 and 129
16 which were in the area of highest discrepancy.

17 Selected water information was provided to
18 us from SM wells from 2008 but the one in the main
19 area is SM1-2, whereas, all the other SM wells go to
20 2015. Inexplicably, SM1-2 stops at 2005 and it
21 doesn't go from the beginning of the pumping area.
22 None of the SM wells go from the beginning of the
23 pumping in that area where the discrepancies exist.

24 JUDGE WARDWELL: Okay, thank you.

25 Crow Butte, would you like to respond to

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1 what Dr. Kreamer just said? Do you have any response?

2 MR. BEINS: Yes, Your Honor. Wade Beins
3 with Crow Butte.

4 In regard to SM1-2, the data set ending in
5 -- I believe Dr. Kreamer said 2005. Actually, I
6 believe it ended in 2003. That is because my Unit 1
7 was deemed restored by the State of Nebraska,
8 Department of Environmental Quality as well as the
9 NRC. And at that time period those wells were removed
10 from the monitoring program and they have been
11 abandoned and the surface reclaimed. That's why
12 there's no data for that particular time period after
13 2003.

14 JUDGE WARDWELL: Thank you. Okay.

15 We'll move on to Issue 2. What is the
16 available head in the Basal Chadron's chamber on past
17 formation and the maximum anticipated draw down during
18 Crow Butte's operation and restoration of its mining
19 facility.

20 NRC Exhibit 095, page 7, Answer 2.3,
21 states that this analysis demonstrates a far larger
22 consumptive use rates likely be needed before the
23 average reduction of the available draw down would
24 reach even 50 percent. And I guess I'll turn to the
25 staff considering this was your testimony. And I'm

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1 not sure who this will be addressed to. Mr. Back
2 again?

3 MR. BACK: Yes.

4 JUDGE WARDWELL: Okay. It's still not
5 clear to me when you use the phrase, maximum draw down
6 at any point, most likely at one of the production
7 wells, I assume, ever exceeded the available head at
8 that well such that part of the aquifer remains, yes.
9 I didn't phrase that very well.

10 Has the maximum draw down at any point
11 which, again, is most likely one the production wells,
12 ever exceeded the available head at that well such
13 that part of the aquifer becomes unconfined?

14 MR. BACK: No, Your Honor.

15 JUDGE WARDWELL: Okay. Thank you.

16 You go on to state on the same page 7,
17 Answer 2.4, referencing again NRC 001 page 93, Answer
18 9.4, that according to CBR's annotations in Exhibit
19 CBR 062, the 2015 water levels in this area were
20 between 36/39 at CM 10-26 and 36/37 at CM 10-1.
21 Therefore, the water levels have decreased by about
22 108 feet due to consumptive use rates of about 210
23 gallons per minutes.

24 And, I guess my question, Mr. Back, is
25 just want to verify that this 108 feet and 210 gallons

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1 per minute are actual values? They're not estimated
2 values that are to occur but those are what you
3 actually experienced in the field, is that correct?

4 MR. BACK: To the best of our knowledge,
5 Your Honor.

6 ADMIN. JUDGE HENRY: Thank you.

7 Crow Butte's exhibit 067, page 7, Answer
8 20, says that as a result, pumping rates are presently
9 at or near their projected maximum. As production
10 wells and in the current mine units restoration is
11 completed in the mine units. Pumping rates will
12 decline.

13 So, I'll turn to Crow Butte, whoever would
14 like to answer this and say that are there ever going
15 to be pumping rates greater than 210 gallons per
16 minute during either operations, restorations or
17 combinations of the two?

18 MR. PAVLICK: Doug Pavlick for Crow Butte,
19 Your Honor. As far as for clarification 210 gpm is
20 when you say flow rate you mean consumptive use,
21 correct?

22 JUDGE WARDWELL: Yes. I guess so. Yes.

23 MR. PAVLICK: Well, let me answer it two
24 ways. So, the --

25 JUDGE WARDWELL: Well, let me back up

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1 again. Is that what your licensed by? Is it the
2 pumping rate or is it the consumptive use rates?

3 MR. PAVLICK: We are licensed by maximum
4 flow rates so there's a piece of that that is
5 commercial production flow and a smaller piece that is
6 restoration flow. So, that's total re-circulatory
7 flow rate for those two processes. The waste water
8 generated off of those two processes, otherwise known
9 as bleed, is the consumptive use that is I think where
10 you're going with the question.

11 But the answer to the question from a flow
12 rate standpoint so we're licensed for 9,000 gpm of
13 production flow and another 2,000 gpm of restoration
14 flow. We have never approached that total flow in
15 either respect, production or restoration.

16 Currently, our production flows are around
17 6,000 gpm. Our restoration flow is roughly 500 gpm
18 right at the moment. That production flow if you look
19 forward for the next 10 years will go from 6,000 gpm
20 basically approaching zero on a straight line dissent.
21 So, that's just the continued depletion of our ore
22 body and the shutdown of production wells that will
23 occur. As individual wells are mined out, they're
24 shut off.

25 The restoration flow as we transition from

1 production to restoration, our restoration flow will
2 increase from the roughly 500 gallons per minute right
3 now up to 1,500 to 2,000 gpm rates. Certain phases of
4 restoration generate more waste than others. So when
5 a mine unit is being restored and the process we're
6 using is reverse osmosis that generates a higher bleed
7 rate.

8 I'll finish with the answer I think you're
9 looking for.

10 So, currently, yes, an average bleed or
11 consumptive use for the mine site is around 200 gpm.
12 There is a point in the future when we're restoring
13 some of the larger mine units where we achieve a
14 maximum consumptive usage of around 300 to 305 gpm.
15 That's for a period of I want to say four or five
16 years and, again, that's when our largest mine units
17 are in that phase of restoration when they're seeing
18 the reverse osmosis process. But at that time the
19 production flow will be very minimal.

20 Sorry for the long-winded answer.

21 JUDGE WARDWELL: No, that helped. And so
22 you are not licensed to hold to any set value of
23 consumptive use rate, is that what you're saying?
24 It's based merely on the production pumping rates for
25 the various activities that you're doing? Am I

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1 understanding that correctly?

2 MR. PAVLICK: That's correct. We are --
3 our license does have parameters around the amount of
4 bleed that we need to carry to maintain inward
5 hydraulic bleed. The other constraint is just the
6 physical infrastructure at the mine site so that's the
7 waste capacity -- waste disposal capacity through the
8 deep wells that we have.

9 JUDGE WARDWELL: Thank you.

10 And your Exhibit 067, testimony page --
11 Answer A.21, the Exhibit CBR 062 shows the available
12 head in a number of points throughout the various mine
13 units at the license renewal area. The available head
14 ranges from 435 feet to 147 feet based on the August
15 2015 data.

16 The Intervenors Exhibit 083, page 2,
17 states that apparently there is significant less
18 available head in the north part of the mining area
19 (147 feet). In query, is this due to larger
20 withdrawals from mining or change in the thickness of
21 confinement of the Basal Chadron Chamberlain Pass
22 Aquifer caused by the White River structure.

23 And I guess I'll start off with Crow Butte
24 just to verify that the values that are presented in
25 black ink on Crow Butte 062 at the top is that a value

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1 that represents the top of the Basal Chadron
2 Chamberlain Pass Formation Aquifer Elevation? And
3 there is the 062 and the top values that are in black.
4 I'm asking is that the top of the Basal Chadron
5 Chamberlain Pass?

6 MR. BEINS: That's correct, Your Honor.
7 Wade Beins with Crow Butte.

8 JUDGE WARDWELL: And do you have any
9 opinion as to what is the cause for the lower
10 available head in the northwest part of the license
11 area?

12 MR. BEINS: Wade Beins with Crow Butte,
13 Your Honor.

14 Yes, we do. The difference there is
15 primarily a result of surface topography decreasing as
16 you move from south to north across the mine site.
17 That surface topography slopes down towards the White
18 River. At the same time the Basal Chadron sandstone
19 and the Pierre Shale surface is rising as you move
20 from south to north and it's that change in surface
21 topography as well as the rising surface of the Basal
22 Chadron that results in that decreased amount of
23 available head.

24 And then you also have the water table
25 surface of the Chadron formation. It slopes I believe

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1 eight feet. It's eight feet lower on the north end
2 than it is on the south end of the mine.

3 If you take a look at CBR Exhibit Number
4 074, I believe, that demonstrates that.

5 JUDGE WARDWELL: Do you have a page number
6 for that we might refer to or was it in words or is it
7 a picture?

8 MR. BEINS: It's in page 9 or on page 9.

9 MR. LEWIS: It's a figure.

10 MR. BEINS: And it's a figure. Yes, Your
11 Honor, that's a figure.

12 JUDGE WARDWELL: And can you describe what
13 we're looking at here?

14 MR. BEINS: What we did to create this
15 particular cross section, we took a look at the
16 geophysical logs across the mine site and just for a
17 reference point we put on a commercial monitor well,
18 the farthest well south. I believe it's CM11-16.
19 Then also the shallowest or most northerly well to the
20 north there at CM10 and I can't quite make it out,
21 possibly 15 on the figure, and then you're looking at
22 the surface elevations at each well site, the water
23 levels for each well and then the top of the Pierre
24 Shale surface there. And this particular figure has
25 a vertical exaggeration of 10x in the vertical so just

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1 to help expand that so it's a little more visible to
2 you.

3 And so you can see the Pierre Shale
4 surface as you move from south to north increases
5 about 108 feet, I believe it is or 104 feet as you
6 move from the south end to the north end. And that's
7 largely the result of why we've got the decreased
8 amount of available head there.

9 JUDGE WARDWELL: Thank you. So, based on
10 this it's not due to larger withdrawals for mining or
11 a change in the thickness or the confinement of the
12 Basal Chadron Chamberlain Pass Aquifer caused by the
13 White River structure?

14 MR. BEINS: Correct.

15 JUDGE WARDWELL: Okay. Thank you.

16 I guess it was Mr. Wireman who presented
17 this. Does that answer your question that you
18 presented in your testimony? I believe 083 is yours?

19 MR. WIREMAN: It is and, no, it doesn't
20 fully answer my question. A change in the thickness
21 of the potentiometric surface above the Basal Chadron
22 can be affected by a number of things including the
23 thickness of the overburden, that's true. However,
24 there is a concern here that there are other things
25 that may affect this and may change this saturated

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1 thickness or this thickness of the potentiometric,
2 including a structure that is off to the northwest and
3 how that might affect the overall regional
4 potentiometric surface of the Basal Chadron.

5 Our concern is not so much that the
6 potentiometric surface Basal Chadron will be drawn
7 down below the top of the formation. That's an
8 operational issue for Crow Butte. The concern we have
9 is the effect off to the northwest on the aquifer,
10 that is the Basal Chadron beyond the mining unit.
11 This could result in lowering potentiometric surface
12 to the northwest. That will affect well yields for
13 any wells that are in it. It could affect discharge
14 that may occur from the Basal Chadron to the White
15 River or some other surface water. Somewhere that
16 Basal Chadron has to discharge. And so lowering the
17 potentiometric surface for whatever reason may have an
18 impact and that hasn't been addressed.

19 There is no monitoring well that I know of
20 in the Crawford area. There's no real look at how
21 this thinning that may be a result at least partially
22 of this structure. I think it's just under evaluated.

23 JUDGE WARDWELL: Thank you.

24 NRC Exhibit 092, page 8, Answer 2.6, the
25 Basal Chadron at Sandstone is import with respect to

1 maintaining surface water flow or wetlands. And I
2 guess I'll turn to staff initially because it's your
3 testimony. What is your evidence for this statement?

4 MR. BACK: We have not seen --

5 JUDGE WARDWELL: Is this Mr. Black?

6 MR. BACK: Mr. Back, yes.

7 JUDGE WARDWELL: Back.

8 MR. BACK: That's okay.

9 JUDGE WARDWELL: I must not be the first
10 one to make that error.

11 MR. BACK: Your Honor, we know there are
12 reported springs in the area. We have never had any
13 observational and these are up near Chadron, nowhere
14 near the license area. So, if you go back through
15 literature there are statements that say, you know,
16 springs can be fed by the Basal Chadron. However,
17 we've never seen any indication that what the mine
18 operations have any impact on spring flow to the
19 surface.

20 JUDGE WARDWELL: Thank you.

21 Intervenors Exhibit 082, page 4, says the
22 observed changes in the Brule water table concurrent
23 with the underlying pumping have the unambiguous
24 potential to affect surface flows in wetlands as does
25 the potential up welling of contaminants during

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1 excursion events observed in the Brule.

2 And I guess I'll turn to Dr. Kreamer
3 because I believe 082 is yours that I was curious as
4 to what evidence from the documents in these
5 proceedings do you have that there's a significant
6 amount of draw down in the Brule to impact surface
7 water flow or wetlands, specifically, what are these
8 observed changes in the Brule water table to which you
9 refer?

10 DR. KREAMER: Your Honor, first of all, I
11 don't know where that statement is made and I would
12 have to check that in its context. But the --

13 JUDGE WARDWELL: It's in your Exhibit 082,
14 page 4 if you want to look at that quickly.

15 DR. KREAMER: Okay.

16 JUDGE WARDWELL: Or we can do it -- you can
17 do it at break and come back to it rather than hold up
18 while you read that if you wish.

19 DR. KREAMER: Okay. Well, just some
20 general statements on that.

21 The major differences between the 1982
22 water levels and the 2008 water levels were just to
23 the southeast of Mining Area 1. There was not any
24 information from Well 19 and Well 129 in that area at
25 that time, even though they're listed as monitoring

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1 wells. And SM1-2 also in that area didn't have
2 information from that time period on either end.

3 But the information that was presented as
4 far as the wells in the area show a significant
5 discrepancy in water levels in that area, twenty to
6 thirty feet. Even if we account the typo that is
7 claimed for the one well that shows 40 feet
8 discrepancy.

9 Also along those lines there's an overall
10 trend of some of the reservoirs getting smaller in the
11 available Google Maps of the area if you look
12 historically. So, there is some trend that doesn't
13 seem to -- and I put this in my previous testimony,
14 Your Honor, and there seems to be no correlation with
15 any climatic event or weather event. And so I think
16 that there is evidence that suggests that something
17 may be going on.

18 JUDGE WARDWELL: Thank you.

19 And when you read 082, page 4, if you want
20 to add anything to that, let us know. Otherwise,
21 we'll assume that those comments suffice in regards to
22 responding to my question. Okay?

23 DR. KREAMER: Yes, Your Honor. Thank you.

24 JUDGE WARDWELL: And when we get back from
25 lunch. If you don't hear from me after lunch we'll

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1 assume that was sufficiently answered. Thank you.

2 Moving on to Issue 3, Whether the results
3 from the four pump test demonstrate a hydraulic
4 connection between Brule and Basal Chadron/Chamberlain
5 Pass formations.

6 Intervenors, Exhibit 003, page 4, which
7 we've talked about before back in August, that faults
8 could potentially connect uranium-bearing Chamberlain
9 Pass formation to modern river alluvium which in
10 brackets is a White River alluvium and connect the
11 water bearing Chamberlain Pass formation to overriding
12 secondary porosity of the Brule formation.

13 NRC in their environmental assessment,
14 Exhibit 010, Section 4.6.2.2.6, page 81, states that
15 Crow Butte is required in its license to monitor
16 ground water quality at water supply wells located
17 within one mile of a well field as part of the
18 environmental monitoring program and the program
19 monitor ground water quality at 19 water supply wells.

20 NRC Exhibit 001, A.6.4, page 20, states
21 that all but one of these wells are screened in the
22 Brule aquifer and they reference NRC Exhibit 009 at
23 129.

24 NRC Environmental Assessment 010, again,
25 Section 4.13.6.2, page 115, states that the Brule

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1 formation is an important aquifer regionally and
2 locally producing sufficient quantities of water
3 suitable for domestic and agricultural purposes.

4 The Intervenors in 003, again, on page 3,
5 state that once into the White River alluvium ever
6 rain event will push the contaminants a little
7 downstream. In the case of the White River downstream
8 is to the north/northeast and directly onto the Pine
9 Ridge Reservation.

10 So, I would like to ask this of all of the
11 parties and, I guess, I'll start with the Intervenors
12 and ask if you agree that any impacts to the Brule has
13 a potential to affect local use -- strike that.

14 I've got a question for Crow Butte first.
15 Of those 19 water supply wells I assume most of those
16 are in the Town of Crawford or on the way between the
17 license renewal area and Crawford?

18 MR. TEAHON: Your Honor, this is Teahon,
19 Crow Butte.

20 JUDGE WARDWELL: We've missed you.

21 MR. TEAHON: Yes.

22 JUDGE WARDWELL: Welcome.

23 MR. TEAHON: Available here on the end.

24 JUDGE WARDWELL: I saw you hiding. I was
25 wondering when you were going to break your cocoon and

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1 join us.

2 MR. TEAHON: I'm back. The wells listed
3 are you stated within one miles. It's actually within
4 one kilometer of an active mine unit. And there is
5 only one well basically at the end of Crawford which
6 is the well that's located in the Basal Chadron sands.
7 The rest are in the Brule.

8 JUDGE WARDWELL: Now, I'm sorry.

9 JUDGE WARDWELL: your question was, were
10 they in the Town of Crawford? There are none in the
11 Town of Crawford.

12 JUDGE WARDWELL: There's none in the Town
13 of Crawford?

14 MR. TEAHON: There are none --

15 JUDGE WARDWELL: Okay.

16 MR. TEAHON: That's correct.

17 JUDGE WARDWELL: Thank you.

18 CHAIR GIBSON: Let me just ask one
19 question.

20 You say there's none in the Town of
21 Crawford. Are you talking about that draw out of
22 which aquifer, Mr. Teahon?

23 MR. TEAHON: Out of the Basal or out of
24 either the Basal or the Brule. Our one kilometer ring
25 does not extend into the Town of Crawford.

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1 CHAIR GIBSON: Okay. Okay. Okay. Thank
2 you.

3 JUDGE WARDWELL: On Crow Butte 067 Exhibit,
4 page 8 and Answer 25 there's a table of key pump test
5 values. I'll stay with Crow Butte that the maximum
6 drawdown value for Test No. 1 is missing. Is there a
7 reason for that?

8 MR. BEINS: I'm not sure why that value is
9 missing, Your Honor.

10 JUDGE WARDWELL: Okay. Are these maximum
11 drawdowns point values at the pump well or average
12 values over the entire drawdown curve?

13 MR. BEINS: My understanding is that those
14 values are the drawdown at the pumped well or pumping
15 well.

16 JUDGE WARDWELL: Thank you. I want to see
17 Exhibit 095, page 9, Answer 3.2 for Pump Test Number
18 One you state that we note that several of the figures
19 presented indicate that a small amount of water is
20 being released from storage in the overlying and
21 underlying aquitards. And you reference Exhibit --
22 Board Exhibit 002A at Figures 2.7A4 through 2.7A7.

23 And so my question for staff, if we can
24 stay with Mr. Back, is that, is the raw data available
25 for Pump Test Number One?

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1 MR. BACK: I know it is for the other --
2 for a number of the other pump tests. I'd have to
3 look quite honestly. I don't know.

4 JUDGE WARDWELL: And for the other pump
5 tests you believe it is available?

6 MR. BACK: Yes, I've look at it for the
7 other pump test.

8 JUDGE WARDWELL: Where is this release of
9 water from storage observed in your exhibits at Board
10 Order 002A, Figures 2.7A4 through 2.7A7?

11 MR. BACK: One of the figures, in
12 particular. It might be A7. I'd have to look at the
13 exhibit, actually shows some of the points towards the
14 latter time period falling under the curve, under
15 the --

16 JUDGE WARDWELL: Maybe can pull that up and
17 we'll take a look at it.

18 MR. BACK: Just flip through a couple of
19 the curves. And keep in mind the authors of this
20 aquifer test also concluded that they showed minor
21 amounts of leakage and so, you know, there is one
22 curve that clearly showed it. Not this one and others
23 the dots just -- oh, this one here. So, if you turn
24 that on its side and you'll notice that a number of
25 the data points actually fall below the match curve

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1 and that's typically indicative of leakage.

2 And now the other curves you don't --

3 JUDGE WARDWELL: So, you're speaking of the
4 points that underneath the --

5 MR. BACK: The curve.

6 JUDGE WARDWELL: -- the smooth line?

7 MR. BACK: Yes. Because --

8 JUDGE WARDWELL: At the later time frame?

9 MR. BACK: Yes, that indicates that the
10 drawdown was not as much as would have been
11 theoretically predicted.

12 Now the other curves, it's far less
13 pronounced and difficult to see. However, the authors
14 of the test, the aquifer test, people who conduct it
15 and analyze the data indicated that they -- that they
16 looking at the data certainly closer than I did. I
17 mean, this was all done, you know, in '83, that these
18 other curves also indicated some amount of minor
19 leakage.

