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NUCLEAR REGULATORY COMMISSION

Title: Crow Butte Resources, Inc.
Marsland Expansion Area

Docket Number: 40-8943-MLA-2

ASLBP Number: 13-926-01-MLA-BD01

Location: Crawford, Nebraska

Date: Wednesday, October 31, 2018

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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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HEARING

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In the Matter of: : Docket No.

CROW BUTTE RESOURCES, INC. : 40-8943-MLA-2

(Marsland Expansion Area) : ASLBP No.

: 13-926-01-MLA-BD01

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Wednesday, October 31, 2018

Crawford Community Center

1005 First Street

Crawford, Nebraska

BEFORE:

G. PAUL BOLLWERK, Chair

THOMAS J. HIRONS, Administrative Judge

RICHARD E. WARDWELL, Administrative Judge

1 APPEARANCES:

2 On Behalf of Crow Butte Resources, Inc.:

3 TYSON SMITH, ESQ.

4 of: Winston & Strawn, LLP

5 101 California Street

6 San Francisco, California 94111

7 (415) 591-6874

8 trsmith@winston.com

9

10 On Behalf of the Nuclear Regulatory Commission:

11 MARCIA SIMON, ESQ.

12 ROBERT CARPENTER, ESQ.

13 EMILY MONTEITH, ESQ.

14 of: Office of the General Counsel

15 Mail Stop -- O-14A44

16 U.S. Nuclear Regulatory Commission

17 Washington, D.C. 20555-0001

18 (301) 287-9176 (SIMON)

19 (301) 287-9118 (CARPENTER)

20 (301) 415-0926 (MONTEITH)

21 marcia.simon@nrc.gov

22 robert.carpenter@nrc.gov

23 emily.monteith@nrc.gov

24

25

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3
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5
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On Behalf of the Oglala Sioux Tribe:

THOMAS BALLANCO, ESQ.

945 Taraval Avenue, #186

San Francisco, California 94116

(650) 296-9782

harmonicengineering@gmail.com

DAVID CORY FRANKEL, ESQ.

P.O. Box 3014

Pine Ridge, South Dakota 57770

(605) 515-0956

arm.legal@gmail.com

P R O C E E D I N G S

(8:04 a.m.)

1
2
3 CHAIR BOLLWERK: All right. Let's go on
4 the record, please.

5 Good morning, everyone. We are here for
6 the second day of the Crow Butte Marsland license
7 amendment application proceeding, an evidentiary
8 hearing concerning a contention, Contention Two, filed
9 by the Oglala Sioux Tribe, as the intervener in this
10 case.

11 We are going to be proceeding this morning
12 to concern number one. I think we are more or less
13 finished with concern number two, although Judge
14 Wardwell is still contemplating, I can tell. But I
15 think we are done with it.

16 A couple of administrative things, very
17 quickly. This is my old cell phone. It isn't even
18 connected to the internet. But it's nonetheless on
19 vibrate. I hope yours is as well, or off, so we
20 don't have any, please, any cell phone calls that you
21 wish to take. You need to do them somewhere else, not
22 in this hearing room, all right? I appreciate that.

23 I don't necessarily want to play the
24 liquid police. We try to have the same rules as we
25 have in our Rockville hearing room, which is water

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1 only.

2 I understand yesterday there was a bootleg
3 coffee pot that got started. That's not board
4 sanctioned. I am not going to try to control these
5 things. But, again, in the hearing room while we are
6 in session please try to stick to water.

7 Anything they want to do on lunch and
8 breaks is certainly okay because I recognize we have
9 got folks coming in and having to have their lunch in
10 the facility. So just think about that as you're
11 having your liquids.

12 In terms of the witnesses for today, I
13 think we have everyone. It's still the same. I would
14 just mention that, again, you all remain sworn and are
15 under oath.

16 It looks like everybody is seated in the
17 same order. I've talked with the court reporter. He
18 does not need you to give your names at the beginning
19 anymore. He feels he's got everybody down now so we
20 are in good shape.

21 So you don't have to remember to do that.
22 You're certainly welcome to if you want to but it
23 isn't necessary for his purposes.

24 And again, Dr. Kreamer, the same rules
25 would apply as yesterday. You're there in the room

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1 alone, I take it, and if anyone comes in you need to
2 let us know.

3 DR. KREAMER: Yes, sir. My door is
4 locked.

5 CHAIR BOLLWERK: Okay. Thank you very
6 much. And we anticipate you're going to be with us
7 through noon time today?

8 DR. KREAMER: Yes, sir. I have to teach
9 -- I have to leave my office at 11:00 o'clock my time,
10 which is noon your time. So I will not be available
11 in the afternoon.

12 CHAIR BOLLWERK: All right. Thank you
13 very much, sir. We appreciate that. All right. One
14 last thing -- let me mention -- as I mentioned
15 yesterday anyone here I don't think we have too many
16 members of the public. But anyone here that wants to
17 submit a limited appearance statement -- a written one
18 -- we have forms in the back.

19 You're certainly welcome to fill it out
20 and leave it with us. I would add as well that we
21 appreciate all of you being here on Halloween. I know
22 some of you have families and would prefer to be
23 somewhere else, frankly, as would I.

24 But, nonetheless, here we are and we are
25 going to -- I think we are going to finish this

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1 between today and tomorrow. We are looking, I think,
2 in pretty good shape to finish up by tomorrow. So
3 happy Halloween to everyone and maybe we will have a
4 treat at the end. Who knows?

5 All right. Either of the judges have
6 anything they want to say at this point before we get
7 going?

8 Judge Hiron? Mr. Wardwell?

9 And we have restored their signs so now
10 you know who they are. Those were the only thing I
11 think that we are -- took a little bit of a hit
12 yesterday. So I think we are back to -- back to
13 normal.

14 All right. So let me turn to Judge
15 Wardwell. Let me just read the concern into the
16 record before he gets going so I don't want to break
17 up his flow.

18 So the contention we are dealing with, as
19 I mentioned, is OST contention two. The title is "A
20 failure to include adequate hydrogeological
21 information to demonstrate ability to contain fluid
22 migration" and we are going to deal today with --
23 starting today with concern number one, which
24 challenges the adequacy of the descriptions, the
25 affected environment for establishing the potential

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1 effects of the proposed Marsland expansion area
2 operation on the adjacent surface water and ground
3 water resources.

4 So that's what we are going to be dealing
5 with this morning, and at this point I will turn to
6 Judge Wardwell.

7 JUDGE WARDWELL: Thank you. Good morning,
8 everyone. We all are starting with concern one. I am
9 planning on spending most of the morning with Mr.
10 Wireman.

11 But before I get into that, I have some
12 really preliminary questions that I had as kind of
13 background information related to concern number one
14 and it starts off with just some questions for Dr.
15 LaGarry, actually, which he'll be happy -- yeah, he's
16 -- he's the only happy witness I've ever seen in my
17 life or at least certainly the happiest one I've ever
18 seen.

19 DR. LAGARRY: Thrilled to be here.

20 JUDGE WARDWELL: Yeah.

21 JUDGE BOLLWERK: Someone should be happy
22 to be here.

23 JUDGE WARDWELL: I know. At least someone
24 is happy around here. The -- in your testimony it
25 seems to be pretty consistent with your background and

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1 it seems to, to me, to be limited to structural
2 geologist or paleontologist or is there a better term
3 for what you characterize your expertise in?

4 DR. LAGARRY: Stratigrapher. I am a
5 stratigrapher.

6 JUDGE WARDWELL: Stratigrapher. All
7 right. Great.

8 DR. LAGARRY: Yes.

9 JUDGE WARDWELL: And so is it fair to say
10 that you don't consider yourself a hydrogeologic
11 expert even though you've been exposed to it, of
12 course, a lot and have a lot of experience in that
13 area? When you get into the details of hydrogeology
14 you wouldn't necessarily be the one to turn to in that
15 regard?

16 DR. LAGARRY: That's correct.

17 JUDGE WARDWELL: Okay. Thank you. In
18 your rebuttal, OST Exhibit 016 at Page 1, number one,
19 you state that it's your understanding of NEPA that
20 all license conditions -- for example, 11.3.4 -- and
21 related pumping tests to demonstrate confinement must
22 be completed and evaluated before issuance of the
23 license to the mine.

24 Now, this continues not to be the case,
25 and in that regard I was looking over your vitae and

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1 have certainly interacted with you before and I didn't
2 see any mention of any NEPA work and I was just
3 wondering if your testimony as it appears to be
4 focused strictly on stratigraphy, as you mentioned, do
5 you have any experience with NEPA that the Board is
6 not aware of?

7 DR. LAGARRY: My experience with NEPA
8 comes primarily from having participated in four
9 hearings like this one and being immersed in NEPA
10 during the course of those activities.

11 JUDGE WARDWELL: Okay. Thank you. You go
12 on to say that with the proposed, quote, "we make it
13 up as we go -- trust us", end quote, approach the
14 public does not have the necessary information to make
15 an informed choice and reviewers of the EA and TR do
16 not have all the data. The EA is therefore
17 incomplete.

18 And I was curious of who were you
19 referring to when you said we and that -- is the group
20 supposedly proposing to make it up as they go and how
21 does that relate to your expertise and experience in
22 NEPA?

23 DR. LAGARRY: My concerns, Your Honor,
24 stem primarily from the incompleteness of their
25 reports. My response in particular to -- in that

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1 rebuttal was directed to the proposition advanced by
2 the NRC and the mine that -- you know, that it's come
3 up in each and every hearing that I've participated in
4 to this point that -- and when I say, I mean we, the
5 public.

6 So not we, the interveners. Not we, the
7 tribe. But we, the public. It's of great concern to
8 me that the hydrogeology of the MEA is fully explored
9 and disclosed instead of just a portion of it with the
10 caveat that sometime in the future when the mine is
11 ready to expand into a given mine unit then they will
12 do all the required analyses to look at things like
13 fractures and leaking and things like that.

14 Because my concern is is that once a
15 facility gets established it will acquire a momentum
16 and then it'll be harder to challenge, oppose, and
17 intervene and object to problems that the NRC and CBR
18 consider part of their business as usual.

19 But suppose five years from now, six years
20 from now, that they encounter some problems and there
21 is some leaks and, you know, and there isn't an
22 opportunity to intervene.

23 So my main understanding of NEPA is that
24 it's designed to fully disclose both the positive and
25 the negative aspects so the data that doesn't support

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1 mining. All of this stuff has to be laid out and
2 discussed and aired, and then the publicly fully
3 informed can then decide how they feel about the
4 proposed activity. That was my intent with those
5 statements.

6 JUDGE WARDWELL: Okay. Thank you.

7 You did confuse things a little bit in
8 regards to what I heard. You didn't confuse them but
9 you confused me probably. You switched the terms of
10 the we when you said, we, the public and yourself in
11 regards to your concerns and I understood what you
12 mean by that.

13 DR. LAGARRY: Uh-huh.

14 JUDGE WARDWELL: And as I gather from the
15 rest of your statement, when you said in your rebuttal
16 that with the proposed, quote, "we will make it up as
17 we go -- trust us" you're really referring to your
18 impression of what the staff or the -- and/or the
19 Applicant is doing as they are addressing your NEPA
20 issues. Is that a fair assessment?

21 DR. LAGARRY: That's exactly right, Your
22 Honor.

23 JUDGE WARDWELL: Thank you.

24 How many -- how many EAs have you read and
25 dealt with in regards to seeing various drafts and

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1 then final products of the environmental assessments?

2 DR. LAGARRY: Seven or eight.

3 JUDGE WARDWELL: And is that the basis for
4 your opinion on whether or not an EA is complete or
5 not? How do you judge that?

6 DR. LAGARRY: As an interested member of
7 the public, which I state in all my opinions -- the
8 first thing I state right out of the gate is that I am
9 not opposed to uranium mining in fact or principle.

10 My participation comes from incomplete
11 science. There is things -- as a stratigrapher I have
12 some basic knowledge of what's going on in the area.
13 I've seen the faults. I've seen the fractures. I've
14 looked at the air photos. I've looked at the
15 geophysics. We have described the lithology.

16 We have followed the Chamberlain Pass
17 Formation all around, and I really worry about future
18 leakage through this vast and ubiquitous network of
19 faults that blankets the entire area.

20 Okay. So when I -- when I look at -- I am
21 familiar with NEPA. I've attended training through
22 the Oglala Tribal Historical Preservation Office.
23 I've presented things at them. I've seen
24 presentations on NEPA.

25 The idea is in these EAs and other

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1 documents of that sort is this disclosure -- the hard
2 look that's been talked about and discussed at the
3 previous hearing, at this hearing, at other hearings.

4 My impression is that that's entirely
5 what's missing from a lot of this work. There remain
6 tremendous unanswered questions so I continue to
7 participate.

8 What would help satisfy me as a concerned
9 member of the public, if the completeness of -- the
10 incompleteness of the things that we have been going
11 on and on and on and on about, I just figured that
12 seven, eight, ten years on that NRC and the mine would
13 say, this guy and the public continues to worry about
14 these issues -- why don't we do something like a
15 fracture analysis or use plain-mounted ground
16 penetrating radar or just some technique to satisfy
17 the concerns that we are at least addressing
18 cognizant, concerned, and ready to mitigate these
19 things.

20 The faults and fractures are going to be
21 there long after the inward pressure is gone, long
22 after the mining is done, what restoration can be done
23 is done, and then it sits there.

24 I testified in previous hearings and in
25 other written opinions that it's well known that the

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1 fractures in the area open and close, some of them
2 with minor seismic events nearby.

3 One such event deprived this -

4 JUDGE WARDWELL: Can I interrupt you? Now
5 you're starting to get off into -

6 DR. LAGARRY: Thank you for --

7 JUDGE WARDWELL: -- not La La Land but
8 land that we will journey down later and I'd like to
9 reserve your comments on the -- on the fracturing when
10 we -- when we talk about that --

11 DR. LAGARRY: I'll appreciate the
12 opportunity. Thank you.

13 JUDGE WARDWELL: -- and back to the -- to
14 the completeness of the EA, if you could wrap up your
15 thoughts on how you judge the completeness of EA I'd
16 appreciate it.

17 DR. LAGARRY: I still have these strong
18 concerns and that's how I judge it.

19 JUDGE WARDWELL: Thank you.

20 CHAIR BOLLWERK: Do we -- should we
21 mention the -- I think are planned for this afternoon
22 or whenever we get finished with concern one is then
23 to go to Dr. LaGarry with his --

24 JUDGE WARDWELL: Oh, yeah, we will be
25 going -- we are going to go from Mr. Wireman -- as

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1 soon as we get through these background ones and I
2 hope to be done with Mr. Wireman by noon but we will
3 see if it finished off four days from now instead and
4 we will stay here and we will get our way through it
5 and then we have to talk with --

6 CHAIR BOLLWERK: And then three and four.
7 That's the plan.

8 JUDGE WARDWELL: I know you're just so
9 excited about seeing Dr. LaGarry's testimony.

10 CHAIR BOLLWERK: No, no. I just want to
11 -- I want Dr. LaGarry to know what's coming up, we
12 don't want him to leave this afternoon thinking we
13 are done with him.

14 JUDGE WARDWELL: Oh, he's not going to
15 leave. He's here for the whole shebang because he's
16 here tomorrow also. That's why I wanted to get to Mr.
17 Wireman first.

18 Thank you, Dr. LaGarry.

19 DR. LAGARRY: You're welcome.

20 JUDGE WARDWELL: Let's see if -- oh, yes.
21 Okay. Continuing with you, I think I am going to hold
22 off for just a minute of that.

23 Staff, would you like -- would anyone like
24 to comment in regards to the NEPA process? You don't
25 have to. I just want to give you an opportunity if

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1 one of you would like to say something about in
2 response to what Dr. LaGarry's impression is of the
3 NEPA process -- whether there was anything you felt
4 was erroneous and needed some clarification, from your
5 perspective?

6 And no, you're not -- you don't feel a
7 need to respond is an answer. So --

8 MR. BACK: Only obviously that -- this is
9 David Back -- only obviously that we disagree. We
10 feel that we have fulfilled all the requirements of
11 NEPA and that's our response.

12 JUDGE WARDWELL: Okay. Thank you very
13 much.

14 Dr. LaGarry, in -- I think it's your --
15 yeah, it's your rebuttal -- Exhibit 016 at 2 -- you
16 respond to certain answers. For instance, you say
17 Page 2 -- at Page 2 you say, quote, "response to
18 answer 25 according to NRC's rebuttal CBR employee
19 geophysical logging of bore holes."

20 And my first question is, and you've used
21 this in several times during your rebuttal
22 specifically, where you're responding to an answer.

23 Do you remember whose answer that is?
24 It's either CBR's or the staff's, and I believe it's
25 the NRC's and I just want you to confirm that yes,

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1 when you mention any answer in your rebuttal testimony
2 you're referring to NRC's answers.

3 DR. LAGARRY: As I recall, Your Honor,
4 most of my responses were to NRC.

5 JUDGE WARDWELL: Okay. And I think that's
6 correct. I just want you to confirm. If you knew it
7 was different then that's fine. But I am pretty sure
8 you were responding -- when you say A.25 you mean
9 NRC's A.25, not CBR's A.25.

10 DR. LAGARRY: That's correct, Your Honor.

11 JUDGE WARDWELL: You did say according to
12 NRC's rebuttal. Did you see NRC's rebuttal testimony
13 before you prepared your rebuttal?

14 DR. LAGARRY: Yes, Your Honor, although I
15 had limited access at that time.

16 JUDGE WARDWELL: Thank you. And I guess
17 I -- it's obvious that you wouldn't have had the
18 possibility of that if in fact the schedule stayed the
19 same for all parties. Would you have -- it's obvious
20 you wouldn't have. You don't have to answer that.

21 In the SAFE's EAs at Section 3 -- it's 3-1
22 -- it says, quote, "this chapter describes
23 environmental resources in the MEA and an area of
24 review, AOR, within two miles of the site boundary."
25 See figure 3.1-1, which is consistent with regulatory

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1 guide 3.46, which is the standard format for content
2 of license applications including environmental
3 reports for in-situ uranium solution mining issued
4 June 1982, and it's referenced as NRC 1982, which
5 recommends that the Applicant provide information on
6 adjacent lands and waters within a two-mile radius.

7 The EA -- then in a footnote on Page 3-3
8 states that the NDEQ requires an assessment of 2.25
9 miles radius of the proposed project site boundary for
10 a Class 3 underground EI UIC application and
11 references CBR 2014 Section 3.1.

12 Crow Butte, in their technical report --
13 Exhibit 006 at Section 2.2 Page 2-3 says therefore
14 NRC's two-mile radius has been extended to 2.25 miles
15 for consistencies with the NDEQ requirements.

16 But then the AOR in CBR 008 the technical
17 report figures vary widely. I'll mention that in
18 Figure 2.9-3 the AOR is stated as a 1.2 mile and
19 Figure 1.7-3 at seven and Figure 2.24 at 13 is listed
20 as two miles. Two point two five miles is used for
21 several other figures and tables and I'll go ahead and
22 list them for the record: Figure 2.2-1, Figure 2.2-3,
23 Figure 2.7-4, Figure 2.7-6, Figure 2.7-8, Figure 2.7-9
24 and then Table 2.2-2 and Table 2.2-11.

25 Those all do list the 2.25 miles or the

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1 figure may not state it either way but it kind of
2 looks like it's the 2.25 miles.

3 Then, lastly -- 2.25 miles -- then lastly,
4 Figure 2.8-1 at 101 and Figure 2.8-2 at 102 has it
5 listed as 2.5 miles.

6 So I guess what I want to get clarified
7 before we start into looking at some of these figures
8 which is the AOR for this project? Is it 1.2 miles,
9 2 miles or can you commit to the 2.25 and then why is
10 the 2.5 miles there in some of the figures?

11 And I'll start off with Crow -- yeah, if
12 Crow Butte could answer that I'd appreciate it.

13 MR. PAVLICK: Your Honor, I think we need
14 some time to sort that out. I can -- all I can say is
15 that it's been our intent to address all of the buffer
16 zones or areas, buffer designations, as they come
17 through in the process and from the various regulatory
18 agencies.

19 So -

20 JUDGE WARDWELL: Do you consider your AOR
21 to -- and do you commit to have an AOR of the 2.2
22 miles in -- as your review area?

23 MR. PAVLICK: Yes.

24 JUDGE WARDWELL: And that's consistent
25 with what you're stating in the technical report at

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1 Section 2.2-3 -- that you've extended it from the 2 to
2 the 2.25 miles. And if you happen to -- Figure 2.8-1
3 and 2.8-2 at 102 that's looking at a 2½ mile radius.
4 Fine. If you want to still do that, that's fine. I
5 am just mainly concerned that at least it's -- you're
6 committing to the 2.25 and you don't have to correct
7 anything as far as I am concerned in regards to that
8 with your statement.

9 And do you agree with that?

10 MR. PAVLICK: Yes.

11 JUDGE WARDWELL: Thank you.

12 Okay. Mr. Wireman.

13 MR. WIREMAN: Good morning.

14 JUDGE WARDWELL: He's a happy witness,
15 too. Geez.

16 CHAIR BOLLWERK: Everybody's happy today,
17 I guess.

18 MR. WIREMAN: I am going on vacation
19 tomorrow so that's why I am happy.

20 JUDGE WARDWELL: I figured. That was --
21 that was going to be one of my questions to you.
22 There are some people who are under the false
23 impression that you were going there for work. I said
24 no, he's going to Cuba -- he's going to Cuba for fun.
25 I got that.

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1 MR. WIREMAN: You got it. You are
2 correct.

3 JUDGE WARDWELL: Great. Okay. Just got
4 to get -- got to pull up the right page here.

5 Okay. We are now in what I've called
6 Section 1.2 of the affected environment, which Mr.
7 Wireman has provided testimony in both OST Exhibit 004
8 as his pre-file testimony and rebuttal testimony OST
9 015, and 1.2.1 I had as opinion one, which just talks
10 about regional hydrogeology and groundwater flow.

11 And Mr. Wireman, that's your opinion at 2.
12 You claim there is too much uncertainty regarding the
13 groundwater flow in the basal Chamberlain Pass
14 Formation aquifer and I guess I'll start off and just
15 say do you agree that there is uncertainty in
16 everything, especially in the engineering aspects of
17 earth sciences, having the most uncertainty probably
18 of all the engineering disciplines? Is that a fair
19 assessment?

20 MR. WIREMAN: There is uncertainty in
21 every scientific investigation but it's critical to
22 understand the uncertainty.

23 JUDGE WARDWELL: And that's certainly one
24 of our -- one of the challenges in the earth sciences.
25 Is that a fair assessment?

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1 MR. WIREMAN: It's a challenge in science.

2 JUDGE WARDWELL: Isn't it always a
3 tradeoff between the amount of data study or
4 investigations that are conducted and its associated
5 costs compared to the magnitude of the potential
6 impacts of the projects?

7 MR. WIREMAN: I don't look at it quite
8 that way, in all honesty. There are tradeoffs,
9 clearly, and cost is a factor.

10 But it's more important to have the
11 correct design of any characterization study that
12 precedes any proposed action, baseline, and
13 characterization. The critical thing is the design of
14 the scope of work and that's not just a cost factor.

15 JUDGE WARDWELL: Thank you.

16 With anything that's stated, if there
17 isn't any demonstration of how a potential change in
18 a potential impact results from any allegations, would
19 not that allegation be considered somewhat unsupported
20 speculation if someone just says, oh, I think this
21 might happen, but doesn't provide any evidence or
22 indication of how it could happen or whether or not if
23 it did happen it has any resulting change in the
24 impact of the -- for instance, of the design that's
25 being carried out?

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1 MR. WIREMAN: Well, I wouldn't make a
2 statement like that unless I had some basis for
3 thinking that way. You know, I might not have
4 empirical data but I might have enough knowledge about
5 the area and the situation to say there might be
6 problems and we need to look at it.

7 JUDGE WARDWELL: So you can point to that.
8 But isn't it one step further you have to go, though,
9 if you really want to comfort yourself that you're
10 going to be effective in any particular discussion if
11 you have that -- if it does change from what's -- if
12 your change does in fact happen will in fact there
13 will be any net result on the design of the structure
14 or facility or system?

15 If there is -- just because you -- let me
16 reword and --- just because you propose something that
17 might be in error, if that error doesn't in fact
18 change the design doesn't that have to be pointed out?

19 Isn't that a critical part of it?

20 MR. WIREMAN: Well, clearly. But you
21 don't know if it will have an effect on the design or
22 operation until that happens.

23 JUDGE WARDWELL: Right. And so won't you
24 be more effective if in fact you could show an impact
25 that it does have a change to it rather than just say

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1 oh, it might happen?

2 MR. WIREMAN: Well, I think I understand
3 your point. If you say it may happen, first of all,
4 you need to have some basis for that -- some
5 professional judgment.

6 But then to demonstrate if it happens and
7 demonstrate if it has an effect if it happens, that's
8 where monitoring comes in and that's where that data
9 is useful to determine if there has been an impact and
10 if that impact is a negative impact.

11 So it all kind of rolls together that way.

12 JUDGE WARDWELL: Okay. Thank you.

13 Section 1.2.1.1, basis one, which is a sub
14 basis under the regional hydrology and groundwater
15 flow, you've raised the issue of recharged sources and
16 discharge locations for the Basal Chadron aquifer.

17 And under your testimony, Exhibit 004,
18 your basis says that you assert that CBR has failed to
19 include any information on the sources of recharge or
20 discharge of groundwater in the Basal Chadron or the
21 primary pathways which deliver water to the deep
22 confined aquifer.

23 Crow Butte, in their rebuttal, as 033
24 answer 25 at 13, states that in response to Mr.
25 Wireman's arguments relating to the recharge

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1 discharge, Crow Butte responds that a conceptual
2 diagram showing areas of recharge and discharge from
3 the Basal Chadron was provided and they listed CBR
4 021.

5 Recharge two, the Basal Chadron occurs as
6 a direct infiltration of precipitation where the
7 formation is exposed at different distant locations
8 west and south of the mining area and the MEA and also
9 a small amount of draw down flow from the overlying
10 confining unit.

11 And I'll turn to NRC first and just ask do
12 you believe that CBR 021 is the same figure as
13 presented in your documents -- your EA documents, NRC
14 006 as Figure 3-8 at Section 3.3.2.1 at 3-29?

15 MR. BACK: Yes, sir. David Back.

16 David Back. Yes, Your Honor.

17 JUDGE WARDWELL: Okay, good. And can we
18 get that figure up? And this is the one from NRC is
19 006, Joe?

20 PARTICIPANT: Yes, it is.

21 JUDGE WARDWELL: Good.

22 PARTICIPANT: Oh, no. Not NRC. This is
23 CBR. Do you want NRC?

24 JUDGE WARDWELL: I want the NRC because it
25 has the title and figure number and all that. This

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1 one has cut that off.