20 JUDGE WARDWELL: You go on to state I
21 believe on that same page 9 of Exhibit 095, Answer 3.2
22 that based on consolidation tests the change in the
23 pore pressure, however, did not propagate through the
24 clay and into the overlying clay stones.

25 Besides this statement in Pump Test Number

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1 One what's the basis for these conclusions?

2 MR. BACK: Well, the consolidation tests
3 indicates that the permeability is so low that the
4 pore pressure wouldn't go across. It's not something
5 that comes out of the pump test. It comes out of the
6 consolidate test itself. So, it's at these extremely
7 low permeabilities, very little water actually comes
8 the clay itself. The clay is being squeezed,
9 squeezing water into the aquifer and so it's a side
10 calculation where that's done.

11 JUDGE WARDWELL: Well, aren't you speaking
12 of two different things? You're speaking of the
13 squeezing of the water out of the clay which you say
14 is very small but in this statement you say that based
15 on a consolidation test the change in pore pressure
16 did not propagate through the clay into to the
17 overlying clay stones. And isn't that a different
18 issue and what is the basis for that? How do you
19 glean that out of a consolidation test?

20 MR. BACK: The consolidation test basically
21 provide information on how permeable the clay unit is.
22 And the clay unit is extremely impermeable and so
23 that's, knowing, and again I did not do these
24 calculations. I'm reviewing their work but based on
25 those extremely low permeabilities the pore pressure

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1 would not have been able to move beyond the clay.

2 JUDGE WARDWELL: Okay. Thank you.

3 NRC Exhibit 095, page 10, Answer 3.3 for
4 Pump Test Number Two as shown on Figure 2.7-21, Board
5 Exhibit 002B-R at 2.749, the overlying confining layer
6 piezometer, UCP1 showed no response to pumping from
7 the Basal Chadron sandstone.

8 And I guess you've answered the question
9 but let me just fix that. This response that you're
10 referring to would show up on this figure if, in fact,
11 the data points fell beneath the fitted line, is that
12 correct. Or is there some other way to show up?

13 MR. BACK: Not necessarily, Your Honor.
14 You'd actually see a decrease. You'd actually see an
15 impact. In the monitoring well itself you would see
16 drawdowns going down. So, you would see some leakage
17 like you say below the line but you'd also see an
18 impact in the well itself.

19 JUDGE WARDWELL: So, you're saying this is
20 merely the observation of the well itself and the lack
21 of drawn down in it?

22 MR. BACK: Yes, Your Honor.

23 JUDGE WARDWELL: Is that a standpipe
24 piezometer or is it electronic piezometer or --

25 MR. BACK: that was a standpipe piezometer

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1 in the Brule.

2 JUDGE WARDWELL: it was in the overlying
3 confining --

4 MR. BACK: That one was lysimeter, so that
5 was set up with the little disc to pick up pore
6 pressure changes.

7 JUDGE WARDWELL: Which one are we talking
8 about now? In your testimony you said for Pump Test
9 Number 2, the overlying confining layer piezometer--

10 MR. BACK: Yes, Your Honor --

11 (Simultaneous speaking)

12 JUDGE WARDWELL: What type of piezometer is
13 that?

14 MR. BACK: A small diameter tube with a
15 porous cap. So, it's a small -- it's really called--

16 JUDGE WARDWELL: A small standpipe?

17 MR. BACK: Yes.

18 JUDGE WARDWELL: And do you know the
19 diameter of that standpipe?

20 MR. BACK: Two inches I've been told.

21 JUDGE WARDWELL: Okay. Would not this
22 instrument with a two-inch diameter and a certain
23 amount, a two-inch diameter instrument have an
24 extremely long response time given the volume of water
25 in the standpipe and the very low hydraulic

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1 conductivity of the aquitard itself, that monitor
2 readings are almost useless in this device?

3 MR. BACK: No, Your Honor. It's actually
4 measuring changes in moisture. So even small changes
5 in moisture. It's not like we've got a water level
6 that we're measuring. We're actually measuring a
7 pressure difference and moisture changes. So, that's
8 why they've probably used this approach.

9 JUDGE WARDWELL: And so that the porous tip
10 of this piezometer is acting like a lysimeter as you
11 described.

12 MR. BACK: Yes, Your Honor.

13 JUDGE WARDWELL: Okay. Thank you.

14 NRC Exhibit 095, page 10, Answer 3.3.
15 There are no indications of recharge in the recovery
16 graphs, Figures 2.7-18 through 20. And it's page 2.7,
17 44-46 of Board Exhibit 002B-R. And now I could say I
18 guess that -- well, let me ask you. How would
19 recharge show up now on the recovery curves?

20 MR. BACK: It would show up as a curve
21 upward toward -- you got to keep in mind the recovery
22 curves are a little tricky to read because it's an
23 inverse time that the recovery is going towards the
24 zero drawdown. And so at the top at that curve you
25 would start having it curl up if there was a recharge

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1 boundary.

2 JUDGE WARDWELL: Thank you.

3 Same cite, the 095 Exhibit, Page 10, 3.3.
4 We note that during the aquifer test it's likely that
5 the overlying and underlying aquitards yield small
6 amounts of water squeezed from storage due to pore
7 pressure changes.

8 And, I guess, I'd ask you again, not again
9 but I'll ask you. Where was this observed in the pump
10 test figures?

11 MR. BACK: Your Honor, that would be
12 observed as we saw in the last figure the dots falling
13 under the theoretical lines.

14 JUDGE WARDWELL: Is there a way to quantify
15 the volume of water associated with those dots and the
16 difference between the curve and where those are
17 located to get a handle of how much that would be
18 because it would seem like that's a fair amount
19 compared to what you might get out of just squeezing
20 some clay?

21 MR. BACK: Your Honor, those calculations,
22 those volume calculations have been done in the
23 aquifer test and the reports. Actually in Crow
24 Butte's testimony they've provided some of that
25 information and so it is -- they are small amounts and

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1 they are recorded. I just don't have the numbers off
2 the top of my head.

3 JUDGE WARDWELL: Okay. Thank you.

4 Let me turn to Crow Butte in regards to
5 that. Could you guide us on where you might have
6 documented these calculations in either the report or
7 subsequent analyses?

8 MR. LEWIS: Sorry, could you rephrase your
9 question, Your Honor? I'm not sure I understand with
10 respect to which data.

11 JUDGE WARDWELL: The question I had was
12 that I asked Mr. Back who referenced that you had done
13 some of these so that's why I'm turning to it. But
14 the question I asked Mr. Back was, have you tried to
15 calculate out the volume of water associated with what
16 might be recharge, i.e., leakage, associated with the
17 recovery curves and the difference between the fitted
18 line and what the recharge that shows up on that
19 diagram shows? And he said that the report had such
20 calculations or that you had run some calculations
21 that would indicate whether or not those values are
22 reasonably to be associated with a small amount of
23 water coming out of the clay or whether or not it's a
24 larger volume of water coming out to fractures in the
25 clay?

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1 MR. LEWIS: I guess, Your Honor -- this is
2 Bob Lewis, Crow Butte.

3 I believe you're referring to my direct
4 testimony in regard to Pump Test One in which
5 basically the authors themselves had a very small
6 amounts of leakage based on deviations of the leaky
7 type curve analysis.

8 I believe the amount of water was 947
9 gallons that was spread out over 50,268,000 square
10 feet or 1,154 meters. That's essentially the radius
11 of influence of the pump test. And when you do those
12 calculations over a 51-hour period of time which was
13 the duration of the pump test we got a reading of
14 .00001884 gallons per square foot. In quantifying
15 that amount of leakage that was essentially basically
16 the numbers that the authors had presented just
17 putting different units.

18 JUDGE WARDWELL: And you haven't performed
19 any other calculations of your own in regards to that
20 for Pump Test Two or any other pump test?

21 MR. LEWIS: Not personally no. Not that I
22 know of.

23 JUDGE WARDWELL: Did somebody else start to
24 say something?

25 I'm turning back to Mr. Back. Is that

1 what you think you were referring to or did you think
2 there was something more?

3 MR. BACK: Your Honor, I believe that was
4 what I was referring to.

5 JUDGE WARDWELL: Thank you.

6 NRC Exhibit 095, Testimony Page 10, Answer
7 3.4 for Pump Test 3 the drawdown curves provided in
8 Appendix C of the Board Exhibit 002C indicate a fully
9 confined aquifer. And, I guess, I would ask Mr. Back,
10 what distinguishes this curve from one representing a
11 fully confined aquifer?

12 MR. BACK: Your Honor, you mean partially
13 confined aquifer?

14 JUDGE WARDWELL: No, why do you believe
15 this curve demonstrates a confined aquifer?

16 MR. BACK: Because of the points fall on
17 the theoretical line so there's no signs of any
18 leakage in these test results.

19 JUDGE WARDWELL: But isn't it different
20 than saying whether it's confined or unconfined?

21 MR. BACK: Yes, Your Honor. There are many
22 degrees of confinement running from very, very
23 confined with a very low storage co-efficient to
24 unconfined with a high storage co-efficient.

25 JUDGE WARDWELL: So, what I'm driving at is

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1 how did you derive the fact that this is a confined
2 aquifer and not an unconfined aquifer out of just this
3 shape of the curve or the points on the line?

4 MR. BACK: Your Honor, the shape of the
5 curve but if the water level is above the top of the
6 aquifer that is a good indication that it has some
7 degree of confinement. But the shape of the curve
8 will help define that.

9 JUDGE WARDWELL: I understand the
10 definition of a confined versus a unconfined.

11 MR. BACK: Okay.

12 JUDGE WARDWELL: What I'm still having
13 trouble with is your statement saying that the
14 drawdown curves indicate a fully confined aquifer and
15 I'm not sure how those drawdown curves indicate a
16 fully developed, a fully confined aquifer as opposed
17 to an unconfined aquifer.

18 MR. BACK: There's no leakage indicated.
19 In Test One there was some leakage indicated. In this
20 test, there was not.

21 JUDGE WARDWELL: So, you had a perfect
22 curve fitting is what led you to believe that?

23 MR. BACK: Yes, Your Honor.

24 JUDGE WARDWELL: Okay. Thank you.

25 I'll turn to the Intervenors to see if

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1 they'd like to comment on that. I believe it would
2 probably be Dr. Kreamer but whoever would like to,
3 including Mr. LaGarry if he wants to.

4 DR. KREAMER: Your Honor, for clarification
5 you covered Pump Test, One, Two, Three. Are you
6 asking me a question specifically for just that very
7 last question --

8 JUDGE WARDWELL: Yes.

9 DR. KREAMER: -- or are you asking me to
10 comment on the range of testimony that you covered?

11 JUDGE WARDWELL: No, I was asking whether
12 you had a comment on Pump Test Three in regards to the
13 drawdown curves indicating a fully confined aquifer
14 and their response to that.

15 DR. KREAMER: I would say that the drawdown
16 curves are perfect. Pump Test Three did not show as
17 strongly as the others.

18 JUDGE WARDWELL: Okay. Now, would you like
19 to comment about -- would you like to make a comment
20 about Pump Test Two?

21 DR. KREAMER: Oh, yes. Where would you
22 like me to start?

23 JUDGE WARDWELL: I would start at the
24 beginning and try to finish up near the end.

25 DR. KREAMER: I shall do that, Your Honor.

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1 In my testimony I presented one of the
2 figures and let me get to that. I'll make sure that
3 it's there.

4 The figure is from -- let's see. It's
5 Figure 2.7-14 on page 2.7(40), the Jacob-Cooper plot
6 for COW3. That's a semi-logarithmic plot.

7 JUDGE WARDWELL: And is this --

8 DR. KREAMER: And what it shows is it shows
9 the dramatic change in the drawdown.

10 JUDGE WARDWELL: Excuse me, excuse me,
11 excuse me.

12 DR. KREAMER: Yes.

13 JUDGE WARDWELL: I don't think you gave the
14 exhibit number, did you?

15 DR. KREAMER: I tried to. The exhibit
16 number. Oh, the exhibit number. That would be oh,
17 excuse me. That would be from the pump test which is
18 listed as BD-2B.

19 JUDGE WARDWELL: B, okay. Is that B, Pump
20 Test One but we'll pull it up if it's not?

21 DR. KREAMER: That would be Pump Test Two,
22 sir. You asked me about Pump Test Two. And if you go
23 down to Figure, on page 40, I believe. It's on page
24 2.7(40). That would be the other direction, down. It
25 would be one of those straight-line looking plots.

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1 JUDGE WARDWELL: It's four up from there.

2 DR. KREAMER: I am not sure. Okay. That's
3 the one right there.

4 JUDGE WARDWELL: There it is.

5 DR. KREAMER: That's the plot.

6 JUDGE WARDWELL: Okay.

7 DR. KREAMER: In this plot if you look at
8 it what you see is you can see that only the late-time
9 data has been matched. On the x axis you have time
10 and it's sort of a logarithmic plot with time. And
11 you can that they've matched their data only to the
12 late time.

13 The drawdown is on the y axis and so the
14 beginning of the test is on the upper left and it
15 moves and progresses to the lower right as there's
16 more drawdown. But you can that a lot of the early
17 data is not plotted to line and would plot as a line
18 from about maybe seven minutes or so into the test to
19 probably about 100 minutes there is a straight line
20 there that can be drawn in the early time. That would
21 be the pumping rate or the drawdown rate to start that
22 test.

23 The diversion that is measured with the
24 little orthogonal measurement at the bottom would be
25 the late data once a recharge boundary would kick in.

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1 And so in this plot there's very definitely a change
2 from the early time data and then suddenly there's a
3 recharge source. This would not indicate the
4 assumption that Crow Butte or NRC staff would make
5 that any leakage would be not from a small fracture
6 but would be overall from a clay that would be leaking
7 slowly.

8 JUDGE WARDWELL: And do you believe that
9 this--

10 DR. KREAMER: So, I renew that in my
11 testimony to show where that recharge boundary would
12 be and I think that clearly shows that in Pump Test
13 Two there was leakage and there was leakage from some
14 source that is not consistent with just an overall
15 leakage out a clay layer slowly. It would --

16 JUDGE WARDWELL: Okay. And I believe that
17 would be in Exhibit 079, page 3, that you made these
18 comments and had the plots, I believe?

19 DR. KREAMER: Yes, it wouldn't be page 3.
20 That was for Pump Test One, Your Honor. It would be
21 page 6, I believe.

22 JUDGE WARDWELL: Okay. Did your analysis
23 account for the quantity of water in the well casing?

24 DR. KREAMER: Yes. I did look at the well
25 casing. That was one of the comments. The well

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1 casing was said to be back, two inches in diameter.
2 Originally four inches in diameter.

3 If you look at the volume and pumping rate
4 was 24 gallons per day within a few minutes, the first
5 few minutes, the well volume of the pumping well would
6 have been -- it would have been accounted for. So,
7 after just a few minutes probably my calculations with
8 a two inch were about 3.4 minutes. If you say there
9 would be wider well diameter it would be a few more
10 minutes, but certainly by the time that straight line
11 starts about seven or eight minutes in, any pumping
12 well or volume would be insignificant.

13 JUDGE WARDWELL: Was it staff or Crow Butte
14 raised some concerns in regards to the early time of
15 value? Staff, do you remember that or was it --

16 MR. BACK: Your Honor, it's both staff and
17 Crow Butte raising very similar concerns.

18 JUDGE WARDWELL: And so while I've got you
19 here would you like to express them where have you
20 done any calculations in the documents that have been
21 presented in this proceeding that highlight this
22 concern with the early time data and why is it?

23 MR. BACK: Your Honor, Crow Butte actually
24 did calculations for showing that time that concerns
25 with the early time. The staff provided reference

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1 material showing what a recharge boundary would really
2 look like and why it is that the early time data is
3 not used for these calculations.

4 JUDGE WARDWELL: And what references are
5 these and are these documents in our proceeding?

6 MR. BACK: They are documents in your
7 proceedings that --

8 JUDGE WARDWELL: Do you have an exhibit
9 number for them?

10 MR. BACK: One of the exhibit numbers is
11 NRC-108. That actually shows what a recharge boundary
12 looks like in a straight line analysis. That's out of
13 a better text book.

14 And then --

15 MS. SIMON: Your Honor, Mr. Back can
16 confirm --this is Marsha Simon, but I believe it's
17 NRC-110 is an excerpt from Kruseman and de Ridder.

18 MR. BACK: Yes --

19 JUDGE WARDWELL: Okay.

20 MR. BACK: -- Your Honor.

21 JUDGE WARDWELL: Thank you. Thank you all.

22 CHAIR GIBSON: All right. We'll stand in
23 recess for 30 minutes and we'll be back on the record.

24 (Whereupon, the above-entitled matter went
25 off the record at 1:03 p.m. and resumed at 1:35 p.m.)

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1 CHAIR GIBSON: All right. We're back on the
2 record.

3 JUDGE WARDWELL: Ready for me to rock and
4 roll, huh?

5 CHAIR GIBSON: Yes.

6 JUDGE WARDWELL: All right. We're in the
7 middle of this pump test stuff, and let me --- I'll
8 pick up here. Intervenor's testimony 079, page 1 says
9 "The tenth test was not discussed nor complete
10 information provided." Dr. Kreamer, is that tenth
11 test to which you refer the 2006 test? Dr. Kreamer?

12 CHAIR GIBSON: I guess we're all not here. We
13 have some technical difficulties. Could somebody get
14 a call into Dr. Kreamer, see if he's ---

15 MR. WIREMAN: This is Mike Wireman. I'll do
16 that right away.

17 CHAIR GIBSON: Thank you. Here he is.

18 DR. KREAMER: Okay. I'm back on line.

19 JUDGE WARDWELL: Okay, great. In your Exhibit
20 INT-079, page 1, you say that the tenth test was not
21 discussed nor complete information provided. And my
22 question to you is the tenth test to which you refer
23 the 2006 test, or is it another test? We can't hear
24 you. You need to go back and unmute yourself.

25 CHAIR GIBSON: Dr. Kreamer ---

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1 DR. KREAMER: Yes.

2 JUDGE WARDWELL: There we go.

3 DR. KREAMER: Okay, I'm sorry. I'm back on.
4 Let's see. I don't have it by those numbers. Are you
5 talking about my revised testimony?

6 JUDGE WARDWELL: INT-079, page 1.

7 DR. KREAMER: INT-079, page. Hang on a second,
8 I'll dig that out. I'm sorry. I don't have it by that
9 number, and I'm having trouble figuring it out. Are
10 you talking about my supplemental testimony?

11 JUDGE WARDWELL: I'm talking about INT-079,
12 page 1.

13 MR. WIREMAN: Yes, David, that's your
14 supplemental testimony.

15 DR. KREAMER: Okay. Yes, sir, I'm there. Got
16 it. I'm there.

17 JUDGE WARDWELL: Okay. And I believe somewhere
18 on there you refer to a tenth test. There it is. The
19 tenth test was not discussed nor complete information
20 provided. So, it is the 2006 test that you're
21 referring. Correct?

22 DR. KREAMER: That is correct, Your Honor.

23 JUDGE WARDWELL: And was not the 2006 test
24 described in detail in Crow Butte's Class 3 UIC
25 application to NDEQ? And that would be NRC Exhibit

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1 028, G10-G-15?

2 DR. KREAMER: Yes, but they were not discussed
3 in the hearing.

4 JUDGE WARDWELL: So, why are you saying it
5 isn't --- wasn't discussed, nor complete information
6 provided? You mean the hearing or in evidence?

7 DR. KREAMER: In the hearing, we didn't
8 discuss it. And it concerns the North Trend which is
9 fairly far from the area that we're talking about.
10 But, no, the information was provided, but it was not
11 discussed at the hearing.

12 JUDGE WARDWELL: Okay. So, this wasn't a
13 criticism that you didn't have anything to review. It
14 was a completely separate argument that you were
15 making.

16 DR. KREAMER: Yes.

17 JUDGE WARDWELL: Statement of Fact.

18 DR. KREAMER: That was a separate argument,
19 sir.

20 JUDGE WARDWELL: Fine. Board Exhibit 002A,
21 page 278 says, "Based on significant deviation of the
22 pump test data from the type curve in the original
23 analysis, the U.S. NRC questioned the use of non-
24 leaky analysis method in this data. So, I'll ask the
25 Staff to explain your concern. I think it will be a

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1 repeat of what we said before, but then what actions
2 were taken in regards to that?

3 MR. BACK: Your Honor, are we talking about --
4 - which pump test now are we talking about?

5 JUDGE WARDWELL: This should be --- it's Board
6 002A, so I believe that's pump test 2, isn't it?

7 DR. KREAMER: No, it's pump test 1, Your
8 Honor.

9 JUDGE WARDWELL: Okay, pump test 1.

10 MR. WIREMAN:

11 MS. SIMON: Your Honor, also --- Marcia Simon.
12 Just so it's clear in the record, that test was
13 reviewed in 1983, so none of these witnesses actually
14 reviewed it at that time.

15 JUDGE WARDWELL: Thank you for sharing.

16 MR. BACK: Your Honor, so the question is ---
17 let me just rephrase it. It's --- initially, a non-
18 leaky solution was used to analyze the data. The
19 Board --- the NRC came back and said it looks like
20 the analyst should be using a leaky solution, and so
21 move to like another analytical solution to better
22 match the data.

23 JUDGE WARDWELL: That's the answer to the
24 question.

25 MR. BACK: That is ---

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1 JUDGE WARDWELL: That's not the question.

2 MR. BACK: Okay. Does that answer the
3 question?

4 JUDGE WARDWELL: Yes, it does.

5 MR. BACK: Yes.

6 JUDGE WARDWELL: And what was the results of
7 their reevaluation? Did any dramatic --- how much
8 leakage is occurring from pump test 1, I guess, or
9 how did you --- what did you evaluate, and how did it
10 affect your decisions in regards to the use of that
11 test, and how much leakage is coming out of the Brule
12 into the Basal Chadron/Chamberlain Pass formation?

13 MR. BACK: Your Honor, no leakage came out of
14 Brule into the Basal Chadron from this test. This
15 test was showing leakage from the immediately
16 adjacent confining unit which was the clay.

17 JUDGE WARDWELL: Okay.

18 MR. BACK: And per the earlier testimony by
19 Crow Butte this morning, it was approximately 1,000
20 gallons was calculated to leak.

21 JUDGE WARDWELL: Thank you. The Intervenor's
22 079, Page 5 say that the authors of the aquifer test
23 1 report argue that the lake leakage is attributed to
24 an increase in aquifer thickness and commensurate
25 with increase in the aquifer transmissivity. The

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1 added water comes from the Chamberlain Pass/Basal
2 Chadron and not vertical leakage. And, therefore, a
3 non-standard two-stage tie spit analysis is
4 justified. The Intervenors state that,
5 "Unfortunately, for the author's argument to hold
6 water, the aquifer thickness would have to increase
7 in all directions radially from the pumping well.
8 This is not the case as the thickness actually
9 decreases in some directions. The transmissivity
10 would be expected to be lessened in those directions
11 and less water would be available as the radius of
12 influence of the pumping well increases, not more as
13 indicated by the data."

14 I'll start off with Crow Butte to --- how do
15 you respond to this position of the Intervenors?

16 MR. LEWIS: Bob Lewis at Crow Butte. Your
17 Honor, the authors of this report did five different
18 analyses. As you point out, one of the analyses that
19 they did was a leaky analysis. Another analysis they
20 did was a two-stage tie spit. The two-stage tie spit
21 was done to demonstrate that the flattening of the
22 curve that you did see in late time can also be the
23 result of changes in transmissivity rather than
24 leakage. And looking at this data, they interpret a
25 53 percent increase in transmissivity over the radius

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1 of influence of the pump test. And that kind of
2 variability can absolutely lead to the small
3 flattening of the curve that you see in some of the
4 observation wells during pump test 1. So, I think
5 it's important that the conclusion of the authors of
6 pump test 1 was not that there was a certain amount
7 of leakage, but that there was also the possibility
8 that there was no measurable leakage and simply an
9 increase in transmissivity across the test. And I
10 would agree with that particular conclusion.

11 JUDGE WARDWELL: Thank you. Intervenors 079,
12 page 5 says in the report, that's again the Board
13 Exhibit 002A, "Authors use only a single low
14 hydraulic conductivity for leaky strata over the
15 Chamberlain Pass formation, and assign a high
16 hydraulic resistance to that leaky strata. Only a
17 single value for each strata is reported rather than
18 a range of values. Importantly, no apparent attempt
19 was made to see if by varying the hydraulic
20 conductivity values, particularly in strata overlying
21 the Chamberlain/Basal Chadron formation, field
22 observations of leakage could be replicated." And do
23 you have a response to that comment from the
24 Intervenors for CBR?

25 MR. LEWIS: Bob Lewis, Crow Butte. I think

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1 that's a hypothetical situation that --- I don't
2 really have a comment on that because I would say
3 that it presumes from a false assumption. I don't see
4 that the premise of that is valid. I would not agree
5 with that.

6 JUDGE WARDWELL: Thank you. Intervenors 079,
7 page 5, goes on to say, "Further, assembled field
8 data were not used to characterize the hydraulic
9 conductivity of these underlying and overlying
10 formations, but characterization was simply done in
11 the laboratory geotechnical analysis on selected
12 samples from a single bore hole." And, again, it's
13 the conductivity of the confining units on either
14 side of the Basal Chadron/Chamberlain Pass formation.
15 So, for Crow Butte, I wondered whether you had any
16 response to that position of the Intervenors?

17 MR. LEWIS: Your Honor, I think the position
18 is consistent with the pump test analysis in that
19 there is no indication of significant leakage on
20 these pump test curves, in my opinion, and that
21 that's consistent with the geotechnical analysis of
22 the data. So, you know, the samples that were done,
23 the consolidation testing, the permeability testing
24 and the pump test together as a single story are
25 consistent to me. That's how I would view this

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1 situation. I don't particularly have any other
2 comment on Intervenors' position.

3 JUDGE WARDWELL: Okay, thank you. Intervenors
4 079 on page 7 say, "In Exhibit 3 below is Figure 2.7-
5 14 with additional early time interpretation showing
6 a distinct break at about 30 minutes signifying a
7 clear recharge boundary which can be interpreted as
8 additional vertical flow." And I think we talked
9 about that, but maybe you want to answer it again in
10 response to this, and this particular test for Crow
11 Butte. Have you performed a calculation showing the
12 Cooper-Jacob method is considered invalid during
13 early time? And, if so, where is that documented?

14 MR. LEWIS: Yes, Your Honor. Bob Lewis, Crow
15 Butte. In my rebuttal testimony, I describe the use
16 of the Cooper-Jacob method, and some of the
17 constraints on that method; one of those being that
18 the early time data using that approximation method
19 is --- needs to be examined closely to see if it's
20 valid for use in the analysis. In particular, when
21 you plug in the various distances from the pumped
22 well to the observation wells, the average
23 transmissivity of the aquifer, et cetera, you would
24 conclude that the early time data less than about 37
25 minutes is not useful in this type of analysis. It

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1 should be discarded, if that's the calculation that
2 you're referring to.

3 JUDGE WARDWELL: Yes, thank you. Dr. Kreamer,
4 do you disagree --- do you have comments on Crow
5 Butte's calculation showing that the Cooper-Jacob
6 method is considered invalid during the early time
7 frame?

8 DR. KREAMER: Absolutely.

9 JUDGE WARDWELL: And what analysis did you do,
10 and how did that result in your conclusion?

11 DR. KREAMER: If you go to NRC Exhibit 081,
12 which is Kruseman and de Ridder, on page 65 it lists
13 what the results of using different U values are.
14 Essentially, in the rebuttal, Crow Butte Resources
15 said that anything before 37 minutes should be
16 invalidated because anything of a U value that's
17 larger than .01 should be invalidated. And some
18 textbooks put that down as one of the assumptions,
19 but if you go to Kruseman Ridder, Kruseman de Ridder,
20 excuse me, which is CRB, excuse me, it's not NRC.
21 It's CRB-081, and if you go to page 85, you can see
22 what the results are, and what the errors are if you
23 consider earlier times. So, if we could bring that
24 up, I could demonstrate just exactly what my
25 calculations were very succinctly.

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1 JUDGE WARDWELL: Okay. And that's CBR-081?

2 DR. KREAMER: Yes, page 65.

3 JUDGE WARDWELL: Page 65. And while our
4 cracker jack IT group is pulling that up, did you
5 submit your calculations as part of your testimony?

6 DR. KREAMER: No, because their calculations
7 were done in the final rebuttal. And that was after
8 my comments were submitted. They criticized my
9 analysis in the very last bit, so I could not do that
10 at that time, Your Honor.

11 JUDGE WARDWELL: I understand.

12 DR. KREAMER: If we could go to the bottom of
13 that page, please, right there. If you see after the
14 word "with", it has different values for U. My
15 freshmen and sophomores would have just used U values
16 of 0.01 which is listed in Fedder and de Ridder here
17 as one of the assumptions. But it turns out you don't
18 invalidate the analysis if it's greater than that.
19 So, this lists the error associated with using
20 different U values. And let me just tell you what
21 these correlate to.

22 If you use a U value of 0.03 or smaller,
23 which comes out to a much different time. That comes
24 out to a time of 12 minutes and beyond. The error is
25 less than 1 percent, so that would mean more than 99

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1 percent correct. If you use a U value of 0.05, the
2 error would be less than 2 percent, which would be --
3 - the time associated with that is 7.4 minutes, which
4 is really where my straight line occurs in the early
5 time data. So, the recharge boundary that I'm seeing,
6 the bottom line here is that there's more than a 98
7 percent chance that this is valid data, and that that
8 recharge doesn't really exist, Your Honor.

9 JUDGE WARDWELL: Thank you, Dr. Kreamer. Crow
10 Butte, do you have a response to what you just heard?

11 MR. LEWIS: Yes, I do, Your Honor. First of
12 all, the use of the value of U less than .01 is the
13 number recommended by the authors of the method,
14 Cooper and Jacob. It's also utilized by all
15 commercial software packages that I know that you use
16 for aquifer test analysis, so it is --- the exception
17 to the rule would be to use a U value higher than
18 .01, not the rule.

19 The second is that this method --- that the
20 U value is only one reason that the early time data
21 shows the deviation from the curve that it does. The
22 well bore storage effects that are clearly impressed
23 upon this test go beyond 24 minutes just based on the
24 size of the casing, which is 4-1/2 inches, not 2
25 inches, it's a 4-1/2 inch casing over 500-foot head.

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1 You get well in excess of 500 gallons considering
2 just the casing, and not even including the gravel
3 pack which is normally included in that calculation
4 for well bore storage. So, we have in excess of 500
5 gallons of water in well bore storage at 24 gallons
6 a minute, you are going to have in excess of 20
7 minutes of duration in which that data should be
8 invalidated simply for the purpose of well bore
9 storage. That's not taken into account directly in
10 the U value described to the Cooper-Jacob method.
11 That's the error that is calculated based on the
12 assumptions to the method. The well bore storage
13 effects go beyond that. So, regardless of what has
14 been stated here, I also want to point out Figure 215
15 of Kruseman and de Ridder Exhibit CBR-81 at page 52,
16 which demonstrates basically the effect of well bore
17 storage on the Cooper-Jacob method. And you see
18 basically the shape of that curve in early time is
19 nearly identical to the exhibit prepared by the
20 Intervenors that they ascribe to leakage.

21 JUDGE WARDWELL: Thank you. Dr. Kreamer, do
22 you know if the same recharge effect was observed in
23 the wells during recovery of this test?

24 DR. KREAMER: I'm having a little trouble
25 hearing you, Your Honor, but I think I ---

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1 JUDGE WARDWELL: My fault. I was falling
2 asleep. No. Do you --- was the same recharge effect
3 observed in the wells during recovery?

4 DR. KREAMER: I used an example, I did not
5 analyze the recovery on that particular well, Your
6 Honor.

7 JUDGE WARDWELL: Okay, thank you. Intervenors
8 Exhibit 079, page 7 says, "Residual time drawn-down
9 curve for COW3 also exhibits this recharge boundary."
10 And that's Figure 2.7-20 on page 2.746. And I was
11 curious, Dr. Kreamer, where is this recharge boundary
12 illustrated in Board Exhibit 002B, Figure 2.7-20,
13 page 2.746?

14 DR. KREAMER: 2.746, hang on a second. Yes,
15 there's an early time drawdown there.

16 JUDGE WARDWELL: Wait just a second, sir.

17 (Simultaneous speaking)

18 JUDGE WARDWELL: Sir, sir, sir, sir, sir.

19 DR. KREAMER: But that was not your question.
20 The time data that goes from approximately 7 minutes
21 --- and I said 30 minutes with a straight line,
22 probably is closer to 80 minutes or 70 minutes. But
23 that early time data there, then you get a break and
24 the line then cuts off in the direction. That's not
25 the correct --- we'd have to change that figure

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1 around sideways. Okay. That may not be the correct
2 figure.

3 JUDGE WARDWELL: That's what you referenced,
4 anyhow.

5 DR. KREAMER: Page 46?

6 JUDGE WARDWELL: Yes, right there, shows right
7 where the cursor is, 2.746. And it should be Figure
8 2.720, which it is, I believe.

9 DR. KREAMER: I'm sorry, residual time
10 drawdown. I did analyze that, and it also shows the
11 recharge boundary. I apologize. And that would be
12 above where the cursor is now, you can see the
13 deviation from the line.

14 JUDGE WARDWELL: Well, which --- the cursor is
15 now in the middle. He was moving it while you were
16 speaking. Could you --- is it lower right, or upper
17 left of what we're looking at?

18 DR. KREAMER: I am sorry. I am not seeing the
19 axis for these ---

20 JUDGE WARDWELL: Oh.

21 DR. KREAMER: --- so I can't really read what
22 times these are. I can pull up the figure separately,
23 if you would like. I can't see what --- the X axis I
24 guess is time, and that ---

25 JUDGE WARDWELL: Yes, and there's no units on

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1 it. But you reference this figure.

2 DR. KREAMER: It times over original ---

3 JUDGE WARDWELL: Oh, that --- okay, there we
4 are.

5 DR. KREAMER: Yes. Well, the deviations from
6 a straight line indicate a recharge boundary, Your
7 Honor.

8 JUDGE WARDWELL: But where on this? Is it
9 upper left that you see this, the entire figure, or
10 the middle of the figure, or lower right?

11 DR. KREAMER: I ---

12 JUDGE WARDWELL: You claim is the recharge
13 demonstration.

14 DR. KREAMER: Well, there's definitely a break
15 --- the axis says time over time prime, and that was
16 a little confusing to me, too. It wasn't listed as
17 far as what that value was. It's kind of fuzzy on my
18 copy here but, essentially, it would be the ---
19 there's two breaks here from the data. One is early
20 on at a time over original time of 7, or time prime.
21 And then down below there's another time that appears
22 to be at --- and, again, it's on the upper --- yes,
23 straight up from there. Thank you. Right about there.

24 JUDGE WARDWELL: So, you're saying both times
25 that the dots fall below the line, that's an

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1 indication of the recharge?

2 DR. KREAMER: I would have to go back to the
3 analysis to see how they define T over T Prime, and
4 I don't have that at my fingertips here.

5 JUDGE WARDWELL: Well, what did you use in
6 your analysis? You referenced this. You say it
7 exhibits this recharge boundary. What did you use in
8 your analysis that led you to this conclusion?

9 DR. KREAMER: I would have to say it's the
10 latter of the two, there, if I recall correctly how
11 they define T over T Prime.

12 JUDGE WARDWELL: And the latter of the two is
13 the lower right-hand side. Is that correct?

14 DR. KREAMER: That's correct, if I recall
15 correctly how they defined T over T Prime.

16 JUDGE WARDWELL: Okay, thank you. Crow Butte,
17 can you shed any light onto the T over T Prime
18 parameter, and what that relates to for Dr. Kreamer's
19 edification?

20 MR. LEWIS: I believe Dr. Kreamer's latter
21 statement regarding the T over T Prime value would
22 set the early time value towards the lower right of
23 that graph. I don't see a deviation from the curve in
24 the upper right corner that he identified. That's a
25 very small deviation, if at all. The deviation in the

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1 lower right corner would just be the inverse of the
2 well bore storage, the filling of the casing versus
3 the drawdown in the casing. That would be my
4 interpretation of that particular curve.

5 JUDGE WARDWELL: And ---

6 DR. KREAMER: I'm sorry, Your Honor, I missed
7 what the definition of T over T Prime was.

8 JUDGE WARDWELL: Crow Butte, did you say ---
9 did you define what T over T Prime is?

10 MR. LEWIS: I didn't find its residual
11 drawdown. It's basically the ratio of test time over
12 real time. That's my understanding of that term. So,
13 I think --- my interpretation of that graph, which is
14 that early time data would be in the lower right
15 portion of that curve, which is what I believe Dr.
16 Kreamer also said.

17 JUDGE WARDWELL: Okay. Dr. Kreamer, does that
18 make sense to you?

19 DR. KREAMER: I, quite frankly, didn't
20 understand the explanation. The time of --- if the T
21 value could be explained and the T Prime value could
22 be explained a little bit more clearly, that would
23 help.

24 JUDGE WARDWELL: But I --- my question to you
25 is, you made a statement in regards to this figure,

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1 and a conclusion as an expert saying it showed
2 recharge.

3 DR. KREAMER: I would be happy to ---

4 JUDGE WARDWELL: And how did you do that ---

5 DR. KREAMER: I'd have to get out my
6 calculations, Your Honor, and see how it was defined.

7 JUDGE WARDWELL: Okay, thank you. In your
8 testimony on page 8, you say that "the samples showed
9 variation of approximately double the coefficient of
10 consolidation and hydraulic conductivity in just
11 these few vertical feet demonstrating the lack of
12 homogeneity, although homogeneity was assumed in the
13 analytical mathematical interpretation approaches by
14 the report's authors." And I guess I'd ask you, Dr.
15 Kreamer, that isn't knowing the coefficient of
16 consolidation and hydraulic conductivity within a
17 factor of 2 a pretty major accomplishment in your
18 field? I mean, aren't ---

19 DR. KREAMER: No, Your Honor.

20 JUDGE WARDWELL: Aren't these values within a
21 factor of 2 pretty much that same parameter for this
22 type of value?

23 DR. KREAMER: Are you talking about how
24 representative they are of the entire clay layer and
25 the consistency of that clay layer, or just if you

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1 take ---

2 JUDGE WARDWELL: My comment relates to the
3 fact --- yes, my question ---

4 DR. KREAMER: I think these were just a couple
5 of feet apart, you would expect them to be closer in
6 value.

7 JUDGE WARDWELL: So, you like to pin down
8 these parameters less than a factor of 2.

9 DR. KREAMER: Well, it was taken in the same
10 bore hole, Your Honor, about 3-feet apart, and that's
11 all the information they had on the clay boundary.
12 And then they extrapolated that to say that there
13 were no other variations, or there were no other
14 secondary porosities. So, a priori they assumed that
15 this value was the only consistent value over the
16 entire space of the mine.

17 JUDGE WARDWELL: Thank you. Crow Butte, in
18 your experience is knowing the factors of coefficient
19 of consolidation and hydraulic conductivity within a
20 factor of 2 a major accomplishment, or does it need
21 to be --- you need to get it much better than that?

22 MR. LEWIS: I would say in my experience,
23 that's fairly typical, that kind of variation in that
24 parameter. Does that answer your question?

25 JUDGE WARDWELL: Well, maybe or maybe not. If

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1 you had --- if you were able to isolate the hydraulic
2 conductivity and a coefficient of consolidation by a
3 factor of 2, and your samples, all your samples
4 showed that same variation, would you consider it the
5 same value, or would you consider it the range of
6 values?

7 MR. LEWIS: This is from a laboratory test,
8 Your Honor?

9 JUDGE WARDWELL: I don't know. I assume so. I
10 don't know of any --- you people performed the only
11 consolidation test I know of. I assume it was a
12 laboratory test. I believe that's where this is
13 coming from.

14 MR. LEWIS: I'm sorry, Your Honor. I'm just
15 having a problem framing the question. If I have a
16 single value from a consolidation test, are you
17 asking me to estimate the uncertainty, or are you
18 giving me a ---

19 JUDGE WARDWELL: No.

20 MR. LEWIS: --- hypothetical ---

21 JUDGE WARDWELL: If you had two results that
22 varied by a factor of 2 would you do more testing to
23 narrow that down, or would you consider it pretty
24 much the same value?

25 MR. LEWIS: I would say that that's

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1 sufficient. That's the same value, that's sufficient.

2 JUDGE WARDWELL: Thank you. Intervenors 079,
3 pages 8-9 says, "Single average values were selected
4 by the report authors for recording vertical
5 hydraulic conductivity in the confining layers rather
6 than a range of values to simulate field drawdown
7 scenarios from pumping test data." And my question to
8 Crow Butte is, has sensitivity analysis such as what
9 this is kind of alluding to been performed? And, if
10 not, why not?