2 MR. BACK: It's Figure 3-8 in the NRC.

3 JUDGE WARDWELL: It should be on 3-29. So
4 if you get to 28 I don't think it's necessarily
5 numbered 3-29 but it will -- it'll be the one after 3-
6 28. See how I do that like that? Pretty impressive.

7 MR. WIREMAN: I am impressed.

8 JUDGE WARDWELL: I am an engineer.

9 (Pause.)

10 JUDGE WARDWELL: I can move on while
11 you're doing that. We don't necessarily need it right
12 off the bat.

13 CBR, are you aware of any outcropping of
14 the Arikaree Brule or the Basal Chadron Chamberlain
15 Pass Formation within the boundaries of the MEA?

16 MR. STRIVER: No, Your Honor. There are
17 no outcroppings within the MEA of the Basal Chadron.

18 JUDGE WARDWELL: You mentioned at the end
19 of this -- that I cited CBR 003 rebuttal A.25 at 13.
20 You say that there is a small amount of downward flow
21 from the overlying confining unit. Doesn't this admit
22 that you have a leaky aquitard to some degree?

23 MR. LEWIS: Bob Lewis, Your Honor.

24 Yes. As we discussed yesterday, there is
25 no such thing as perfectly confined unit. There is

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1 some very small amount of recharge or leakage from the
2 overlying confining there on a regional basis.

3 JUDGE WARDWELL: And restate then again
4 why didn't you at least take a look at doing a leaky
5 aquifer analysis on that data.

6 MR. LEWIS: On the scale of the MEA, that
7 amount of leakage is insignificant. It doesn't show.

8 JUDGE WARDWELL: Thank you.

9 Okay. CBR rebuttal at 033 answer 25 at 13
10 states that elevations of the potential metric surface
11 of the Basal Chadron -- of the Basal Sandstone of the
12 Chadron formation indicate that the recharge zone must
13 be located above the minimum elevation of 3,715 feet
14 AMSL -- that's above mean sea level.

15 Discharge from the Basal Chadron
16 concurrently occurs primarily to wells at the main
17 mining area and flowing wells located near the town of
18 Chadron.

19 Prior to the ISR development of the
20 installation of flowing wells, discharge from the
21 basal Chadron occurred in the drainage and by
22 evapotranspiration in areas east and north of Chadron
23 where the formation is exposed at or near the surface.

24 The distance from the recharge and
25 discharge areas from the MEA are such that they will

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1 not affect the behavior of the Basal Chadron aquifer
2 in the MEA.

3 And I'll ask CBR whether in reviewing this
4 figure where is Chadron on this figure?

5 MR. STRIVER: Chadron is located in the
6 center part of the map just to the northwest of the --
7 I am sorry, that's the town of Crawford. Chadron is
8 going to be east 25 miles approximately.

9 JUDGE WARDWELL: So it's not on this --
10 it's beyond the limits of this page?

11 MR. STRIVER: That's correct.

12 JUDGE WARDWELL: And where is it in
13 regards to the limits of this page? Directly to the
14 top? To the top right? To the top left? To the
15 bottom?

16 MR. STRIVER: It would be to the -- to the
17 top right, to the east -- northeast.

18 JUDGE WARDWELL: Okay. Having said that
19 then, in looking at this map it appears to me that the
20 discharges to which you are referring to are near
21 Crawford and not Chadron. Is that not correct?

22 Wherein your testimony you stated it was
23 -- it was east and north of Chadron and near the town
24 of Chadron.

25 MR. LEWIS: Your Honor, that would be a

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1 misstatement. It would be Crawford in that case.

2 JUDGE WARDWELL: So the testimony should
3 change, not the figure should change. Is that
4 correct?

5 MR. LEWIS: That's correct, Your Honor.

6 JUDGE WARDWELL: And how would that impact
7 any of your conclusions that you've made in regards?
8 You might take a look at that and get back to us.
9 Even if you have to wait until tomorrow that's fine.

10 But I think you ought to take a look at
11 that because it's a tad bit different between having
12 flowing rains and the discharge at flowing wells and
13 the discharges at Crawford as opposed to Chadron.

14 MR. LEWIS: Yes, Your Honor.

15 JUDGE WARDWELL: And this is -- yeah, this
16 is a question I think as important as that. Make sure
17 you still want to -- still believe that the distance
18 from the recharge discharge areas from the MEA are
19 such that they will not affect the behavior of the
20 Basal Chadron aquifer at the MEA and that the -- yeah,
21 that's a -- and I guess I would then state that with
22 that correction and anything we find out from that
23 I'll turn to Mr. Wireman and say I think you were
24 concerned -- you said there wasn't any discussion of
25 it. Doesn't this demonstrate that there is a

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1 discussion of the recharge discharge areas and does
2 that alleviate your concerns?

3 MR. WIREMAN: No, it doesn't. It's wholly
4 inadequate and it's based on not much data.

5 Figure 3.8 is conceptual. There is very
6 few data points to support that and, if I may, I've
7 looked at the Basal Chadron and the groundwater flow
8 system in this aquifer. I visited the outcrop at
9 Orella Bridge and looked at that.

10 JUDGE WARDWELL: I am sorry. What outcrop
11 --

12 MR. WIREMAN: Orella Bridge, which is
13 northwest of Crawford. And that is a place where the
14 Basal Chadron outcrops -- I've been there -- and by
15 the way, it is a solid sandstone -- very solid.

16 There is another outcrop at a place called
17 Trunk Butte, which is east of Crawford, and the
18 conceptual understanding of this aquifer in terms of
19 its geology it occurs, as was mentioned yesterday, in
20 the bottom of either a syncline or an erosional
21 valley, and then the formation comes up on the sides
22 of that and then pinches out.

23 The Trunk Butte location is on the east
24 side of that as it starts up the hill. There is a
25 wetland there and while I don't have data because

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1 there is no data from this wetland -- there is no
2 sampling -- but it is likely a situation where this is
3 -- the Chamberlain Pass is the subcrop there and
4 probably outcrops. Receives a small amount of
5 recharge.

6 It's very thin there, and that recharge
7 quickly comes out because it hits the pure shale.
8 That's the explanation of that I all likelihood.

9 There is no discharge from this formation
10 at Orella Bridge. None. So the question that I keep
11 asking is where is the discharge from this regional
12 aquifer. It's a large aquifer.

13 Groundwater apparently flows mainly from
14 south to north or to the northwest. Their reports are
15 very confusing with respect to the direction of flow.

16 I could -- in my rebuttal there is
17 indications of flow from the north, from the
18 northwest, from the west, from the southwest, from the
19 south. It's unclear.

20 In my view, the flow is primarily to the
21 northwest and the discharge is primarily to the White
22 River, and there might be some discharge by flowing
23 wells along that pathway because you've put a hold on
24 there and let the pressure off.

25 But the importance of this -- and let me

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1 just explain this --

2 JUDGE WARDWELL: Before you do that,
3 because I am going to lose track of what I want to
4 respond to you.

5 MR. WIREMAN: Okay. Sure.

6 JUDGE WARDWELL: I think you'll have a
7 better chance of remembering what you were going to
8 say than I am going to remember what I was going to
9 ask.

10 MR. WIREMAN: Okay. Fair enough.

11 JUDGE WARDWELL: In regards to those
12 directions, weren't those north, west, south, et
13 cetera, where you rattled off several different
14 directions promulgated in regards to discussing what
15 we see here on 3.8?

16 MR. WIREMAN: I am sure they were.

17 JUDGE WARDWELL: Is that a fair
18 assessment, where in fact the flows are different
19 directions because of the pinch outs you're talking
20 about? Isn't that a fair assessment?

21 MR. WIREMAN: There is no indication or
22 discussion of whether any recharge happens on the west
23 side of this map. There is no discussion.

24 Are there outcrops there? I have no idea.

25 Is there any indication that there is any significant

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1 recharge from that? There is no data, no discussion
2 of that.

3 In this type of an aquifer that's deeply
4 buried and has limited outcrops, the -- it's focused
5 recharge is the term we use. Recharge doesn't happen
6 everywhere. It happens in selected locations.

7 JUDGE WARDWELL: All right. Okay. If I
8 can interrupt.

9 I wasn't talking about the recharge. I
10 was talking about the flow patterns that you were
11 talking about -- the north, south, east and west.

12 That's coming from this -- from a written
13 version of the flow directions from this contour map,
14 isn't it? And that answers your question of where is
15 the flow. It's consistent -- that description is
16 consistent with what we see on this map, is it not?

17 MR. WIREMAN: I don't know, because the
18 arrows in the far left here that indicate eastward
19 flow there is no contours there. So there is no
20 indication that they have data to suggest there is a
21 higher elevation contour there. I don't know that.

22 JUDGE WARDWELL: Are you talking about the
23 flow that -- I mean, it is pictorially representative
24 but there is an elevation of 3,700 on a contour and
25 then it goes down to 3,680 and --

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1 MR. WIREMAN: Right, and that makes sense.
2 That shows a northward flow. What I am talking about
3 is way to the left where there are arrows outside of
4 the 3,700 contour. There is no data points over there
5 to support those arrows.

6 JUDGE WARDWELL: Is the flow that they
7 show going across the MEA consistent with what they've
8 -- what they've shown on their cross-sections in some
9 of the maps we talked about yesterday in regards to
10 flow in the Basal Chadron across the MEA?

11 MR. WIREMAN: From my look at this, flow
12 across the in the Basal Chadron through the MEA is
13 more or less to the north and northwest. That's my -

14 JUDGE WARDWELL: That's consistent with
15 what they've shown in their -- in their --

16 MR. WIREMAN: Well, it's not consistent
17 with their text because, as I just indicated, they've
18 got groundwater flow directions in, like, seven or
19 eight different directions.

20 So, excuse me, that's too many. But --

21 JUDGE WARDWELL: But I am looking at the
22 outline of the MEA on this map --

23 MR. WIREMAN: Mm-hmm.

24 JUDGE WARDWELL: -- 2.8 and it seems there
25 is an arrow right directly south of that pointing

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1 northwest, is there not?

2 MR. WIREMAN: Yes, and I would say that
3 arrow is probably correct.

4 JUDGE WARDWELL: Thank you.

5 Now, if we -- sorry, I interrupted you on
6 something you were saying and now you probably forgot
7 it, I hope I ---

8 MR. WIREMAN: No, no. I haven't forgotten
9 it. I haven't forgotten it.

10 JUDGE WARDWELL: Oh, darn.

11 MR. WIREMAN: I just want to explain what
12 my concern is with this.

13 JUDGE WARDWELL: Sure.

14 MR. WIREMAN: As the mining proceeds and
15 one mine unit is mined and then they move to the next
16 mine unit and next mine unit, each preceding mine unit
17 that is completed, even though there has been a
18 restoration effort, when you put a lixiviant into this
19 formation you mobilize metals. You dissolve metals.
20 That's the whole point.

21 But you don't just dissolve uranium. You
22 dissolve a whole bunch of other metals and cations.
23 The restoration and the groundwater cleanup is not 100
24 percent effective by any stretch of the imagination.

25 So as you move down you are leaving behind

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1 groundwater that has concentrations of metals that are
2 higher than background.

3 That groundwater keeps flowing -- keeps
4 flowing to the northwest, and over time as you go mine
5 unit after mine unit, concentrations increase it
6 leaves the mining area and it keeps going to its
7 discharge point.

8 The critical environmental safety question
9 here is what is delivered to that discharge point in
10 terms of contaminant mass. That's the critical
11 question.

12 If you're delivering lots of load is the
13 term we use, which is mass, you're delivering a lot of
14 mass to a certain point, whether that be a well or
15 whether that be the White River, whether that be a
16 spring. That's a concern because the water quality in
17 those receptors change and could change for the worse.

18 So the point I am making here is there is
19 not enough understanding of where this groundwater
20 goes and who might be impacted by that groundwater
21 when it discharges to a stream or a well.

22 There is no discussion here. The comment
23 about groundwater occurring east of Crawford, there is
24 no support for that and it doesn't make sense to me
25 because the wetland I spoke about at Trunk Butte is

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1 kind of up on the side of this valley or this incline,
2 whatever it is.

3 Groundwater is not flowing east. It's
4 not, because it would have to go up that hill. That
5 wetland, as I said, is in all likelihood a local
6 wetland due to immediate discharge.

7 There are ways to answer all these
8 questions. You can do average residence time of
9 groundwater to understand how long it's in this
10 aquifer.

11 You can go down to the White River and you
12 can say okay, upstream of where this -- where this
13 White River goes across this subcrop or outcrop of the
14 Chamberlain Pass -- what's the flow there, what's the
15 flow on the downstream end -- do you have a gaining
16 stream. That's a simple thing to do.

17 And then you monitor that as a discharge
18 point over time to see if concentrations of these
19 contaminants are going up or not.

20 So that's really what I am getting at. If
21 you don't understand the flow system well enough, you
22 don't have an ability to monitor for impacts.

23 JUDGE WARDWELL: Thank you.

24 Crow Butte, would you like to respond to
25 the discussion that Mr. Wireman just provided?

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1 MR. LEWIS: Yes, Your Honor.

2 Your Honor, currently the discharge from
3 the Basal Chadron aquifer results from pumping at CDL
4 and from the flowing wells that are shown on the
5 figure. So --

6 JUDGE WARDWELL: And where are those wells
7 shown? I really can't see them too well.

8 MR. LEWIS: There are -- there are two
9 small dots just northeast of Crawford, the town.
10 Flowing well 123 and flowing well 97.

11 JUDGE WARDWELL: I see. Okay.

12 MR. LEWIS: And those wells are flowing at
13 about 40 gallons a minute and they have been since at
14 least the '80s.

15 So basically the discharge -- all the flow
16 in the system is currently flowing, as you can see on
17 the potential metric surface map, is flowing into the
18 mine and to those flowing wells.

19 The potential metric surface is below the
20 White River substantially. So there is no discharge
21 from the Basal Chadron to the White River currently
22 and it does not subcrop in the White River.

23 So my interpretation of that as well as
24 the Crow Butte geologist who helped me put this figure
25 together, Mr. Beins, is that the discharge prior to

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1 development would have taken place in the tributaries
2 north of Crawford where the red dashed line is draw
3 where it says extent of Basal Chadron sandstone.

4 That's an outcrop area for the Basal
5 Chadron formation. There are tributaries that cut
6 through that area and if you look at old aerial
7 photographs from the '60s and '70s of that area you'll
8 see that it's much more lush and vegetation exists in
9 those drainage where now it has a very dry -- there is
10 no discharge occurring in those tributaries at all.

11 So the interpretation is prior to
12 development the discharge from the aquifer took place
13 north of Crawford. I keep saying Chadron -- I am
14 sorry. North of Crawford.

15 And so that's the conceptual summary of
16 our interpretation of the discharge of the system.

17 With respect to the recharge, Mr. Beins,
18 a former geologist with Cameco, and I had sat down and
19 Mr. Beins had personally field checked geologic maps
20 of the area where he believed the Basal Chadron
21 outcropped regionally, and we know that at very
22 distant locations 60 miles to the southeast of Scott's
23 Bluff area, for example, there are recharge areas to
24 the -- to the Basal Chadron and significant distances
25 to the west.

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1 I can't recall precisely what Mr. Beins
2 had said in terms of those distances but it was
3 substantially off this map. To the west there were
4 some outcrop areas where he believed there was local
5 recharge to the aquifer.

6 So that's my summary of response to the
7 discussion conceptually.

8 JUDGE WARDWELL: And did you provide this
9 response in either your testimony or your rebuttal
10 testimony to this detail?

11 MR. LEWIS: I believe that's summarized
12 generally in the rebuttal testimony or when we
13 provided this figure.

14 JUDGE WARDWELL: Thank you.

15 Mr. Wireman, succinctly, do you want to
16 have any other last words on this topic area?

17 MR. WIREMAN: Yeah. I'd like to see some
18 empirical data that supports their conceptual
19 understandings.

20 If there is a suspected discharge point to
21 the north of here they could go sampling. They could
22 put a well in and you could look at that.

23 Their water level maps -- they have four
24 potential metric surface maps for the Basal Chadron
25 here which is -- let's see the figure number here.

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1 It's in the EA. There is four maps -- January, April,
2 October and December -- where they put potential
3 metric surface maps.

4 In their text, they indicate about a
5 seven-foot annual fluctuation in these water -- the
6 potential metric surface levels.

7 These maps indicate to me that the highest
8 water levels or highest potential metric surface
9 occurs October through January while the lull is April
10 and July.

11 I see that frequently in confined aquifers
12 in this setting and it tells me that there is a
13 process that we call piston flow going on.

14 You get recharged at the higher elevations
15 and that recharge moves into the rock where it
16 subcrops or outcrops and it pushes water that's down
17 deeper in the aquifer forward because it has to
18 displace it. If you just put water in at the top it
19 moves water at the bottom.

20 But it takes a while for the water that
21 went in to get down there. How long? We need average
22 residence time here to see how long -- in a post-
23 mining scenario how long does it take this water to
24 move from recharge through the MEA and onward to the
25 north to the discharge areas.

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1 That's an important understanding, because
2 if it's carrying contaminant mass you need to kind of
3 know when it's going to get somewhere. That could be
4 figured out, and I don't see any of that.

5 I don't see an explanation for this seven
6 foot of annual fluctuation. They report it, but there
7 is really no explanation for that.

8 And then finally, recharge 60 miles away
9 -- as I understand it, and Dr. LaGarry knows more
10 about this than I do -- but at the MEA the Chamberlain
11 Pass occurs in a depression. Whether that be a
12 syncline or some kind of erosion valley, I don't know.
13 But it pinches out as it goes up.

14 So 60 miles one way or the other there is
15 no way it can get into this portion of the Chamberlain
16 Pass because it's in between. It doesn't occur on the
17 high points.

18 So there has to be some recharge within
19 this valley or syncline that contains this part of the
20 Chamberlain Pass, and my question is where does that
21 happen and how long does it take to get through and
22 where does it go.

23 JUDGE WARDWELL: And your motivation for
24 why you need this information is because of the
25 ultimate potential contamination after the mine is

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1 done and finished and removed is one of them, if -

2 MR. WIREMAN: That's correct, because I've
3 looked at a number of in situ uranium mining
4 operations around the West. When I was with EPA we
5 were very engaged in these, and one of the issues --
6 and this is not -- this is not an advocate against or
7 for mining but one of the issues is it's very
8 difficult to achieve background in the restoration
9 efforts. It is just simply difficult to do.

10 So we end up oftentimes with ACLs. We end
11 up with concentrations of metals that are higher than
12 background though they are legally permitted. But
13 they move on down gradient.

14 And so having some sense of the
15 consequence of that is important.

16 JUDGE WARDWELL: And do you see any
17 changes in the concentration as it does move down
18 gradient?

19 MR. WIREMAN: At in situ uranium mines
20 nobody monitors down gradient. The compliance points
21 are typically at the boundary of the license area, not
22 beyond.

23 JUDGE WARDWELL: But I was referencing
24 your other work with EPA. Have you seen any changes
25 in concentration as it moved down gradient?

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1 MR. WIREMAN: We did not do that directly.
2 But there are a couple of USGS reports out that look
3 at this, and I don't have the citation and mine is in
4 Texas.

5 And yes, they have detected concentrations
6 down gradient of the permit boundary that they
7 attribute to mining. So yes.

8 JUDGE WARDWELL: That wasn't the heart of
9 my question but that's okay. But what I was kind of
10 referring to is that what's your experience with how
11 do concentrations change as they start moving down
12 gradient in an aquifer?

13 Do they not -- do they not tend to
14 dissipate for various and sundry reactions?

15 MR. WIREMAN: I'll answer it this way. As
16 this contaminant mass moves in dissolved form down
17 gradient, there are a number chemical reactions that
18 affect those concentrations, obviously, redox
19 reactions primarily. But absorption, other things
20 that affect those.

21 So it's very difficult to have a general
22 answer to that. You have to look at what the nature
23 of the geological formation is, the aquifer, what are
24 the geochemical conditions.

25 I will say this. If you have highly

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1 oxidized water, which is a result of the lixiviant,
2 that tends to promote dissolution of metals.

3 But I am not saying that happens for a
4 great distance down gradient. It depends on whether
5 or not you have reducing conditions down gradient or
6 whether or not you have more oxidizing conditions down
7 gradient.

8 Both are possible. But we don't know
9 because there are no monitoring wells in this Basal
10 Chadron beyond the permit area.

11 JUDGE WARDWELL: Thank you.

12 1.2.1.2 basis two, down gradient MEA Basal
13 Chadron groundwater flow -- at your rebuttal -- at
14 your testimony, Mr. Kreamer, opinion one basis two at
15 two, you state that there is significant uncertainty
16 about the groundwater flow in the Basal Chadron
17 downgrading of the MEA because CBR's claim that
18 groundwater flow in this aquifer is not affected by
19 the Pine Ridge escarpment even though this escarpment
20 functions as a groundwater divide in the Arikaree and
21 the Brule aquifers.

22 CBR, in their rebuttal, 033 answer 26 of
23 14, says in response to Mr. Wireman's claims that
24 there is significant uncertainty about the groundwater
25 flow in the Basal Chadron downgrading of the MEA the

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1 Applicant states that the potentiometric surface
2 elevation has shown consistent flow towards the
3 northwest consistent with the predevelopment and
4 current flow directions near the mining area, and they
5 are citing CBR 021, and that was the figure we were
6 looking at before.

7 And do you have any evidence contradicting
8 this statement that the flow is to the northwest
9 through the MEA and beyond the limits of the MEA to
10 the northwest?

11 MR. WIREMAN: I believe it is to the
12 northwest, as I said earlier. My issue with this --
13 my comment here, the Chamberlain Pass Formation was
14 deposited as the Black Hills uplift was occurring at
15 the same time.

16 So the Pine Ridge escarpment is kind of a
17 ceta. The rocks are dipping off to the south there,
18 and the Chamberlain Pass Formation is dipping off to
19 the south as is the rest of the White River Group as
20 is the Arikaree. They are all in that cuesta.

21 So I don't understand how you can say the
22 escarpment affects the Arikaree and the Brule and does
23 not affect the Chamberlain Pass because they are all
24 uplifted and they are all dipping off to the south.

25 So I just didn't understand how they

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1 separated those out. So that's the issue there. And
2 then in terms of the down gradient, it's what I was
3 saying before. We don't understand where the natural
4 discharge is.

5 I have a hard time believing, real hard
6 time, that two wells -- 40 GPM -- represent all of the
7 discharge from this quite large aquifer. There has to
8 be more discharge somewhere. That's a very local
9 discharge point.

10 But that does not take all the water out
11 of this aquifer. There is no way.

12 JUDGE WARDWELL: Thank you.

13 CBR, would you like to comment in regards
14 to the representation of the Pine Ridge escarpment and
15 impacts on that -- the water level readings or any
16 other statements that Mr. Wireman made after I read
17 the -- your rebuttal testimony?

18 MR. STRIVER: Yes. The Basal Chadron
19 formation is nearly flat across the escarpment from
20 south where the Niobrara River occurs through Marsland
21 through the Crow Butte across the Pine Ridge
22 escarpment and north of Crow Butte. So it's --

23 JUDGE WARDWELL: You don't believe it's
24 dipping to the south, as far as the structure, not the
25 water levels -- not the piezometric surfaces?

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1 MR. STRIVER: No. It's nearly flat.
2 There is a slight change. But no, and it is
3 consistent. I mean, it is there across the Cochran
4 Arch and through the escarpment and across the Crow
5 Butte mine and there is very little change in dip
6 across that area.

7 According -- if you look at the regional
8 cross sections that were constructed for that, there
9 is minimal dip change.

10 JUDGE WARDWELL: So how do you account for
11 the fact that the Arikaree and the Brule are affected
12 by the escarpment and are dipping to the south?

13 MR. STRIVER: They are recharged at the --
14 at the escarpment where you have a divide at the Pine
15 Ridge escarpment. You have flow, you know, into the
16 Arikaree and the Brule that goes towards the Niobrara
17 towards the south at the escarpment and then towards
18 the north, north of the escarpment.

19 So we have two different hydrologic flows
20 towards the -- towards the south for the overlying
21 aquifer and towards the north northwest for the
22 underlying Basal Chadron.

23 JUDGE WARDWELL: Well, you do believe that
24 the Arikaree and the Brule are impacted by the
25 escarpment but the Basal Chadron isn't?

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1 MR. STRIVER: That is correct. That's my
2 opinion. Correct.

3 JUDGE WARDWELL: And do you have a
4 geologic justification for why that might be
5 occurring? Is it that the escarpment occurred after
6 the Basal Chadron was deposited or and then the
7 Arikaree and Brule were later or what would be your --
8 do you have any hypothesis in that regard?

9 MR. STRIVER: My opinion was that the
10 Basal Chadron and the Chadron -- the Brule and the
11 Arikaree were deposited and then erosion occurred on
12 the north side of the -- of the escarpment.

13 So the -- any structural or upheaval was
14 not affected by the deposition of the Basal Chadron
15 and the overlying formations, at least to the --

16 JUDGE WARDWELL: And that upheaval didn't
17 affect the Brule or the -- so was it the erosion of
18 the Arikaree and the Brule that caused the changes in
19 the deposition or -- I am still a little confused in
20 regards to that.

21 MR. STRIVER: Well, the erosion that
22 occurs on the north side of the escarpment,
23 obviously, it has eroded. That is why we have the
24 escarpment.

25 That may have been related to something

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1 structural later. But we do have deposition probably
2 occurred at the same time that the -- any structural
3 occurred -- any sort of structural deformation
4 occurred.

5 But during the deposition of the Basal
6 Chadron that occurred before any structural changes or
7 uplift.

8 MS. STRIZ: Your Honor, may I make a
9 comment that would assist with this discussion -- for
10 a figure?

11 JUDGE WARDWELL: Yeah, I'll get to you --
12 I'll get to you in a minute.

13 MR. LEWIS: Your Honor, I wanted to touch
14 --

15 JUDGE WARDWELL: Yeah, you were going to
16 say -- that's where I wanted -

17 MR. LEWIS: I had one comment with regard
18 to Mr. Wireman's statement and the discharge.

19 I didn't testify that 40 gallons a minute
20 was the total discharge from the system currently.
21 The Crow Butte mine is discharging net or has recently
22 discharged 200, 240 -- in that range of net discharge.

23 So if I do the math I would say 280 to 300
24 gallons a minute when you include the flowing wells
25 and the Crow Butte mine is the current net discharge

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1 in the sub basin.