11 MR. LEWIS: Bob Lewis of CBR. Sensitivity
12 analysis has not been performed to my knowledge. I
13 didn't analyze these pump tests. I may have done that
14 type of analysis had I been asked to, but the
15 uncertainties that exist in the data are such that I
16 think it's sufficient for purpose, so I'm not
17 suggesting that sensitivity analysis is necessary, or
18 even commonly performed. It would be an unusual step
19 to take, in my experience.

20 JUDGE WARDWELL: Thank you. Intervenors 079
21 page 9 says, "Some key analytical results were not
22 presented in the report, Board Exhibit 002B for the
23 second aquifer test. For example, the complete
24 results of the Hantush analysis leakage information
25 are not reported with a principle axis of anistropy,

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1 are only reported." And I ask Dr. Kreamer, did you
2 ask for this data?

3 DR. KREAMER: Your Honor, no, I did not. The
4 test --- there was a real lack of information. I
5 assumed this report for pump test 2, which is what
6 we're discussing here, was the entire report, and
7 that the information --- it referred to other
8 analyses that they've done, and they haven't shown
9 the results of those analyses, nor are they clear on
10 all their assumptions. So, I assume that that
11 information was not there. They just reported on the
12 principle axis of Anistropy after assuming that it
13 was isotropic.

14 JUDGE WARDWELL: In your testimony, 079, page
15 9, you --- thank you for that, by the way. 079, page
16 9, test 3 was not performed to quantitatively assess
17 the nature of the confining layer above the Chadron
18 sandstone. And the question I have for Crow Butte, is
19 that correct? And, if so, what was the purpose of
20 test 3?

21 MR. LEWIS: Your Honor, Bob Lewis, Crow Butte.
22 The purpose of the test was to demonstrate adequate
23 confinement between the production aquifer and the
24 shallow aquifer. So, the production aquifer and the
25 shallow aquifer were monitored as required by the

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1 NRC.

2 JUDGE WARDWELL: Would you say that again?

3 MR. LEWIS: Well, the purpose of the aquifer
4 test was to demonstrate adequate confinement between
5 the production aquifer and the shall aquifer. So, the
6 monitoring network was established based on the
7 shallow aquifer and the production aquifer. Those
8 were the two units that were monitored. And that's
9 what DEQ had prescribed and had approved as part of
10 the pump test plan.

11 JUDGE WARDWELL: Okay. Let me move on, and
12 maybe this will answer my question. The Intervenors
13 in Exhibit 079, page 10, go on to say, "Aquifer test
14 3 was expressly designed not to test for vertical
15 leakage. Also, assumed no leakage a priori.
16 Inadequate monitoring was carried out in the upper
17 Brule formation during these tests." And my question
18 to Dr. Kreamer is how did Crow Butte expressly design
19 a test not to monitor for vertical leakage?

20 DR. KREAMER: Good question. The answer to
21 that is two-fold. One, they did --- in other tests
22 they took from a single bore hole clay samples and
23 tested those. At these they didn't test the
24 permeability of the "confining" layer anywhere.

25 And then the second part of the answer for

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1 that --- well, they state that they were not testing
2 for confinement in their own statements. And then
3 lastly, the Brule formation, they only have very,
4 very few wells. They --- in some of these tests, Your
5 Honor, some of the wells in the Chadron did not
6 respond, and they looked and they were clogged up;
7 yet, when the Brule wells didn't respond, they have
8 no documentation of testing to see if they were
9 clogged. And there are only one or two in the Brule,
10 so it's an inadequate array of monitoring in the
11 Brule to come up with any conclusions at all about
12 the confinement between the Chamberlain Pass
13 formation and the Brule.

14 JUDGE WARDWELL: If I go to Crow Butte, Mr.
15 Lewis, how many wells did you have in the Brule for
16 this test?

17 MR. BEINS: Wade Beins, Your Honor. I believe
18 that on pump test 3, we had just a single Brule well
19 that was located within 100 feet or so of the pumping
20 well.

21 JUDGE WARDWELL: So, how was --- how were you
22 --- I guess I'm still confused on what the purpose of
23 test 3 was, and then how did you design your
24 monitoring program to accomplish that test? Did you
25 or did you not try to assess the nature of the

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1 confining layer? It seems like that's what Mr. Lewis
2 was saying, that was the purpose of the test.

3 MR. BEINS: That was the purpose of the test,
4 Your Honor, was to ascertain the confining layer's
5 properties and demonstrate that confinement, as was
6 presented to DEQ in the approved pump test plan.

7 JUDGE WARDWELL: And how was that test
8 performed to achieve that without more than one
9 monitoring well in the Brule, which would indicate
10 whether there's a connection between the Brule and
11 the Basal Chadron/Chamberlain Pass formation?

12 MR. LEWIS: Your Honor, Bob Lewis, Crow Butte.
13 As we've discussed quite thoroughly today, leakage is
14 very apparent from the shape of the time drawdown
15 curves at all observation wells in the production
16 aquifer. So, if we had an indication of leakage
17 across the site you would have seen that in the
18 deviation of the curve in late time in the
19 observation wells. And that's typical of an aquifer
20 testing program with a confining layer; is, yes, you
21 can have an overlying observation well or observation
22 wells, but you can also identify leakage across the
23 testing area simply by the shape of the time drawdown
24 curves in the production aquifer.

25 JUDGE WARDWELL: Thank you. The Intervenors

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1 Exhibit 079 goes on on page 10 to say, "However, in
2 the active mining area, numerous well points showed
3 drawdown in the Brule aquifer from 1982 to 2008, not
4 just a single location. And many points in the areas
5 that were not mined before 2008 show no drawdown."
6 Dr. Kreamer, could you lead us to where that data is
7 that supports this statement? And does the drawdown
8 match with the drawdown in the Basal
9 Chadron/Chamberlain Pass formation?

10 DR. KREAMER: Sure. We would have to have some
11 figures up here. I guess there --- the 1982 and 2008
12 data that we had up previously.

13 JUDGE WARDWELL: Table 2.7-5, I believe, from
14 the license renewal application?

15 DR. KREAMER: I believe that's correct.

16 JUDGE WARDWELL: Let's try that and see if it
17 works, 011. Yes, 2.7-5, I believe, is the table. Yes,
18 there it is. Is that what you're after, Dr. Kreamer?

19 DR. KREAMER: No, no. Actually, I was talking
20 about the actual numbers that were on the map.

21 JUDGE WARDWELL: Okay. So, try --- well, no,
22 you still want the license renewal --- well, you
23 could use the Board exhibit, also. But you could stay
24 with 001.

25 DR. KREAMER: Yes, those are the ones.

1 JUDGE WARDWELL: Okay. Down to the --- I just
2 want to make sure what we're at. Go down to the
3 title. Okay, regional level. That's '82-'83 Brule
4 formation.

5 DR. KREAMER: That's correct.

6 JUDGE WARDWELL: Yes. So, numerous wells ---

7 DR. KREAMER: There is a map with the 2008
8 map, you'll see that when you go to the northwest
9 where there wasn't mining activity that was heavy
10 early on, you can see that there's not too much of a
11 difference. But the major differences occur --- well,
12 if you look at the --- and, I'm sorry, it's a little
13 bit out of focus here. I think we're talking Well 17,
14 if you could expand that just a little bit. Yes,
15 thank you. All right. Now, if you could move back
16 over to the mining area which would be to your right.
17 Thank you. You can see Well 17, Well, I believe it's
18 21 or 26. It's fuzzy on my copy. Well 24, and Well
19 64; in those areas, that's where the discrepancy
20 lies. Unfortunately, there's no information from Well
21 19 or Well 29 where that's sort of the hotspot of the
22 discrepancy according to the differences in the two
23 maps.

24 JUDGE WARDWELL: I'm sorry, but what do you
25 mean the differences in the two maps? What's the

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1 second map that you're comparing this to?

2 DR. KREAMER: That would be the 2008 map
3 that's associated with it.

4 JUDGE WARDWELL: Okay.

5 DR. KREAMER: I think it's also ---

6 JUDGE WARDWELL: A couple of pages down.

7 DR. KREAMER: Yes. So, have you tabulated
8 these and shown that drawdown in the Basal Chadron,
9 and then compared it to any drawdown you saw in the
10 Brule?

11 DR. KREAMER: Yes, Your Honor. I haven't drawn
12 the second map. Could we put the map back up? I can
13 show you what I've done. If you go to the --- a
14 little bit lower in that map. The major differences
15 occur not too far, actually, above where that black
16 arrow next to the red lines is. The major differences
17 when you compare the two maps and the water levels
18 are just about --- just a little bit to the
19 northwest, not very far at all from the tip of the
20 black arrow there. And when you compare those water
21 levels, you can see 15-foot changes, 20-foot changes
22 between the contours and the --- between the 1982 and
23 the 2008 data.

24 JUDGE WARDWELL: Yes. Have you tabulated this
25 anywhere and presented it in your testimony for us to

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1 review?

2 DR. KREAMER: No, I have not, Your Honor.

3 JUDGE WARDWELL: Thank you. On that same page,
4 you go on to say, "Mining activities began, however,
5 in 1991, not 1999, and no data were presented from
6 the critical period for those eight years after the
7 mining began." And I think we've covered this. We can
8 strike that question, that line of questioning.

9 I will ask this, Dr. Kreamer. If there were
10 a hydraulic connection between the Brule and the
11 Basal Chadron aquifers wouldn't you still likely see
12 and expect to see a sustained drawdown trend in the
13 water levels as represented by the hydrographs for
14 SM-722 and 717 as it's pumped for all those years it
15 has pumped, like a big, giant longevity pump test?

16 DR. KREAMER: No, Your Honor.

17 JUDGE WARDWELL: Okay, thank you.

18 DR. KREAMER: What happens is drawdown is
19 rapid at first in the initial stages of the spreading
20 of the cone of depression. But as the cone of
21 depression and the radius of influence spreads out,
22 the drawdown rates increase exponentially. So, after
23 the first few years you would see with additional
24 pumping and long-term pumping test very little change
25 in the piezometric surfaces that drive this process,

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1 and you would have a quasi-equilibrium that would be
2 set up.

3 JUDGE WARDWELL: Thank you. In your Exhibit
4 079, page 11 --- well, this goes to the same
5 question, so we can ignore that.

6 In your Exhibit --- in Intervenors Exhibit
7 082, page 4, in document NRC 095, pages 6, 7, and 8,
8 the NRC Staff make calculations about consumptive use
9 and drawdown in the absence of conducting a complete
10 water balance. The calculations do not include robust
11 uncertainty analyses, and assume a priori the
12 hydraulic isolation of the Chamberlain Pass/Basal
13 Chadron formation. These calculations are geared
14 toward short time frame analysis of aquifer response.
15 Analysis of long-term effects require full water
16 balance which is not provided, including recharge
17 source and regional groundwater movement." Dr.
18 Kreamer, what's your definition of a short time frame
19 and a long time frame?

20 DR. KREAMER: The --- I'm trying to see the
21 context of this. Did you just switch documents, Your
22 Honor?

23 JUDGE WARDWELL: Yes, I did.

24 DR. KREAMER: Okay. I --- without looking at
25 the context of that statement, Your Honor, the long-

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1 term --- the pump tests were run for a day, two days,
2 three days, and the conclusions that there was no
3 connection were in the range of two to three days.
4 The long-term effects of pumping would be more than
5 two days, three days. So, the pumping tests
6 exclusively were over a short-term period. The
7 conclusions that there was confinement was based on
8 one or two wells in the Brule which did not respond,
9 that were not checked if they were clogged or not.
10 And they went over a very, very short time period,
11 and that's the basis for the assumption that there's
12 no confinement. That and laboratory tests from a
13 single bore hole for one of the tests, consolidation
14 tests, which they then extrapolated making the a
15 priori assumption that there was no fractures or
16 secondary porosity that are shown in the pumping
17 data. So, the short time frame that we're dealing
18 with is the pumping test data. Longer time frames,
19 such as the reservoirs on the surface drying up over
20 years, or apparently going down when you look at
21 Google Earth imagery and things like that were not
22 accounted for. And by long term, how much water is
23 coming into the area every year, where is it coming
24 from? What are the connections? Those sort of
25 calculations were not --- if they were made, I did

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1 not see them, Your Honor.

2 JUDGE WARDWELL: Thank you. Crow Butte, what's
3 your response to Dr. Kreamer's observations?

4 MR. BEINS: Your Honor, Wade Beins with Crow
5 Butte here. You know, I guess we've got these four
6 pump tests that we've run so far on the current
7 license area. There's actually another set of data
8 out there that we have not talked that much about.

9 You can consider the entire operation of the
10 mine itself with all of the shallow monitoring wells
11 across the entire length of the well field, and all
12 of the production wells that are in the Basal
13 Chadron. You can treat that as a very long term
14 pumping test in which, you know, in 1991 we started
15 production in Mine Unit 1, '92 we turned on Mine Unit
16 2, '93 was Mine Unit 3, and so and so forth up
17 through the years. During those times that we've
18 started those new mine units, each one of those new
19 mine units being started up could be looked upon as
20 you look at the various hydrographs for each mine
21 unit, or for each shallow monitoring well for that
22 mine unit. You could look on that as being analogous
23 to a pumping test of very long duration. And we do
24 not see long term declines in the Brule surface
25 there, so I think that's something that you need to

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1 take into consideration, as well; that there is no
2 connection between the Brule and the Basal Chadron.

3 JUDGE WARDWELL: Thank you. Staff, do you have
4 any responses to the observations that Dr. Kreamer
5 provided in regards to the pump tests?

6 MR. BACK: Our only observation is that we
7 have had actual measured data compared against
8 predicted data, and the predictions were reasonable.
9 And that's the end of our comments.

10 JUDGE WARDWELL: And where --- what are you
11 referring to now in regards to this comparison, and
12 where might we find that in the record?

13 MR. BACK: It's NUREG-087, and it goes through
14 the --- before the mine was opened. They had
15 projected what the potential impacts would be on the
16 various water levels. And then in 2009, the Staff
17 asked for them to go out and actually measure water
18 levels to see how well their projections had been
19 fulfilled. And that write-up is NUREG-087, oh, NRC-
20 087.

21 JUDGE WARDWELL: Okay. Both of those are 087,
22 or are there two documents that --- two exhibit
23 numbers?

24 MR. BACK: NRC-59 is the RAI, and NRC-87 is
25 the actual mapped out showing what the comparison is.

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1 JUDGE WARDWELL: Thank you.

2 DR. STRIZ: Your Honor, I have one additional
3 comment.

4 JUDGE WARDWELL: Sure.

5 DR. STRIZ: There's been a great deal stated
6 about the missing data from 1991 on. In the
7 hydrograph for SM1-2 in the Brule aquifer, which is
8 in Exhibit CBR-065, the water levels remained
9 consistent around 3,845 from the time period from
10 1994 until 2003 when the wells were removed. And if
11 you compare that to the nearby wells, PM-6 and PM-7,
12 it's almost exactly the same water level that was
13 measured in those wells in 1982 and '83, I think it
14 was '82, which is 3,843. So, if you extrapolate over
15 that distance between '82 and '94 when they first
16 started the measurements in SM1 and 2, you see that
17 it's been essentially the same over that time period.

18 JUDGE WARDWELL: Thank you.

19 DR. KREAMER: May I respond to that, Your
20 Honor?

21 JUDGE WARDWELL: Yes, you may.

22 DR. KREAMER: Thank you. The wells that are
23 being referred to, first of all, PM-6 and PM-7 are
24 not located correctly according to the map unless
25 there's been a mistake. But assuming that they're

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1 where they've been identified as, Your Honor, they
2 are very, very close to what's listed as Squaw Creek
3 on Google Maps, which could moderate any flow.

4 The other thing about SM1-2 is the --- Crow
5 Butte Resources made the statement that all their
6 monitoring wells were in operation all the way
7 through --- at the beginning of this testimony they
8 said all their monitoring wells were in operation all
9 the way through until the current day, and then they
10 made the statement that SM1-2 was shut off in 2004-
11 2005, somewhere in that range, because mining
12 operations were over. So, it is the only well that is
13 --- that doesn't have data through 2015 that would
14 allow us to see if the reduced pumping in that area
15 showed a rebound effect in that area.

16 I guess, nor have we been provided with
17 pumping data and pumping schedules to show short-term
18 changes in the SM wells that we see that vary
19 slightly up and down are in response to pumping in
20 the Chadron. We don't have those Chamberlain Pass
21 pumping schedules, and so that sort of analysis
22 between the minor changes in the Brule wells, in the
23 SM wells, we could not make that analysis, Your
24 Honor.

25 JUDGE WARDWELL: Thank you. Staff, would you

1 like to respond to what Dr. Kreamer just said?

2 DR. STRIZ: No, Your Honor.

3 JUDGE WARDWELL: Okay, thank you.

4 Moving on to Issue 4, whether the Basal
5 Chadron/Chamberlain Pass formation exists beneath the
6 Pine Ridge Reservation, and its connection, if any,
7 to the Basal Chadron/Chamberlain Pass formation
8 beneath the license renewal area.

9 NRC's Exhibit 095, page 12, answer 4.1 says
10 that, "According to the Exhibit INT-072, the High
11 Plains aquifer in the Chamberlain Pass formation are
12 used as sources of drinking water at the Pine Ridge
13 Reservation, but the exhibit does not provide any
14 additional information on the locations or types of
15 these sources." And I guess I'll turn to the
16 Intervenors, and I assume Dr. LaGarry will be ready
17 to address the question for the uranium discussed in
18 INT-072, what is its source as defined in this
19 document?

20 DR. LAGARRY: Okay. This is Dr. LaGarry.

21 JUDGE WARDWELL: We weren't sure exactly what
22 you were doing there, but it was --- we're welcoming
23 you here to the hearing.

24 DR. LAGARRY: Well, I thank you. I missed you.
25 Okay. Could you --- while I was fumbling with the

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1 button, I kind of missed the question. Could you
2 repeat it?

3 JUDGE WARDWELL: Sure. I'll start again. In
4 the NRC Exhibit 095, they state that according to
5 your exhibit, that's the Intervenor's Exhibit 072,
6 "The High Plains aquifer and the Chamberlain Pass
7 formation are used as sources of drinking water for
8 the Pine Ridge Reservation, but the exhibit does not
9 provide any additional information on the locations
10 or types of these sources." My question to you is,
11 for the uranium discussed in your Intervenor's 072,
12 was it source-defined in this document?

13 DR. LAGARRY: No, Your Honor. There's actually
14 --- there is no comprehensive compilation of data
15 from where people get water on the Pine Ridge
16 Reservation. These are often --- you know, it's the
17 situation where the driller goes out to a property
18 and drills until they find water, and that's the long
19 and the short of it. So, exactly which unit --- I
20 mean, we could --- it's conceivable that a person
21 could go and if the geology was known as well as it
22 is here in Nebraska, which it's not, but if the
23 geology were better known, a person could go and then
24 find the depths to the water, and independently
25 verify based on stratigraphic cross sections, you

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1 know, where this water comes from. But unless it's a
2 well that was --- that's been drilled by Oglala
3 Lakota College or one of our collaborators, generally
4 that data doesn't exist or isn't easily available.

5 JUDGE WARDWELL: In Exhibit --- on that same
6 cite of NRC-095, they say, "Exhibit Intervenors 073
7 is an abstract from a GSA presentation in October
8 2006 that describes a provisional revision to the
9 lithostratigraphy of the White River Group in
10 Nebraska and South Dakota to include the Chamberlain
11 Pass formation. The abstract does not identify
12 specific locations where the Chamberlain Pass
13 formation exists at or beneath the surface of the
14 Pine Ridge Reservation." And I guess my question to
15 you is, are the specific locations of the existence
16 of the Chamberlain Pass formation designated anywhere
17 in INT-073, or other cites to documents in this
18 proceeding?

19 DR. LAGARRY: Your Honor, in my supplemental
20 testimony on the Board exhibits before us today, I
21 provided a color plate that showed surface exposures.
22 These are the surface exposures identified in that
23 abstract. Although there is no subsurface data
24 identifying the Chamberlain Pass formation on the
25 reservation, there's ample surface data that does so.

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1 JUDGE WARDWELL: And do you know off the top
2 of your head just what the cite, what the exhibit
3 number is for that? I remember seeing it, but if you
4 remember it, fine, if not, we'll be able to find it.