2 JUDGE WARDWELL: Dr. Striz for NRC.

3 MS. STRIZ: Yes. I think that this
4 discussion could be greatly aided by pulling up the
5 regional cross-sections that Crow Butte provided,
6 which is Figure R, 2.6-23 from the technical report.
7 It's cross-section R1 R prime which extends through
8 north of the White River all the way to -- past the
9 Niobrara River and --

10 JUDGE WARDWELL: Wait. If you want it up
11 you're going to have to wait for us to get it up. If
12 you don't want it up, fine. We will leave the --

13 MS. STRIZ: No. No. No.

14 JUDGE WARDWELL: -- we will leave the
15 screen blank.

16 MS. STRIZ: Just saying that -

17 JUDGE WARDWELL: But you were asking for
18 it so --

19 MS. STRIZ: -- they provided a very
20 detailed cross-section that demonstrates the geology
21 and the behavior and location of the Pine Ridge
22 escarpment.

23 MR. DEUCHER: Can you give me the
24 reference again, please?

25 MS. STRIZ: It's Figure 2.6-23. It's a

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1 regional cross-section. They provided three of them.

2 JUDGE WARDWELL: And what -- what -- is
3 this on their TR or what is it out of? What's this --
4 what's the exhibit number?

5 MS. STRIZ: It's out of the TR -- Figure
6 2.6 -

7 JUDGE WARDWELL: What's the exhibit
8 number?

9 MS. STRIZ: It would be -- Your Honor, it
10 would be Exhibit --

11 JUDGE WARDWELL: Exhibit number first
12 before we worry about the figure number.

13 MS. STRIZ: Yes. It's Exhibit CBR 008-R.

14 (Pause.)

15 JUDGE WARDWELL: Is that the one you're
16 speaking of?

17 MS. STRIZ: Yes. It's very large figure
18 so it's going to be a little difficult to see it. But
19 I think you'll be able to understand how the layers
20 are oriented to one another. But it needs to be
21 rotated.

22 JUDGE WARDWELL: Talk us -- well, good
23 luck. Can we at least rotate that?

24 (Pause.)

25 MS. STRIZ: It would be nice if we could

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1 get the entire cross-section.

2 JUDGE WARDWELL: Well, you're not going to
3 and you're not going to see anything until we zoom in.
4 So you're going to have to do -- you have to talk us
5 through what you see here and then we will be able to
6 look at it ourselves --

7 MS. STRIZ: All right. Well, let's --

8 JUDGE WARDWELL: -- later on and as we
9 review the testimony.

10 MS. STRIZ: -- let's zoom in on the Pine
11 Ridge Escarpment. Right there in the middle.

12 That's absolutely good, if you could zoom
13 in right there in the middle, the Pine Ridge
14 escarpment and the Cochran Arch, and then pull it up
15 a little higher.

16 So that's the Cochran Arch. We need to go
17 to -- a little to the left to also show the Pine Ridge
18 escarpment.

19 JUDGE WARDWELL: Could you speak up a
20 little bit and get the mic closer to you so we can
21 hear you?

22 MS. STRIZ: Could you please zoom out to
23 show more of the cross-section centered on those
24 locations with the Pine Ridge? That -- I think that
25 will do it.

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1 So would you like me to continue to
2 discuss my interpretation of the geology or --

3 JUDGE WARDWELL: Yeah. Tell us what we
4 should be looking at here.

5 MS. STRIZ: Okay. So exactly as Crow
6 Butte mentioned, you can see that in the location
7 where the green line is it's the Pine Ridge escarpment
8 and also the Cochran Arch to the right in red.

9 The Basal Chadron is flat and consistent
10 and the -- and the overlying Chadron formation is
11 thick and consistently flat as are the marker beds --

12 JUDGE WARDWELL: I am sorry. The what?

13 MS. STRIZ: The marker beds. The lower
14 Whitney Ash and the upper Whitney Ash.

15 DR. KREAMER: Excuse me. Could that be
16 projected here? I -- it's not being projected here at
17 all.

18 Thank you.

19 MS. STRIZ: So Crow Butte is making the
20 case that these were deposited and that they were not
21 offset by any activity at the Pine Ridge.

22 JUDGE WARDWELL: And is that true for the
23 Arikaree and the Brule also?

24 MS. STRIZ: As CBR stated, they were
25 affected by erosion north of the Pine Ridge but not

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1 south of the Pine Ridge or less erosion south of the
2 Pine Ridge.

3 The Pine Ridge is the northern boundary of
4 the High Plains Aquifer and it is a well-known
5 erosional escarpment with sediments eroded to the
6 north and not so much to the south.

7 JUDGE WARDWELL: And as a result also that
8 none of -- neither the Basal Chadron nor the Arikaree
9 and the Brule were affected by any uplift or
10 associated with past geologic action?

11 MS. STRIZ: That is our conclusion.

12 JUDGE WARDWELL: And is that your
13 conclusion, Crow Butte?

14 MR. STRIVER: Yes, it is.

15 JUDGE WARDWELL: And just to tie the loop
16 and finish it, Mr. Wireman or Dr. LaGarry, would you
17 like to comment on that?

18 DR. LAGARRY: Yeah, I'd like to comment on
19 that.

20 There is -- there is 70 years of
21 geological literature that says otherwise. I would
22 have liked to have seen a detailed treatment of that.

23 Why is it that 70 years of research is
24 wrong and these folks are right? That would need to
25 be worked out.

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1 JUDGE WARDWELL: Have you looked over
2 these cross-sections that the Applicant submitted and
3 --

4 DR. LAGARRY: Yes, sir.

5 JUDGE WARDWELL: -- compared that to the
6 historic position that was taken and does that change
7 or how does it not change it?

8 DR. LAGARRY: Well, I'd like to see a peer
9 review process, at least have other geologists look at
10 it. You know, I work in the scientific literature.
11 My work is reviewed by other geologists before it
12 becomes, quote, unquote, "final."

13 Now, I think -- I think a profound change
14 like that deserves the same treatment. I myself,
15 personally, measured the 7 degree dip to the south.

16 JUDGE WARDWELL: Sorry. Say that -- say
17 that again.

18 DR. LAGARRY: The dip that Dr. Wireman --
19 Mr. Wireman is referring to is a dip measured during
20 the state map program in the '90s which was my program
21 and I mapped the 7 degree dip to the south and --

22 JUDGE WARDWELL: Over across the MEA?

23 DR. LAGARRY: Across the entire region,
24 sir. Yes.

25 JUDGE WARDWELL: Including the MEA?

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1 DR. LAGARRY: Yeah, so including the MEA.
2 You know, that deserves more treatment. You know, it
3 seems that, you know, and this is just -- this is just
4 an impression but, you know, that I worry about two
5 standards -- a peer review standard and a not peer
6 reviewed standard.

7 I would like to see the same standard
8 apply.

9 MR. WIREMAN: May I add just one note to
10 that?

11 JUDGE WARDWELL: Sure, if it's a little
12 note.

13 MR. WIREMAN: Very small. Very short.

14 These formations were deposited
15 contemporaneously with the uplift. It makes perfect
16 geologic sense that as an uplift is going on to the
17 north things dip off to the south. I mean, that's
18 just -- these are not very far from that uplift.

19 If it's a cuesta it's a result of the
20 uplift folding the rocks and dip off to the south. So
21 I'll leave it that. Hopefully, I can discuss it at a
22 later time.

23 If the Chamberlain Pass does extend over
24 this escarpment we should talk about the hydrology
25 around that.

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1 DR. KREAMER: May I make a very short
2 comment, Your Honor?

3 JUDGE WARDWELL: Dr. Kreamer, no, I am not
4 going to allow it for the sake of time.

5 DR. KREAMER: Okay.

6 JUDGE WARDWELL: I see your role is one
7 that if I ask, as I was mentioning yesterday -- I see
8 your role as assistant to Mr. Wireman should he be
9 asked a question that really isn't in his area because
10 it's his testimony, and I am afraid we just don't have
11 the time to allow free -- you know, discussion by
12 everyone. We have to focus on the people that
13 provided it with their testimony.

14 So but thank you for the offer and
15 certainly we will call on you when Mr. Wireman's
16 presented with something that he wishes to defer to
17 you. Then you're the resource. Appreciate you being
18 here.

19 Crow Butte's rebuttal -- let's see, that's
20 mostly covered.

21 DR. LAGARRY: Your Honor, I would like to
22 correct the record from what I said a few questions
23 ago.

24 My rebuttal was to the testimony, not
25 rebuttals. That's the correction I'd like to make.

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1 JUDGE WARDWELL: You've confused me.

2 DR. LAGARRY: I think -- I think in our --
3 in our discussion you were asking about when I said --
4 talking about the NEPA.

5 JUDGE WARDWELL: Yes.

6 DR. LAGARRY: Yeah. That was in -- that
7 was in reference to the testimony.

8 JUDGE WARDWELL: Okay. Thank you.

9 MR. STRIVER: Your Honor, may I make --

10 JUDGE WARDWELL: I see. Yeah. When I was
11 asking you about whether or not you've reviewed -- in
12 your statement you said that you reviewed NRC's
13 rebuttal. You meant to say NRC's testimony.

14 DR. LAGARRY: Correct. Thank you.

15 JUDGE WARDWELL: Thank you for clarifying
16 that.

17 MR. STRIVER: Your Honor, may I make one
18 comment?

19 JUDGE WARDWELL: Yes, I will give you one
20 comment.

21 MR. STRIVER: Thank you.

22 In the cross-section depicted here we have
23 the existence of the Basal Chadron across the
24 structure along with the Whitney -- upper and lower
25 Whitney Ash that Dr. Striz mentioned. That makes a

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1 compelling case showing there is not displacement
2 across the area. There is no offsets that we can see
3 from these geophysical logs and shows the -- it's
4 consistent with our case.

5 JUDGE WARDWELL: Crow Butte's rebuttal is
6 003 answer 26 at 14 says observations indicate no
7 influence. No flow divide exists between the Pine
8 Ridge escarpment and the Basal Chadron, which is
9 consistent with the conceptual model of groundwater
10 flow indicating no significant recharge to the Basal
11 Chadron along the Pine Ridge escarpment.

12 This is not unexpected, given the
13 significant depth of the Basal Chadron below the
14 escarpment and the significant thickness of the
15 confining unit that separates the Basal Chadron from
16 the Brule and the Arikaree aquifers.

17 Hydraulic gradients data at both the
18 regional and local levels is presented in a
19 potentiometric maps provided by CBR at CBR 008 Figures
20 2.9-4(a) through 2.9-4(d) in Arikaree and 2.9-5(a)
21 through 5(d) in the Brule and 2.9-6(a) through (d) in
22 the Basal Chadron.

23 So I'll ask Mr. Wireman, and I read this
24 for just the specific thing because you did talk about
25 just discussion of the flow through that.

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1 So do you have any evidence that the
2 groundwater flow is affected by the Pine Ridge
3 escarpment in the Basal Chadron?

4 MR. WIREMAN: Well, it really does depend
5 on whether or not the groundwater --

6 JUDGE WARDWELL: Excuse me. Whether or
7 not you've provided any evidence doesn't depend on
8 anything. Either you have or you haven't. And so if
9 you have, fine. But if you haven't then --

10 MR. WIREMAN: Okay. Well, the evidence
11 really relates to the literature I've read and
12 discussions about the structural nature of the Pine
13 Ridge escarpment whether or not it's a true question.

14 JUDGE WARDWELL: Okay. And have you
15 already discussed that already in your --

16 MR. WIREMAN: Yes.

17 JUDGE WARDWELL: Okay. So we don't need
18 to repeat it here.

19 MR. WIREMAN: Yes.

20 JUDGE WARDWELL: That's fine. That's
21 good.

22 And a question for Mr. Wireman again. In
23 comparing the water levels in the Basal Chadron with
24 those of the -- of Brule and the Arikaree, do you --
25 do you -- is it not true that the potentiometric level

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1 in the Brule Aquifer is several hundred feet higher
2 than that in the Basal Chadron?

3 MR. WIREMAN: Yes.

4 JUDGE WARDWELL: And so you agree there is
5 a downward gradient between the two aquifers?

6 MR. WIREMAN: Under current conditions.

7 JUDGE WARDWELL: That's right. Thank you.
8 Covered that.

9 Just show how incredibly insightful all
10 the witnesses are, you've covered many of the
11 questions. That's why it's taking time. I am looking
12 at my questions and they've already been addressed
13 during our discussion.

14 Yeah. Okay. Here, I got one.

15 OST -- Mr. Wireman, your testimony 004
16 opinion one basis to the use of continuous pumping
17 associated with the mining and groundwater restoration
18 will cause some draw down of the Basal Chadron and
19 aquifer miles from the pumping centers.

20 Now, this is going to be a real hard one.
21 So I want you to put your thinking cap on and explain
22 to me what you mean by the MEA pumping center. That's
23 all I am after. Just a clarification of that.

24 MR. WIREMAN: As they mine -- as they
25 progress with the mining units and continue to pump

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1 within the MEA, there is going to be a cone of
2 depression and as was indicated yesterday, which is
3 true, in confined aquifers the radius of those cones
4 go way out because of the low storage coefficients.

5 JUDGE WARDWELL: So, in essence, you're
6 saying it's the same thing as miles from the -- I am
7 trying to put -- to pinpoint when someone reads miles
8 from something and then we come upon the statement
9 pumping center, I want to know what it -- where is
10 that pumping center located on the face of the earth.

11 MR. WIREMAN: That's a good question, Your
12 Honor, and by pumping center it's kind of a collective
13 term for all of the pumping that will go on in the
14 MEA. Yeah.

15 JUDGE WARDWELL: That's fine. I think
16 that answers it. So it's basically the MEA --

17 MR. WIREMAN: Exactly.

18 JUDGE WARDWELL: -- and nothing else.
19 Someone could use the center line of the MEA for that.

20 MR. WIREMAN: That's right. Yes. I just
21 used that for lack of a better term.

22 JUDGE WARDWELL: Just want to make sure
23 that's what it was. Thank you. And you didn't have
24 anything else in mind with that.

25 For Crow Butte, have you estimated the

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1 draw down due to operations and restoration in the
2 MEA? And if so, how much do you expect in the
3 production wells -- at the production wells and what
4 is the radius of influence?

5 MR. LEWIS: Your Honor, we did conduct a
6 hydrologic impact assessment to answer each of those
7 questions. I have to look at those results in more
8 detail to give you a precise answer.

9 JUDGE WARDWELL: And say that again, just
10 the very beginning. I didn't get that.

11 MR. LEWIS: We did conduct a hydrologic
12 impact assessment of draw down at the MEA, and if I
13 was to answer each of your questions I'd have to look
14 -- refer to that in detail.

15 MR. SMITH: That's document -- Exhibit CBR
16 017.

17 JUDGE WARDWELL: And that is -- is that
18 one of the modeling reports?

19 MR. LEWIS: Yes.

20 JUDGE WARDWELL: Okay. We will get to all
21 of those reports at this rate about 11:00 o'clock
22 tonight.

23 (Laughter.)

24 CHAIR BOLLWERK: I hope you're enjoying
25 yourself at 11:00.

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1 JUDGE WARDWELL: I'll be asleep but I
2 don't know about the rest of you. I hope you carry on
3 well, though.

4 All righty.

5 CHAIR BOLLWERK: Do you have a break point
6 in mind? Just wanted to -

7 JUDGE WARDWELL: Yeah. I was kind of
8 looking at that and -- let's move on to Section
9 1.2.1.3. Yeah, why don't we -- this is probably ---
10 close enough to an hour and a half. Yeah.

11 CHAIR BOLLWERK: All right. Why don't we
12 go ahead? It's about 20 after right now. Let's go
13 ahead and take an approximate 10-minute break until
14 about 9:30 if we could.

15 Thank you.

16 (Whereupon, the above-entitled matter went
17 off the record at 9:22 a.m. and resumed at 9:32 a.m.)

18 CHAIR BOLLWERK: All right. We're back
19 after our break, and Judge Wardwell has a few more
20 questions.

21 JUDGE WARDWELL: Yes, I think I'll just
22 start right off. I'm in Section 1.2.1.3 talking about
23 basis three now, groundwater monitoring wells. And
24 we've touched upon this before, and I really only have
25 a couple of questions I think we need, as a board, to

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1 be addressed. And I'll turn to CBR and just ask, in
2 preparing a potentiometric structural contour and
3 isopach maps, did you have water level data northwest
4 and southeast of the MEA or was all of the data within
5 the MEA?

6 MR. LEWIS: Your Honor, did you say
7 potentiometric or structural?

8 JUDGE WARDWELL: All of them, any of them,
9 potentiometric, structural contour, and isopach maps.
10 And if they vary, some you had, you know, you had
11 different pieces of information from different
12 locations, then you can respond by each category:
13 potentiometric, structural contour, or the isopach
14 map.

15 MR. STRIVER: With the potentiometric
16 surface maps, site data was used within the MEA.

17 JUDGE WARDWELL: Would you say that again?
18 I think I interrupted you, at least I thought it. Say
19 it again.

20 MR. STRIVER: For the potentiometric
21 surface maps, the site data from the monitor wells was
22 used.

23 JUDGE WARDWELL: And that was all within
24 the MEA?

25 MR. STRIVER: Correct.

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1 JUDGE WARDWELL: Okay.

2 MR. STRIVER: For the isopach, for the
3 formation thickness maps, primarily within the license
4 or within the MEA site with some offsite data. For
5 the structural contour map, elevation map, the same
6 goes for that. We had inside and some outside data
7 points.

8 JUDGE WARDWELL: Thank you. Oh, I should
9 have backed up a little bit. I forgot to do this. I
10 apologize. Mr. Wireman's testimony on OST004, opinion
11 one, basis three at 2-3 says because it appears that
12 CBR is not installed, any Basal Chadron monitoring
13 wells upgrading or downgrading the license area, you
14 opine that these wells are necessary to provide data
15 to require, to provide the data required to fully
16 evaluate the downgrade impacts to the Basal Chadron
17 aquifer.

18 And so I'll ask Crow Butte also. Are
19 there, in fact, monitoring wells upgradient or
20 downgradient the license area presently? And then
21 what's the plans for the future?

22 MR. PAVLICK: Presently, there's no
23 monitoring wells upgradient and downgradient. In the
24 future, there will be as mining commences.

25 JUDGE WARDWELL: And you say again what's

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1 the --

2 MR. PAVLICK: In the future, there will be
3 within the permit area wells upgradient and
4 downgradient.

5 JUDGE WARDWELL: And what are those wells
6 and how are they going to be in, what's the
7 requirement for them to be installed or how are the
8 plans controlled, or comment more about them, if you
9 would.

10 MR. PAVLICK: So, typically, they would be
11 the monitor well rings that surround each mine unit
12 completed in the Chadron formation. And there's also
13 a license condition that requires downstream
14 monitoring, downgradient monitoring, at Marsland and
15 downstream surface water monitoring.

16 JUDGE WARDWELL: And would you know the
17 number of that license condition offhand?

18 MR. PAVLICK: Not right now. Sorry.

19 JUDGE WARDWELL: NRC, do you agree that
20 there's a license condition that requires these
21 monitoring wells? And if so, what's the number?

22 MR. LANCASTER: Yeah, as far as the
23 perimeter monitoring wells, we have a license
24 condition for the spacing and the distance from the
25 pattern production wells for those perimeter

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1 monitoring wells. And then as far as, you know, the
2 requirements that we put forth for overlying wells,
3 it's license condition 11.1.4 and that sort of thing.
4 It's --

5 JUDGE WARDWELL: What number was that?
6 What number was that?

7 MR. LANCASTER: 11.1.4, but it's also --
8 so, yes, that's the license condition, 11.1.4. So --

9 CHAIR BOLLWERK: 11.1.4? Is that -- yes.

10 MR. LANCASTER: It should be noted that,
11 you know, here with these license conditions, the
12 applicant is stricter than our license condition and
13 they have committed under license condition 9.2 for
14 the overlying wells to be put into the Arikaree and
15 the Brule at a spacing of one to four, I mean one well
16 per four kilometers, four acres, I'm sorry. Excuse
17 me. Four acres.

18 So I'd have to get back to you. I'm
19 having a, I'm forgetting where this license condition
20 -- as far as downgradient, further downgradient, you
21 know, we've got this perimeter monitoring well ring
22 that's required by license condition. I'm not sure if
23 that's what you're referring to.

24 JUDGE WARDWELL: So I'll go back to Crow
25 Butte. Are you, are you planning on putting in wells

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1 further downgradient or were those perimeter wells,
2 the perimeter monitoring wells are what you consider
3 to be the downgradient wells for each mine unit?

4 MR. NELSON: Walt at Crow Butte. The
5 downgradient wells are for water level monitoring to
6 track the level of the aquifer drawdown throughout the
7 operation of the mine. It's a new requirement under
8 the newly-amended license that we don't have at Crow
9 Butte but is in the license as amended, and I don't
10 have the license condition number.

11 JUDGE WARDWELL: It is a documented in a
12 license condition, you said, as part of the renewal?

13 MR. NELSON: Correct.

14 JUDGE WARDWELL: And these are additional
15 ones beyond the perimeter monitoring wells; is that
16 correct?

17 MR. NELSON: These would be outside of the
18 perimeter monitor wells.

19 JUDGE WARDWELL: Okay. Thank you.

20 MR. LANCASTER: Your Honor, yes, sorry
21 about that. Yes, that's correct. No, no, no, it's my
22 oversight.

23 JUDGE WARDWELL: Do you want to fight over
24 who's more sorry?

25 (Laughter.)

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1 MR. LANCASTER: Pretty sure I'm more sorry.
2 Yeah. So license condition 11.3.3 is a license
3 condition that they'll have two additional monitoring
4 wells downgradient. And this is concerning, you know,
5 measuring water levels and that sort of thing. You
6 can read it and ask me questions if you'd like.

7 JUDGE WARDWELL: Thank you. And I think
8 you alluded to this and it was one of my questions
9 that, at some point, I was reading where the overlying
10 wells would be in one per four acres and another place
11 it says one per five acres. I think it was in your
12 SERs where you had one per five acres.

13 MR. LANCASTER: Yes.

14 JUDGE WARDWELL: And that's what you were
15 referring to, that they do it even more strict than
16 you require?

17 MR. LANCASTER: That's correct. And
18 they're committed to that more stringent requirement
19 under license condition 9.2.

20 JUDGE WARDWELL: Thank you. That
21 basically answers the questions I had in regards to
22 the groundwater monitoring wells. The rest of the
23 testimony was clear enough. Sorry? Oh, yes, but I'm
24 not done yet talking. And so I thought I would turn
25 to Mr. Wireman to see if he had anything else.

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1 MR. WIREMAN: Thank you. I do have a
2 comment on that. The additional wells beyond the
3 perimeter wells is indicated there for water levels,
4 but water quality is the issue here or one of the key
5 issues. Secondly, are they going to be beyond the
6 license area or are they still going to be within the
7 license area? Because the risk is to users outside of
8 the license area. So that's a question I have if
9 these additional outside perimeter wells are going to
10 be water quality sampled and are they going to be
11 outside the license area?

12 JUDGE WARDWELL: So I'll ask that of Crow
13 Butte. Are these going to be sampled for water
14 quality and will they be outside of the license area
15 or are they only outside of the mining unit area as
16 you progress northwest or however you progress with
17 your mine units?

18 MR. NELSON: The current requirement is
19 that they're water-level sampled a couple of times a
20 year, if I remember correctly. As I said, it's a new
21 requirement, so I'm not completely familiar with it.
22 Also, it would be not water sampled, just water level.
23 And then the second question was I believe they're
24 inside of the licensed area but outside of the MEA
25 operational monitor well ring. Is that correct? Tom

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1 maybe can --

2 MR. LANCASTER: Yes, that is correct.
3 Yes, they're within the boundary and their exact
4 location is defined in license condition 11.3.3, which
5 is downgradient of these mine units that he's
6 referring to.

7 JUDGE WARDWELL: Thank you. Moving on to
8 1.2.1.4, basis four, surface water hydrology. Mr.
9 Wireman, in its testimony 001, opinion one, basis four
10 at three states that CBR has not submitted any data or
11 information regarding surface water hydrology at the
12 MEA in either its TR or its ER, meaning technical
13 report and environmental report. In your rebuttal,
14 Mr. Wireman, you also state that two southward flowing
15 in ephemeral streams traverse the MEA. A spring,
16 Dooley Spring, parenthesis Dooley Spring, is located
17 within the MEA. The baseline sampling conducted by
18 CBR should include sampling the two streams when the
19 ephemeral flow is occurring in investigating this
20 spring.

21 Crow Butte's 003 rebuttal at answer 28 at
22 15 says, in response to Mr. Waterman's assertion that
23 the Crow Butte, that Crow Butte omitted discussion of
24 ephemeral streams, for instance the Dooley Spring,
25 located within the MEA and the baseline sampling

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1 should include the streams. CBR responds that the
2 Dooley Spring is not located within the MEA but is
3 located approximately 1.5 miles west of the MEA
4 boundary and site investigations found no surface
5 water impoundments within the MEA, as discussed in a
6 technical report, Section 2.7, and that's Exhibit
7 CBR006.

8 And, three, that the lack of water flow
9 and ephemeral drainages in the MEA has prevented
10 collection of surface water samples, citing, again,
11 the technical report at Section 2.9.4. And, four,
12 that the technical report notes that the rainfall
13 runoff occasionally creates temporary small pools in
14 a few places on the MEA site, but there's no evidence
15 of a persistent stream flow in recent times.

16 And I guess I'll just ask Mr. Wireman to
17 what degree does this satisfy any statements that you
18 made for the lack of the surface water hydrology?

19 MR. WIREMAN: It doesn't satisfy my
20 concern. I recognize they're ephemeral and they only
21 flow in response to rain or snow melt, but they should
22 be sampled whenever that happens. That's not unusual
23 in site characterization. And the spring, just the
24 fact that it's located off the MEA site, in my view,
25 doesn't mean that you shouldn't sample it. There is

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1 a potential and it should be sort of investigated as
2 to whether or not that spring is discharged from the
3 Basal Chadron or whether it's discharged from the
4 Brule or whether it's discharged from Arikaree.
5 That's an important understanding because it's water
6 coming to the surface that people use or animals use
7 or is used.

8 JUDGE WARDWELL: Crow Butte, would you
9 like to respond in regards to the sampling the Dooley
10 Spring and what your commitments are in regards to
11 sampling the ephemeral drainage system within the MEA?

12 MR. PAVLICK: Yes, your Honor. Regarding
13 Dooley Spring, on our sampling visits that we've been
14 to that location there's been no water to sample. As
15 regarding the capturing a runoff event, to my
16 knowledge there has not been an opportunity where
17 we've had personnel available and been able to capture
18 water, although we have visited the site on numerous
19 occasions after a rainfall event for that purpose.