5 DR. LAGARRY: I don't, Your Honor. I don't
6 have a list of that, or my computer here with me.

7 JUDGE WARDWELL: No problem. Exhibit INT-074
8 states that, "The natural devitrification of the
9 Chamberlain Pass outcrops is a likely source of
10 natural uranium contamination of soils, sediments,
11 and surface waters near Whitney, Nebraska, and
12 general communities in the Pine Ridge Reservation,
13 Ogalala, Calico, Pine Ridge, Rockyford, Red Shirt,
14 Scenic, and Interior South Dakota. This exhibit also
15 identifies sub-crops of the Chamberlain Pass
16 formation as the likely source of natural groundwater
17 contamination in other communities at Pine Ridge
18 Reservation." And I guess my question to you, Dr.
19 LaGarry is, do you agree with your INT-074, that the
20 source of uranium on the Pine Ridge Reservation is a
21 natural release from the weathering of the
22 Chamberlain Pass outcrops, and as such is not a
23 result of the mining in the license area?

24 DR. LAGARRY: Your Honor, as -- I provided a
25 poster by Sabre and Carlson as a reference in some of

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1 my earlier testimony back in May, where they
2 concluded the devitrification of the volcanic ash of
3 the White River Group is the source of the uranium;
4 and as such, this devitrification process is
5 widespread over the entire area of the Chamberlain
6 Pass formation.

7 In my 2006 abstract, I may have talked about
8 or in one of the abstracts I provided, I may have
9 talked about this Chamberlain Pass formation being a
10 mixture of air fall volcanic ash, which blanketed the
11 entire region, interbedded with stringers of
12 sedimentary rocks which presently hold the uranium
13 that radiate outward from the Black Hills. Okay, so
14 the --- so when the volcanic ash of the Chamberlain
15 Pass formation fell on the ancient landscape, which
16 was warm tropical at the time, the glass went from
17 its original gray color, silvery gray color which you
18 can find preserved in some outcrops. It then oxidized
19 and turned bright red. And in the figures I provided
20 in my recent testimony I identify that red stripe of
21 the Chamberlain Pass formation along with those
22 sandstones, wherever I was able to get pictures of
23 them.

24 Okay. So, this process of the transformation
25 of the gray ash to the red, what now people call

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1 claystone, is widespread and ubiquitous, and an
2 inherent natural feature of these rocks. And this
3 uranium, however, the uranium released by this
4 process is concentrated in certain areas. It's known
5 to be concentrated around the Town of Red Shirt on
6 the reservation, it's known to be concentrated in
7 some sandstones in the area of Scenic, it's known to
8 be concentrated in a syncline, a downward wrinkle in
9 the earth's crust that runs from the Black Hills
10 generally right through Crawford, Nebraska which Crow
11 Butte Resources mines. Okay. So, it's true that there
12 is natural amounts of uranium and radioactive
13 materials ubiquitous within the Chamberlain Pass
14 formation.

15 JUDGE WARDWELL: Thank you. Exhibit --- still
16 with NRC Exhibit 095, page 13, A4.1, in regards to
17 Intervenors Exhibit 075, they state that, "This
18 exhibit does not identify specific locations where
19 the Chamberlain Pass formation exists at or beneath
20 the surface of the Pine Ridge Reservation." And I
21 think I'll stay with you, Dr. LaGarry. And we had a
22 lot of testimony back in August discussing whether it
23 matters that this aquifer formation is called the
24 Basal Chadron or the Chamberlain Pass formation. I
25 guess I will ask you, to what degree, if any, would

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1 the Board be derelict in calling this formation by
2 both these names in its decision, i.e., calling it
3 the Basal Chadron/Chamberlain Pass formation?

4 DR. LAGARRY: Well, Your Honor, I can repeat
5 what I said back in August. I mean, it depends. I
6 mean, if you're using the term Basal Chadron or
7 Chadron A merely in a historical ---

8 JUDGE WARDWELL: Oh, we lost you.

9 CHAIR GIBSON: Dr. LaGarry, we lost you there.

10 JUDGE WARDWELL: There we go.

11 DR. LAGARRY: Okay, I'm back.

12 JUDGE WARDWELL: Yes, back.

13 DR. LAGARRY: It's okay, I'll figure the
14 button out. It depends, Your Honor. If you're talking
15 about the Basal Chadron or the Chadron A purely in a
16 historical context so that we can keep track of what
17 it used to be called, then that's fine, but there's
18 a danger there. The danger is, is that the names are
19 shorthand for the ideas and concepts, and the
20 progression of science, you know, and how we think
21 about these things. So, I mean, what we currently
22 recognize as the Chadron formation is extremely
23 different than what we currently recognize as the
24 Chamberlain Pass formation.

25 In the Chamberlain Pass formation, the glass

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1 is devitrified, it's come out as zeolite minerals,
2 and free silica, and clay, and uranium. Okay? And
3 these conditions don't exist in the remainder of the
4 Chadron formation. So, to the extent that it's a
5 historical marker and refers to it as it was
6 considered in the past, that's fine. But in any
7 modern use of the terms we now know enough about the
8 Chamberlain Pass and Chadron formations to know that
9 they have entirely different chemistries, entirely
10 different hydrologies, entirely different geological
11 histories, you know. So, I mean, that's the
12 foundation of why the name change and the split, and
13 the stratigraphic revisions, is that we now recognize
14 that the two things are extremely different. And to
15 avoid confusion going forward as people read these
16 transcripts and they go on and they read the
17 scientific literature that we're very careful to
18 distinguish between the two things as we presently
19 understand them.

20 JUDGE WARDWELL: The outcrops of Chamberlain
21 Pass formation in the Badlands area, and the --- is
22 that the same deposit as the ore layer being mined in
23 the license area of the Crow Butte Resources that's
24 under license renewal?

25 DR. LAGARRY: Yes, Your Honor. The Chamberlain

1 Pass formation as we currently recognize it extends
2 from southwestern North Dakota, southeastern Montana,
3 western Nebraska, northwestern --- I'm sorry, western
4 South Dakota, northwestern Nebraska, northeastern
5 Colorado, and eastern Wyoming. It covers a vast area.
6 It is exposed on the land surface where it's been cut
7 into by erosion, and under the land surface
8 everywhere else.

9 JUDGE WARDWELL: And so the ore deposit in the
10 license area is a devitrified formation similar to
11 what the Badlands is, also, the material up in the
12 Badlands, and going ---

13 DR. LAGARRY: Yes, Your Honor. The ---

14 JUDGE WARDWELL: Go ahead.

15 DR. LAGARRY: Yes, Your Honor. It just so
16 happens that in this particular river system
17 following this particular syncline, more of it
18 accumulated here than elsewhere.

19 JUDGE WARDWELL: Thank you. In Intervenors
20 075, are there specific locations of the existence of
21 the Chamberlain Pass formation designated at or
22 beneath the surface of the Pine Ridge Reservation in
23 that particular document, are you aware of?

24 DR. LAGARRY: Yes.

25 JUDGE WARDWELL: There are.

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1 DR. LAGARRY: In my testimony, yes, Your
2 Honor.

3 JUDGE WARDWELL: And could you point us to the
4 page numbers or whatever where they designate where
5 that's located?

6 DR. LAGARRY: I don't have it in front of me,
7 Your Honor, but if we could bring it up on the
8 screen, I could easily take us to it.

9 JUDGE WARDWELL: As long as it won't be too
10 laborious, if we could bring up INT-075. And where
11 would you like to go?

12 DR. LAGARRY: I need it to be much bigger,
13 Your Honor. My eyes aren't very good.

14 JUDGE WARDWELL: Why don't you get rid of the
15 history ---

16 DR. LAGARRY: Oh, that's good.

17 JUDGE WARDWELL: --- get rid of him. Oh, he
18 doesn't see it anyway.

19 DR. LAGARRY: Okay, scroll --- okay. All
20 right. Your Honor, this particular exhibit does not
21 have specific locations in it.

22 JUDGE WARDWELL: Okay, thank you.

23 DR. LAGARRY: Not having had the exhibit list
24 in front of me, this one does not have it in it.

25 JUDGE WARDWELL: Thank you. That's fine.

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1 DR. LAGARRY: This is from 2006, and it was
2 the first widespread report of this. Terry, in 1998,
3 which is also one of the exhibits we've been --- we
4 reviewed for this current proceeding, shows figures
5 that do have the specific locations. And in my most
6 recent testimony, I also show pictures of it. The
7 pictures that I showed in my most recent testimony
8 were, in fact, drawn from the slides used in the
9 presentation of this abstract.

10 JUDGE WARDWELL: Well most of those pictures
11 were of the outcrops, were they not?

12 DR. LAGARRY: All of them were, Your Honor.

13 JUDGE WARDWELL: All right. And, so ---

14 DR. LAGARRY: The 2006 abstract --- go ahead.

15 JUDGE WARDWELL: No. So, what I'm interested
16 in, is there any reference to where this material,
17 the Chamberlain Pass formation underlies the Pine
18 Ridge Reservation, where locations of where, if I
19 went to the Pine Ridge Reservation and drilled a hole
20 would I encounter the Chamberlain Pass formation? Is
21 there a map showing that anywhere?

22 DR. LAGARRY: Your Honor, in large part the
23 existence of the Chamberlain Pass formation under the
24 land surface is inferred and interpolated by
25 connecting between surface exposures.

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1 JUDGE WARDWELL: I see. Yes, thank you. But is
2 that also --- is that shown anywhere on an exhibit,
3 that interpolation?

4 DR. LAGARRY: The surface exposures, Your
5 Honor?

6 JUDGE WARDWELL: The surface exposures and the
7 interpolation between them for the various --- I
8 believe they would be river valleys or something,
9 historic river valleys or depositional outstreams, or
10 something like that that would be depositing this
11 material. Is that correct?

12 DR. LAGARRY: Yes, there are not cross
13 sections. Since the subsurface data is only
14 obtainable by drilling, and the drillers on the
15 reservation didn't routinely record that data, or
16 perhaps were even aware of the Chamberlain Pass
17 formation, then that data would have to be acquired
18 in the future. It doesn't exist for compilation in
19 the present.

20 JUDGE WARDWELL: You don't think those
21 drillers get as excited as you do with the cuttings
22 that come out of a drill hole?

23 DR. LAGARRY: Probably not, Your Honor.

24 JUDGE WARDWELL: But who would, though,
25 really? Right?

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1 DR. LAGARRY: Well, in my experience, Your
2 Honor, if you don't believe it, you don't see it. I
3 mean, and if a driller is looking for water and they
4 find water, then the details of whether it's from a
5 gray rock or a red rock, or from a siltstone or a
6 sandstone aren't particular germane at that time. I
7 mean, the emphasis is on getting the water. For a
8 stratigrapher like myself, I might be less interested
9 in the water, and more interested in the little chips
10 of rock.

11 JUDGE WARDWELL: Thank you. Would you agree
12 that it is likely that the Basal Chadron/Chamberlain
13 Pass formation in the license area is not in direct
14 contact with any of the Chamberlain Pass formations
15 whether they're channels or not beneath the Pine
16 Ridge Reservation?

17 DR. LAGARRY: Based on the amount of data that
18 I'm aware of, Your Honor, I would bet that it
19 probably wasn't.

20 JUDGE WARDWELL: Okay, thank you. I'll turn to
21 --- I'll go to Crow Butte and see if anyone there is
22 interested in responding to a professional opinion of
23 whether the Basal Chadron/Chamberlain Pass formation
24 underlies the Pine Ridge Reservation, if anyone would
25 care to address that?

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1 MR. SPURLIN: Your Honor, Matt Spurlin, Crow
2 Butte. The plausibility of the Chamberlain Pass
3 formation being present in that region of South
4 Dakota I don't think is in question. It's very likely
5 that it is present. But it's the White River Group
6 between the two, and the connectivity of those
7 stratigraphic units that I think needs more
8 discussion. You know, essentially between the license
9 area and the Pine Ridge Reservation, the entire White
10 River Group has been removed by erosion exposing the
11 low permeability Pierre Shale at the surface. And at
12 this point, we haven't seen any evidence of a
13 hydraulic pathway between the license area and Pine
14 Ridge.

15 JUDGE WARDWELL: So, are you saying that the
16 area between the license area heading off to the
17 northeast towards --- north-northeast towards the
18 Pine Ridge Reservation has the Pierre Shale at the
19 surface, or just that the White River Group has been
20 eroded?

21 MR. SPURLIN: Both, Your Honor. The White
22 River Group has been removed by erosion. In the
23 present day, it would be, you know, above the land
24 surface in the air, if you could imagine that, and
25 the Pierre Shale is currently exposed on the surface.

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1 JUDGE WARDWELL: And, Dr. LaGarry, do you
2 agree with that, that that's what exists at least in
3 some part between the license area and the Pine Ridge
4 Reservation? If one was to start walking north-
5 northeast towards the Pine Ridge Reservation from the
6 license area they would encounter the Pierre Shale
7 under their feet?

8 DR. LAGARRY: Yes, they would, Your Honor, as
9 they cross the structure called the Chadron Arch.

10 JUDGE WARDWELL: Okay, thank you. NRC Exhibit
11 095, page 14A.4.2, states that, "Taken together,
12 these exhibits, Intervenors 072 to 077, identify
13 several outcrops and/or sub-crops of the Chamberlain
14 Pass formation in the Badlands National Park and
15 state that they are present at several locations of
16 the Pine Ridge Reservation. They do not provide any
17 evidence of the extent of the Chamberlain Pass
18 formation beneath the reservation, however." And I
19 guess I'll address this to Staff now who hasn't had
20 a chance to answer questions in this regard. Do you
21 --- do these exhibits state that the Basal Chadron or
22 the Chamberlain Pass formation does not underlie the
23 Pine Ridge Reservation, or is it mostly just silent
24 on it?

25 DR. STRIZ: Board Exhibit 003, which is the

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1 groundwater modeling report for the Pine Ridge
2 Reservation which was done with the intent of trying
3 to locate groundwater sources in the area for supply
4 for the Pine Ridge does not identify the Chamberlain
5 Pass formation in any of the exhibit as being present
6 in the subsurface geology, or as a source of drinking
7 water.

8 JUDGE WARDWELL: Is it your belief that
9 Chamberlain Pass formation does not underlie the Pine
10 Ridge Reservation, or do you think more data is
11 needed to really confirm or deny that?

12 DR. STRIZ: The groundwater modeling study
13 uses the test hole database for the State of South
14 Dakota, and the test holes across Pine Ridge went to
15 depths of 2,000 feet. They did not identify the
16 formation in those drill holes or in their subsurface
17 geology. So, at this point I don't know if you would
18 say it's deeper. Dr. LaGarry had stated that he has
19 not conducted any sort of subsurface characterization
20 of the Chamberlain Pass in the Pine Ridge or in the
21 southern Dawes County area where the Basal Chadron
22 exists, so all the interpretation of the subsurface
23 is based on outcrops.

24 JUDGE WARDWELL: Do you have an exhibit number
25 for the groundwater study that you were referring to?

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1 DR. STRIZ: Yes, it's Board Exhibit 003.

2 JUDGE WARDWELL: Okay, thank you. And, Dr.
3 LaGarry, would you like to comment on what Dr. Striz
4 just mentioned in regards to her evaluation of the
5 presence of the Chadron Pass under the --- I mean,
6 the Chamberlain Pass under the Pine Ridge
7 Reservation?

8 DR. LAGARRY: Yes, Your Honor. In 1985, the
9 Nebraska Geological Survey published a paper called
10 "Cenozoic Paleogeography of Western Nebraska." It's
11 one of the references in my earlier opinions. And in
12 that document, they provide cross sections through
13 Sioux County, Dawes, Box Butte County, and Sheridan
14 County, Nebraska compiled from 12,500 drill holes
15 which clearly demark what was then considered to be
16 the Chadron A or the Basal Chadron under the entire
17 panhandle of Nebraska. In my most recent filing, the
18 one for this hearing, in particular, I provided a
19 figure from Evanoff and Larson, or Larson and Evanoff
20 published in 1998 showing the aerial extent that I
21 mentioned previously of the White River Group,
22 including the Basal Chadron or Chamberlain Pass
23 formation. Dennis Terry provides ample outcrop data.
24 I provide pictures of the outcrop data of the
25 Chamberlain Pass. And it's true, Your Honor, there

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1 has been no systematic drilling designed to work out
2 the stratigraphy on the Pine Ridge Reservation of
3 South Dakota. That much is absolutely true.

4 However, I did review the hydrological
5 modeling in my most recent testimony submitted for
6 today's proceeding, in which I went through the
7 references of that groundwater modeling study, and
8 that groundwater modeling study has some issues with
9 it. The issues are that for whatever reason the
10 groundwater modeling study refers to Jim Martin's
11 geological map of South Dakota, where in the legend
12 of that map the Chamberlain Pass formation is
13 mentioned specifically by name as being in South
14 Dakota, and the geological map shows it on the Pine
15 Ridge Reservation. So, although, the groundwater
16 modeling report chose to omit the Chamberlain Pass
17 formation for whatever reason, in the references that
18 they cite, which I went and checked, the Chamberlain
19 Pass formation is mentioned by name.

20 JUDGE WARDWELL: Thank you. In your Exhibit
21 080, page 6, it stated that, "In my early testimony,
22 2008 and 2015, I indicated that the White River and
23 its alluvium are a complex network of intersecting
24 joints and faults were the most likely ways for
25 contaminants for migrate from the Crow Butte

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1 Resources license area to the Pine Ridge Reservation.
2 In my opinion, a newly proffered Exhibit, Board
3 Exhibit 006, suggests that there might be another
4 route through the Arikaree Group, but if so, it would
5 likely be in combination with faults and joints for
6 reasons discussed in the Crawford hearings." And I
7 just wanted to question you on this, Dr. LaGarry.

8 By this, do you mean that the likely
9 hydraulic connection between the license area and the
10 Pine Ridge Reservation is northwest flow from the
11 license area to the White River alluvium and the
12 White River itself, and then subsequent northeast
13 flow through the Modern River alluvium to connect
14 with exposed or water table aquifer of the Basal
15 Chadron/Chamberlain Pass formation and/or the
16 Arikaree-Ogallala aquifers underlying the Pine Ridge
17 Reservation."

18 DR. LAGARRY: Yes, Your Honor, that's what I
19 mean. And, also, in that testimony that you're
20 currently referring to is where I show the pictures
21 of the Chamberlain Pass formation on the reservation.
22 So, in my opinion, that lateral migration of
23 contaminated water from the license area somehow
24 around, or over, or through the Chadron Arch onto the
25 reservation is extremely unlikely. And, in fact,

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1 since my 2008 testimony, I've largely discounted that
2 as not being possible. However, you know, once
3 contaminants through cracks, or spills, or whatever
4 found their way into the White River, then they would
5 be flushed diagonally across the Pine Ridge
6 Reservation, and in short order could get from there
7 into people's wells, or into the sediments.

8 The other possibility was the, you know, the
9 situation like I described back in August where the
10 water disappeared into --- the Chadron Creek water
11 disappeared into a crack, and then, you know --- so,
12 if water is disappearing down into these cracks, is
13 it just filling up an underground reservoir, or is it
14 popping out elsewhere? Well, also in some of the
15 stuff I provided on the flash drive back in August,
16 I showed a poster by Shawn Garnette and some other
17 students and faculty at Oglala Lakota College in
18 which we show uranium-contaminated water burbling up
19 from the White Clay fault in southern Oglala Lakota
20 County like as an effect of artesian flow. Okay, so
21 artesian flow is known to occur in the area of Crow
22 Butte. It's ubiquitous around the region, and in
23 presenting all this data, I was intending to show
24 that it's entirely plausible that contaminated
25 liquids from underground can be driven by artesian

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1 flow to pop out at faults and cracks elsewhere. So,
2 in establishing in my earlier testimony that there
3 are faults and cracks ubiquitous throughout the
4 region, it's not too big of a stretch to then project
5 that, you know, if let's say that in the area that
6 close to study for me, or the proprietary permit
7 area, if I were to find faults that were transmitting
8 liquids between and around monitoring wells, and
9 these were getting into the White River, that those
10 contaminants could then be taken directly to Pine
11 Ridge. It's also possible that this underground
12 network of faults could transmit fluids between and
13 around monitoring wells to bubble up through artesian
14 flow somewhere, perhaps, in southern Oglala Lakota
15 County. So, in my opinion, Your Honor, those
16 contaminant pathways are much more likely than any
17 lateral connection of the Chamberlain Pass.

18 Now, the issue of the Arikaree, that was one
19 was new to me, Your Honor. I don't --- in my
20 stratigraphic work, I don't often come cross a lot of
21 flow models for the Arikaree, and so when Ms.
22 Whiteface presented that map, that was the first time
23 I seriously considered that pathway as a contaminant
24 flow pathway. But at this stage, Your Honor, it's too
25 early to dismiss that. Also, there's no data to

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1 confirm it either.

2 JUDGE WARDWELL: So, your latter comment on --
3 - that I just quoted from your Exhibit 080, page 6,
4 where you say that another route through the Arikaree
5 Group, but if so, would likely be in a combination
6 with faults and joints. What you just said in regards
7 to too early to tell one way or the other applies to
8 that. Is that correct, if I understand you?