20 JUDGE WARDWELL: Have you committed to
21 doing that and at what frequency or what is the
22 process, system in place for ensuring that takes
23 place?

24 MR. PAVLICK: I would have to get back to
25 you on that.

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1 JUDGE WARDWELL: Did you say anything
2 about the Dooley Spring?

3 MR. PAVLICK: We have been to Dooley
4 Spring and never found water there.

5 JUDGE WARDWELL: How often have you been
6 there? Once, twice --

7 MR. PAVLICK: I can't answer the number of
8 times. I'm sorry.

9 JUDGE WARDWELL: NRC, would you like to
10 elaborate on any -- what's your understandings of any
11 commitments to do the surface ephemeral stream
12 sampling and whether or not the Dooley Spring ought to
13 be included in that?

14 MR. LANCASTER: So Crow Butte has made a
15 commitment to sample Dooley Spring if water is
16 available, and that brings us over to the two
17 ephemeral streams that run across the MEA. They
18 provided also a commitment there that, you know, when
19 water becomes available, they'll sample those. It's
20 very difficult to sample these ephemeral streams that
21 have no base flow. And so they've made some
22 commitments to sample, you know, these areas.

23 MR. BACK: Your Honor, they also have a
24 commitment to sample the sediment, and, in our
25 opinion, the sediment is at least as important as the

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1 groundwater, I mean as the surface water because the
2 sediment would leave traces of any contamination that
3 may have been moving through the surface water runoff.

4 JUDGE WARDWELL: Have they sampled the
5 sediments?

6 MR. LANCASTER: Yeah, they sampled the
7 sediments, and this is for radionuclides in accordance
8 with which is consistent with our Reg Guide 4-14 and
9 also the surface water. They made an attempt to do
10 the sampling, but, of course, because we got these dry
11 stream beds, that's very difficult. Their commitment
12 is to sample at seven different locations within these
13 ephemeral streams. They do have, they have sampled
14 the Niobrara River upriver and downriver of where
15 these ephemeral streams drain into the Niobrara River.
16 They sample them for non-radionuclides, and there's a
17 license condition at those two spots that are upstream
18 and downstream to sample for non-radionuclides.
19 There's a license condition for that. So, yeah, you
20 want to add anything?

21 JUDGE WARDWELL: Could you elaborate a
22 little more on their commitment? I mean, it's fine to
23 say you've committed to do it, but if you don't go out
24 there to look to see whether there's flows, it doesn't
25 really help too much. So is there any statements in

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1 their commitments that you're aware of that define
2 when they will come out, you know? Are they required
3 to come out and look at both -- and I think you said
4 both the streams and the Dooley Spring they're
5 committed to sample, and are there designated
6 definitions of when they shall look to see whether or
7 not there is flow, i.e. after a certain rainfall or,
8 you know, a weekly accumulation of that or a snow melt
9 or whatever else that might be there, to assure that
10 they do, they are actively trying to get out there and
11 take a look at the rainfall?

12 MR. LANCASTER: Your Honor, I don't have
13 those words handy right in front of me. Maybe Crow
14 Butte can, you can go to Crow Butte first here on this
15 or we can get back to you.

16 JUDGE WARDWELL: We will see whether some
17 activity over on the Crow Butte bench results in some
18 definitions of when they will attempt to sample for
19 our consideration.

20 MR. PAVLICK: Yes, your Honor. Mr. Smith
21 isn't apparently sleeping behind us. He's actually
22 found something that helps with this.

23 JUDGE WARDWELL: He's the guardian of all
24 information.

25 MR. PAVLICK: Yes, he is, or at least all

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1 commitments anyway. This is in the TR, Section
2 2.9.8.1, baseline direct radiation monitoring. So it
3 reads recommends direct radiation measurement to be
4 collected at 150 meter intervals to a distance of
5 4,921 feet. Oh, excuse me, sorry. I'm reading the
6 wrong excerpt. I apologize. Let me back up to get
7 this section number.

8 JUDGE WARDWELL: Talk a little louder,
9 too. Project your voice. You ought to be able to
10 pull that closer to you, if you want. There you go.
11 That works.

12 MR. PAVLICK: Sorry. New section number,
13 2.9.7.2, ephemeral drainages.

14 CHAIR BOLLWERK: This is in CBR006, right?
15 That's a technical report.

16 MR. SMITH: That's correct.

17 MR. PAVLICK: It states, the last
18 sentence, if water flow becomes available at any time
19 prior to mining at any of the sampling points, MED-1
20 through MED-7, CBR will collect baseline water
21 samples.

22 JUDGE WARDWELL: How do you assure that
23 you're out there when any water is present? That's my
24 question, though.

25 MR. PAVLICK: So the site is staffed, the

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1 site will be staffed 24/7 during that time.

2 JUDGE WARDWELL: So you're not making any
3 attempts between now in regards to getting a
4 background and when you start operations out there; is
5 that correct?

6 MR. LANCASTER: Your Honor, while they're
7 discussing, let me say something here. I think it's
8 Exhibit, okay, CBR006 exhibit, Table 5.7-1, this is
9 the operational affluent and monitoring program, and
10 they have committed here very clearly that, in their
11 pre-operational, that they will be collecting -- that
12 is the operational.

13 MS. SIMON: Your Honor, while Mr.
14 Lancaster is looking, it's Exhibit CBR009 that the
15 tables from the technical report, I believe, that he's
16 referring to.

17 CHAIR BOLLWERK: The technical report
18 cites it several times, but it's actually in nine.

19 JUDGE WARDWELL: And I have a simple
20 question for you. You have done baseline monitoring
21 and collection of sediments in other things, the
22 Niobrara for instance. And attempts were made to do
23 it in the ephemeral streams, but no water was in it.
24 Fine. Is there a program in place such that, if
25 tomorrow we got a big thunderstorm here, they would go

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1 out at that point at least to look to see if there was
2 water there to sample them or is it going to wait
3 until they're closer to initiating mining before they
4 do that? And let's just, we'll get back to that,
5 we'll put that on our list of things to get back to us
6 on because it's obviously taking way too long to do
7 what I thought was a pretty simple question that
8 people would know off the top of their heads one way
9 or the other. Crow Butte, are you now actively going
10 out there several times whenever you have a
11 thunderstorm or not, or are you waiting until you're
12 going to start doing mining? That's the answer to the
13 question.

14 MR. PAVLICK: No, we're not.

15 JUDGE WARDWELL: So you're not planning on
16 going out there prior to, until you get closer to the
17 mining? You're not going out there now consistent
18 with what you did with the pre-mining sampling of the
19 other bodies, water bodies?

20 MR. PAVLICK: We're not doing it now.
21 Table 2.9-41 in the TR lists surface water
22 requirements, sampling requirements. For the Niobrara
23 River, there's a monthly sampling requirement both
24 pre-operational and pre-construction, also a semi-
25 annual requirement for sampling for some different

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1 parameters.

2 JUDGE WARDWELL: Yet, you're not at your
3 pre-operational stage yet; is that correct?

4 MR. PAVLICK: We are not.

5 JUDGE WARDWELL: But, yet, you did
6 background monitoring for other constituents,
7 constituents is the wrong word. Were you there for
8 both sediments and you did it for both surface water
9 where it was available, correct?

10 MR. PAVLICK: Correct. All the sampling,
11 soil and water samples were done for preparation of
12 this process.

13 JUDGE WARDWELL: At the time you took the
14 Niobrara River samples during this baseline
15 monitoring, if there was flow in those ephemeral
16 streams, wouldn't you have sampled them?

17 MR. NELSON: Yes, sir.

18 JUDGE WARDWELL: Then my question is why
19 aren't you now, as soon as there is the opportunity,
20 obvious that streams are flowing around here because
21 of the weather conditions, do you go out there to look
22 to see if they are flowing and, if so, you sample
23 them, or are you just going to wait until the pre-
24 operational stage?

25 MR. PAVLICK: We're going to wait.

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1 JUDGE WARDWELL: Thank you. NRC, and if
2 you don't have an answer to this, that's fine, but are
3 you, what is your position in regards to what their
4 commitments are for sampling these ephemeral streams
5 that are now dry?

6 MS. STRIZ: They have made a commitment to
7 do one-year pre-operational sampling if water is
8 available. This is over and above what is required by
9 our guidance. There's no requirement to sample
10 ephemeral streams. These sort of flows of water
11 quality are not representative of any average.
12 They're very much, you know, dependent on the quantity
13 of water. So this is over and above what is required.
14 We require perennial streams to be sampled where it's
15 representative of base flow and you can get some sort
16 of assessment of what the average water quality is, so
17 this is over and above a typical requirement for an
18 ISR facility.

19 JUDGE WARDWELL: Okay. Thank you very
20 much. Moving on to a similar but somewhat different,
21 and that's 1.2.1.5, basis six, mine unit groundwater
22 quality baseline monitoring. And I will note that,
23 which I'm sure everyone is just so fine in tune with
24 my sections of my outline that I read here that you'll
25 recognize and probably should be jumping off your

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1 seats saying what happened to basis five because we
2 have gone from four to six, and I know you noticed it.
3 So I'll just remind everyone that the meteorological
4 data that's associated with basis five was struck, so
5 that's to comfort you so you can relax now straight
6 through before we have lunch.

7 Mr. Wireman's testimony, again Exhibit
8 004, states that baseline monitoring, paren, only
9 restoration wells, close paren, that the TR reports
10 that baseline groundwater quality is determined from
11 data from the baseline restoration wells. CBR
12 proposes a minimum of six baseline restoration wells
13 per mine unit. Each of these wells will be sampled
14 four times prior to mining. This data will be used to
15 establish baseline. These wells have not been
16 selected and no data is provided regarding background
17 concentrations for applicable constituents.

18 And I guess I'll start with Crow Butte.
19 What are these restoration wells, and how do they
20 relate to monitoring wells? Are they one in the same,
21 or are they different ones? And what do you mean by
22 them?

23 MR. NELSON: This is Walt at Crow Butte.
24 Baseline restoration wells are established both with
25 the NRC license conditions and in compliance with the

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1 NRC license and with the NDQ Class III permit. Those
2 wells will eventually be operational wells that we'll
3 use during or could be used as operational wells
4 during the production phase. They will be, the
5 baseline water quality will be established by the four
6 samples, as indicated there. And then --- but that
7 will be prior to the initiation of mining in that mine
8 unit.

9 Those wells, we would need a license and
10 a Class III permit to drill those wells. So those
11 have not been even drilled yet. Those will be
12 identified during the operation, as we do it at Crow
13 Butte site.

14 JUDGE WARDWELL: And if I understand it
15 correctly that you do install and sample these wells
16 for baseline conditions, correct?

17 MR. NELSON: Yes, and that's prior to
18 mining in that area. That's done on a mine unit
19 basis, so, for mine unit one, we would go in and drill
20 the well field. Then we would establish the baseline
21 water quality using those baseline restoration wells.
22 That establishes the restoration parameters for that
23 mine unit. Then with approval from the regulatory
24 agencies, we're able to begin mining in that mine
25 unit. That package includes the baseline restoration

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1 standard for that mine unit.

2 Some of those wells may be used in the
3 operational phase, so they may be a production or an
4 injection well during mining. And then when
5 restoration is complete or when we deem that we're
6 nearing the completion of that phase and go into the
7 monitoring phase, those are part of the sampling
8 program that we have to confirm that we've achieved
9 the restoration standards.

10 JUDGE WARDWELL: As you progress with your
11 mine units being, when you're completing and you're
12 moving into the next one, isn't there a possibility
13 that the water quality in the new mine unit has been
14 affected by the mining that's occurred in the previous
15 mine unit?

16 MR. NELSON: We have perimeter monitor
17 wells around each mine unit. So then, as the mine
18 expands, the ones that are interior to the mine are
19 absorbed into the operation. But we do have perimeter
20 monitor wells around those so that we're protecting
21 those mine units outside of the active part of the
22 mine from exposure to lixiviant until we progress in
23 our mining plan into that mine unit.

24 JUDGE WARDWELL: So it's your position
25 that, when you sample the restoration wells, say at

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1 your third mine unit, that you've already done two of
2 the mine units and they may be off to one side or the
3 other of the third one that you're doing, that neither
4 of those mine units have any chance of affecting the
5 background water quality in that third mine unit from
6 what it was right as it exists today for instance?

7 MR. NELSON: They're currently, they're
8 protected by our monitoring program as we progress
9 through the mine units.

10 JUDGE WARDWELL: And have you ever seen a
11 situation that indicates that, in fact, a mine unit
12 has been affected by the previous mining of any other
13 mine units?

14 MR. NELSON: Not that I'm aware of. The
15 baseline water quality that we've observed, as we've
16 progressed through our mining plan, in the mine units
17 as they come on have been fairly consistent with what
18 we've seen in previous mine units. That would be the
19 best data that I could point to that would support
20 that.

21 JUDGE WARDWELL: NRC, are you concerned
22 that there might be some disturbance or changes in the
23 water quality of a proposed mine unit prior to getting
24 there caused by the mining activities in the existing
25 unit, such that the background water quality that's

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1 sampled, once they get to that new mine unit, is not
2 indicative of what the baseline was prior to any
3 mining, for instance as it exists today in that
4 location?

5 MS. STRIZ: From the testimony from Crow
6 Butte, they stated that they will be placing the
7 perimeter monitoring wells and that they will be
8 monitored to prevent this sort of incursion that you
9 are describing into the surrounding mine units. When
10 they go and put the wells into a mine unit, they will
11 provide us with a well field package demonstrating all
12 the well completions and all their locations. And at
13 that time, we will be able to evaluate whether or not
14 that we agree that those perimeter monitoring wells
15 are placed so that there would not be incursions into
16 the adjacent mine units. So that would be something
17 that we would have to evaluate at the time that they
18 present the well field package.

19 JUDGE WARDWELL: If it happened and an
20 excursion happened to go into a pre-operational mine
21 unit prior to establishing background, have you ever
22 taken the position -- and you saw a change in that, do
23 you have any options to require a different baseline
24 concentration be used besides the one that's there
25 now, recognizing that the one that's there now has

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1 been elevated, if you will, because of the previous
2 mining activity surrounding it?

3 MS. STRIZ: Well, first of all, let's be
4 very clear about what an excursion is. It is a
5 detection of the three indicator parameters of
6 alkalinity, chloride, and conductivity. It's not an
7 indicator of contamination such as --

8 JUDGE WARDWELL: Well, stop right here
9 because I don't want to get into a discussion of
10 excursions. I use that word because you used that
11 word.

12 MS. STRIZ: Correct.

13 JUDGE WARDWELL: But I will say just
14 impact. Let's forget about the word excursion then.
15 If there's an indication that a proposed mine unit
16 that hasn't even been considered yet but is going to
17 be the next one that's going to be developed has been
18 impacted, the water quality in that area has been
19 impacted by the previous mining units, if there is an
20 indication of that, you have any, is it part of your
21 plans and abilities to say that the existing ground
22 water that exists under that proposed mine unit
23 currently isn't what the background was prior to them
24 mining such that you would use a different baseline
25 value for restoration standards than what the pre-

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1 operational restoration wells might show because of
2 the impact from the other two mine units?

3 MS. STRIZ: I would say definitely yes.
4 We saw that the hazardous constituents that have to
5 meet the restoration standards within an adjacent mine
6 unit have been impacted, yes, we would consider
7 whether or not to adjust the baseline restoration
8 values. This has happened with previous pilot sites
9 where a pilot was conducted and there was an elevated
10 level when they came in to do the commercial
11 production, and we have considered that. So I would
12 say that would be an analog to that.

13 JUDGE WARDWELL: Thank you. CBR, in their
14 rebuttal, 033, answer 30 at 16 says wells will be
15 established as part of developing the mine units at
16 Marsland under license condition 11.1.3, and that's
17 Exhibit NRC009, and that it specifically addresses a
18 sampling necessary to establish background groundwater
19 quality data for the ore zone and overlying aquifers.
20 This background water quality will be used to define
21 the background groundwater protection standards
22 required to be met in 10 CFR Part 40, Appendix A,
23 Criteria 5(b)(5) for the ore zone aquifer and
24 surrounding aquifers.

25 And so, for Mr. Wireman, I'll ask is not

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1 the applicant committed to collecting baseline for
2 each mine unit prior to its development under this
3 license condition?

4 MR. WIREMAN: The method that they're
5 proposing here for establishing baseline is inherently
6 flawed because it's hard to establish --

7 JUDGE WARDWELL: Is not the applicant
8 committed to collecting baseline for each mine unit
9 prior to its development?

10 MR. WIREMAN: No, I don't believe they
11 are.

12 JUDGE WARDWELL: Why not?

13 MR. WIREMAN: Because it's not baseline.

14 JUDGE WARDWELL: And now you can go on
15 with that. I've got to get the answer to that on the
16 record. Otherwise, I've been through it too many
17 times. I get to the transcript thinking, because I
18 know what you're doing here by looking at you and
19 you're going on with a statement. I fully understand
20 what your answer in regards to yes and no is, but then
21 when I go to write it up I don't have that on the
22 record and it's not going to do me any good. Oh, I
23 know he really meant to say that and that's what he
24 was alluding to. So answer the question first, then
25 go on to elaborate.

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1 MR. WIREMAN: I'll do better, I promise.
2 The answer is no, and the reason for the no answer is
3 it's hard, baseline is pre-mining. It's what's there
4 now. Before any mining operations take place, what is
5 the current water quality? It's hard for me to
6 imagine a scenario if your mine unit process, as you
7 go from one mine unit to the next, if you're working
8 in the downgradient direction, in this case south to
9 north, it's really hard for me to imagine a scenario
10 where the mine unit that's already been mined and
11 water quality has been altered, that none of that
12 water gets into the next mine unit. I just have a
13 real hard time with that.

14 I understand the monitoring, but
15 monitoring, in and of itself, doesn't prevent that
16 change. It may tell you what the change is, but it
17 doesn't prevent it. So as soon as you've moved water
18 from a mined unit that's been impacted by the mining,
19 downgradient into an unmined unit, you've altered that
20 chemistry and it's no longer baseline.

21 JUDGE WARDWELL: Is it your position that,
22 as I'm hearing you say that, I don't want to put words
23 in your mouth, but is it possible that you don't even
24 need to have the water get there, just the fact that
25 you're changing the environment there may see that

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1 changes in the water quality away from that, even
2 upgradient and downgradient through --

3 MR. WIREMAN: Yes.

4 JUDGE WARDWELL: -- dispersion and just
5 the change of the oxidation limit in one area?

6 MR. WIREMAN: You're absolutely correct,
7 your Honor. And one of the ways that could happen is
8 by lowering the potentiometric surface and lowering
9 the water levels and exposing previously-saturated
10 materials to an unsaturated condition. So that can
11 cause what you're talking about.

12 JUDGE WARDWELL: You're not referring to,
13 you're not alluding or implying that, in fact, they
14 will actually draw down the piezometric level to turn
15 the confined aquifer to non-confined aquifer?

16 MR. WIREMAN: I was just giving you an
17 example of what you were referring to.

18 JUDGE WARDWELL: But I would see that as,
19 would that not, when you're drawing down the
20 piezometric level in a confined aquifer, you aren't
21 really removing water from some other aquifer up above
22 or below with that activity to the degree that you
23 would with an unconfined aquifer where, truly, when
24 you're lowering the level, you're removing water from
25 storage in the aquifer. You're not removing water

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1 from storage in the confined aquifer, you're reducing
2 the pressure levels?

3 MR. WIREMAN: That's correct.

4 JUDGE WARDWELL: Yes, okay. Thank you.
5 Would not the assurances of staff that they have the
6 flexibility to change the baseline values from what
7 might be encountered in a restoration well if they had
8 any indications that, in fact, they were entirely
9 different than what they had seen up to that point?
10 It's how I interpreted what they said.

11 MR. WIREMAN: I don't understand how
12 anybody can change baseline. Baseline is pre-mining
13 and it is what it is. If it's been altered due to
14 mining operations, it's no longer baseline.

15 JUDGE WARDWELL: But could not they -- I
16 mean, the goals of this are in regards to establishing
17 what are the parameters that we're going to use and
18 target for our restoration efforts under 5(b)(5), and
19 these wells are being installed to establish that
20 number. If the water quality from those wells gave an
21 indication that that's not baseline because it's so
22 much higher, for instance, than what they've seen for
23 the past five years of mining, for instance, as just
24 an example, I heard NRC say, and I'll verify again
25 with them when we're through this, that, in fact, they

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1 have the abilities to say, no, you're not going to use
2 that as your baseline level because it's artificially
3 elevated because of the other mining units, you're
4 going to be using this, i.e. probably some average of
5 what they've seen or what they would expect to see.
6 Isn't that a comfort that this issue would be somewhat
7 mitigated?

8 MR. WIREMAN: I'm glad they have that
9 ability, and I would like to better understand how
10 that process, how they would go from the number
11 reported to what I assume would be a lower number, and
12 what that lower number would be and what triggers
13 that, you know, what triggers that action on their
14 part. But I am glad they have that ability, yes.

15 JUDGE WARDWELL: Well, I'll clarify they
16 do. This is what I thought I heard, but it may not
17 be, I might not be correct, but we'll see. NRC, Dr.
18 Striz?

19 MS. STRIZ: As part of the well field
20 package, they will provide the water quality for all
21 the constituents, hazardous constituents and
22 additional constituents, that will be used for the
23 restoration standards. They have to do a statistical
24 analysis of those constituent levels. If there's an
25 outlier, it's very clear and it is subjected to

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1 outlier tests to evaluate whether or not it should be
2 included in the data set, and we would note that and
3 they would provide an explanation, as you do in an
4 outlier analysis, of why it's occurring, if it's a
5 sampling error or if it's because of prior impacts, as
6 you stated.

7 So that is part of the well field package,
8 and we do evaluate it statistically for all the
9 hazardous constituents that will be regulated.

10 I do want to correct Dr. Wireman. He
11 continuously states that the mine unit fluids are
12 moving into other mine units. This is completely
13 incorrect. Each mine unit is required to have an
14 inward hydraulic gradient and to be monitored, an
15 excursion perimeter monitoring wells every two weeks
16 to detect even the slightest whiff that something is
17 moving out of that mine unit and then corrective
18 action is taken. So it is an implausible scenario to
19 state that these constituents are just freely moving
20 downgradient into other mine units.

21 JUDGE WARDWELL: But is it not true that
22 you're drastically changing the environment in the
23 Basal Chadron at the mine unit?

24 MS. STRIZ: Absolutely. When you inject
25 --

1 JUDGE WARDWELL: And, and that
2 constituents are mobilized and move both upgradient
3 and downgradient, so chemical transportation rather
4 than hydraulic transportation --

5 MS. STRIZ: No, absolutely not. If you
6 maintain an inward gradient, all the water flow is
7 into the mine unit, and they have to demonstrate it by
8 license condition, and constituents cannot overcome
9 and move out against the groundwater flow.

10 JUDGE WARDWELL: So you don't believe in
11 any chemical transport phenomena?

12 MS. STRIZ: Diffusion does not overcome a
13 very strong inward hydraulic gradient, if that's what
14 you're inferring.

15 JUDGE WARDWELL: That's what I'm asking.

16 MS. STRIZ: No, absolutely not.

17 JUDGE WARDWELL: Crow Butte, do you
18 disagree with what NRC believes is their position and
19 abilities to, abilities that they can exercise during
20 their evaluation of your water quality data as you
21 move into a new mine unit?

22 MR. PAVLICK: We agree with the NRC.

23 JUDGE WARDWELL: Okay. Mr. Wireman, one
24 last comment on what you've heard and if you have any
25 extras that you would like to make.

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1 MR. WIREMAN: I thought I heard her say
2 that she had an experience where this had happened
3 once.

4 JUDGE WARDWELL: That's what I heard, yes.

5 MR. WIREMAN: So I guess I would ask what
6 happened under that scenario? It obviously did move
7 from one to the other, so that tells me that it can
8 happen.

9 JUDGE WARDWELL: Thank you. Section
10 1.2.2, opinion two, structural geology
11 characterization. Mr. Wireman states in his testimony
12 004, opinion two at three, in addition to those
13 factors affecting regional hydrogeology and
14 groundwater flow, Oglala Sioux Tribe challenges the
15 characterization the structural geology is
16 insufficient to develop an acceptable conceptual model
17 of the site hydrology that is adequately supported by
18 the data.

19 Crow Butte, in their rebuttal at 033,
20 answer 31 at 16 to 17, in response to Mr. Wireman's
21 position that the characterization of structural
22 geology at the regional level is insufficient to
23 develop an acceptable conceptual model of the site
24 hydrology, in particular with respect to the effects
25 of the Pine Ridge escarpment on the groundwater flow

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1 in the Basal Chadron, CBR notes that MR. Wireman has
2 not discussed how the structural geology that he
3 implies may exist between the main mine unit and the
4 MEA can be reconciled with the hydraulic data at those
5 sites.

6 I've now, after reading all that, come to
7 realize that this is, again, talking about mostly
8 relationship to the Pine Ridge escarpment, which I
9 think we've covered in pretty well depth. I'm looking
10 over my questions that I have. They were pretty much
11 addressed by our pretty long discussion earlier this
12 morning. We covered, yeah, we've covered this in good
13 detail, so I don't have anymore questions on this
14 section.

15 And, yeah, all the discharge zones stuff
16 is back again. It's interwoven with all of that.
17 Would you agree, Mr. Wireman, that lots of this
18 discussion was interwoven with we had in regards to
19 recharge, discharge, and the Pine Ridge escarpment in
20 this section? Is there something else that you wanted
21 to bring up?

22 MR. WIREMAN: Just, I totally mostly agree.
23 Just one note I would -- I want to, first of all,
24 defer to Dr. LaGarry. He's more of an expert on the
25 structure than I am. And, secondly, I come at this

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1 from, maybe it's a rather simple look, but we have a
2 Black Hills uplift to the north and, you know, I'm --

3 JUDGE WARDWELL: I'm having a little
4 trouble, it's not that you're just not loud enough --

5 MR. WIREMAN: I'm sorry.

6 JUDGE WARDWELL: Yes, I think if you just
7 --

8 MR. WIREMAN: Again, I defer to Dr.
9 LaGarry on the details of this, and I'm sure you'll
10 question him more about that. The second point I'll
11 make is that the structure is more complex. In
12 reading the MEA or the EA and the TR, relative to what
13 I understood a couple years ago with the renewal,
14 there's a lot more information in these documents
15 about the structure and there's apparently significant
16 disagreement out there about the structures that exist
17 here in this part of Nebraska.

18 I would just simply say from a simple
19 point of view, with a Black Hills uplift very close
20 by, these rocks have been perturbed. There's no
21 question about that. There are structural elements
22 here, and they're apparently not very well known,
23 disagreement.

24 And then, finally, as a hydrologist, you
25 know, my view is almost all groundwater flow is

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1 preferential flow. So structure leads to pathways,
2 pathways may or may not move water, and so that's the
3 understanding we need to be a little better at.

4 JUDGE WARDWELL: Thank you. That's good
5 because you've pointed out that's one section we
6 haven't talked about much. I'm just trying to see if
7 I want to do it now or later with -- I can't remember
8 whether I've got it under you, Dr. LaGarry, so I can't
9 find the questions that I actually remember, I
10 remember I have written down, but I know I can re-do
11 it.

12 Well, let me go with what I've got here.
13 And when we get to you later this afternoon or early
14 tomorrow morning, we'll cover the fractures in more
15 depth. But what I've got under this section, at
16 least, the Oglala Tribe, Mr. Wireman, in his rebuttal,
17 Exhibit 015 at two, says there is significant
18 uncertainty about groundwater flow in the Basal
19 Chadron downgradient in the MEA and notes that Section
20 3.3.2.1 of the EA, that's NRC document 006 at 67,
21 states that groundwater flow in the Basal Chadron
22 aquifer is not affected by the Pine Ridge escarpment
23 even though this escarpment functions as a groundwater
24 divide for the Arikaree and Brule. And there's no
25 discussion or statement, which we've talked about

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1 before.

2 I read too early. Here we go. This is
3 OST010, which everyone will remember is Dr. LaGarry's
4 testimony, rebuttal, no regular testimony at five.
5 You state that my work over the past 25 years has
6 shown that there are likely hundreds more fractures
7 that are too small to be shown on such a diagram,
8 referring to just a structural map showing the
9 evidence of faults. And I'd just ask you what
10 evidence or experience do you have that justifies the
11 statement that there's hundreds more fractures that
12 are too small to be shown?

13 DR. LAGARRY: During the 1990s, when I was
14 employed by the Nebraska Geological Survey, I headed
15 the state map program. This state map program, over
16 those ten years, mapped 80 one to 24,000 quadrangles
17 towards eventual compilation into a larger-scale map,
18 which never happened because of a giant rift and the
19 disbanding of the Nebraska Geological Survey in its
20 form at that time.

21 These one to 24,000 geologic maps are
22 archived at the United States Geological Survey. They
23 are also available in limited amounts locally. I have
24 copies of some of them.

25 During the course of that ten years, we

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1 walked over the entire 80 one to 24,000 quadrangles,
2 photographed and directly observed hundreds upon
3 hundreds upon hundreds of parallel joint sets oriented
4 generally northwest to southeast and southwest to
5 northeast.

6 In my rebuttal testimony, I included a
7 poster by Maher and Shuster which attempted to give an
8 idea of the ubiquity of the joint sets. They selected
9 in that poster, they selected particular areas to use
10 in the poster, but those areas that they used were not
11 isolated areas. Those areas were entirely
12 representative.

13 So over the course of ten years of walking
14 over the terrain in this area, I observed these joint
15 sets. But because of the conventions I was given, I
16 did not map those joint sets. If you map them all,
17 then you have a map that's entirely cluttered with
18 little lines. So we had a one-meter displacement
19 informal rule. If there was over a meter of
20 displacement -- okay, oh, it's back. Awesome. What
21 was I saying? Oh, yes, I walked over it all and
22 mapped it all and saw it all. It was awesome.

23 JUDGE WARDWELL: That's good testimony.
24 I'm going to task you with another obligation, if you
25 will. I believe most of the discussion that I want to

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1 talk about in regards to whether or not there's a
2 presence of the Niobrara fault and the Pine Ridge
3 fault within the MEA I have for you, that's prior to
4 Mr. Wireman, so that's why I refer to it here in my
5 questioning because I'm doing it out of order.

6 If I'm wrong in my memory, still remind me
7 to make sure we cover it when we're chatting later
8 this afternoon, that we get to that if I don't get to
9 it myself. And I'll check over lunch.

10 DR. LAGARRY: That would be awesome.

11 JUDGE WARDWELL: I want another memory
12 because we don't want to miss not talking about
13 whether or not the Niobrara fault and the Pine Ridge
14 fault crosses the MEA or not, and I just don't see it
15 here, because I'm going to go on and now talk about
16 that. Under NRC006, their EA, Section 3.2.2.2, there
17 are three .2s, so I hope I didn't do four of them, at
18 3-14, while a potential presence of a Niobrara fault
19 further south of the MEA is more certain, and this is
20 NRC speaking, even if the Pine Ridge fault and the
21 Niobrara fault do exist, and, again, we're going to
22 discuss whether or not they do this afternoon, it is
23 staff's opinion that the presence could not lead to
24 significant adverse environmental impacts for several
25 reasons. One, it's based on groundwater velocity

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1 estimates provided in the EA and it would take at
2 least 500 years for groundwater to migrate from the
3 MEA to the reported Pine Ridge fault during which time
4 any constituents of the lixiviant would attenuate
5 through absorption and dilution. Two, ambient
6 groundwater flow in the Basal Chadron sandstone
7 aquifer is to the northwest and away from the reported
8 Niobrara River structural feature or fault. Three,
9 once uranium extraction begins, groundwater flow would
10 be inward towards mining units, as required by license
11 condition 10.1.6, and away from both the Pine Ridge
12 fault and the Niobrara fault for the ambient water
13 hydraulic gradients and strongly downward, are
14 strongly downward from the overlying aquifers of the
15 Brule Formation and the Arikaree Group to the Basal
16 Chadron sandstone aquifer and, therefore mining fluids
17 would not be able to migrate upward through any
18 preferential pathways. Five, the downward gradient
19 would become even more pronounced during the recovery
20 operations. And, six, CBR will conduct additional
21 aquifer pumping tests that would be designed to
22 identify hydraulic, including those caused by
23 faulting.

24 And I guess, I guess I'll ask just Mr.
25 Wireman, while I've got him, if he would like to

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1 comment on the position of NRC in regards to, if any
2 faults did exist, they're basically saying they won't
3 be an issue because of these other controls that are
4 at the site.

5 MR. WIREMAN: I guess I would answer that,
6 I think the uncertainties around this are still far
7 too high to be making very many conclusions about the
8 effect of these structures and these faults on
9 groundwater flow. Secondly, I would say my experience
10 with faults and their interaction with groundwater,
11 there are sort of two possibilities. Faults can be
12 superhighways for groundwater if they're permeable and
13 if they're not gouged up and cemented up. I've seen
14 that, and I've seen just the opposite where faults are
15 so gouged up that groundwater cannot flow across them
16 or in them. Both are possible, both exist out there.
17 I have no idea what these faults do or how they might
18 interact with groundwater. My only comment was maybe
19 we need to find out. But I would defer to Dr. LaGarry
20 as to their presence and how close they might be to
21 the MEA and whether or not they're close enough that
22 we need to be concerned.

23 JUDGE WARDWELL: Well, then, hopefully, we
24 get to it this afternoon so you're still sitting next
25 to, and I think we should if we keep on moving along,

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1 but I appreciate that response and we will cover that
2 in depth, if my memory serves me correctly on where
3 I've got that located in my notes.

4 Yes, there is one. Yes. Wouldn't it be
5 pretty difficult, especially in regards to the gouging
6 that you were talking about, to ascertain -- what
7 we're really concerned about is the transmissivity of
8 any fracture or fault in what we're dealing with.
9 Isn't that a fair assessment?

10 MR. WIREMAN: Well, we're concerned as to
11 whether or not they're a preferential flow path.

12 JUDGE WARDWELL: Right. So, yes, okay,
13 that's a good phrase. And that's going to be directly
14 related not so much to the presence of a fault but
15 really is a preferential pathway through that fault --

16 MR. WIREMAN: Correct.

17 JUDGE WARDWELL: -- and if it's gouged up,
18 as you say, which we've seen in lots of faults, such
19 that it's pretty well plugged, it's not an issue. If
20 it isn't, it's a big issue. That's pretty hard to go
21 and sample for, isn't it? It's very difficult to
22 really tell the degree of transmissive or -- I forgot
23 your phrase, but I like your phrase. I'll use the
24 word transmissive to mean what you just said earlier
25 in regards to the phrase, preferential pathway.

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1 MR. WIREMAN: Right.

2 JUDGE WARDWELL: By drilling because, you
3 know, the gouge tends to get washed out, it's hard to
4 get a core, for all the different reasons. And is it
5 really representative of what it is through the whole
6 site? Don't most people rely on just hydraulic
7 responses to aquifer testing, rather than trying to go
8 out and actually sample a bedrock, especially when
9 it's several hundred feet below the ground surface?
10 It's one thing to look at an outcrop and make a
11 decision on it, but we can't do that because an
12 outcrop isn't where it is where we're looking at it.
13 And isn't that pretty much what most people do now,
14 rather than try to sample rock and make some decisions
15 based on that?

16 MR. WIREMAN: You're correct. It would be
17 difficult and expensive to drill into a fault and look
18 for gouging, and gouging might occur here and not
19 occur there. The way we typically approach that is a
20 monitoring well on either side of a fault in the same
21 formation. And if the water levels are drastically
22 different, that tells you that the fault is probably
23 a boundary to flow. If the water levels are similar,
24 it tells you the fault is not much of a boundary to
25 flow.

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1 So that's a much better way to approach
2 that than drilling into the fault, which you're
3 absolutely correct. That's just not going to be very
4 enlightening.

5 The other thing I would just mention is
6 that, and I've had this experience, sometimes water
7 will flow to a fault groundwater and it won't flow
8 across it, not because it's gouged, because it's
9 totally open and the water gets in it and makes a
10 right-hand turn. I've seen that.

11 So all those things are possible, but
12 you're absolutely correct. You don't come at this
13 from drilling into the fault.

14 JUDGE WARDWELL: Thank you. The last item
15 under this section, Dr. LaGarry's rebuttal, 016 at
16 five, says of greatest concern is the proximity to the
17 Niobrara, a national scenic river, which is used for
18 recreation by thousands of people each year.
19 Unfortunately, if the High Plains aquifer, and the
20 High Plains aquifer is Arikaree in the Oglala; is that
21 correct, Dr. LaGarry?

22 DR. LAGARRY: That's correct.

23 JUDGE WARDWELL: Okay. Thank you. And
24 you want to say impacts the High Plains aquifer and
25 ultimately to the Niobrara River because vertical

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1 excursions from -- I'm sorry. I jumped ahead.
2 Unfortunately, if the High Plains aquifer were to
3 become contaminated, the effects would be irreversible
4 and catastrophic for the local agricultural economy.

5 And so for you, Dr. LaGarry, I'd like to
6 ask do you agree with the staff that even if the Pine
7 Ridge fault and the Niobrara River fault do exist,
8 their presence would not lead to significant adverse
9 environmental impacts to the High Plains aquifer and,
10 ultimately, the Niobrara River because vertical
11 excursions from the Basal Chadron Chamberlain Pass
12 Formation up to the Brule or Arikaree aquifers would
13 not occur for a suite of reasons previously mentioned,
14 and that is the fact that the ambient groundwater flow
15 in the Basal Chadron is to the northwest away from the
16 Niobrara River, that ambient groundwater gradients are
17 strongly downward from the overlying Brule Formation
18 and Arikaree Group down to the Basal Chadron, and that
19 with uranium extraction groundwater flow would be
20 inwards towards the mine units.

21 Would you like to comment on that, Dr.
22 LaGarry?

23 DR. LAGARRY: Firstly, I don't agree that
24 that's true. I agree with Mr. Wireman that there's a
25 lot of uncertainty. If, if the applicant or NRC or

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1 some third party were to do a satisfactory fracture
2 analysis using inexpensive surface geophysics,
3 lineaments, pedestrian survey, some of the same kinds
4 of things we did in the 90s when originally mapping
5 it, that might bring us closer to having confidence
6 that what they assert is true. At this point, I
7 consider it presumptive.

8 JUDGE WARDWELL: Thank you. Moving on to
9 1.2.3, opinion three, the MEA aquifer testing, Mr.
10 Wireman, Exhibit 004, opinion three at four, echoes
11 Dr. Kreamer's criticisms of CBR's aquifer testing
12 conducted at the MEA, stating that it is inadequate
13 for developing an acceptable statewide conceptual
14 hydrologic model and does not adequately characterize
15 a subsurface heterogeneity. His opinion is reflected
16 in the previous 2.1, opinion one, mischaracterization
17 of the hydrogeologic environment addressing concern
18 two of this contention.

19 And so I think we've covered most of this
20 yesterday. I'll look through to see if there's
21 anything and then ask Mr. Wireman if he has any
22 additional things besides what we've already covered
23 extensively yesterday and even our conversations today
24 under this topic area.

25 I will ask one from you. Do you agree

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1 that the Theis analysis is a well-established method
2 that is often used as a starting point for evaluating
3 pumping test analyses and that the closeness or the
4 goodness of the fit, if you will, you know, however to
5 describe it, to the type curve, that also helps to
6 indicate whether other methods, such as leaky aquifer
7 techniques, should be employed to evaluate the field
8 data? Is that a standard way that people approach it
9 usually?

10 MR. WIREMAN: Yes, I agree that Theis
11 equation and analysis is used very commonly and I
12 would stress the point that it is a starting point and
13 that it helps you determine whether you need more
14 sophisticated analysis.

15 JUDGE WARDWELL: Okay. Thank you. Is
16 there any other under this topic area that we've kind
17 of exhausted yesterday it seems like, but feel free to
18 --

19 MR. WIREMAN: I don't think there's
20 anything in addition. I'll just reiterate the point
21 that there was only one test and it did not cover a
22 large part of the MEA and their indications of
23 heterogeneities even from this test. So that tells me
24 that maybe some more testing should be done.

25 JUDGE WARDWELL: Thank you. I can go

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1 straight through lunch, but if you want to give them
2 a break this is probably a good shot.

3 CHAIR BOLLWERK: Well, let's do it right
4 now then. Why don't we go ahead and take a ten-minute
5 break, and we'll come back at about five til 11.

6 (Whereupon, the above-entitled matter went
7 off the record at 10:44 a.m. and resumed at 10:57
8 a.m.)

9 CHAIR BOLLWERK: We're back from our break
10 and continue with Judge Wardwell's questions.

11 MS. SIMON: Excuse me, your honor, excuse
12 me. Before we go on, could -- Mr. Wireman had made a
13 remark about Dr. Striz's comments on the pilot study,
14 and I was wondering if Dr. Striz could have an
15 opportunity to clarify with regard to that really
16 quickly.

17 JUDGE WARDWELL: I can't hear. It's fine,
18 whatever they want to say.

19 CHAIR BOLLWERK: About the pilot, Mr.
20 Wireman made a comment about the pilot project.

21 JUDGE WARDWELL: Okay.

22 CHAIR BOLLWERK: Do you have time? Go
23 ahead.

24 MS. SIMON: Yes, apparently I wasn't
25 clear. I was searching in my mind for an analog where

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1 the baseline restoration values had been impacted by
2 operations, and apparently I didn't make it clear.
3 That pilot study was not due to migration of any
4 contamination, that elevated value. It was the fact
5 that they had operated a pilot study on a very small
6 footprint, maybe one well pattern.

7 And then they went to commercial
8 operation. And so that one well pattern had an
9 elevated value for uranium. And so when you come back
10 in, we looked at it in terms of all the other
11 measurements in the larger mine unit versus that pilot
12 being an outlier that needed to be thrown out and not
13 included in the calculation of the baseline water
14 quality for the restoration standards.

15 It was not due to movement of contaminants
16 away from that pilot study. I just wanted to make
17 that very clear, just trying to give you an example of
18 how it would be evaluated.

19 JUDGE WARDWELL: Thank you kindly. And
20 now that I remember what we're dealing with here, and
21 you're giving it as an example that comforts you that
22 you have, that you could implement that same program
23 if in fact an unanticipated constituent level was such
24 to agree that it wasn't, you felt it wasn't
25 representative of background conditions.

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1 MS. SIMON: Absolutely.

2 JUDGE WARDWELL: Thank you.

3 MR. SMITH: Your Honors, Tyson Smith for
4 Crow Butte. We also had a --

5 JUDGE WARDWELL: Machines are running the
6 world. Notice that we don't talk, we don't just say
7 it, because we can't, because the mic's not on. You
8 couldn't just say it, could you, Mr. Smith, right now?

9 MR. SMITH: Now I can. I would have loved
10 to, but I would have just had to say it again. So I'm
11 saving my breath and you all from having to --

12 JUDGE WARDWELL: All right, I like that.
13 See, I killed enough time.

14 MR. SMITH: We had a correction to our
15 rebuttal testimony, which is CBR033. We discussed it
16 earlier. Mr. Lewis is going to describe the
17 correction. It's on, in response to A25, where we
18 misused, flip-flopped the words Chadron and Crawford.
19 He's going to explain that for us here and correct the
20 record.

21 JUDGE WARDWELL: Okay, thank you.

22 MR. LEWIS: Your Honor, in the reference
23 to the town of Chadron in the second and third
24 sentence to the reference Mr. Smith cited, there
25 should be interchanging the words Crawford and

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1 Chadron. The reference doesn't affect any of the
2 conclusions or the text discussion of the conceptual
3 model that was described at the time.

4 JUDGE WARDWELL: Thank you. Moving on to
5 1.2.4, Opinion 4, applicable groundwater restoration
6 standards, Mr. Wireman, Exhibit 004 of the Oglala
7 Tribe, Opinion 4 at 5. Mr. Wireman questions the
8 applicable groundwater restoration standards, which to
9 him is problematic, given the inadequate site
10 hydrologic characterization.

11 The basis that he describes is that both
12 the CBR Exhibit 006, technical report, and the NRC006,
13 Environmental Assessment, are confusing regarding
14 applicable restoration monitoring requirements and
15 compliance standards. The EA at NRC006 at 2-9 and the
16 technical report, CBR006 at 6-4, state that the
17 primary goal of the groundwater restoration program is
18 to return groundwater affected by uranium recovery
19 operations to pre-injection baseline values at a mine
20 unit average, as determined by baseline water quality
21 sampling program.

22 But, then under NRC EA, sections, and
23 that's Exhibit 006, Section 2.3.3 at 2-9, and NRC008,
24 which is the Safety Evaluation Report, Section 6.1.3.1
25 at 1-47 and criteria 5(b)(5) of Appendix A to 10 CFR

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1 Part 40, states that with the mining termination,
2 groundwater must be restored to the regulatory
3 standards identified in criteria in 5(b)(5) of
4 Appendix A to 10 CFR Part 40, and that under the
5 5(b)(5) criteria.

6 And so there's some confusion, as Mr.
7 Wireman says, in regards to this. And I just want to
8 verify with Mr. Wireman, is his, is the difference
9 between the desire to return to baseline values and
10 the three options available in the restoration
11 standards your confusion, or is it something else that
12 you are referring to?

13 MR. WIREMAN: The confusion mainly centers
14 around whether or not the NDEQ standards are
15 applicable here. And if they're applicable, do they
16 essentially comprise an ACL.

17 JUDGE WARDWELL: And that's the same
18 confusion I had, so I got a list of questions for
19 that, exactly. I just wanted to make sure we were, we
20 had the same confusion factors. That's what you were
21 referring to, because I had the same ones.

22 And so NRC Exhibit 006, the EA under 2.3.3
23 at 2-9, citing 40 CFR 192, says that EPA requirements
24 groundwater restoration at ISR facilities must meet
25 the, and I know an old program I worked under was

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1 called UMTRAP. This is UMTRCA. Is that what you say?
2 Yeah, so you use the only UMTRAP phrase for this,
3 except it's UMTRCA standards rather than those
4 associated with the Safe Drinking Water Act, or
5 analogous state regulations.

6 And my first question for NRC is which
7 column or columns in Table 6.1-1 at 227 of your
8 Exhibit 009, of Crow Butte's number 009, are included
9 in the criteria 5C table? And if we can, why don't we
10 go ahead and pull up that table. It's again, Exhibit,
11 Crow Butte's Exhibit 009. And it will be at page 227.

12 MR. WIREMAN: Dash 27?

13 JUDGE WARDWELL: No, I believe Crow Butte
14 009 is just a list of the tables that are from the
15 Technical Report, if I remember correctly, and that
16 this is just the PDF page number.

17 MR. WIREMAN: Okay, 227, got it.

18 MS. SIMON: I don't think that's the
19 correct figure.

20 JUDGE WARDWELL: That's not it. You got
21 table 6.1, if you, the number's different. Well, I
22 guess I got the number wrong.

23 MS. SIMON: It's the next page.

24 JUDGE WARDWELL: There you go. Oh, yeah,
25 and that's because the PDF has the cover sheet on it.

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1 So you will see sometimes if you're, once you read the
2 transcript, if we refer to a page number and it
3 doesn't appear -- when you get to that page number it
4 doesn't appear correct, don't be surprised because it
5 may be off by one, because people are referencing
6 things from the original document without the cover
7 page.

8 So where I'm trying to go with all of this
9 is to try to, well, let's just stay with this
10 question. Here we've got a table that says NDEQ title
11 1-18 groundwater standard, we've got an NDEQ
12 restoration standard, and we have the UMTRCA
13 groundwater standard.

14 And under the EA, you're saying that they
15 need to meet the UMTRCA standard if they haven't gone
16 to background. We're recognizing we're in a different
17 level of the three options available, and then we're
18 trying to sort out really whether, what's the NDEQ
19 compared to the UMTRCA compared to EPA standards.

20 So which of these columns are in the
21 regulatory table, which I assume has a different
22 number if it has a number at all, under criteria 5C?

23 MS. STRIZ: I haven't double-checked them
24 against each other, but it would be the NRC UMTRCA
25 standards that should be in the 5C table, if they've

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1 done it correctly.

2 JUDGE WARDWELL: Okay, so it's the last
3 column would be the one that's, is the 5C table, is
4 that correct?

5 MS. STRIZ: That should be what they have
6 there, yes.

7 JUDGE WARDWELL: Does this mean that the
8 maximum values for groundwater protection in the
9 criteria 5C table, Appendix, table Appendix A of 10
10 CFR does contain, and that's what you're saying, does
11 contain the UMTRCA values?

12 MS. STRIZ: Yes.

13 JUDGE WARDWELL: UMTRCA.

14 MS. STRIZ: UMTRCA.

15 JUDGE WARDWELL: UMTRCA.

16 MS. STRIZ: There you go.

17 JUDGE WARDWELL: CBR, in their technical
18 report, Section 6.1.3 at 6-4, states that CBR commits,
19 in accordance with the Nebraska Environmental Quality
20 Act, that, and NDEQ regulations, to return the
21 groundwater to the restoration value set by NDEQ in
22 the Class III UIC permit. The TR at 6-4 finishes by
23 stating that the concentration of hazard constituents
24 must not exceed the three options, and listing those
25 presented in 5(b)(5).

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1 So for Crow Butte, I say you are
2 committing to meet the NDEQ values. But then you go
3 on and say that the UMTRCA values control. So which
4 are the governing values?

5 MR. PAVLICK: Your Honor, the most
6 stringent of the three standards would be the value
7 that we adhere to.

8 JUDGE WARDWELL: So you're saying you're
9 actually committing to the highest of the three
10 columns in Table 6.1-1?

11 MR. PAVLICK: Not the highest.

12 MR. NELSON: It'd be the lowest, the
13 lowest concentration.

14 JUDGE WARDWELL: Higher isn't always
15 better, I guess.

16 MR. NELSON: If you'd like higher, we
17 could do that.

18 JUDGE WARDWELL: Yeah, you'd be willing
19 to.

20 MR. NELSON: It'd be okay.

21 JUDGE WARDWELL: The answer to that
22 question was yes, right, but it's not what, you're
23 going to do even better than that, aren't you. Okay,
24 good. So it's the lowest --

25 MR. NELSON: The restoration data will be

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1 reviewed by both regulatory agencies and will have to
2 meet their standards.

3 JUDGE WARDWELL: So you have to meet the
4 lowest standard of both what the NRC requires and the
5 NDEQ by constituent.

6 MR. NELSON: That's correct, sir.

7 JUDGE WARDWELL: And so do you know if
8 there's any cases, and does it vary then in regards to
9 whether it's in NDEQ or in UMTRCA? Does it bounce
10 back and forth? I haven't looked over the table.

11 MR. NELSON: The standards are not the
12 same for each constituent with this sort of --

13 JUDGE WARDWELL: Oh, does one always, is
14 one always lower, or does it fact, it does if two vary
15 --

16 MR. NELSON: No, it depends on the
17 constituent.

18 JUDGE WARDWELL: Okay, thank you. And so
19 if that's correct, and NRC, did you say that -- yeah,
20 you said that the 5C table is the UMTRCA.

21 MS. STRIZ: That's correct.

22 JUDGE WARDWELL: So in fact that may be
23 going to a lower standard in order to meet the DEQ,
24 that the applicant will, has the potential to be going
25 to a lower standard than you require. Is that a fair

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1 assessment?

2 MS. STRIZ: Yes. It's a DOE regulation.

3 JUDGE WARDWELL: Someone just said
4 something and I missed it.

5 MS. STRIZ: I said there's a DOE
6 regulatory scheme. They have to meet the NDEQ's --
7 the NDEQ standards for the UIC permit in the
8 restoration, and they have to meet our standards. And
9 in general, our standards are lower, from my
10 understanding.

11 JUDGE WARDWELL: Does that clarify it for
12 you, Mr. Wireman? I think it does for me, but I
13 haven't looked through all my questions.

14 MR. WIREMAN: You know, I was going to
15 have the same response. I think it does.

16 JUDGE WARDWELL: I think it does too.

17 MR. WIREMAN: I'll say this, I'm not fond
18 of the NDEQ standards. One of the reasons for raising
19 this, I understand the Class III and that that's a
20 state permit, I get that. But the restoration
21 standards, I think, should be the lowest and the most
22 stringent. And if that's what NRC staff is telling
23 me, that the UMTRCA standards will rule the day here
24 if they're lower than the NDEQ standards, I'm happy
25 with that.

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1 But I'll make one additional statement.
2 The goal, as stated very clearly here, is to go back
3 to baseline concentrations. And the concern I always
4 have with these mines, and it's becoming, I get the
5 sense that there's an anticipation these days that
6 baseline will not be able to be met from the
7 beginning. And that anticipation leads folks towards
8 a different set of standards and ACLs.

9 And then finally, the question is still in
10 my mind about if an NDEQ standard is utilized, is that
11 considered an ACL? I don't know the answer to that,
12 because my understanding, and correct me if I'm wrong,
13 and I could be, is that any ACL then requires an NRC
14 approval, and which could trigger another public
15 process. That's kind of where I'm going.