9 DR. LAGARRY: That's correct, Your Honor.

10 JUDGE WARDWELL: Okay, thank you.

11 CHAIR GIBSON: Okay, we'll take a 10-minute
12 recess, and get back on the record again.

13 (Whereupon, the above-entitled matter went
14 off the record at 3:01 p.m. and resumed at 3:18 p.m.)

15 CHAIR GIBSON: All right. We're back on the
16 record. Judge Wardwell.

17 JUDGE WARDWELL: Okay. We are moving on to
18 Issue 5. To what degree, if any, do the additional
19 exhibits affect the conclusions regarding the
20 structure of the White River feature and the NRC
21 Staff's maximum likelihood modeling? I'll start off
22 with NRC Exhibit 095, page 20, answer 5.2. And it
23 quotes, "The models were developed and calibrated but
24 no documentation or final report describing the
25 development, parameterization, or calibration of the

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1 final models was prepared, and the person who did the
2 modeling left the Agency over two years ago.
3 Therefore, we have no information on which to
4 evaluate the selection of the design of the models,
5 or evaluate their calibration."

6 On page 21, the answer 5.2 continues and it
7 states that, "The modeler selected a value of
8 recharge which greatly exceeds the rule of the thumb
9 of assigning 10 to 20 percent of historical annual
10 precipitation as the recharge value. In addition, the
11 modeler calibrated a steady-state model to transient
12 pumping test data. Again, no justification was
13 provided for this approach.

14 Given these concerns, we are unable to defend
15 the use of the selected recharge value," it then goes
16 on and talks about "or the use of the steady-state
17 model." As a result, NRC states that "we are not,
18 however, able to determine why the modeler chose
19 specific values for input parameters, or explain the
20 iterative approach the modeler used to calibrate the
21 models." So, my question to Staff, and who will I be
22 addressing these to?

23 DR. STRIZ: Me, Your Honor.

24 JUDGE WARDWELL: Dr. Striz, good. And make
25 sure you bring that --- just tuck it right under your

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1 chin so we can hear you.

2 DR. STRIZ: Okay.

3 JUDGE WARDWELL: You should be able to pull
4 the mic right up as opposed to before. Get it real
5 close, and still, if you're like me, you wander off,
6 but we'll try to get you over the mic, as I try to
7 keep myself over it, and not very successfully.

8 Anyhow, when we are talking about this
9 modeling that I just quoted from your exhibit that
10 was done to help evaluate the White River feature,
11 are you referring to the groundwater modeling system,
12 the GMS, discussed in the environmental assessment?
13 That's NRC-010, page 39, or the subsequent other
14 models discussed on that same page, or all of them?

15 DR. STRIZ: All of them. The models were done
16 within the GMS environment, GMS software environment.
17 So, all the groundwater models were run with the GMS
18 software.

19 JUDGE WARDWELL: And did you make any attempt
20 to contact the programmer to help with the evaluation
21 of these parameters?

22 DR. STRIZ: Not since he's left the Agency,
23 Your Honor.

24 JUDGE WARDWELL: Without the information to
25 evaluate the selection of the input parameters and

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1 design of the modeling should be afforded little to
2 no weight. Are these statements in your testimony
3 also a mission that no weight should be given to the
4 White River feature modeling because the modeler
5 selected an excessive value of recharge and
6 calibrated a steady-state model to transient pumping
7 test data?

8 DR. STRIZ: Those are just two of the reasons
9 that we have concerns about the validity of the
10 modeling, and ask that it be given no weight.

11 JUDGE WARDWELL: Thank you. So, Crow Butte,
12 just to tie up some loose ends. I don't want to beat
13 a dead horse here, but I do want to tie up some loose
14 ends. That in your Exhibit 067, page 14A.31, "While
15 further refinements and additional modeling runs can
16 also be made, there's no reason to believe that the
17 NRC Staff's modeling efforts were unreasonable given
18 the stated limited purpose of the model." I would ask
19 anyone from CBR to respond and answer the question of
20 how do you have any confidence that there is no
21 reason to believe that the modeling efforts were
22 unreasonable given that the modeler selected the
23 values of recharge as they did, and calibrated using
24 a steady-state model; i.e., do you now consider that
25 the model should be given no weight?

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1 MR. SPURLIN: Sorry, Your Honor. Could you
2 repeat that?

3 JUDGE WARDWELL: My question was in regards to
4 a comment you made or statement you made in your
5 Exhibit 067, page 14, answer 31 where you said,
6 "While further refinements and additional modeling
7 runs can also be made," and this is in regards to the
8 White --- the GMS model run for the White River
9 feature, you go on to state that, "there is no reason
10 to believe that NRC Staff's modeling efforts were
11 unreasonable." I'm now asking you, do you agree that
12 maybe the Staff's modeling was not reasonable and
13 that we should afford it no weight, as Staff has
14 suggested we do?

15 MR. SPURLIN: I'll repeat what we put into our
16 draft testimony. Again, this is Matt Spurlin with
17 Crow Butte. You know, we relied on several other
18 lines of evidence.

19 JUDGE WARDWELL: Excuse me. Excuse me, excuse
20 me, excuse me, excuse me. I'd rather you answer my
21 question, and then we'll get into what you're just
22 about to discuss in depth. I promise you. Would you
23 afford the Staff's GMS modeling no weight if --- as
24 far as your position is concerned?

25 MR. BEINS: Your Honor, Wade Beins with Crow

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1 Butte. We are comfortable with making that statement
2 to afford no weight to the modeling as it was done by
3 the NRC, as it's not required to support our
4 position.

5 JUDGE WARDWELL: Thank you. This is also
6 picking up in 095, NRC Exhibit 095, page 25, answer
7 5.5 talks about the Bayesian maximum likelihood
8 analysis, and the maximum Bayesian likelihood model
9 averaging models. And I assume that those models also
10 because of their interaction with the GMS should also
11 be afforded no weight? Is that correct, Dr. Striz?

12 DR. STRIZ: There seems to be some confusion,
13 I'd like to clear up quickly.

14 JUDGE WARDWELL: Sure.

15 DR. STRIZ: The models were run within GMS.
16 The output from all of the models for simulation 1
17 and simulation 2 were used in the Bayesian maximum
18 likelihood analysis. It was those outputs. GMS is
19 only a software package that's run off your computer.
20 All the models --- it was just used to run the
21 models, and then the output from the models which was
22 provided by GMS were then used as inputs into the
23 Bayesian maximum likelihood analysis. Does that help?

24 JUDGE WARDWELL: Yes, it does, and I had
25 broken it down to several questions, and that was one

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1 of my questions. But I thought I could jump to the
2 very end conclusion, because the input into those
3 Bayesian models came from the earlier models that you
4 say afforded no weight. Don't we also have to afford
5 no weight to the output from the Bayesian models?

6 DR. STRIZ: Exactly, because the inputs ---
7 the outputs from the models which were the inputs to
8 the analysis were suspect, then it would be carried
9 through the entire analysis.

10 JUDGE WARDWELL: Great. And that's exactly ---
11 I went through a whole list and even drawn up, and
12 we don't have to go into that. Thank you.

13 NRC 095, page 22, answer 5.3 states that, "In
14 A.D.10 of our initial testimony, and that's Exhibit
15 NRC 001R at 38 to 39, we discussed all of the bases
16 other than the modeling for our conclusions regarding
17 the White River structure feature. If the modeling is
18 not considered, that does not affect Staff's
19 conclusions because the modeling was only one of a
20 number of bases for concluding that the White River
21 feature is not a transmissive fault, and does not
22 serve as a conduit for transporting contaminants to
23 the White River and Pine River Reservations.

24 In our initial testimony at A.D.1, and our
25 rebuttal testimony A.D.18, we specifically stated

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1 that the modeling was not essential to the Staff's
2 conclusions regarding the confinement of the Basal
3 Chadron/Chamberlain Pass formation," I added that.
4 This was in the middle of a quote, but I added the
5 Chamberlain Pass formation, sorry, "a sandstone
6 aquifer or expected environmental impacts but was an
7 additional line of evidence."

8 For Staff I would say, does not your EA and
9 SER stress the importance of this modeling in
10 defining the structure of the White River feature in
11 that modeling was conducted as expressed in Section
12 3.5.2.3.3 of the EA?

13 DR. STRIZ: Yes, sir, substantial text
14 dedicated to the model in the EA and in the SER.

15 JUDGE WARDWELL: So because of that, you know,
16 your last statement that I just quoted from, NRC 095
17 page 22, answer 5.3, it said that, "In our initial
18 testimony at A.D.21, and our rebuttal testimony of
19 A.D.18, we specifically stated that the modeling was
20 not essential to the Staff's conclusions regarding
21 the confinement of the Basal Chadron sandstone
22 aquifer or expected environmental impacts, but was an
23 additional line of evidence." Right now we wouldn't
24 even consider additional line of evidence. Is that
25 correct?

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1 DR. STRIZ: That's correct.

2 JUDGE WARDWELL: NRC testimony again, 095,
3 page 22 to 23, A.5.3, "The additional bases included
4 (1) the creation of inward groundwater gradients; (2)
5 the length of time required for contaminants to reach
6 the Pine Ridge Reservation; (3) the lack of hydraulic
7 impact of the White River feature on the Basal
8 Chadron/Chamberlain Pass formation; and (4) NDEQ's
9 independent review of the White River feature
10 modeling."

11 In regards to each, I'm going to have some
12 questions for you, so I'm now going to go into each
13 one of these sub-areas to ask some questions about.
14 And we'll start off with these inward gradients that
15 you discuss in, again, Exhibit 095, page 22, answer
16 5.3. And there you say, "As stated in our initial
17 testimony," and you're referencing NRC Exhibit 001 at
18 38, "and also as discussed in the Evidentiary
19 Hearing," see transcript at page 1086, "Crow Butte is
20 required by license conditions to operate under
21 inward hydraulic gradient which creates a cone of
22 depression that draws fluids into the license area.
23 This has reversed the flow direction of the
24 groundwater in the Basal Chadron sandstone aquifer
25 from northwest to southeast in the northwest portion

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1 of the license area, and prevents the movement of
2 water through the Basal Chadron sandstone aquifer
3 towards the White River." My question to Staff, does
4 not this inward gradient also help prevent vertical
5 movement upwards into the Brule?

6 DR. STRIZ: That is correct.

7 JUDGE WARDWELL: And where are these
8 attributes discussed in the Environmental Assessment
9 or the SER, if for nothing else, in support of a lack
10 of impact to the local and regional uses of
11 groundwater, i.e., the private wells in the vicinity
12 of the mine in Crawford, and the wells --- any wells
13 that might exist in the Pine Ridge Reservation?

14 DR. STRIZ: I don't believe it's discussed
15 with respect to the Pine Ridge Reservation, but I do
16 believe the inward gradient is discussed with the EA,
17 but I'll have to defer to someone to try to find the
18 location of that discussion.

19 JUDGE WARDWELL: And could you try to get us
20 a cite to the EA and/or the SER, also?

21 DR. STRIZ: Okay, definitely.

22 JUDGE WARDWELL: I'd like both explored and
23 now whether both, or neither, or one and not the
24 other does or does not address the inward gradients.
25 And that, likewise, will take place with the

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1 transport times, hydraulic confinement, and the NEDQ
2 review, so I don't have to repeat that question
3 again.

4 DR. STRIZ: Okay.

5 JUDGE WARDWELL: Because I've got the same
6 question for each one of those categories.

7 DR. STRIZ: Okay.

8 JUDGE WARDWELL: Under transport times, NRC
9 095, pages 22 to 23 for --- in answer 5.3, "We also
10 note that even if contaminants could move from the
11 license area towards the White River, the time of
12 travel from the license area boundary to the White
13 River structural feature would be several hundred
14 years. During this travel time convection,
15 dispersions, absorption, and geochemical processes,
16 i.e., redox, would reduce concentrations of any
17 contaminants of concern." And my question to Staff
18 is, what is the basis for this several hundred years
19 of travel time? Is that a calculation, or a wild
20 guess, or an educational guess, or what was the basis
21 of that?

22 DR. STRIZ: The basis would be the groundwater
23 velocity in the Basal Chadron should it move away
24 from the inward gradient capture zone, and that would
25 be based on the hydraulic gradient within the Basal

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1 Chadron and the conductivity within the Basal
2 Chadron.

3 JUDGE WARDWELL: And did you actually perform
4 a calculation for that, or is it just a ---

5 DR. STRIZ: Oh, yes, you can perform the
6 calculation.

7 JUDGE WARDWELL: Okay, thank you.

8 CHAIR GIBSON: Can I just ask you a question?
9 Is that calculation set forth in the Environmental
10 Assessment?

11 DR. STRIZ: No, it is not.

12 CHAIR GIBSON: Okay.

13 JUDGE WARDWELL: The --- so, let's explore
14 that a bit in regards to what happens with the
15 stopping of the mining operations when that inward
16 gradient doesn't exist anymore?

17 DR. STRIZ: Well, the inward gradient will
18 remain until the mine unit is restored to the 5(b)(5)
19 criterion which is background MCLs, whichever is
20 higher, or an alternate concentration limit. So, they
21 are required to maintain that gradient until they
22 achieve the groundwater protection standards. At that
23 point, there is no requirement for an inward
24 gradient. They go into stabilization, and it is
25 accepted that if you leave it at the groundwater

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1 protection standard there is no potential for
2 contamination of surrounding groundwater.

3 JUDGE WARDWELL: Thank you. And, again, I'd
4 like to know if this attribute is discussed in the EA
5 and the SER. Under hydraulic confinement--

6 CHAIR GIBSON: Is it --- do you know off the
7 top of your head is it discussed in the EA?

8 DR. STRIZ: I believe it is, leaving the
9 aquifer ---

10 CHAIR GIBSON: The inward hydraulic gradient
11 is discussed there?

12 DR. STRIZ: I believe so. It would be part of
13 the mitigation.

14 CHAIR GIBSON: Okay. Well, yes, I'll second
15 what Rich just asked for, we'd like to have a cite.

16 JUDGE WARDWELL: For both the transport times
17 and the inward gradients. And under hydraulic
18 confinement, we're going to break it down to several
19 things, because as you state in your testimony, 095
20 page 23, answer 5.3, "In A.D.10 of our initial
21 testimony we identified several bases for concluding
22 that the White River structural feature would not
23 affect hydraulic confinement of the Basal Chadron
24 sandstone aquifer." Exhibit NRC 001R at 39,
25 "including evidence that (1) the White River

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1 structural feature does not offset geologic contact
2 between the Pierre Shale and the Basal Chadron or
3 members of the Chadron in Brule formation based on
4 130 geophysical logs," citing Exhibit NRC 028 at F19
5 to F25. "And there is a consistent vertical gradient
6 and potentiometric groundwater surfaces of the Basal
7 Chadron sandstone aquifer and the Brule aquifer over
8 the area of the White River feature," citing NRC
9 Exhibit 028 at G15 to G16. And then in addition to
10 this, "the geologic contact and the vertical gradient
11 number 2 aquifer test in the area demonstrate that
12 integrity of the overlying confining unit," and you
13 cite NRC 028 at G9 to G11. And then 3, "that there
14 are distinct geochemical variations among the
15 aquifers."

16 And Staff, in regards to the --- yes, I kind
17 of broke this down into two types of questions being
18 answered in regards to where it might be described,
19 that in regards to your opinion that the White River
20 structural feature does not affect the potentiometric
21 surface of the Basal Chadron/Chamberlain Pass
22 aquifer, where is the flow system in the vicinity of
23 the White River feature described and analyzed in
24 either the EA or the SER to demonstrate the
25 uniformity of the potentiometric surface, or in any

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1 of your other documents that are in the record of
2 this proceeding? So, do you understand --- it may be
3 in the answer to the question, but if not, get back
4 to us on that, too.

5 DR. STRIZ: The continuity of the
6 potentiometric surface across the fault?

7 JUDGE WARDWELL: Yes, what types of analyses
8 do you do in regards to assessing the potentiometric
9 surface and reaching a conclusion that surface has
10 maintained its consistency and is not warped by the
11 White River feature?

12 DR. STRIZ: I'm not sure that it was looked at
13 in the SER or the EA because of the distance of the
14 feature from the facility. I'd have to go back and
15 look.

16 JUDGE WARDWELL: Okay, thank you. And then
17 beside Section 3.5.2.3.3 of the EA, and that's NRC
18 010, pages 38 to 39, I'd ask you to look to see if
19 there's any other locations in the EA or the SER
20 where the continuity of the geological features based
21 on these three lines of evidence, those three lines
22 are the hydraulic confinement as caused by the
23 constant vertical gradient and potentiometric
24 surfaces, and the fact that it does not offset the
25 geologic contact, that's one. Two, the aquifer test

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1 demonstrating the integrity of the overlying
2 containment unit. And three, the distinct geochemical
3 variations among the aquifers. That these three lines
4 of evidence are discussed, if for nothing else, again
5 to --- in regards to an impact.

6 And then Crow Butte --- no, I'm sorry, the
7 Intervenors, sorry to wake you, but I actually have
8 a question. Do you have any evidence from the
9 documents in this proceeding refuting any of these
10 hydraulic confinement attributes that NRC states is
11 present at the mine unit that would help mitigate any
12 potential impact to the surrounding receptors?

13 MR. WIREMAN: This is Wireman, Your Honor. Our
14 view has been and continues to be that not enough is
15 known about the effect on the potentiometric surface
16 of the Basal Chadron as a result of this White River
17 structure. Regardless if it's a fault or a fold, or
18 what the structure is, it is likely to have an effect
19 on that surface. And what that effect is, is unknown.
20 And the concern is that combined with the pumping and
21 the inward gradient there will be a reduction in
22 discharge from the Basal Chadron to whatever surface
23 water features it must discharge to. And, secondly,
24 anyone who has a water supply well in the Basal
25 Chadron down gradient will see a reduce yield because

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1 of a reduced potentiometric thickness. So, that's our
2 concern. And we have not looked at all of the
3 detailed data around that structure. And as far as I
4 know, no potentiometric surface data in any detail
5 around the structure was provided in the LRA, or the
6 FD, or the EA. So, we're just asking what's going on
7 there.

8 JUDGE WARDWELL: Thank you.

9 DR. KREAMER: Can I add something, Your Honor?
10 This is Dr. Dave Kreamer.

11 JUDGE WARDWELL: Sure.

12 DR. KREAMER: With the modeling invalidated,
13 you said there's a certain amount of protection from
14 the inward gradient. And I think you were referring
15 to the ---

16 JUDGE WARDWELL: I didn't say it. I was asking
17 the Staff.

18 DR. KREAMER: Let me clarify. You were asking
19 about that and it was confirmed ---

20 JUDGE WARDWELL: Their statement that it does.

21 DR. KREAMER: I'm sorry about my wording. Yes,
22 you were asking that, you didn't say that. It was
23 confirmed that there was an inward gradient, and that
24 that would form some measure of protection. When you
25 say "protection," you're referring to the water

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1 quality aspects perhaps, but not the water quantity
2 impacts, if there is hydraulic connection with the
3 Brule. The water quantity impacts, actually, that
4 "inward gradient" would be very detrimental as far as
5 protection of wells that are in the Brule, and
6 wetlands, and streams.

7 JUDGE WARDWELL: Thank you.

8 DR. KREAMER: Thank you.

9 JUDGE WARDWELL: The last item was the ---
10 that you raised in regards to other bases besides
11 the modeling was the NDEQ review. In NRC Exhibit 095,
12 page 23, answer 5.3, as one of these additional bases
13 you "explain that NDEQ independently evaluated the
14 White River structural feature during its review of
15 Crow Butte Aquifer Exemption Petition for the north
16 trend expansion area. NDEQ's review, which included
17 a review by an independent panel of geology experts
18 concluded that Crow Butte's interpretation of this
19 feature as a fold was plausible, and there is no
20 evidence of faults or contaminant pathways between
21 the Basal Chadron sandstone aquifer and the Brule
22 aquifer within the north trend expansion area." And
23 I was just wondering, did NDEP review your modeling
24 analysis as part of developing its evaluation, do you
25 know?

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1 DR. STRIZ: Did they evaluate our in-house
2 Bayesian analysis?

3 JUDGE WARDWELL: Right.

4 DR. STRIZ: No, sir.

5 JUDGE WARDWELL: So, they didn't use -- this
6 modeling didn't contribute to their conclusions.

7 DR. STRIZ: No, it did not.

8 JUDGE WARDWELL: Thank you. That cuts out a
9 lot of questions. And, again, would like to see where
10 that's mentioned in the EA or the SER.