16 JUDGE WARDWELL: I've got some questions
17 on that, so we will cover that last item. And I'll
18 ask Crow Butte, are not you required to start off
19 restoration with the goal to meet background and then
20 only back off of that when it's shown that you can't?
21 Is that a fair assessment or not?

22 MR. PAVLICK: That's correct.

23 JUDGE WARDWELL: And NRC, is that your
24 understanding of what they need to do?

25 MS. STRIZ: Yes.

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1 JUDGE WARDWELL: And then if they can't
2 meet it, then they could go to the other option of
3 looking at the lowest value of what's on these three
4 tables, is that?

5 MS. STRIZ: No, that's incorrect. The
6 standards are that they should reach background, or
7 the values in this table, whichever is higher.

8 JUDGE WARDWELL: Right.

9 MS. STRIZ: Or an ACL. Those are the
10 standards.

11 JUDGE WARDWELL: Yeah, that's, I thought
12 I said the same thing, but maybe I didn't. That's my
13 understanding also. And does that make sense to you?
14 We'll talk about the ACLs in just a second, but just
15 that flow pattern.

16 MR. WIREMAN: Yeah, I just want to make
17 sure I understand. The first goal is baseline or --
18 and then the second one is whatever the standard in
19 this table. And then there's a third option, which is
20 an ACL. So what I get from that, and this is what I'm
21 kind of asking, is are the NDEQ standards in the ACL
22 category as the third option?

23 JUDGE WARDWELL: Well, let's talk. And
24 Dr. Striz, is, did what he just say match with what
25 you said? Because that's my understanding also. And

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1 what you said before was my understanding too. He
2 said it a little bit different way, but it essentially
3 to me simplifies the way he just said. Do you have
4 any comments on that in regards to this?

5 MS. STRIZ: What I'd like to clarify is
6 it's background or the values in the table, whichever
7 is higher. So they don't have to go below the MCL,
8 they can meet the MCL if background was below the MCL.
9 Or an ACL. And they can propose an ACL, and that ACL
10 may be safe at the levels of the state class of use
11 that are in this table.

12 So they can propose values for the ACL
13 that may end up being the same as the Nebraska
14 Department of Environmental Quality values, if they
15 can demonstrate that they meet all of the requirements
16 of criterion 5(b)(6). So ACLs can be proposed.

17 JUDGE WARDWELL: And how is an ACL
18 granted? What's the procedure and what, is an
19 amendment needed for that, or is a hearing needed for
20 that, or describe the ACL process. And what goes into
21 defining when that ACL, what that ACL value is. Is
22 there?

23 MS. STRIZ: If they cannot meet background
24 for the values in that table --

25 JUDGE WARDWELL: Can you pull your

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1 microphone, you're.

2 MS. STRIZ: If they can't meet background
3 or the values of the table for a specific hazardous
4 constituent that has to meet the regulatory standard,
5 then they can propose an ACL that meets the criteria
6 in 5(b)(5) and 5(b)(6), which states that they have
7 taken all best practicable actions to demonstrate that
8 they made the good-faith effort to get it as low as
9 possible. And our standard is ALARA.

10 And that it's, also meets all the
11 requirements in 5(b)(6), and those are quite
12 extensive. I can read them off if you'd like to, I
13 don't know all of them off the top of my head. But
14 that's hydrological evaluations, surface water use,
15 groundwater use, it's quite extensive.

16 In addition, they also have to do a hazard
17 assessment for each constituent, they have to do an
18 exposure assessment for each constituent to evaluate
19 whether anyone could be exposed at that level, and
20 what the impacts would be.

21 They have to provide that to us in a
22 document, and we have to approve it as a license
23 amendment. So as a license amendment, it would
24 trigger the opportunity for a hearing, and we would do
25 an extensive technical review, just like we do with

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1 any license amendment. So it's quite a detailed
2 process.

3 JUDGE WARDWELL: As, so to answer one of
4 the questions I heard Mr. Wireman ponder, which is
5 also what I pondered, the ACL may be what's in the
6 table, but likely will be somewhat different than
7 what's in the table for a given constituent, depending
8 upon what the process sugars out to be after making
9 all best available technology efforts and the other
10 steps that you were talking about.

11 MS. STRIZ: That is correct.

12 JUDGE WARDWELL: Any other questions on
13 that?

14 MR. WIREMAN: First of all, I commend the
15 NRC for this, what I believe is a relatively new
16 policy of ACLs have to go back through the process and
17 then amendment process. I think that's good.

18 Secondly and finally, I'll just say in the
19 TR, on page 6-4, it says, and I quote, if restoration
20 efforts are unable to achieve baseline conditions
21 after diligent application of best available
22 technology. It does not say best practicable
23 technology, and there is a distinct difference between
24 those two. So I'm wondering which applies.

25 And then as the second part of that

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1 question, if the best available technology has not
2 achieved it, what criteria are used and who will make
3 that determination?

4 JUDGE WARDWELL: Dr. Striz, would you be
5 able to address his questions in regards to the
6 difference between available and practicable best
7 technologies in regards to the regs? And then
8 likewise, what's the criteria for determining that
9 they have achieved the best available?

10 Say it again, because I heard you talk
11 about it, but say it again in regards to the criteria
12 that you use to guide you into whether or not they
13 have really tried to make the best available or
14 practicable, whichever it is.

15 MS. STRIZ: 5(b)(6) actually says
16 consideration of practicable corrective actions that
17 limits or as low as reasonable achievable. And our
18 license condition says that it's, the licensee must
19 also show that it has first made practicable efforts
20 to restore the specific hazardous constituents to the
21 background or maximum contaminant levels, whichever is
22 higher.

23 So I understand that there's some
24 disagreement about it, but basically we look at, have
25 they used all the reasonable technologies that are

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1 available and made the effort. When I do a
2 restoration evaluation, I look to see if it's
3 asymptotic, what technologies they applied to try to
4 reduce the constituents. And is it asymptotic and has
5 it been that way for --

6 DR. KREAMER: If I may interrupt for a
7 second. I just think it's important if you need this
8 as audio record, the audio is totally garbled on this
9 side as people get further and further away from their
10 microphones. I just wanted to inform that I sent
11 messages to the technician. And just so you know, the
12 distance from the microphones seem to be increasing
13 and it's totally inaudible as far as the audio record.
14 I'm sorry to interrupt.

15 JUDGE WARDWELL: Go ahead.

16 MS. STRIZ: So I evaluate what they have,
17 the treatments that they have conducted and what
18 actions they've taken and how long it's progressed and
19 if the values are asymptotic and obviously not
20 changing. And ALARA requires them to try to get what
21 is reasonably achievable. And so that's the
22 evaluation that we do.

23 JUDGE WARDWELL: Okay, thank you. Mr.
24 Wireman's testimony, Exhibit 004, Opinion 4 or 5,
25 states that the NRC in an NDEQ also have different

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1 regulations regarding stabilization phase monitoring.
2 The NRC regulations require that regulated constituent
3 concentrations be stable for four consecutive quarters
4 before closure can occur.

5 NDEQ regulations only require sampling for
6 six months. There's no discussion of post-closure and
7 long term monitoring. So I ask the NRC which of these
8 stabilization criterias control in your opinion?

9 MS. STRIZ: The stabilization criteria is
10 four consecutive quarters of no statistically
11 increasing trends.

12 JUDGE WARDWELL: Thank you. CBR Exhibit
13 006, the technical report, Section 6.1.5 at 6-10 to 6-
14 11, and CBR009, technical report, Table 6.1-1 at 228,
15 I guess it is.

16 Although CBR's CSA Class III UIC permit
17 requires one sample a month for a minimum of six
18 months for stability monitoring of a mine unit to
19 demonstrate the success of restoration , parenthesis
20 stabilization, for CPF's NRC license, the specified
21 ore zone monitoring wells will be sampled at a
22 frequency of one each quarter.

23 The quarter monitoring will continue until
24 the date for the most recent four consecutive quarters
25 indicate no statistical significance increasing trend

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1 for all constituents of concern. At that point,
2 stabilization will be deemed complete, subject to NRC
3 approval.

4 And did it, is, and I'll ask Crow Butte,
5 is that consistent with what Dr. Striz just said in
6 regards to the stabilization that the NRC believes is
7 being done?

8 MR. PAVLICK: Yes, Your Honor.

9 JUDGE WARDWELL: Then under your CBR006,
10 technical report, Section 6.1.5 at 6-11, it states
11 that the sampling frequency will be one sample every
12 other month for four quarters. And if the six samples
13 show that the restoration values for all wells are
14 maintained during a stabilization period, with no
15 significant increasing trends, restoration shall be
16 deemed complete.

17 That just muddied the water for me.
18 Seemed like everything was rolling along, and now,
19 then we have two different sampling procedures? Or,
20 yeah, protocols, I guess. One is one sample once a
21 quarter for four consecutive, and then other is one
22 sample every two months for four quarters.

23 MR. NELSON: Without looking at the
24 reference here, our, what we do is six months of
25 sampling for the NDEQ, where we're doing monthly

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1 sampling. Included in that is the quarterly sampling
2 for NRC requirements. At the conclusion of the six
3 months of monthly sampling, we do two more quarters of
4 quarterly sampling. That's assuming that the
5 constituent levels meet the trend requirements.

6 JUDGE WARDWELL: And Dr. Striz, is that
7 your understanding of their sampling program, and is
8 that consistent with what NRC requires?

9 MS. STRIZ: It's over and above what we
10 require, but we welcome the additional data points to
11 establish the trend.

12 JUDGE WARDWELL: I will wait for the
13 transcript to sort it all out in my mind, but at least
14 it's on the record so I can proceed with that.

15 MR. NELSON: Your Honor, for
16 clarification, we have to meet both requirements.

17 JUDGE WARDWELL: I understand that, yes.

18 MR. NELSON: Yes, we do what NDEQ requires
19 as well as what NRC requires, and some of that
20 sampling is concurrent.

21 JUDGE WARDWELL: That dawned on me when
22 you were speaking, so thanks for that clarification.
23 Because that's why I did read between the lines, and
24 a light dawned on Marblehead finally why there's all
25 these others, because it's dependent upon whether

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1 you're talking NDEQ or whatever, or the NRC
2 requirements. So I'm sure it'll make sense to me a
3 couple months from now when I'm looking over that
4 section.

5 I'm sad to say, but I think we're on the
6 last section for Mr. Wireman, which grieves us sorely,
7 but that's 1.2.5, Opinion 5, on wastewater disposal.
8 And the opinion of 5 at 6, Mr. Wireman for OST claims
9 that there is an inadequate information regarding
10 disposal of wastewater at the MEA, and specifically
11 CBR plans to use one or two deep disposal wells to
12 dispose of the mining fluids.

13 CBR rebuttal at 033, A5 at 20, in response
14 to Mr. Wireman's allegations that there is an
15 inadequate information regarding wastewater disposal,
16 CBR posits that this issue is outside the scope of
17 admitted Contention 2 as we understand it.

18 And I think I would ask NRC, while I
19 understand that you do not regulate these underground
20 injection systems, that you still do review whether or
21 not you have, there's some, there's enough capacity,
22 if nothing else, and evaluate its effectiveness as
23 part of your review to just assure that you've able to
24 get a handle on potential groundwater quality impacts.
25 Is that a fair assessment?

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1 MR. BACK: Yes, Your Honor. David Back.

2 JUDGE WARDWELL: So, do you agree that the
3 review of the DDW system with respect to impacts on
4 water quality is part of Contention 2, as a water
5 quality issue?

6 MR. BACK: The staff did review, as part
7 of the EA, the deep water disposal injection.

8 JUDGE WARDWELL: I'll ask the question
9 again. Do you agree that the review of the DDW system
10 with respect to its impacts on water quality is part
11 of Contention 2?

12 MR. BACK: Yes, Your Honor.

13 JUDGE WARDWELL: What'd you say?

14 MR. BACK: Yes, Your Honor.

15 JUDGE WARDWELL: I thought you said yes,
16 no. I thought, well, here we go. All right, and then
17 for the reasons that you stated previously. Right,
18 thanks.

19 Mr. Wireman's opinion goes on to say that
20 the TRA states that on page 7-22 of CBR006 page 347,
21 that CBR plans to use one or two deep disposal wells
22 to dispose of waste fluids comprised primarily of lead
23 water up to 120 gallons per minute and groundwater
24 restoration wastewater.

25 The disposal wells will presumably be

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1 permitted as a Class I UIC well. The TR does not
2 include any information on the geologic formations,
3 aquifers into which the CBR proposes to inject waste
4 fluids.

5 Crow Butte, in their rebuttal, Exhibit
6 033, answer 35 at 20, said, we provided the following
7 information on deep disposal wells for completeness.
8 Crow Butte currently operates two non-hazardous waste
9 Class I injection wells in the main license area for
10 disposal of waste water. And I think we often have
11 been using the terms that it's the existing Crow Butte
12 ISR license facility, or something like that anyhow.
13 But we all know what we're talking about, the existing
14 operations now.

15 And that Crow Butte has prepared a permit
16 application for a DDW at Marsland, in accordance with
17 regulatory requirements and in the NDEQ assessment
18 section rules. The formation receiving the injection
19 waste fluids is restricted to the lower Dakota, the
20 Morrison, and the Sundance formations, which have been
21 demonstrated to be located below the lowermost
22 underground source of drinking water.

23 In addition, the lower Dakota, Morrison,
24 and Sundance Formations exhibit water quality that is
25 not considered under state, federal regulations to be

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1 underground sources of drinking water, due to measured
2 concentrations of their total dissolved solids.

3 And I'll ask, and they mention that
4 CBR005-R, the Environmental Report, Section 3.12.2.1
5 at 3-99, this same information was provided. So as
6 far as your application is concerned, CBR, that you
7 have, that's the information. You had provided it, it
8 was in your ER and not necessarily in any other
9 application document. Is that correct?

10 MR. PAVLICK: Yes.

11 JUDGE WARDWELL: Okay. And do you know
12 what the concentration of the, say, the average TDS is
13 in the formations receiving the waste water? And the
14 approximate depth that you're going down? And I
15 believe it's, are you also, I'm piling on the
16 questions, looking for only one well, or two wells, in
17 your application to the state?

18 MR. PAVLICK: In no particular order, the
19 answers to your questions, so license condition 10.3.4
20 stipulates that we will drill a minimum of two
21 disposal wells for the Marsland area. The depths of
22 the well, the disposal wells, would be 3400 feet to
23 3600 feet. That would intercept the formations that
24 you previously read there.

25 JUDGE WARDWELL: So it's well below the

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1 Pierre Shale is what you're saying.

2 MR. PAVLICK: Yes, sir. And as far as the
3 conductivity or TDS of the formation, I'd have to
4 reference the analytical data on that, so we can find
5 that quickly.

6 JUDGE WARDWELL: Yeah, when you get a
7 chance. Again, we'll, after lunch or, you can get
8 back to us on that.

9 MR. PAVLICK: An aquifer can't exceed
10 10,000 TDS. If it exceeds 10,000 TDS, it's not
11 considered a potential source of drinking water. So
12 it would be in excess of 10,000 TDS.

13 JUDGE WARDWELL: Okay, but still, I'd like
14 to see what that number is just see where you fall
15 within that. Thank you for that. And confirm that
16 none of these formations have the potential to serve
17 as an underground source of drinking water, a USDW, as
18 defined by the Federal Safe Drinking Water Act, is
19 that correct?

20 MR. PAVLICK: Yes.

21 JUDGE WARDWELL: Okay, thank you. Mr.
22 Wireman's rebuttal, OST015 at 2 number 1, states that
23 appropriate hydrogeologic water quality data will be
24 necessary to address the DDW requirements, and should
25 be included as part of the conceptual model of the

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1 site hydrology that CBR and staff claim is adequate in
2 their direct testimony. And as not, this information,
3 and once we get it augmented by the actual TDS values,
4 sufficient to address the information you were
5 interested in?

6 MR. WIREMAN: Partly. The part that's not
7 addressed here is under the Safe Drinking Water Act,
8 a Class I UIC well has to inject below the deepest
9 USDW. I just heard that there's been a, quote-
10 unquote, demonstration that there are no USDWs below
11 these Dakota and these Jurassic rocks. How is that
12 known?

13 And the reason I ask that is because we've
14 had significant experience throughout the Rockies now
15 where the Madison Formation, which occurs below these
16 rocks, is a well-known regional aquifer with TDSs
17 clearly below 10,000 over a large part of its
18 occurrence. So they've addressed the concern upfront
19 with the injection formations. If those are over
20 10,000, they don't need an exemption. That's a good
21 thing in my mind.

22 What they have not addressed is the
23 question of whether or not there's a USDW below this
24 injection zone, and the law requires that that be
25 done.

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1 JUDGE WARDWELL: And CBR, is your
2 understanding that you have to be below any of the
3 USDW aquifers, and have you demonstrated that?

4 MR. SMITH: This is Tyson Smith for Crow
5 Butte. A clarification when you say have to be, are
6 you talking about for NRC purposes, or for some other
7 regulatory review?

8 JUDGE WARDWELL: Let's start off with the
9 NDEQ review.

10 MR. PAVLICK: Your Honor, we would need,
11 again, some time to discern that.

12 JUDGE WARDWELL: But you understand the
13 question that Dr. Wireman, I mean Mr. Wireman, asked.

14 MR. SMITH: And I guess I'll ask what's
15 the relevance of the NDEQ standard to the requirements
16 of the NRC process?

17 JUDGE WARDWELL: I think it still falls
18 under Contention 2 in regards to whether or not
19 there's impacts that should be part of the EA. And
20 that's where it comes into play. If in fact there is
21 a potential that those wells are not meeting whatever
22 criteria people establish, that is what was testified.
23 Well, we just said earlier that we agree it is part of
24 Contention 2.

25 So that's where I'm asking questions from,

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1 if that clarifies for you, if you want to put me on
2 the witness stand, as you have, by asking me a
3 question. That's why I'm asking the questions.

4 NRC, would you like to comment on any of
5 this discussion?

6 MS. STRIZ: They have to meet the NDEQ
7 requirements for the deep disposal well. We require
8 them to have all permits before they will be able to
9 operate. So my understanding is that there is no
10 lower USDW also reflected in the fact that there is a
11 deep disposal well in the same formation just 11 miles
12 north at the main facility.

13 So I'm, it appears to me there is no lower
14 USDW, but if the state determines that there is, they
15 will not grant the permit and CBR will not be able to
16 operate.

17 JUDGE WARDWELL: Thank you.

18 MR. LANCASTER: The associated license
19 conditions requirements that she's referring to are --

20 MS. SIMON: The license is NRC009.

21 MR. LANCASTER: License Condition 10-34
22 and License Condition 12-5.

23 JUDGE WARDWELL: Thank you. I'm ready to
24 move on with Dr. LaGarry, or we can break for lunch
25 now or go for another 15 minutes, 20 minutes. Might

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1 as well go for another 20 minutes.

2 CHAIR BOLLWERK: Let's go right to noon if
3 we can.

4 JUDGE WARDWELL: So we're now at the
5 beginning of Concern 1, considering we were in the
6 middle of Concern 1 when we started the day, at the
7 end of Concern 1 now, so that we go back now to the
8 beginning of Concern 1, which deals with the
9 description of the affected environment as
10 insufficient to establish the potential effects of the
11 proposed ISR operations on the adjacent surface water
12 and groundwater resources.

13 And 1.1 is the stratigraphy and
14 contaminant pathways, of which we are looking at Dr.
15 LaGarry's testimony. Much of the stratigraphy, I'm
16 sad to say, has already been stipulated because of his
17 fine work in previous efforts, so we'll move beyond
18 that. And, but do ask some questions about it, to
19 start with. And first of all, I'll, that we've
20 already discussed.

21 And let's go to Figure 1 of Exhibit 010 of
22 OST, OST001, Figure 1. It's on the fourth page of Dr.
23 LaGarry's testimony.

24 Does anyone know who Midnight the Cat is?
25 This screen reminds me of Midnight the Cat.

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1 CHAIR BOLLWERK: Is this a Halloween-
2 related question?

3 JUDGE WARDWELL: It is, while we're
4 waiting. Did I see any hands? I hope there's no
5 hands, because you probably got to be 70 or over. And
6 so I think the only, well, no. There's a couple
7 suspects, but.

8 DR. LaGARRY: Wardwell, could I have the
9 reference again, the exhibit number?

10 JUDGE WARDWELL: You mean you don't want
11 to talk about Midnight the Cat? OST010.

12 It was a cat on the Andy Devine Show.

13 DR. LaGARRY: PDF page 4, there you go.

14 JUDGE WARDWELL: So I start off, Dr.
15 LaGarry, where was this profile or cross-section,
16 whichever you want to call it, taken? Was it through
17 the MEA or, and the existing CBR ISR facility, or was
18 it offset somewhat or whatever?

19 DR. LaGARRY: The line that was drilled is
20 in the inset in the bottom right of the figure. It's
21 the line A to A-prime, or A-prime to A.

22 JUDGE WARDWELL: Oh, what happened?

23 DR. LaGARRY: Right, okay, in the bottom
24 right, there's a purple map of Nebraska with a purple
25 box. It says map area. And there's, and the box

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1 outside the state of Nebraska shows the counties
2 within the lighter purple box. And so A-prime is in
3 Sioux County to the west, and the line goes south from
4 there.

5 JUDGE WARDWELL: And where is the, so the
6 map of Nebraska, the relationships between the line A-
7 A-prime and the outline of the state of Nebraska are
8 not to scale? There's no relationship, right?

9 DR. LaGARRY: That's right. So the little
10 picture of the state of Nebraska is just to orient the
11 viewer of where the, I guess it's, to be precise,
12 Nebraska is purple, the little box is fuchsia, to my
13 eyes, and then the larger box surrounding the whole
14 thing is what's inside the fuchsia box. Okay, so and
15 then you can see the A-prime and the A there, those
16 match the A-prime and the A in the larger cross-
17 section above.

18 JUDGE WARDWELL: And so, and then where is
19 the MEA in that larger box that's probably, I mean, I
20 don't know where it is.

21 DR. LaGARRY: It's 30 miles west. The
22 cross-section is 30 miles west of Marsland.

23 JUDGE WARDWELL: Did you say 3-0 miles to
24 three, three miles?

25 DR. LaGARRY: 30.00-ish.

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1 JUDGE WARDWELL: Thirty miles.

2 DR. LaGARRY: Thirty miles.

3 JUDGE WARDWELL: Okay.

4 DR. LaGARRY: That same publication
5 produced in a cross-section through the, closer to the
6 area of interest, but that illustration at the time,
7 I deemed this one to be a better one.

8 JUDGE WARDWELL: So where you show
9 Marsland isn't where Marsland is, but that's where the
10 projection of Marsland would be on this as you move it
11 30 miles to the west.

12 DR. LaGARRY: Absolutely correct.

13 JUDGE WARDWELL: And where would be, so
14 that is basically where the MEA would be, is that,
15 that's what you mean by Marsland, right?

16 DR. LaGARRY: That's correct.

17 JUDGE WARDWELL: Not the town of Marsland,
18 but it's close to.

19 DR. LaGARRY: The Marsland vicinity.

20 JUDGE WARDWELL: Right. And where would
21 be the existing Crow Butte site, just a skosh to the
22 right of Marsland just based on the --

23 DR. LaGARRY: That's right.

24 JUDGE WARDWELL: Scale, it wouldn't be
25 very far at this scale from the righthand side of the

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1 bracket that you show for Marsland.

2 DR. LaGARRY: That's correct. The
3 existing facility to the righthand side of the cross-
4 section, you can see the north face of the Pine Ridge
5 escarpment. Representatively, not to scale, the
6 existing facility would be somewhere in the brown,
7 down that north edge a little bit. So the existing
8 facility isn't up in the Arikaree Group, it's
9 somewhere down lower within the White River Group.

10 JUDGE WARDWELL: Oh, really, okay, so I
11 was way off. That doesn't make much sense to me, I
12 guess. Say that again. I see the Niobrara River.

13 DR. LaGARRY: Right, you see the Niobrara
14 River, okay, and then following the Niobrara River
15 just along the top surface, I'm going to try to orient
16 you.

17 JUDGE WARDWELL: Yeah.

18 DR. LaGARRY: Okay, so you're at the
19 Niobrara River, and now we're on top of the orange,
20 above the word vulnerable in those brackets, right.
21 And so going along there to the right. At the high
22 point, on the righthand-most side there's then a steep
23 drop-off. That's the north face of the Pine Ridge
24 escarpment.

25 JUDGE WARDWELL: Okay, great.

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1 DR. LaGARRY: Okay, and as you may recall
2 from our visits to the Crow Butte facility, standing
3 there at the Crow Butte facility, you can look around
4 and you can see the cliffs above you, the cliffs
5 above. The cliffs above, the steeply walled Crown
6 Butte and Crow Butte, and the Pine Ridge escarpment at
7 the very, very south extent of the main facility.
8 That would be that orange stuff the has the word
9 vulnerable in it.

10 JUDGE WARDWELL: Right, okay. And that
11 orange is the Arikaree Group, and the brown is the
12 White River Group.

13 DR. LaGARRY: That's correct.

14 JUDGE WARDWELL: And refresh my memory of
15 the White River Group, that's the Chadron and the
16 Brule?

17 DR. LaGARRY: Yes, and according to some
18 literature I've just read, the Nebraska Geological
19 Survey now represents, now uses the terms Sharps
20 Formation in the place of what used to be called the
21 brown siltstone of the Brule. So the current makeup
22 of the White River Group is the Chamberlain Pass
23 Formation at the base, the Chadron Formation above
24 that, the Brule Formation above that, and the Sharps
25 Formation above that.

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1 JUDGE WARDWELL: Thank you. And then the
2 green's the Pierre Shale.

3 DR. LaGARRY: That's correct.

4 JUDGE WARDWELL: And then the existing
5 facility would really be off to the left of that.
6 Right of that, I mean.

7 DR. LaGARRY: Yeah, that's correct. It
8 would be some distance out of the page, yes.

9 JUDGE WARDWELL: And this particular
10 cross-section doesn't show any of the Oglala or
11 alluvium overlying the MEA, is that correct?

12 DR. LaGARRY: I see, no, it doesn't.
13 There's a little bit of Oglala and alluvium on the
14 diagram, but it's all south of the Niobrara River.

15 JUDGE WARDWELL: And do you agree that
16 it's fair to say that there's no continuous layer of
17 the Oglala or the alluvial connecting the MEA with the
18 Niobrara River?

19 DR. LaGARRY: No, that's not correct. In
20 my rebuttal, I reference a paper by Douglas R. Hallum,
21 Stephen S. Sibray, and Leslie M. Howard that
22 extensively goes into detail about the
23 interconnectedness of the surface and groundwater, the
24 bedrock and the alluvium, in our area of interest.

25 And to make a long story short, this

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1 paper, called Hydrologic Framework Studies of Portions
2 of the Niobrara River, demonstrates interconnectivity.

3 JUDGE WARDWELL: Thank you. In your
4 Figure 1 again, in the Marsland, are there rocks of
5 the Arikaree that are exposed at the land surface or
6 in the valleys and in the -- you state that in the
7 Marsland area, these rocks of the Arikaree are exposed
8 at the land surface and in the valleys of the White
9 and Niobrara Rivers. You aren't suggesting that the
10 MEA is in the surface watershed of the White River,
11 are you?

12 DR. LaGARRY: We visited the site, and the
13 surface watershed drains into the Niobrara. So we're
14 south of the divide between the White and Niobrara.

15 JUDGE WARDWELL: To your knowledge, do you
16 support, and I maybe asked you this, but support CBR's
17 statements earlier this morning that within the area
18 of review of the MEA, that the Arikaree does not
19 outcrop is not exposed at any surface anywhere within
20 the MEA?

21 DR. LaGARRY: With reservation. And my
22 reservation stems from the fact that there's younger
23 aeolian sediment on top and without some subsurface
24 activity, that may be true for parts of it. But my
25 review of Hallum and others supports my initial

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1 statement. There are surface exposures of the
2 Arikaree Group nearby.

3 JUDGE WARDWELL: Thank you. You say that
4 in Marsland, that these sediments, meaning alluvium,
5 are exposed at the land surface and are extremely
6 porous and permeable, and include at least three
7 terraces of the Niobrara River. Are these terraces
8 considered alluvium, or are they part of the Arikaree
9 Formation, or are they a separate breed of cat
10 altogether?

11 DR. LaGARRY: They're older alluvium. So
12 they're, most of the alluvium around is less than 5500
13 years old, based on my radiocarbon dating. However,
14 the alluvium in the Niobrara Valley goes back tens of
15 thousands of years.

16 JUDGE WARDWELL: And are these terraces
17 all south of the MEA? To your knowledge, do they
18 extend into the MEA?

19 DR. LaGARRY: Based on our drive on
20 Monday, the highest of these terraces may intersect
21 the MEA.

22 MR. SMITH: Excuse me --

23 JUDGE WARDWELL: Do you have any evidence
24 supporting that or documenting that it does?

25 DR. LaGARRY: Well, like I said earlier,

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1 it's tenuous because it's covered by the younger
2 alluvium. There would have to be, you know, you can
3 drive closer to the river and see the terraces,
4 they're exposed. But then once you get up under the
5 grass, you know, you have to pay particular attention.

6 MR. SMITH: Excuse me, Judge Wardwell, I
7 have a comment. We had a discussion at a break about
8 a potential correction that Mr. Striver needed to make
9 and you just touched on it there, so I think it would
10 be an appropriate time to address it.

11 Earlier you had asked whether there were
12 any outcroppings of the Basal Chadron, the Brule or
13 the Arikaree at this site. Mr. Striver said no, not
14 the Basal Chadron. He did not address the Arikaree or
15 the Brule, at least he didn't intend to in his
16 response. And so he wanted to clarify that now.

17 MR. STRIVER: Yes, thank you. Thank you,
18 Your Honor. Yes, I would like to correct and clarify
19 that response I had to your question. I -- can you
20 hear me now? Okay, I would like to clarify that the
21 response to the question you had is the Arikaree,
22 Brule -- the Arikaree Group, the Brule Formation or
23 the Chadron exposed at the surface at the MEA.

24 I responded no, that the Basal Chadron was
25 not exposed.

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1 And to continue that, yes, the Arikaree is
2 exposed at the surface at MEA in certain locations at
3 the surface.

4 JUDGE WARDWELL: Okay, thank you.

5 MR. STRIVER: Thank you, sir.

6 JUDGE WARDWELL: And have you mapped those
7 or anything, or at this point?

8 MR. STRIVER: We've gone with the state
9 geologic map has a quadrangle that shows that, yes,
10 sir.

11 JUDGE WARDWELL: Okay, thank you. Back to
12 Dr. LaGarry. In regards to the connections with the
13 MEA and potential alluvial deposits, wasn't that part
14 of the stipulations, or am I, I'm not, I'm incorrect
15 in my memory of what the stipulations said in regards
16 to stating that the alluvial deposits are
17 discontinuous from the MEA?

18 DR. LaGARRY: You lost me for a second
19 there, would you?

20 JUDGE WARDWELL: Yeah, I probably lost
21 myself too.

22 DR. LaGARRY: Okay.

23 JUDGE WARDWELL: Didn't you stipulate that
24 alluvial deposits are discontinuous at the MEA and not
25 been shown to contain usable amounts of water?

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1 DR. LaGARRY: I don't recall having shown
2 that. The, I am extremely grateful that Crow Butte
3 used my 1-24,000 seven and a half-minute map. And in
4 that map, as I recall, I mapped alluvium and all the
5 ephemeral drainages and along the Niobrara River in
6 that vicinity. Which would mean then that the
7 alluvium is in contact with the Arikaree, and it's
8 also in direct communication with the river.

9 JUDGE WARDWELL: It's just -- fine. In
10 regards to your comment on page 5, the recent mapping
11 of the geology of the northwestern Nebraska has shown
12 that the simplified layer cake concept applied by the
13 pre-1990s workers is incorrect and overestimates the
14 thickness and aerial extent of many units by 40-60%.

15 And by the layer cake concept, do you mean
16 that this concept is one of a uniform thick deposit
17 with a constant interface slopes between the older and
18 underlying and the younger overlying strata?

19 DR. LaGARRY: Yes, that's correct. There
20 was a model in use between about 1935 and 1995 that
21 that was an implicit assumption of the model, that the
22 deposits were tabular and continuous.

23 JUDGE WARDWELL: And has the applicant or
24 the staff ever claimed that there's a perfect layer
25 cake of strata underlying the MEA?

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1 DR. LaGARRY: As I recall, during the
2 relicensing hearing for Crow Butte, we talked about
3 this. This original opinion was written several years
4 ago before we had gone through this process and talked
5 about how it wasn't layer cake. So the last time you
6 and I spoke, we discussed this layer cake idea.

7 And at that time we sort of put it to
8 rest, that neither NRC, Crow Butte, or ourselves in
9 the Nebraska Geological Survey continued to adhere to
10 that layer cake idea.

11 JUDGE WARDWELL: Okay, thank you,
12 appreciate that. Had to put that to rest again, just
13 for this record. It can't use the other record.

14 DR. LaGARRY: It does, it is all
15 throughout the scientific literature from that time,
16 however, so people using older references and not
17 using new references could easily be misled into
18 thinking that we still use the layer cake idea.
19 That's why I brought it up back then.

20 JUDGE WARDWELL: Continuing, you say in
21 situ leach mining in the Marsland area would likely
22 contribute toxic heavy metal contaminants, including
23 but not limited to uranium, through three pathways.
24 Surface leaks and spills is one. Two, underground
25 leaks and spills, parenthesis, excursions. And three,

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1 lack of containment.

2 Once in the aquifer -- and by the way, we
3 will get to each one of these separately after lunch,
4 because I think this will be close to my last
5 question. I have two more questions.

6 CHAIR BOLLWERK: Can I interrupt one
7 second? Dr. Kreamer, are you about to leave us? You
8 did leave, okay. All right, that answered my
9 question. I'm sorry.

10 JUDGE WARDWELL: Yeah, so anyhow, we will
11 cover each one of those this afternoon separately as
12 an entity. But going on, you said, Once in the
13 aquifer, contaminants would migrate laterally through
14 porous and permeable sandstones into the White and
15 Niobrara River. And whereabouts, would the White
16 River also be off to the right in Figure 1, then, is
17 that correct?

18 DR. LaGARRY: Yeah. From where this
19 figure illustrates, I mean the White River heads in
20 the Harrison Formation of the Arikaree Group closer to
21 actual Marsland than this diagram. This diagram is to
22 the west, the head of the White River in the Harrison
23 is to the east. But the headwaters of the White River
24 are relatively close to Marsland, yeah, and to the
25 MEA.

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1 JUDGE WARDWELL: And so based on this
2 cross-section, it would be, if we look in the box,
3 White River would be between the fuchsia -- the pink
4 box and the cross-section. Recognizing the pink box
5 I'm only using as a reference for how to orient
6 ourselves in the big box.

7 DR. LaGARRY: Yeah.

8 JUDGE WARDWELL: You're saying that the
9 White River's rolling in there closer to where
10 Marsland is.

11 DR. LaGARRY: The, I would put the
12 headwaters of the White River above the A in map, in
13 the box just to the right of A-prime. That box just
14 to the right of A-prime is Dawes County. And the
15 headwaters of the White River are just almost in the
16 center of Dawes County, almost.

17 JUDGE WARDWELL: Of that box off to the
18 right of A-prime.

19 DR. LaGARRY: Of that, that's correct.

20 JUDGE WARDWELL: And then where is
21 Marsland in the big box and in reference to the A-
22 prime A? How far down and how far to the right?

23 DR. LaGARRY: Well, it's, the Marsland is
24 about in the center of Dawes County. It's, you know,
25 give or take. It's in the, well, a little south of

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1 center. It's in the lightly bordered box to the right
2 of A-prime, a little south of center.

3 JUDGE WARDWELL: Okay, I got you, I was
4 too far down.

5 DR. LaGARRY: I continue on, and I want to
6 explain why I picked this western cross-section. In
7 that opinion, I wrote that the High Plains Aquifer
8 would be vulnerable. And I considered the High Plains
9 Aquifer to be vulnerable, groundwater levels show.
10 There are two large deep pockets of water remaining in
11 the High Plains Aquifer in this area, one of which is
12 under Sheridan County, the other of which is in the
13 Marsland vicinity.

14 And that the diagram I selected shows the
15 stratigraphy of that deep pocket of usable water.
16 It's under the E in vulnerability, where you can see
17 an exaggerated little trough there next to a fault,
18 which is why I chose this diagram, because it showed
19 the pocket of, you know, the stratigraphy of the
20 pocket of groundwater, and the one thorough Dawes
21 County did not.

22 JUDGE WARDWELL: Thank you. And about how
23 far away do you believe the White River is from the
24 MEA?

25 DR. LaGARRY: Less than ten miles, maybe

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1 15.

2 JUDGE WARDWELL: Crow Butte, do you agree
3 with that assessment of how far the White River is
4 from the MEA, or do you have any other estimations?

5 MR. STRIVER: I concur, that's correct.

6 JUDGE WARDWELL: You said?

7 MR. STRIVER: Yes, that is correct.

8 JUDGE WARDWELL: Okay, thank you. The
9 last thing I want to cover, I think. This is a good
10 time to break.

11 CHAIR BOLLWERK: All right. At this
12 point, then, excuse me, it's 12:15, we'll go ahead,
13 I'm sorry, it's five after 12. Go ahead and take a
14 break until five after one, approximately. So
15 everyone should be back by then.

16 First thing we'll take care of if there's
17 any additional explanations or additional information
18 that needs to be given about outstanding matters.
19 We've got couple of them pending. We'll take care of
20 those first, and if not, then we'll just move on to
21 additional questions from Judge Wardwell.

22 MS. SIMON: Your honor, I'm sorry, could
23 I just ask a quick question. I wanted to just clarify
24 whether Mr. Wireman's going to be here for the entire
25 day or not, because if we have any additional

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1 questions for the Board.

2 CHAIR BOLLWERK: It is my understanding he
3 is, but we'll let Mr. Wireman address that. What time
4 do you need to leave?

5 (Off-microphone comments.)

6 CHAIR BOLLWERK: So, like, soon. All
7 right, why don't you go have a seat back there. So
8 should we go ahead and take proposed questions
9 quickly? Okay, so if you all have any proposed
10 questions for Mr. Wireman, or does, if Crow Butte
11 does, but relative to the testimony he's given. Why
12 don't we go ahead and take care of that now?

13 So ten minutes, is that good enough? All
14 right. We won't break right now, we'll wait another
15 15 minutes, that's good.

16 (Whereupon, the above-entitled matter went
17 off the record at 12:05 p.m. and resumed at 12:17
18 a.m.)

19 CHAIR BOLLWERK: Let's go onto the record
20 briefly.

21 We've received some questions from the NRC
22 staff or Mr. Wireman. Crow Butte did have any
23 questions? All right. I guess, obviously, you could
24 have asked a question, I suppose, but you have not, in
25 any event, have you? No?

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1 So, we're going to go ahead and take a
2 couple-minute break here. We'll take a look at these,
3 and we'll be right back.

4 (Whereupon, the above-entitled matter went
5 off the record at 12:17 p.m. and resumed at 12:20
6 p.m.)

7 CHAIR BOLLWERK: Back on the record,
8 please.

9 Just to clarify, because we're going back
10 on, that Dr. Wireman is going to be leaving us this
11 afternoon. The staff has proposed some questions for
12 him, based on his testimony this morning. We got no
13 questions from Crow Butte or from the Oglala Sioux
14 Tribe.

15 So, once again, Judge Wardwell has a few
16 questions.

17 JUDGE WARDWELL: Mr. Wireman, you
18 mentioned Trump Butte as an outcrop of the Basal
19 Chadron sandstone. How far from the MEA and what
20 direction is that outcrop located?

21 MR. WIREMAN: I have not been to the
22 outcrop. I've read about it and discussed it with Dr.
23 LaGarry. So, I really can't answer the question very
24 specifically. I understand it's east of the MEA, but
25 Dr. LaGarry, I'm sure, can give you the details.

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1 JUDGE WARDWELL: Before that, isn't that
2 the one that had a wetland added or was that a
3 different one?

4 MR. WIREMAN: Yes. This is the one I've
5 been told there's a wetland there.

6 JUDGE WARDWELL: Okay. So, you've just
7 been told that? You haven't been to it yourself?

8 MR. WIREMAN: I have not visited the
9 wetland, no.

10 JUDGE WARDWELL: Okay. Yes, go ahead, Dr.
11 LaGarry, how far from the MEA and what direction is
12 the outcrop located?

13 DR. LaGARRY: The outcrop is located 14
14 miles east of Crawford. So, then, we add on the
15 distance to the MEA, 10 or 15 miles. So, about 30 to
16 -- maybe 30 miles, yes.

17 JUDGE WARDWELL: And in what direction
18 does that end up to be?

19 DR. LaGARRY: East. North.

20 JUDGE WARDWELL: North?

21 DR. LaGARRY: East northeast of the MEA,
22 east of Crawford.

23 JUDGE WARDWELL: In the EA, the staff
24 estimated that the travel time from the MEA to the
25 reported Pine Ridge Fault to be approximately 500

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1 years, in referencing NRC 006, Section 3.3.2.1, and
2 that any contaminants in water traveling through the
3 Basal Chadron sandstone will be attenuated by dilution
4 and other processes. Given those facts, what is your
5 basis for asserting that there could be impacts from
6 water reaching distant outcrops of the Basal Chadron
7 sandstone?

8 MR. WIREMAN: Well, I didn't say distant
9 outcrops. What I said was it could reach the
10 discharge point of this major aquifer, wherever that
11 may be, and I suspect it's the White River.

12 And the basis for that is all estimates of
13 groundwater velocity -- and this is a referenced; it's
14 not one they've determined, as I understand -- they
15 are subject to very large error bars, huge error bars,
16 because they're calculated based on point data, No. 1,
17 typically, unless there's a nice potentiometric
18 surface map across the whole aquifer and you can look
19 at gradients. And as we had these discussions
20 yesterday, velocity is dependent on hydraulic
21 conductivity, and that can vary by orders of
22 magnitude. So, velocity can change greatly. So, I
23 always take those estimates with big error bars.

24 And secondly and finally, they don't
25 represent flow through preferential pathways. It's an

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1 average velocity over a very large area that may or
2 may not be applicable at any given location.

3 JUDGE WARDWELL: Thank you.

4 In Opinion 2 of page 3 in your Exhibit
5 OST004-R, and in your oral testimony, you stated that
6 there is significant disagreement about geologic
7 structures. What evidence in the record can you point
8 to that demonstrates these significant disagreements?

9 MR. WIREMAN: I've read -- well, and it's
10 pointed out in their own, in the TR and in the EA,
11 that they cite previous reports by folks I assume Dr.
12 LaGarry knows -- I don't know them -- and they have
13 disagreed with those folks about the presence or
14 absence of some of these major faults and major
15 structures. So, there's disagreement between Crow
16 Butte and these previous authors.

17 And as a neutral third person, I come in
18 and read all that, and I say, well, these people say
19 this; these people say that; I don't know. That was
20 my point.

21 JUDGE WARDWELL: We thank you for your
22 testimony and your participation over the last day and
23 a half. We're eating our hearts out, where you're
24 going to be tomorrow and where we aren't going to be.

25 (Laughter.)

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1 MR. WIREMAN: I want to thank all three of
2 you very much for accommodating my schedule. I very
3 much appreciate that. My plane ticket was bought some
4 months back.

5 CHAIR BOLLWERK: We're glad we could do
6 so, and on behalf of the Board, I want to thank you
7 for your service to the Board. We appreciate it very
8 much.

9 MR. WIREMAN: Thank you.

10 CHAIR BOLLWERK: All right. At this
11 point, I think it's now, well, we'll call it 12:30.
12 So, why don't we come back at 1:30 after our luncheon
13 break, and we'll pick up with some questions for Dr.
14 LaGarry.

15 So, we'll see everybody at 1:30.

16 (Whereupon, the above-entitled matter went
17 off the record at 12:26 p.m. and resumed at 1:30 p.m.)

18 CHAIR BOLLWERK: Why don't we go ahead and
19 go back on the record? It looks like everybody is
20 here and ready.

21 We finished our afternoon break, our lunch
22 break, on Wednesday, and we're about ready to continue
23 with some questions for Dr. LaGarry.

24 Now that we've excused Mr. Wireman, it
25 occurred to me we should maybe talk a little bit about

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1 scheduling. My understanding is that Dr. Kreamer is
2 available tomorrow morning, is that correct, and
3 basically all day, more or less, or not?

4 MR. BALLANCO: That is correct.

5 CHAIR BOLLWERK: Okay. So, I think the
6 plan will be to start at eight o'clock again tomorrow
7 morning. We don't anticipate at this point, anyway,
8 that we're going to go as late as we did yesterday
9 today probably, because we are going to need to deal
10 with Contentions 3 and 4 tomorrow, and having Dr.
11 Kreamer for that would be important.

12 So, basically, when we finish with the
13 testimony today for Dr. LaGarry, we will be done. I'm
14 thinking -- I don't know; what do you think, maybe
15 4:00? Something around four o'clock, we'll see how
16 that works out.

17 Then, for tomorrow, let's go ahead and
18 plan on starting at 8:00 again. We've kind of set
19 that as our baseline, and it's probably easier just to
20 continue with that. I don't know that we're going to
21 go late tomorrow; hopefully, early afternoon I think,
22 given where we're headed. So, just for everybody's
23 edification, that's kind of what I'm thinking we're
24 headed for tomorrow, but we'll have to see how long it
25 takes. It will take as long as it takes, but that

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1 would be our kind of goal, if we can do that. So,
2 that's kind of where we're headed with schedule.

3 If there's any problems with Dr. Kreamer,
4 let us know, but we'll just proceed with that. I
5 wanted to talk to him today before he signed off and
6 I was not fast enough, but I take it, you all, he
7 knows he need to be here at 8:00 tomorrow or seven
8 o'clock your time?

9 MR. BALLANCO: He does, Your Honor. We'll
10 remind him, but he intends to participate.

11 CHAIR BOLLWERK: Okay. That would be
12 terrific. Thank you. I appreciate it.

13 All right. Let me just check before we
14 start with any more additional testimony if there's
15 any clarifying information anybody wants to provide.
16 Yes?

17 MR. SMITH: Yes, Your Honor. Tyson Smith
18 for Crow Butte.

19 We have some follow-up on our homework
20 assignment regarding the deep disposal well. I think
21 Mr. Pavlick is going to address the two questions
22 relating to the conductivity concentration of the deep
23 disposal well injection zones and, also, whether there
24 are underground sources of drinking water below the
25 injection zone.

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1 MR. PAVLICK: Yes. Excuse me, Your Honor.
2 The deep wells at Marsland would be injecting into the
3 Lower Dakota, Morrison, and Sundance Formation. The
4 TDS of the Lower Dakota is 58,000 to 81,000 milligrams
5 per liter; Morrison is 24,000, and Sundance is 45,000
6 milligrams per liter. And there are no aquifers that
7 meet the definition of USDW below the injection zone
8 of those three formations.

9 CHAIR BOLLWERK: All right. Does that
10 provide you with the information you needed? Do you
11 have any questions? No?

12 Is there anything else outstanding we need
13 that we've asked you all for? Is that it?

14 MR. SMITH: For Crow Butte, that's the
15 only one that I was aware of.

16 CHAIR BOLLWERK: That's it for Crow Butte.
17 Anything for staff?

18 MS. SIMON: Your Honor, yes. Mr. Back is
19 just going to make one small correction to our earlier
20 testimony.

21 CHAIR BOLLWERK: All right.

22 MR. BACK: Yes, Your Honor. I misspoke in
23 that there is no commitment for them, for Crow Butte
24 Resources to sample the Dooley Spring as part of their
25 site monitoring program.

1 JUDGE WARDWELL: But their commitment to
2 do the Ephemeral Streams still exists?

3 MR. BACK: Yes, Your Honor.

4 CHAIR BOLLWERK: All right. Anything
5 further we need to hear about that? You've given us
6 what we need? Okay.

7 All right. Then, I think we're ready to
8 continue with your discussion with Dr. LaGarry, among
9 others.

10 JUDGE WARDWELL: CBR Exhibit 006,
11 Technical Report, Section 3.1.2.4, at 3-7, states
12 that, "As of November 1st, 2011, there have been 1,653
13 exploration development holes and 22 monitor and
14 observation wells drilled within the MEA boundary."
15 NRC Exhibit 001, Answer 19, at pages 24 to 26, states
16 that, "The hydrogeologic conceptual model for the MEA
17 is supported by site characterization data from CBR's
18 subsurface investigation of the MEA that include, one,
19 geophysical logs and observations of drill cuttings
20 providing data on the thickness, extent, and
21 continuity of the stratigraphic units; two, cross-
22 sections covering the entire site constructed using
23 data from 57 bore holes; three, isopach maps and
24 structural contour maps, also created using bore hole
25 data, and, four, physical and chemical properties of

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1 the overlying aquifer's upper and lower confining
2 layers and production zone aquifer based on drill
3 cuttings and analysis of core samples."

4 And I thought I would just ask Dr. LaGarry
5 if he didn't consider that a fair to an impressive
6 amount of field data to support the stratigraphic and
7 hydrogeologic representation of the MEA.

8 DR. LaGARRY: Your Honor, let me respond
9 this way: for a hundred years, people couldn't
10 correlate rocks between Nebraska and South Dakota,
11 despite a hundred years of intensive field work by
12 dozens and dozens of institutions. Then, in the
13 1990s, a couple of graduate students applied an old
14 technique and succeeded.

15 So, just because there's a preponderance
16 of data does not necessarily mean that that data has
17 captured what we're interested in in any particular
18 case, nor does it indicate that that data could be
19 used for any other purpose than what it was intended
20 for.

21 In my mind, someone interested in
22 recovering an ore has an entirely different view than
23 someone who's interested in studying contaminants.
24 So, the data you collect, regardless of what it is, is
25 in large part biased by your intent to use that data.

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1 Data that doesn't help you produce uranium might not
2 even be considered. So, all data is not equal and not
3 all data is useful.

4 And just the fact that there is a
5 preponderance of data intended to help somebody
6 harvest uranium from rocks underground doesn't
7 necessarily mean it applies to any other purpose.
8 Some of it may, and most of it likely does, but
9 there's no guarantees. Somebody could come along a
10 year, two years, a new analysis, a new form of
11 chemistry, different species of interest, and then,
12 that's the magic bullet that solves all our problems.
13 I don't buy that a lot of data necessarily gets us
14 where we want to go.

15 JUDGE WARDWELL: And so, what additional
16 information do you believe is necessary in regards to
17 developing the stratigraphic cross-sections that they
18 had, that they had used the number of bore holes that
19 they reported they did in order to develop that?
20 Because if you carry your argument, it doesn't say
21 that more bore holes -- should they have used less
22 bore holes, so that that would meet what you need,
23 because you've stated more bore holes won't
24 necessarily improve it?

25 DR. LaGARRY: The cross-section I showed

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1 previously, that we had up just before the break, A to
2 A prime, okay, that cross-section is based on 12,500
3 bore holes, the three north-south lines, 12,500 bore
4 holes. However, the bore holes had limitations. In
5 the cuttings from the bore holes, three or four of the
6 units that are similar in lithology, but, yet,
7 different ages, were conflated with each other. It
8 took field work to resolve the problems with the
9 subsurface work, right?

10 And I can't predict what that would be to
11 improve their stratigraphy. I, personally, in this
12 proceeding and in all my opinions, I don't think
13 necessarily the stratigraphy is their problem. I talk
14 in my rebuttal about that bore holes aren't the best
15 tool for discovering and characterizing your vertical
16 joint sets, that they are likely ubiquitous throughout
17 the MEA. There are other better ways to do it. I
18 don't think more bore holes in this case would help.
19 It will have to be something else.

20 JUDGE WARDWELL: What is the length of A
21 prime/A line profile in your figure 1?

22 DR. LaGARRY: Oh, about 100 miles.

23 JUDGE WARDWELL: And what's the length of
24 the MEA?

25 DR. LaGARRY: Seven miles.

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1 JUDGE WARDWELL: Okay. Thank you.

2 NRC Exhibit 001, Answer 10, at 12 to 13,
3 staff testified that, "Based on the bore hole data
4 collected during those investigations, CBR created
5 cross-sections depicting the stratigraphy at and in
6 the vicinity of the MEA, citing CBR008, Technical
7 Report, at 49 to 62, figures 2.6-3A to 2.6-3A. These
8 cross-sections cover the entire site, citing CBR
9 Exhibit 005 of the EA at 3-255, figure 3.3-2," which
10 is what is on pages 3-255. "They also cite CBR008TR
11 at figure 8, figure 2.6-2, and demonstrate the extent
12 and thickness of the stratigraphic units presented at
13 the site."