11 In NRC Exhibit 095, continuing on with now
12 pages 23 to 24, answer 5.3, "The bases discussed
13 above, those were the four bases, and our initial and
14 rebuttal testimony provide ample evidence supporting
15 the Staff's conclusions regarding the White River
16 structural feature independent of any consideration
17 of Staff's modeling. The Intervenors have not
18 provided any evidence to the contrary, i.e., that the
19 White River structural feature is a conductive fault,
20 or that it has transported contaminants to and
21 impacted the water quality of the White River." And
22 I'd ask Staff, are there any other bases besides
23 those four discussed above that supports the premise
24 that the White River feature is a fold, rather than
25 a fault?

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1 DR. STRIZ: Not to our knowledge, Your Honor.

2 JUDGE WARDWELL: Thank you. And it is your
3 opinion, is it not, that the White River structural
4 feature does not affect the potentiometric surface of
5 the Basal Chadron/Chamberlain Pass aquifer. Correct?

6 DR. STRIZ: That is correct.

7 JUDGE WARDWELL: And have you done any
8 analysis to demonstrate that the data is sufficiently
9 sensitive enough to be able to pick up changes in the
10 hydraulic gradient or the potentiometric surface
11 contours if, in fact, this feature did actually
12 change it?

13 DR. STRIZ: None, except a review of the
14 potentiometric surface. No.

15 JUDGE WARDWELL: Okay, thank you. Let me turn
16 again to both Mr. Wireman and Dr. Kreamer. Would you
17 able to provide us any evidence in this proceeding
18 that demonstrates that the --- besides what you've
19 already discussed, that the White River feature is a
20 conductive fault, or evidence to refute the other
21 portions of the four attributes discussed above? And,
22 again, that's --- those four attributes are discussed
23 in NRC Exhibit 095, pages --- in answer to question
24 5.3, pages 22 to 24. I'll start with Mr. Wireman.
25 Would you be able to point us to anything more than

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1 what you discussed before in regards to evidence that
2 would help us determine whether or not it's a fold,
3 or a fault?

4 MR. WIREMAN: Whether it's a fault or a fold?
5 You know, no data has been provided to us, detailed
6 data that would allow for that type of determination
7 on our part. But the point we're making is whether
8 it's a fault or a fold, it is likely to have an
9 impact on the potentiometric surface. It's just
10 really hard to understand how it wouldn't, because
11 the rocks are folded. So, the question is what does
12 that mean, and how does that affect any potential
13 discharge?

14 The other point I will make is that some of
15 this is time-dependent, because mining is just now
16 entering the northwest portion of this ore body. It
17 will go on for a little longer, and there's a
18 transport issue. They estimate hundreds of years. You
19 know, those ranges typically vary orders of magnitude
20 depending on your input parameters, but there would
21 be some time.

22 And the final thing is --- relates to post-
23 mining, once the mining stops, water levels, the
24 potentiometric surface comes back up in the Basal
25 Chadron ore body, then you may have, as we've seen in

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1 some --- in a number of other mine units, you have
2 ACLs that have been approved. The concentrations
3 associated with those ACLs are typically above MCLs,
4 they're typically above risk numbers. So, they could
5 enter the White River down the road at some
6 undetermined time, and then you would have
7 concentrations of some of these contaminants in the
8 river.

9 We don't have any real specific water quality
10 for the White River in the vicinity of this area to
11 have a background and be able to compare to, and see
12 what the long term trends will be. So, while we don't
13 have specific detailed evidence, what we don't have
14 is data and information that allows us to adequately
15 assess that risk.

16 JUDGE WARDWELL: Thank you. Dr. Kreamer?

17 DR. KREAMER: Mr. Wireman made one important
18 point right off, that a fold and a fault can have
19 high permeabilities. So, to me it seems somewhat
20 irrelevant as to whether it's a fold or a fault.
21 Geologically, if you look at pictures of a fold, it's
22 lots of micro faults, and it seems like the posing of
23 this question implied one single fault in the area,
24 yes or no? And that's not how geology works. If
25 there's a tectonic force, there's usually more than

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1 one fault, a series of faults. And in a fold feature
2 where you have some sort of grade uplift, you
3 typically have many, many different folds of
4 different sizes.

5 The point of time that Mr. Wireman made is
6 very good. We haven't seen the calculations of NRC,
7 and we don't know --- it was stated that they took
8 into the average groundwater pore velocity time. We
9 don't know if they took into consideration
10 dispersion. Longitudinal dispersion will get a
11 contaminant further, faster on the forward leading
12 edge of the dispersion, the mechanical dispersion.
13 So, we don't know how those travel times were arrived
14 at.

15 And, lastly, the points of post-mining,
16 whether there's going to be impacts to the deep wells
17 down in Crawford that might use water quantity-wise,
18 and the water in the Brule, as well, are fairly weak.
19 There's been no surface geophysics that we've been
20 presented with that support any of these data, or any
21 of these statements of confinement. Surface
22 geophysics would certainly help, if that's available.

23 JUDGE WARDWELL: Thank you. NRC's Exhibit 095,
24 page 24, answer 5.3, "South Dakota Department of
25 Environmental and Natural Resources has found no

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1 evidence of contamination in the White River
2 associated with the Crow Butte operations. On the
3 contrary, as we explained in our initial testimony at
4 answer D.23, referencing Exhibit NRC 001R at 49 to
5 50, the claims of elevated levels of uranium in wells
6 at Pine Ridge Reservation are most likely explained
7 by natural elevated levels of uranium in wells at the
8 Pine Ridge Reservation --- sorry, are most likely
9 explained by natural sources. In fact, as discussed
10 in A.4.5 above, several of the Intervenors' new
11 exhibits provide additional support for this view.
12 They're referencing INT-072 and 074. As does Exhibit
13 NRC 098, which is cited by Exhibit from the
14 Intervenors 074.

15 I guess I'll turn to Mr. Wireman and Dr.
16 Kreamer again. Have you provided any evidence in this
17 proceeding to refute South Dakota's lack of detected
18 contamination in the White River associated with Crow
19 Butte's operations?

20 DR. KREAMER: Judge Wardwell, let me first say
21 that the monitoring frequency by the State of
22 Nebraska was on a basis that would not pick up flood
23 flow. Very often transport porosities that would
24 transport uranium in the surface to the reservation
25 would be during a post-flow of a flood flow. If you

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1 go to YouTube and you look at White River photos or
2 video of flood events that have occurred recently,
3 you'll see that there's a tremendous amount of
4 sediment in that water. Uranium and other heavy
5 metals have a tendency to want to soar, it's called
6 facilitated particle transport in the trade. So, this
7 facilitated particle transport would be at these
8 flood periods, and these flood periods are short
9 duration, and they would not be really reflected in
10 the monitoring by the State of Nebraska. So, in my
11 professional opinion, I think that there is a
12 possibility of surface transport off the property in
13 the lack of monitoring of these flood events.

14 MR. WIREMAN: May I ---

15 JUDGE WARDWELL: If you monitored at a flood
16 event, would it not be diluted by the high quantity
17 of water that's being moved down, and wouldn't it be
18 more practical to monitor it after the floods, and
19 you would see whatever residual uranium would be
20 there in the surface water if, in fact, something did
21 come down with a flood, wouldn't it?

22 DR. KREAMER: Not necessarily, Your Honor. If
23 the sediment transport was during the flood event,
24 there are ways that you could filter the sediment and
25 leach it and test it independently to see if there is

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1 transport occurring. Your comment on dilution is
2 correct, there probably would be some sort of
3 dilution factor going on if you simply measure the
4 water and you have filtered the sediment out. One
5 sampling technique that's very standard is to take a
6 water sample, filter it, acidify it, and then look
7 for heavy metals and uranium. That methodology would
8 negate facilitated particle transport in flood flows.

9 JUDGE WARDWELL: And I think when you
10 initially testified on this, you mentioned Nebraska.
11 Do you mean South Dakota, rather than Nebraska? You
12 stated Nebraska sampling. The question --- the
13 testimony I was citing talked about South Dakota's
14 water quality testing of the White River, not
15 Nebraska's.

16 DR. KREAMER: It would be either one. In
17 looking at the frequency of sampling and how often --
18 - they go out on a regular basis, and that regular
19 basis is without regard to flow.

20 JUDGE WARDWELL: Thank you. Mr. Wireman.

21 MR. WIREMAN: May I add two additions to that?

22 JUDGE WARDWELL: Yes, you may.

23 MR. WIREMAN: You know, I do believe based on
24 Dr. LaGarry's testimony that there is the source of
25 uranium in South Dakota that is independent of the

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1 uranium in the Crow Butte mine. I also agree with him
2 that the most likely way that uranium from Crow Butte
3 mining operations could reach South Dakota is via
4 flow in the White River, as compared to groundwater
5 flow.

6 The other thing to mention is that any
7 discharge of the Chamberlain Pass formation
8 groundwater carrying uranium into the upper portions
9 of the White River could very well reside there as
10 residual in the sediment for a very, very long time
11 and building essentially another small-scale ore
12 body. And when that is released out of sediment and
13 put into the water just based on many, many factors
14 and is very hard to predict.

15 The third and final thing is, there may be a
16 way using uranium isotopes to separate out uranium
17 from outcrops in South Dakota from uranium in buried
18 ore deposits in Nebraska, and that should be looked
19 at to see if that's a feasible tool. We do that with
20 other types of metals. Whether it can be done here or
21 not would take a little research, but it might be a
22 way to help answer whether some of the uranium seen
23 in South Dakota comes from this particular ore body.

24 JUDGE WARDWELL: Thank you.

25 CHAIR GIBSON: Ms. Striz, on --- going back to

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1 the inward gradient during restoration following ---

2 DR. KREAMER: Could you please speak into the
3 microphone, please? Thank you.

4 CHAIR GIBSON: Thank you. Didn't realize I
5 wasn't speaking into it. I'm sorry.

6 On page 88 of the EA, which is at least ---
7 that's the PDF page number, it talks there about the
8 --- that there is an inward gradient during
9 restoration, but it does not discuss any protective
10 role that it plays. There may be something else in
11 the EA that we're not aware of, but that's what we
12 were able to find while Judge Wardwell was asking
13 that question.

14 So, I think the Intervenor witnesses raised
15 the question of what protective role would that be
16 with respect to water quality, water quantity and
17 wetlands, and just seems like an important question
18 to raise. It doesn't sound like that's addressed in
19 the EA.

20 DR. STRIZ: Thank you, Your Honor.

21 CHAIR GIBSON: You're welcome. On --- with
22 respect to the potentiometric surface that Judge
23 Wardwell asked you about, it appears that there's a
24 reference to that at page 39, which is 52 in the PDF,
25 and to the paragraph right before Section 3.5.2.4. It

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1 notes that "The results of the model matches the
2 current observation of the potentiometric surface of
3 the Basal Chadron," but again, it does not appear
4 that there was any explanation for that analysis
5 other than just a statement that the model confirmed
6 it. So, hopefully, that would help you search for
7 those points.

8 DR. STRIZ: Thank you.

9 MS. MONTEITH: Your Honor, this is Emily
10 Monteith for the NRC Staff.

11 CHAIR GIBSON: Yes?

12 MS. MONTEITH: We have some additional
13 references to the EA, if you would like them now?

14 CHAIR GIBSON: If you've got them, let's get
15 them.

16 MS. MONTEITH: Okay. With respect to pumping
17 with an inward gradient ---

18 CHAIR GIBSON: Yes.

19 MS. MONTEITH: And forgive me, I may have not
20 heard what you referred to earlier, so I may
21 duplicate information you already have, but the
22 Environmental Assessment, Section 4.6.2.2.1 at 75,
23 that is the black number 75, not red page number 75.

24 CHAIR GIBSON: Is that 88 on the PDF?

25 MS. MONTEITH: I think it's only a couple of

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1 digits off, but Ms. Simon is checking.

2 CHAIR GIBSON: Okay. Yes, it is, apparently.

3 MS. MONTEITH: Okay.

4 CHAIR GIBSON: That is what I cited to her.

5 MS. MONTEITH: Okay, maybe I'll decline to
6 give page numbers.

7 CHAIR GIBSON: Very well.

8 MS. MONTEITH: In 4.6.2.3, as well.

9 CHAIR GIBSON: Okay.

10 MS. MONTEITH: In the SER, it would be Section
11 3.1.3.5.3, and 3.1.3.5.7.

12 CHAIR GIBSON: In the SER.

13 MS. MONTEITH: In the SER.

14 CHAIR GIBSON: Very well.

15 MS. MONTEITH: And with respect to transport
16 times in the EA, it would be Section 4.13.6.22. I'm
17 sorry, 2.2 at page 118 of the black PDF page. And no
18 reference that we've been able to discover so far in
19 the SER.

20 CHAIR GIBSON: Okay. Okay, very well. There
21 was no --- other than reference to the modeling,
22 though, there wasn't any specific reference to the
23 length of time. Correct?

24 MS. MONTEITH: There was --- let me --- I'd
25 have to go back and look.

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1 CHAIR GIBSON: I realize they made a mention
2 of it, but they didn't analyze what it said. Right?

3 MS. MONTEITH: I cannot confirm that at this
4 point.

5 CHAIR GIBSON: Okay. Is that it?

6 MS. MONTEITH: I believe a further question
7 was about the four additional lines of evidence, and
8 we are just conferring with our Environmental
9 Assessment author on that.

10 CHAIR GIBSON: Okay.

11 MS. MONTEITH: Just a moment.

12 CHAIR GIBSON: While they're doing that, I
13 just want to make a note of the fact that --- what we
14 can do is, Judge Wardwell can go on to Part 6, and we
15 can come back to this rather than hold things up,
16 because we've got a lot we've got to cover this
17 afternoon. I just want to make a note of the fact
18 that when you all made a mistake about the land
19 application of ISL waste, you all corrected that. It
20 seems to me that when you walked away from your
21 modeling, I'm not sure you can correct all that with
22 just this testimony. And you may need to correct the
23 EA with that, as well, but I guess we'll maybe get
24 some briefing about that subject when we're finished
25 here.

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1 MS. MONTEITH: I think that would be a
2 determination that you may make in the initial
3 decision, Your Honor.

4 CHAIR GIBSON: Possibly, possibly, but I'll
5 let Judge Wardwell get onto his questions. Thank you.

6 (Pause)

7 JUDGE WARDWELL: Okay, Issue 6. To what
8 degree, if any, do the additional exhibits illustrate
9 the groundwater flow directions in the Arikaree and
10 Brule aquifers underlying the Pine Ridge Reservation
11 and the license renewal area? NRC Exhibit 095, page
12 27A.6.2, "As shown on page 2 of Exhibit NRC 102, all
13 groundwater flow in the overlying aquifers in and
14 around the license area discharges to the White
15 River. Therefore, water would have to flow cross
16 gradient and over a groundwater mound to reach the
17 area identified by Dr. LaGarry." And Board Exhibit
18 017, which I believe in citing --- and that cites NRC
19 101 at 2. And my question to Staff is, where is this
20 flow path on the regional groundwater map on NRC 102,
21 for instance? I'm not quite sure where this cross
22 gradient over the groundwater model that you're
23 referring to exists.

24 DR. STRIZ: Mr. Lancaster will address these
25 questions.

1 JUDGE WARDWELL: He looked like he was ready.
2 That's why I was kind of looking at him. He perked
3 right up.

4 MR. LANCASTER: Are you looking at NRC 102,
5 Exhibit 102?

6 JUDGE WARDWELL: You tell me where you're
7 looking. I've quoted what you said, and I question
8 what you said because I couldn't find where is this
9 flow cross gradient and over a groundwater mound to
10 reach the area identified by Dr. LaGarry that you
11 were referring to?

12 MR. LANCASTER: Yes.

13 JUDGE WARDWELL: Could you point me to an
14 exhibit and show me where ---

15 MR. LANCASTER: Yes.

16 JUDGE WARDWELL: --- what you mean by that
17 sentence?

18 MR. LANCASTER: Pull up Exhibit NRC 102,
19 please. Yes, and if we could zoom in on the second
20 figure, probably is --- the bottom figure. Okay. And
21 there you see the facility is --- the location of the
22 facility is recognized. And then the ---

23 JUDGE WARDWELL: And that's the approximate
24 location of the license area which is the red, the
25 rectangle ---

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1 MR. LANCASTER: Right.

2 JUDGE WARDWELL: Standing on its tall portion,
3 the tall portion upwards, yes.

4 MR. LANCASTER: That's correct. And so then
5 the figure also is annotated with the approximate
6 location of the area that Dr. LaGarry had circled
7 during the previous hearing.

8 JUDGE WARDWELL: Yes.

9 MR. LANCASTER: And then also annotated is
10 this area where if we did have some sort of a
11 preferential --- if we did have a legitimate pathway,
12 there is a mound in the Arikaree, and that's what was
13 circled up there and labeled accordingly. And that
14 would act as a groundwater barrier to movement.

15 But here going to the cross gradient, you can
16 see at the facility the flow is --- as Souders in
17 2004, in that portion of the White River Basin that
18 includes the facility, it's more or less to the
19 north, northerly towards the White River, which acts
20 as a regional drain. And so cross gradient would be
21 going to the east-northeast against that flow.

22 Now, also, in order to get to the area where
23 flow would be north or east-northeast in the
24 Arikaree, I wish I had a pointer, but to get to that
25 mound you would have to cross gradient up gradient,

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1 which is not reasonable, if you look at the arrows on
2 that figure, and try to map out a path from the
3 facility over to the circled area that Dr. LaGarry
4 indicated.

5 JUDGE WARDWELL: What are these contours of?

6 MR. LANCASTER: These are contours of the, you
7 know, water level contours.

8 JUDGE WARDWELL: In what?

9 MR. LANCASTER: Potentiometric ---

10 JUDGE WARDWELL: We have Pierre Shale, we have
11 Chamberlain Pass formation, we've got the Brule,
12 we've got river alluvium. I guess I don't understand
13 how they're --- which are these of?

14 MR. LANCASTER: Oh, this is of the Arikaree.

15 JUDGE WARDWELL: So, it's just the Arikaree
16 alone.

17 MR. LANCASTER: Yes. And so you --- now, the
18 Arikaree, there is a downward gradient from the
19 Arikaree to the Brule. But here what we point out is
20 cross gradient at the facility, you go to this figure
21 and you can see the arrows are pointing north, and in
22 order for it to get up into a path, use the Arikaree
23 to get up to the reservation, it would have to go
24 cross gradient up gradient. That's what we're
25 pointing out there.

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1 JUDGE WARDWELL: Could we get the exhibit back
2 up again, Mr. Welkie?

3 MR. LANCASTER: Now, I should point out that
4 at the facility, the Arikaree as it was stated in the
5 Evidentiary Hearing by CBR, which we concur with, is
6 dry within the facility. And it forms a hill that's
7 a part of the Pine Ridge Escarpment in the very
8 southern portion of their licensed area.

9 JUDGE WARDWELL: So, where is that dryness
10 represented here in --- around the license area?

11 MR. LANCASTER: Well, this is a regional flow
12 map. It's the --- the details of those aren't going
13 to be on such a large-scale map.

14 MR. BACK: Your Honor, just a minor point. The
15 potentiometric surface is the shallowest surface, so
16 if you've got the Arikaree, it's the map of the
17 Arikaree. As you move down into the Brule, then it's
18 the Brule. As you move to the Niobrara, it's
19 Niobrara, so it's just showing the shallowest
20 elevation for the shallowest surface. That's why you
21 don't see it dry. It doesn't stop, because it just --
22 - the water table moves from the Arikaree into the
23 Brule, and so that --- just a minor clarification.

24 JUDGE WARDWELL: And, yet, is it not correct
25 that between that rectangle drawing a straight line

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1 up to say the western edge of the oval that was on
2 that previous map that Dr. LaGarry annotated back in
3 August, there is Pierre Shale at the surface.
4 Correct? And are these water levels in the Pierre
5 Shale?

6 MR. LANCASTER: That's correct. If you look at
7 the figure, the upper figure, and you'd have to pull
8 that up. It shows what my colleague was pointing out,
9 that --- let's see here. If you look at the legend
10 and use the colors that this map is showing, you can
11 see that it's annotating the different formations.
12 Now, we have something blocking our view of the
13 legend here.

14 JUDGE WARDWELL: Yes, can we get rid of the---
15 thank you.

16 MR. LANCASTER: Okay. So, you can see the
17 Pierre Shale is --- and here the White River Group,
18 the Pierre Shale is in light blue, the White --- or
19 no --- yes, light blue, and the White River Group is
20 in green. The Arikaree, now you can see this,
21 potential --- this pathway that was --- I guess we
22 were looking at all possible pathways. So, this
23 Arikaree, it would have to go sort of south --- let's
24 see here, southeast into the yellow from the facility
25 and pass the groundwater divide there in the Pine

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1 Ridge Escarpment. Once it gets past that, which is,
2 you know, not likely, and not going to happen
3 according to the regional flows, and it's a
4 groundwater divide. Then going northeast along the
5 yellow up towards the South Dakota boundary it would
6 hit this groundwater mound, but in the process of
7 doing that, it would be going across gradients to get
8 over there. And then once it gets up to the mound it
9 would be a barrier. So, that's what we're pointing
10 out. If we were trying to look for a pathway, and
11 even this pathway doesn't work.

12 JUDGE WARDWELL: Thank you.

13 MR. LANCASTER: Yes.

14 JUDGE WARDWELL: Dr. LaGarry, do you have any
15 comments about what Staff has just said in regards to
16 the shallow potentiometric surfaces?

17 DR. LAGARRY: I agree with their assessment.
18 That's why I was --- when I talked about this with
19 you earlier, that I thought that if it, in fact, did
20 take an Arikaree Group route to Pine Ridge, that it
21 would have to be assisted by faults and artesian
22 flow. I don't --- with the evidence that we have
23 available today, I concur with NRC's assessment that
24 it's very unlikely that there's a direct lateral
25 route from the license area to the reservation.

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1 JUDGE WARDWELL: Thank you, Dr. LaGarry.

2 DR. KREAMER: May I say something? This is Dr.
3 Dave Kreamer.

4 JUDGE WARDWELL: Yes.

5 CHAIR GIBSON: Hold on just one second, Dr.
6 Kreamer. I just want to be sure, this is --- this
7 information we just discussed is in your testimony
8 but not in the EA. Is that correct?

9 MR. BACK: Your Honor, I mean, flow directions
10 are all discussed in the EA, how the ---

11 CHAIR GIBSON: Right.

12 MR. BACK: --- flow is towards the river, so
13 that's what we just discussed.

14 CHAIR GIBSON: But these two exhibits we just
15 said were not part of the EA. Correct?

16 MR. BACK: They're referenced. It's used as a
17 reference in the EA, so we reference this work in the
18 EA.

19 CHAIR GIBSON: Okay, thank you.

20 JUDGE WARDWELL: And who wanted to comment on
21 this?

22 DR. KREAMER: Dr. Kreamer.

23 JUDGE WARDWELL: Yes.

24 DR. KREAMER: Yes. I'd like to say, first of
25 all, this data or these lines are drawn based on 1995

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1 data. The data points to draw these lines are not
2 included, and so independent analysis of how accurate
3 these flow directions are is hard for somebody to
4 independently evaluate from the 1995 data.

5 Lastly I'd like to say that if you just look
6 at the data and don't consider that some of these are
7 low flow areas, there is a route to the reservation
8 that there is flow, and that's along the White River.
9 If you look at --- if you can bring up that picture
10 again, the lower picture, the digital elevation
11 model, you can see that from the site you can follow
12 the flow line along the river in the direction of the
13 Pine Ridge Reservation within a few miles. So, the
14 statement by NRC is correct, that if you go in a
15 direct line you go cross gradient. But if you follow
16 the direction on down from the site, if you could
17 zoom in on the site, you could see that the flow
18 initially goes right at the site to the northwest,
19 changes to the north, and then moves to the
20 northeast, and then eventually starts moving east by
21 northeast along the White River as you move out.

22 I do recognize that eventually it gets into
23 Pierre Shale territory where the flow would be
24 inhibited in speed in groundwater, but the idea is
25 directionally, if you follow that flow map, it does

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1 go toward the reservation. If assisted by surface
2 water particle facilitated transport, that can have
3 a time delay effect, where particles absorb over
4 time, the direction of surface water and groundwater
5 flow, I think can --- is attributable in the
6 direction of the Pine Ridge Reservation.

7 JUDGE WARDWELL: Thank you, Dr. Kreamer.

8 CHAIR GIBSON: You indicated, Mr. Back, just
9 going back to this original --- this question I had
10 just a minute ago about these two figures that were
11 up here that had the black lines drawn on them.

12 MR. BACK: Yes, Your Honor.

13 CHAIR GIBSON: You said that those were
14 referenced in the EA.

15 MR. BACK: Souders is referenced in the EA.

16 CHAIR GIBSON: Okay. Are the black lines on
17 them --- on the documents that are referenced in the
18 EA?

19 MR. BACK: The black lines are what we derived
20 our conclusion that the flow is all towards the
21 river.

22 CHAIR GIBSON: Correct.

23 MR. BACK: So, we made the interpretation. We
24 didn't say --- we looked at Souders, there are black
25 lines, you know, pointing towards the river and,

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1 therefore, flow is towards the river.

2 CHAIR GIBSON: Right.

3 MR. BACK: Okay.

4 CHAIR GIBSON: I'm with you. I understand
5 exactly what you're saying. My question is this, is
6 that what you did for this testimony, or was that
7 included in the Environmental Assessment?

8 MR. BACK: The Staff looked very closely at
9 Souders since it's the most comprehensive work in the
10 area ---

11 CHAIR GIBSON: Yes.

12 MR. BACK: --- in drawing our conclusions as
13 part of the EA.

14 CHAIR GIBSON: I'm with you, but I don't think
15 you understood my question. The lines that were drawn
16 on this to show this flow, that was not included in
17 the Environmental Assessment. Correct?

18 MR. BACK: No, Your Honor.

19 CHAIR GIBSON: Okay, thank you.

20 MR. BACK: Your Honor, those lines are
21 original to the original publication, though. You
22 understand that, though. Right? I mean, I just want
23 to make sure we're on the same page.

24 CHAIR GIBSON: No, I understand that
25 completely.

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1 MR. BACK: Okay.

2 CHAIR GIBSON: You basically took a bunch of
3 data and you made an interpretation of it. Right?
4 That's what you did. With those black lines, you made
5 an interpretation of this data.

6 MR. BACK: No, Your Honor. This is ---

7 CHAIR GIBSON: Well, the black lines are on
8 the original document?

9 MR. BACK: Yes, Your Honor. They're on the
10 original document.

11 CHAIR GIBSON: Okay. Well, that's what I was
12 trying to find out.

13 MR. BACK: Yes. Sorry, I was not clear on
14 that.

15 CHAIR GIBSON: No, that's okay. Okay, great.
16 Thank you.

17 MR. BACK: Yes, Your Honor.

18 CHAIR GIBSON: Okay. Why don't we take a 10-
19 minute recess. You all can put together your
20 questions. You need to email them to our clerks here,
21 and we'll come back on the record in 10 minutes.
22 Thank you.

23 (Whereupon, the above-entitled matter went
24 off the record at 4:18 p.m. and resumed at 4:49 p.m.)

25 CHAIR GIBSON: All right, we're back on

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1 the record. I have a few questions; I believe Judge
2 Wardwell is going to ask them.

3 JUDGE WARDWELL: Yes, I think I'll start
4 off with Crow Butte in regards to some of the Brule
5 monitoring wells--no, I think I'll start off with
6 staff in regards to the monitoring wells. We were
7 talking about one of the wells, and you--that was
8 placed in the upper confining unit, and that you had
9 put a porous stone on the bottom of it so it was
10 acting more like a lysimeter, or that the applicant
11 had I guess, it wasn't you doing it. Are you aware of
12 any other wells that were finished like that in the
13 aquifers as opposed to the aquitards that had this
14 stone and what is a propensity for that possibly to
15 plug during any pump test or any dropping of the water
16 levels?

17 MR. BACK: Your Honor, this is David Back
18 with staff. I am not aware of any of those going in
19 to the Brule. One was placed below in the Pierre
20 Shale, and it actually did leak, and so it was faulty.
21 The way that the analysts were determining whether
22 things worked or not was whether wells picked up
23 barometric pressure and such, so that's -- one was
24 known to leak, and that's the only time that I saw
25 them used.

1 JUDGE WARDWELL: But as far as you know,
2 none of the other wells had this porous tip on the end
3 of it?

4 MR. BACK: Not for the Brule, no, Your
5 Honor.

6 JUDGE WARDWELL: Okay, thank you. For
7 Crow Butte, whoever would like to answer this in
8 regards to some of pumping, some of the completion
9 details associated with pump wells and the observation
10 wells that--and this is in regards to of course the
11 calculations that were used to determine the
12 invalidity of the early time frame analyses and using
13 a four-inch diameter for that calculation in regards
14 to well bore storage. That Board Exhibit 002A
15 described the installation as such that some
16 difficulties with the original four-inch screen made
17 it necessary to install a two-inch, five-centimeter
18 telescoping liners inside the four-inch to control
19 sand production, and then also you go on to state that
20 cement grout was injected into the annular space in
21 the well, restricting the pore volume even more.
22 Would you like to comment on the completion details of
23 these pump test wells and observation wells in regards
24 to the subsequent valuation of the early time frames
25 associated with curb fitting the data results from the

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1 wells?

2 MR. BEINS: Your Honor, could you just
3 clarify for me--this is Wade Beins at Crow Butte--
4 could you clarify was that particular instance where
5 they installed the two-inch screen on a pumping well
6 or one of the observation wells?

7 JUDGE WARDWELL: I do not know; it was in
8 Board Exhibit 002 that you just stated that some
9 difficulties with the four-inch, the original four-
10 inch screen made it necessary to install a two-inch
11 telescoping liner inside the four-inch to control sand
12 production. Does that not ring a bell to you in
13 regards to one of the pump tests and the installation
14 of it and was that followed for all of the wells
15 and/or the observation wells used in the pump tests?

16 MR. BEINS: Your Honor, I believe, and I
17 would have to double check this for certain, but I
18 believe that it was the pumping well on pump test
19 number one. It's most likely that the original
20 pumping well, the screens had been damaged, the four-
21 inch screens had been damaged, and the well was making
22 some sand, and so what they chose to do was go in and
23 blow the sand or jet the sand out of the screened
24 interval on that well, or clean them out would be
25 another way to say that, and then they set a secondary

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1 screen or an inner screen that was two inches in
2 diameter inside the existing four-inch screens that
3 had been broken. That particular screen though would
4 have just been a short screen down into those
5 particular four-inch screens and it wouldn't have been
6 a two-inch pipe, riser pipe clear to the surface. It
7 would have been set on a K-PAC or a J-hook type
8 situation, an assembly that would have just been set
9 just above the top of the old existing screens.

10 JUDGE WARDWELL: So you only know of one
11 instance where this completion detail took place?

12 MR. BEINS: I only know of one instance
13 where this has taken place for a pump test well, yes.

14 JUDGE WARDWELL: And you believe that's
15 pump test number one?

16 MR. BEINS: I believe so.

17 JUDGE WARDWELL: In regards to the cement
18 grout injected into the annular space in the well, is
19 that referring to the injecting the cement grout above
20 any sandpack around the well screen and just the
21 plugging the space between the riser pipe and the
22 surrounding geologic material?

23 MR. BEINS: Yes, Your Honor, this would be
24 the cement grout that was injected at the original
25 time the well was cased back to the surface, back into

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1 that annular space between the geologic formation and
2 the outside of the casing.

3 JUDGE WARDWELL: But only from the top of
4 the sandpack up, is that correct?

5 MR. BEINS: If they even used sandpack;
6 I'm not sure that that particular well had been gravel
7 packed--

8 JUDGE WARDWELL: And I'm not referring as
9 this the same well, either. I just--it's--did you not
10 with all your pump test wells grout the space between
11 the well and the geologic material above the well
12 screen?

13 MR. BEINS: Yes Your Honor, all the wells
14 had been cement grouted from above the screens up to
15 the surface.

16 JUDGE WARDWELL: Okay, thank you. And if
17 my memory serves me correctly, I believe there was
18 some type of cement basket there at the bottom or at
19 the top of the well screen if I remember my details
20 from August correctly.

21 MR. BEINS: That's correct, Your Honor.

22 JUDGE WARDWELL: For the intervenors,
23 would anyone--would Dr. Kreamer or Mr. Wireman like to
24 comment on whether or not you understand it
25 differently in regards to where this two-inch

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1 telescoping liner was placed? Was it pump test number
2 one, was it all the pump tests, what is your
3 evaluation of that particular activity as far as the
4 testimony that was provided?

5 DR. KREAMER: Your Honor, this is Dr.
6 David Kreamer. In evaluating that, we have to go by
7 what's written. It didn't say a screen was put in as
8 Crow Butte Resources just stated; they said a liner.
9 A liner typically is not a hanging liner, and if it is
10 hanging, it's not indicated, so that would be hard for
11 us to evaluate. The calculations that you make, even
12 with a four-inch screen are--and if you assume that
13 it's all the way up, you'd have to make some
14 assumptions as to the water column depth and things of
15 that sort. Even if you make all those assumptions, it
16 would only--and even if you give the benefit of the
17 doubt and you make the dewatering space as large as
18 possible, some of the early time data would still show
19 this recharge boundary. And so even with the most
20 generous calculations saying that there's no
21 interference with a two-inch, it's not a two-inch
22 liner, it's a two-inch screen, unlike what it says in
23 the record, you would still see the recharge
24 boundaries that we're seeing. For pump test one, we
25 have the problem that we don't have the data, so we

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1 can't go back and evaluate the extent of that, and
2 even though Cooper-Jacob was run, it's not presented
3 in the --- so we can't go back and check how profound
4 the recharge boundaries in one are, but they're
5 definitely there, they were commented on by NRC, and
6 this quote though is from pump test one. Pump test
7 two is unclear; I think that it might be larger for
8 pump test two, I'm not sure. But it's certainly not
9 above five or six or eight inches for the well bore,
10 it's either two or in the range of four inches.

11 JUDGE WARDWELL: Okay, thank you.

12 DR. KREAMER: So it wouldn't invalidate
13 the early time data that shows the recharge boundary
14 in pump test two.

15 JUDGE WARDWELL: Okay. And while I've got
16 you here, you said that snowfall was included in your
17 total precipitation in your INT's Exhibit 084, but
18 does not that INT 084 list both total precipitation
19 and total snowfall in inches? I think for year 2007
20 for instance, it says that it was zero inches of
21 precipitation and two inches of snowfall. So how is
22 that snowfall included in your total precipitation in
23 those--

24 DR. KREAMER: I'm sorry, I saw total
25 precipitation and I assumed that was it. I can go

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1 back to that and check and that might have been a
2 misstatement if the total precipitation means the
3 total rainfall. They said total precipitation, and
4 typically precipitation means snowfall and rainfall;
5 I may have been in error when I said that. So there
6 may have been an effect. But the amounts, if you
7 look, it's over a five-month period in one case when
8 there was no snowfall; I randomly chose a couple of
9 places, and many of those had no snowfall associated
10 with it, but still you saw trends that were the
11 opposite of what you would expect, and in the absence
12 of statistical correlation, the broad statements made
13 by Crow Butte Resources that changes in the Brule are
14 related to weather are to me not only unsubstantiated,
15 but in contradiction to the data that's available.³

16 JUDGE WARDWELL: Thank you.

17 MR. BEINS: Judge Wardwell? Judge
18 Wardwell, Wade Beins with Crow Butte. Just to clarify
19 that last question that you had asked of Crow Butte,
20 I can verify that was in aquifer test one where they
21 installed the two-inch screen telescoping liner inside
22 the four-inch to control sand production on that well,
23 and I think it's important to note that this was just
24 a short section of two-inch pipe that went inside the
25 four-inch screens. It didn't change the storage

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1 capacity of the four-inch well appreciably.

2 JUDGE WARDWELL: Thank you. For staff,
3 INT 081 at 3 says a gradient increase from .012 to
4 0.025 to 0.43 in regards to those changes in the
5 hydraulic gradient between the '82 and the 2006 or
6 2008 time frame that we talked about that you agree on
7 the calculations, Dr. Striz?

8 DR. STRIZ: Yes.

9 JUDGE WARDWELL: And I was wondering if
10 that value of .25 to .43 is correct, or did you have
11 a different value that you calculated from the change
12 between those two time frames?

13 DR. STRIZ: My recollection is that those
14 are correct.

15 JUDGE WARDWELL: That the .25 and the .43
16 are the correct--

17 DR. STRIZ: That's what I recollect.

18 MS. SIMON: Your Honor, the SER has the
19 values of .025 to .043, and Dr. Striz testified
20 earlier that that was what she calculated, so I'd just
21 like to have her clarify that.

22 DR. STRIZ: What is stated in the--I'm
23 having trouble with the points and the zeros I'm
24 afraid, so what is stated in the SER is correct.

25 JUDGE WARDWELL: Okay, you're saying that

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1 the SER 22 says the increase went from .012 to .025
2 and .043?

3 DR. STRIZ: Yes.

4 JUDGE WARDWELL: Okay, thank you. That's
5 it.

6 CHAIR GIBSON: Okay. I've got one
7 question her for the intervenors, I think for Dr.
8 Kreamer, but it could be for Mr. Wireman; it could be
9 for Dr. LaGarry for that matter, but there is a claim
10 that facilitated transport down the White River is a
11 viable pathway. Given that the river is an oxidizing
12 environment with carbonate such that uranium should be
13 complexed and anionic, how would sorption work in this
14 system?

15 DR. KREAMER: Great question. This is Dr.
16 Dave Kreamer; I can take that one to start with. The
17 statement made is true that if there's an oxidating
18 environment, you would have more dissolution
19 immediately. When you have a flow with sediment, the
20 sediment is mobilized typically from a stream bed, and
21 stream beds are not always in that oxidized
22 environment, so you could get uranium transport.
23 Essentially, if the uranium were in the dissolved
24 phase or in the particle phase, my point I guess is
25 what I'm saying is originally the mobilization would

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1 be from sorped particles in a more reduced phase in
2 the stream bed. Once it got into a flood flow in the
3 stream, it would be in both; it would be both in the
4 dissolved phase, and it would also be in the particle
5 phase. Regardless, it would be moving downstream, and
6 it would be moving downstream towards Pine Ridge.

7 When you approach Pine Ridge, then you get
8 into more Pierre Shale flays and things like that,
9 which are highly sorped, and then particle transport
10 becomes even more important because of the greater
11 surface area of those clays. So the initial oxidation
12 in the turbulent flow would not be as important at the
13 beginning because it doesn't matter whether the
14 uranium's dissolved in water or on particles, it would
15 be moving downstream. And then when it got to Pine
16 Ridge, you hit a place with a lot of clays; clays have
17 a huge amount of surface area, a huge sorped
18 potential, and therefore the particle transport would
19 become more important when you reach that area.

20 CHAIR GIBSON: Very well. Thank you. We
21 will of course appreciate the parties' suggestions on
22 transcript corrections; when you do submit your
23 proposed transcript corrections, please note that this
24 is not to correct an error that your witness made; it
25 is solely to correct an error that the court reporter

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1 made in transcribing the testimony. This morning, I
2 reviewed the dates the filings are due, and I would
3 also refer you to our September 24 order if you want
4 to see those dates in writing. And if for any reason
5 one of the parties does not like those proposed
6 corrections that will be filed on November 9, they
7 will have five days after that to file any objections.
8 You can contact the court reporter and get a tape if
9 that proves necessary, and whatever you submit to
10 correct the transcript, please be sure to consult 10
11 CFR 2.327(d), as in dog, and use that format.

12 Of course, we can't close the record in
13 this matter until the transcript is corrected; once
14 the record is closed, the 90-day clock begins to run
15 on this Board to issue its initial decision.
16 Obviously in order for us to prepare our initial
17 decision, we will need your proposed findings of fact
18 and conclusions of law. Those are due on November 23,
19 and December 11 for the reply filings, and those are
20 laid out in the September 24 order. I should add that
21 when the parties prepare their proposed findings and
22 conclusions, the Board expects the parties to address
23 the question of the extent to which the EA may be
24 corrected as a result of the evidence that has been
25 adduced at trial and the extent to which the EA cannot

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1 be corrected in that manner and will have to be redone
2 in whole or at least with respect to the matters where
3 it was efficient.

4 Now before we close, I want to express the
5 Board's appreciation to the parties, to the witnesses
6 and to their counsel who assisted them. All of you I
7 know spent a great amount of time and effort
8 marshaling your evidence and filing it so that our job
9 was made much easier. We also want to thank Chadron
10 State College for affording us the facility and for
11 making our stay, the stay of Joe Deucher and others
12 who came there so pleasant. And I want to express our
13 appreciation to Ms. Deucher as well as to Andy Welkie,
14 to Mack Cutchin, Nick Sciretta, Sachin Desai, Maureen
15 Conley and Sara Culler for keeping us on track and
16 ensuring that this hearing ran as smoothly as it did.
17 If there is nothing further, we stand adjourned, and
18 we look forward to seeing your transcript corrections
19 and your proposed findings and conclusions. Good day.

20 (Whereupon, the above-entitled matter was
21 adjourned at 5:10 p.m.)

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