14 Because geophysical logs were obtained
15 from the bore holes, and the bore holes also had the
16 cuttings associated with it, Dr. LaGarry, don't these
17 cross-sections represent natural subsurface conditions
18 at the MEA that were encountered in those bore holes
19 and accurately depict the thickness and aerial extent
20 of the stratigraphic units in the MEA?

21 DR. LaGARRY: To the extent that the
22 boundary picks and the geophysical logs are precise.
23 Typically, that's a professional judgment, you know,
24 based on the configuration of the little wiggly line
25 that makes up the geophysical log. But I work for the

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1 Nebraska Geological Survey, and the rocks out here are
2 siltstones, variations on the theme of siltstone.

3 The major breaks between the White River,
4 Arikaree, and Ogallala groups are based on the amount
5 of silt. Those are pretty secure. But, even
6 experienced geologists working in subsurface rocks
7 struggle to differentiate between the Sharps Formation
8 and the Monroe Creek Formation of the Arikaree Group.
9 So, they struggled to find in the subsurface the White
10 River-Arikaree boundary. In surface exposures, that
11 boundary is very easy to pick out because there's
12 weathering and erosional differences between the two
13 rocks, but in the subsurface it was really difficult.

14 You know, a tremendous amount of work went
15 into Crow Butte subsurface work and it's awesome, but
16 it depends on the experience of the geologists doing
17 the picks. You know, it depends on a lot of things.

18 I have no reason to question or doubt
19 their cross-sections. I accept them at face value.

20 JUDGE WARDWELL: Okay. Thank you.

21 NRC Exhibit 001, Answer 19 at 25, "Cross-
22 sections were created based on the geophysical logs
23 and observations of drill cuttings from 57 bore holes
24 that cover the entire MEA site."

25 And I'll ask CBR, Crow Butte, if you don't

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1 mind, even though it was a quote from the NRC
2 testimony, but I was curious on why you only used 57
3 bore holes from all the 1600 bore holes to draw the
4 cross-sections. And then, how did you choose those 57
5 from the 1600?

6 MR. STRIVER: Your Honor, first, I did not
7 construct these cross-sections originally or pick the
8 bore holes that were utilized for the cross-sections.
9 Those were done by an experienced geologist who had
10 been working at the Crow Butte Mine for several years
11 and has good experience, and he was involved in the
12 Marsland drilling program.

13 JUDGE WARDWELL: And as a side note, do
14 you mind sharing why that person isn't here, just for
15 my own more personal reasons than any professional
16 reason here, if it's the same person I'm thinking of?

17 MR. PAVLICK: So, the person is Wade
18 Bynes, and he has left the company.

19 JUDGE WARDWELL: Okay. I was afraid it
20 going to be worse news than that.

21 (Laughter.)

22 JUDGE WARDWELL: I don't mind him leaving
23 the company. Hey, if you can tell, that's a major
24 thing in my life now in regards to other issues that
25 may occur.

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1 Go ahead. Thank you.

2 MR. STRIVER: Certainly. When cross-
3 sections are going to be constructed, the distance
4 utilized between the bore holes, typically, you're
5 trying to be representative of the area you're trying
6 to characterize. So, for example, in the one that you
7 had depicted in that figure A to A prime going north
8 to south, if you have, say, 200 bore holes, sir, then
9 that would be too busy of a cross-section. Each one
10 of those bore holes are looked at in determining a
11 cross-section of the geophysical logs, but it could be
12 too busy if we have too many bore holes that are
13 utilized in that.

14 JUDGE WARDWELL: And I guess, as you
15 testified, you don't necessarily know how the 57 were
16 collected from the 1600 --

17 MR. STRIVER: That is correct.

18 JUDGE WARDWELL: -- to create those cross-
19 sections?

20 MR. STRIVER: That is correct. I do not.
21 I was not involved in that.

22 MR. PAVLICK: Your Honor, I think the
23 intent was, if you look at the layout on figure 2.6-2,
24 the regional or area layout of all the cross-sections,
25 you'll see there's nice, even spacing. So, it's to

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1 provide an extensive coverage north to south and east-
2 west across the entire permit area, and just give a
3 very representative view of the data from the bore
4 holes as it applies to both the mining area and
5 laterally off to the sides of the ore body.

6 JUDGE WARDWELL: And as such, all these 57
7 holes were drilled within the interior boundaries of
8 the MEA? Or close to it? I mean, they may have been
9 a skosh to the east or west, but they're basically
10 within the MEA? Is that correct?

11 MR. STRIVER: That's correct.

12 JUDGE WARDWELL: Thank you.

13 CHAIR BOLLWERK: That figure is in which
14 exhibit?

15 JUDGE WARDWELL: 008, is it again?

16 CHAIR BOLLWERK: 00 --

17 MR. STRIVER: CBR008.

18 CHAIR BOLLWERK: Yes, CBR008-R? Marsland
19 Technical Report Figures?

20 MR. STRIVER: Correct. Figure 2.6-2.

21 CHAIR BOLLWERK: Thank you.

22 JUDGE WARDWELL: Moving on to Section
23 1.1.1.2, Hydrogeologic Characteristics, Crow Butte, at
24 004, Opinion 3 at 4, stated that, "Water table
25 elevation data from the CBR aquifer or Brule

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1 monitoring wells indicate that these two aquifers
2 comprise a single aquifer system. Therefore, any
3 contaminated groundwater migrating into the Brule
4 could be pumped from Arikaree water wells."

5 And I'll start with Crow Butte. Do you
6 agree with this statement that the Arikaree and Brule
7 comprise pretty much a single unconfined aquifer
8 system?

9 MR. LEWIS: Yes, Your Honor. The water
10 levels between the two formations are similar, so they
11 act as a single system.

12 JUDGE WARDWELL: So, they would tend to
13 act as one unconfined aquifer?

14 MR. LEWIS: Correct.

15 JUDGE WARDWELL: And, NRC, do you agree
16 with that statement?

17 MR. BACK: Your Honor, that's true of the
18 Upper Brule, but if you get into the brown siltstone,
19 it's different.

20 JUDGE WARDWELL: Yes, and I think what
21 they're referring -- that brown siltstone wouldn't be
22 considered part of the Brule aquifer, would it,
23 necessarily?

24 MR. BACK: Yes, Your Honor.

25 DR. LaGARRY: Your Honor, may I interject?

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1 JUDGE WARDWELL: Oh, yes, sure.

2 DR. LaGARRY: The brown siltstone is
3 equivalent to the Sharps Formation, and based on
4 recent documentation from the Nebraska Geological
5 Survey, the term "Sharps" now replaces brown
6 siltstone. That rock would be the upper part of the
7 Brule; that would be part of that aquifer.

8 JUDGE WARDWELL: Okay. And what were you
9 saying? Was it you, Mr. Back, that was saying that
10 you wouldn't necessarily conclude that it would be the
11 same aquifer?

12 MR. BACK: It depends on where you are on
13 the site, but we're in general agreement with what was
14 just said.

15 JUDGE WARDWELL: Okay. That's all we need
16 for now really, just that that isn't a gross
17 mischaracterization of the site.

18 In regards to the Brule Formation -- and
19 I'm referencing now Crow Butte's Exhibit 006, a
20 Technical Report, at Section 2.7.2.3, at 2-86, where
21 it's stated that, "Regional water level information
22 for the Brule Formation is currently only available in
23 the vicinity of the current production facility.
24 However, within the MEA, groundwater generally flows
25 to the southeast across the entire MEA towards the

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1 Niobrara River at a lateral hydraulic gradient of
2 0.011 feet per foot." And referencing Aqui-Ver 2011
3 report.

4 My question for Crow Butte is, is the
5 Aqui-Ver 2011 report Exhibit CBR010, Appendix AA-1,
6 which is actually a 2013 report of Aqui-Ver, or is
7 there, in fact, another report that we don't have or
8 hasn't been submitted?

9 MR. PAVLICK: Your Honor, can we have some
10 time and we'll let you know?

11 JUDGE WARDWELL: Sure. I'm not sure why
12 you're looking at cross-sections. My question was,
13 there was a reference to the Aqui-Ver 2011 report as
14 a reference, and I couldn't find that report in the
15 testimony and exhibits that were submitted. I did
16 find CBR010 in Appendix AA-1, which is a 2013 report
17 of Aqui-Ver, and just wondered if that's what was
18 meant by what was stated in the Technical Report in
19 Section 2.7.2.3 at page 2-86.

20 MR. LEWIS: Your Honor, I'm not looking at
21 the 2013 report. However, in the 2011 report, figure
22 15 of that aquifer testing report, there is a shallow
23 potentiometric surface map that I believe is a similar
24 reference, not the same reference.

25 JUDGE WARDWELL: Where? Where is it?

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1 MR. SMITH: I'm sorry. Aqui-Ver 2011 is
2 likely CBR016, which is the pumping test report. And
3 that's what Mr. Lewis is referring to here as a
4 shallow potentiometric surface map.

5 JUDGE WARDWELL: Okay. So, it's your
6 opinion that the Aqui-Ver 2011 is in reference to the
7 pumping test? Is that correct, Mr. Lewis?

8 MR. LEWIS: Yes. Yes.

9 JUDGE WARDWELL: That's correct, you said?

10 MR. LEWIS: Yes.

11 JUDGE WARDWELL: And was that dated 2011
12 also?

13 CHAIR BOLLWERK: It's dated 2011, but it
14 was revised 2015.

15 MR. SMITH: Correct.

16 JUDGE WARDWELL: So, it's the revision of,
17 the copy we have is the revision of 2015, is that
18 correct?

19 MR. SMITH: That is correct. The report
20 was initially Aqui-Ver 2011. It was revised in 2015.
21 The version you have as CBR016 is the most recent and
22 final version, which is revised October 28th, 2015.

23 JUDGE WARDWELL: Okay. Then, my question,
24 I guess, is, if the pump test related to the Basal
25 Chadron, this testimony that I quoted that references

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1 the Aqui-Ver 2011, which we now say is a '15 pump test
2 report, deals with pumping in the Basal Chadron,
3 doesn't it? Where does it have showing the lateral
4 gradient of 0.11 for the Brule Formation?

5 MR. LEWIS: The 2011 pump test report,
6 figure 15, was a shallow water table map.

7 JUDGE WARDWELL: Could we call that up?
8 And that's -- what is that again, CBR016?

9 MR. SMITH: Correct. If it helps, it's
10 page 47 of the PDF.

11 JUDGE WARDWELL: Sorry, what did you say
12 again?

13 MR. SMITH: It's page 47 of the PDF, if
14 that helps.

15 JUDGE WARDWELL: Okay. Is that with or
16 without the cover sheet?

17 MR. SMITH: That's with the cover sheet.

18 JUDGE WARDWELL: All right.

19 MR. SMITH: PDF page 47. It's figure 15
20 on the report itself. 016.

21 JUDGE WARDWELL: One more down. No, I'm
22 sorry, maybe I missed it. Did you want 15? I was
23 confusing 16 with -- yes, I guess we do. Okay.

24 That shows the groundwater flow direction.
25 I don't see anything in regards to the 011 for the

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1 hydraulic gradient.

2 MR. STRIVER: Your Honor, I believe the
3 potentiometric surface maps that were generated by
4 2014 data may have been utilized for that calculation.
5 I cannot -- well, I'll need to confirm that.

6 JUDGE WARDWELL: I'll give you time later.
7 But say that again, because now we've got enough of
8 these reports floating around and the variations.

9 MR. STRIVER: Yes, sir.

10 JUDGE WARDWELL: And not all of them have
11 been submitted to us, and it gets awful confusion.

12 MR. STRIVER: Yes, sir.

13 JUDGE WARDWELL: Especially when we're
14 dealing with Basal Chadron, we're dealing with Brule,
15 and there's different gradients that we're dealing
16 with and different purposes.

17 MR. STRIVER: Understood.

18 The potentiometric surface maps that were
19 in the TR, in CBR008, figure 2.9-5 for the Brule,
20 those potentiometric surface maps were probably used
21 for that calculation. that would have to be
22 confirmed.

23 JUDGE WARDWELL: You haven't look those up
24 to see if that shows a line with an I equals 0.011,
25 have you?

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1 MR. STRIVER: No. Yes, I will have
2 confirm that, sir.

3 JUDGE WARDWELL: Yes, and you don't have
4 to do it right away again, but, yes, at some point,
5 I'd like confirmation of where that number shows up.
6 Because I will continue with what I thought Aqui-Ver
7 2001 was referring to, and that is the Aqui-Ver 2013
8 report, which I believe is CBR010.

9 I'll pause to make sure people are
10 listening.

11 MR. SMITH: It's taken from the figure 15
12 that we're looking at. The distance between the BOW3
13 and BOW1 is 7,000 feet. The elevation difference
14 between the two is the difference between 4,133.97 and
15 4212.81, but yields a gradient of .011.

16 JUDGE WARDWELL: And so, I'll ask CBR's
17 expert witnesses, where did that hydraulic gradient
18 come from?

19 MR. LEWIS: Your Honor, that came from
20 figure 15 of the 2011 pump test report.

21 JUDGE WARDWELL: And how is that derived?
22 Because the number doesn't show up there.

23 MR. LEWIS: It was calculated by the
24 difference between the head between BOW3 and BOW1,
25 divided by the distance between those wells.

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1 JUDGE WARDWELL: Thank you.

2 CBR010, figure C-1, and it would be wise
3 to pull that up, if we could. And this is an Aqui-Ver
4 report, and on that, figure C-1 -- I think that's C-2.
5 If we could get C-1? There is C-1, yes. Don't
6 expand. Just leave it, unless anyone asks, Joe, just
7 leave it, okay, because I'd rather have it back to
8 where it was before. We'll let you know if we want to
9 go in or out. It's better to show the full -- "fit to
10 height," there you go.

11 You see similar arrows on the
12 potentiometric surface of the Arikaree Group, which,
13 again, we all agreed could be considered the same as
14 the Brule in regards to close enough for what we're
15 dealing with here. We've already stated that.

16 And you show a gradient there. And I
17 believe the gradient shows up as 0.0.0037 for the
18 Arikaree. Is that some magical nomenclature system
19 that I'm not familiar with or is it just an extra .0
20 thrown in there?

21 MR. STRIVER: The Arikaree -- this report,
22 first, is done by a consulting, ARCADIS Group, the
23 potentiometric surface map, from data, it looks like,
24 from 2013.

25 JUDGE WARDWELL: And I'm pointing to the

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1 box that has the 0.0.0037 as the gradient. And I
2 assume that that hydraulic gradient, considering it's
3 next to an arrow, that oftentimes simulates the
4 gradient, in addition to the flow path. Is not that
5 a numerical error in regards to the extra 0.? You
6 have two decimal points in the darn thing. I want to
7 make sure that we're putting it in the right location.

8 MR. STRIVER: Yes. Yes, sir, that is an
9 error. There are two decimal points in that number.

10 JUDGE WARDWELL: And what should the
11 number read? Because you can read it two different
12 ways, depending on which you drop out.

13 CHAIR BOLLWERK: In other words, you're
14 asking does the "0." come out of there or does the
15 point come out of there, right, I guess?

16 JUDGE WARDWELL: Yes. Does the first "0."
17 come out or just the --

18 CHAIR BOLLWERK: The second point should
19 be dropped?

20 JUDGE WARDWELL: Yes, should the 0 and the
21 point come out?

22 MR. STRIVER: It is 0.0037.

23 JUDGE WARDWELL: Thank you.

24 Moving on to C-2, we don't have to go
25 there because you'll see a similar box. He's not

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1 there yet, but it doesn't have to be. You'll see a
2 similar box for the Brule, and it will say "0.0.004".
3 What should that read?

4 MR. STRIVER: Your Honor, we'd like to
5 make a calculation to verify.

6 JUDGE WARDWELL: Okay. So, get back to us
7 on that one.

8 And then, Dr. LaGarry, when we do get to
9 that, make sure you remind me to ask you if you have
10 any reason to contest those values.

11 DR. LaGARRY: Okay.

12 JUDGE WARDWELL: Okay. CBR006, Technical
13 Report, Section 2.7.2.3, at 2-86, says, "In the
14 vicinity of the MEA, groundwater flow in the basal
15 sandstone of the Chadron Formation is predominantly to
16 the northwest towards the White River drainage at a
17 lateral hydraulic gradient of 0.0004 feet per foot."
18 And this is referencing, again, Aqui-Ver 2011. And
19 this is also repeated in, I believe, CBR006, Technical
20 Report, Section 2.9.3.2, at 2-17.

21 And again, you believe that this reference
22 is in relationship to the pump test report, is that
23 correct?

24 MR. STRIVER: No, Your Honor.

25 JUDGE WARDWELL: So, this Aqui-Ver 2011 is

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1 different from the other Aqui-Ver 2011 reference?

2 MR. STRIVER: Your Honor, I cannot answer
3 that question.

4 JUDGE WARDWELL: Is there anyone who can
5 in regards to really the hydraulic gradient of the
6 Basal Chadron? It's what I'm trying to fix here.

7 MR. PAVLICK: Your Honor, we're a little
8 confused on the documents that you're referencing.

9 JUDGE WARDWELL: I'm sorry?

10 MR. PAVLICK: We're a little confused on
11 which documents you're asking us about.

12 JUDGE WARDWELL: Okay. I'll start again
13 then or I'll say it again.

14 You quote, on page 2-86 -- and both of
15 these quotes are at 2-86 of Section 2.7.2.3 of CBR006,
16 which is your Technical Report. The one we just got
17 through talking about is a quote taken out of that
18 reference stating what the hydraulic gradient is in
19 the Basal Chadron sandstone, and it references Aqui-
20 Ver 2011.

21 On that same page, as we previously had
22 discussed -- I'm sorry, did I say -- yes, of 2011. On
23 the same page as this one, we previously discussed the
24 hydraulic gradient for the Brule aquifer, Brule
25 Formation, the Brule Formation aquifer, whatever. And

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1 that also cites the Aqui-Ver 2011 report. And I'm
2 just verifying that those two reports are the pump
3 test report, which is CBR016. Is that correct? And
4 that's where we can find those gradients?

5 As long as you understand what I've asked,
6 then I'll just move on and you can work on that. I
7 don't have to have it done. Am I clear in regards to
8 what I'm asking? I'm really trying to pin down the
9 references that created the calculation of hydraulic
10 gradients for both the Brule and the Basal Chadron,
11 and they're both in your Technical Report 2.7.2.3 at
12 2-86. And I just want to make sure that we're dealing
13 with the -- where those numbers came from.

14 And then, naturally, I'm going to move on
15 to say, well, we see some variation here, depending
16 upon what you happen to be talking about, and we want
17 to fix that, especially since they seem to be awful
18 close in numbers. We tend to mix them up, and I want
19 to make sure we all get on the same page in regards to
20 what's the correct number that we're using.

21 MR. STRIVER: Okay. Your Honor, as I
22 understand it, that is from the 2011 pump test report,
23 both --

24 JUDGE WARDWELL: Both of those came from
25 that? And so, they are both the corrected typo

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1 numbers that were presented on the figures in that
2 pumping test report, is that correct?

3 MR. STRIVER: Yes, Your Honor.

4 JUDGE WARDWELL: Okay. Good.

5 DR. LaGARRY: And, Your Honor, to remind
6 you, I have no reason to object to those numbers. You
7 asked me.

8 JUDGE WARDWELL: Yes. Thank you.

9 DR. LaGARRY: So, you asked me.

10 JUDGE WARDWELL: You did remind -- see,
11 I'm no fool; I know that I won't remember, which is
12 probably three-quarters of the battle. I know I don't
13 remember.

14 Okay. Oh, now I've confused myself again.
15 Sorry. We've got to go back to it.

16 When I had you agree to where those
17 numbers came from, I said they were corrections from
18 the typo that was on there, but that was off of
19 CBR010, Figures C-1 and C-2. It wasn't the pump
20 tests. So, where do these numbers come from in the
21 pump tests? I can see where one comes from. Well,
22 no, the pump -- the CBR010 only came, those
23 corrections only came from the Arikaree and the Brule.

24 MR. SMITH: Perhaps I could offer
25 something that might clarify?

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1 JUDGE WARDWELL: Sure.

2 MR. SMITH: If you look at --

3 JUDGE WARDWELL: As long as it's not a
4 calculation. If it's a reference source, that's fine.

5 MR. SMITH: It's a reference, but it rests
6 on my assumptions regarding the calculations. If you
7 look at CBR010 --

8 JUDGE WARDWELL: Yes.

9 MR. SMITH: -- which is the Aqui-Ver 2013
10 report --

11 JUDGE WARDWELL: All right, and that's
12 AA1, is that correct, of 2010? That's where the
13 report is. I don't know. I shouldn't interrupt you.

14 MR. SMITH: December 10th, 2013, yes.

15 JUDGE WARDWELL: Right.

16 MR. SMITH: If you look at the
17 potentiometric surface on, I guess it's figure C-1 --

18 JUDGE WARDWELL: And that's in CBR010?

19 MR. SMITH: Correct.

20 JUDGE WARDWELL: And that's, yes, that's
21 what we had up before?

22 MR. SMITH: Yes. If you look at the
23 southern end of the Marsland area where you have the
24 gradient written out in red, that is 0.004. If you
25 look at the northern end of that same figure, you'll

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1 see that it steepens to the north and it will be 0.011
2 in that area, and the elevations in that area
3 correspond to the portion of the figure in CBR016,
4 figure 15.

5 JUDGE WARDWELL: Can you pull up 016,
6 figure 15, now? Don't close this one out.

7 MR. SMITH: What you'll see there in --
8 it's CBR016, figure 15. You have a groundwater flow
9 direction that shows in a portion of the site. As we
10 confirmed earlier, the calculation of the gradient for
11 that area is 0.11 -- I'm sorry -- 0.011. And that
12 corresponds to the northern portion of CBR010, figure
13 C-1.

14 JUDGE WARDWELL: You say that's in the
15 northern portion? So, that's the arrow up above on
16 C-1 then, or in that vicinity?

17 MR. SMITH: Correct.

18 JUDGE WARDWELL: Now I need that to come
19 from your experts.

20 MR. LEWIS: Yes, I agree with Mr. Smith,
21 Your Honor.

22 JUDGE WARDWELL: I'm sorry?

23 MR. LEWIS: Your Honor, I agree with Mr.
24 Smith's calculation and references.

25 JUDGE WARDWELL: I don't believe I can

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1 accept that.

2 CHAIR BOLLWERK: Okay.

3 JUDGE WARDWELL: Do you? That's more of
4 a legal question. I would rather have you restate
5 what he said. I don't want to take testimony -- where
6 I'm at is I don't want to take testimony from a
7 lawyer.

8 CHAIR BOLLWERK: Right, he's right.

9 JUDGE WARDWELL: That's where I'm at at
10 this. I don't mind the information and the guidance,
11 but I've got to take testimony from you guys. I can't
12 take it from your back table. Only the front table
13 gets to do any talking around here.

14 CHAIR BOLLWERK: This is not a legal
15 question, either.

16 MR. LEWIS: Your Honor, I believe the
17 summary of this situation is that the gradient 0.011
18 is referenced to CBR016, figure 15, and the 0.004 is
19 from CBR010, that map that we were discussing.

20 Does that answer the question?

21 JUDGE WARDWELL: I don't know. Say it
22 again.

23 MR. SMITH: Perhaps if Mr. Lewis added
24 that CBR010 shows two different gradients, depending
25 on where you are in the map, and perhaps Mr. Lewis

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1 could clarify that the one at the northern end of the
2 site is the steeper one, 0.011, and the one on the
3 southern end is the shallower gradient, 0.004.

4 MR. LEWIS: Yes, Your Honor, the gradient
5 0.011 is from the northern portion of that map, and
6 the gradient --

7 JUDGE WARDWELL: Which is "that map"?

8 MR. LEWIS: CBR016.

9 MR. SMITH: 010 --

10 MR. LEWIS: 010 --

11 MR. SMITH: Figure C-2.

12 MR. LEWIS: Figure C-2. And the gradient
13 0.004 is from the southern portion of that map.

14 JUDGE WARDWELL: Okay. Thank you. I
15 think that will suffice. I think we're there.

16 Dr. LaGarry, do you have any evidence that
17 disproves those numbers?

18 DR. LaGARRY: I have no reason to dispute
19 any of those numbers, Your Honor.

20 JUDGE WARDWELL: Thank you.

21 You probably don't even care who says them
22 necessarily. You're happy with that.

23 DR. LaGARRY: Not at all, Your Honor.

24 JUDGE WARDWELL: All right. Oh, boy, here
25 we go. This is NRC Exhibit 006EA at Section 4.3.2.1,

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1 at 4-17, says, "Transmissivity is defined by the
2 aquifer thickness multiplied by the permeability;
3 i.e., hydraulic conductivity." We've said that.
4 That's been testified before here over the last day
5 and a half.

6 The section, then, goes on to say, "The
7 transmissivity multiplied by the hydraulic gradient
8 and cross-sectional area determines the volume of
9 water flowing through an aquifer or an aquitard."

10 So, I guess I'll ask NRC, is that second
11 sentence correct? Because, if so, the units are
12 really weird. Because if you take transmissivity
13 multiply it times a hydraulic gradient and a cross-
14 sectional area, don't you get cubic -- don't you get
15 feet to the -- distance to the 4th divided by a time?

16 MR. BACK: Your Honor, let me check that
17 calculation. It might have to do with --

18 JUDGE WARDWELL: And when you do that,
19 keep it in mind, should not say really hydraulic
20 conductivity times the hydraulic gradient times the
21 width of the aquifer? Because I think we have the
22 height, the thickness of the aquifer as part of
23 transmissivity.

24 MR. BACK: Your Honor, I believe you are
25 correct, and I will check and confirm.

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1 JUDGE WARDWELL: Why don't we do it this
2 way: unless you get back to me different, you will
3 testify that that is, in fact, an error and it should
4 be that the flow flowing through an aquifer is really
5 the hydraulic conductivity times the gradient times
6 the width of the aquifer at that location?

7 MR. BACK: That is correct, Your Honor.

8 JUDGE WARDWELL: Thank you.

9 NRC, in their environmental assessment,
10 3.3.2.1, at 3-28, then says that, "The hydraulic
11 gradient in the Basal Chadron aquifer is about 0.002
12 feet per foot." And then, in parentheses, it says,
13 "6.1 times 10 to the minus 5 meters per meter".

14 And I guess my question is, isn't
15 hydraulic gradient a dimensional number? And if
16 so, shouldn't those numbers be the same?

17 MR. BACK: Yes, Your Honor.

18 JUDGE WARDWELL: So, which is correct? Is
19 it the 0.00 or the 6.1 times 10 to the minus 5?

20 MR. BACK: Oh, this has to do with the
21 conversion that technical editors did. So, they
22 converted the feet to meter, and it should be the foot
23 value, the point --

24 JUDGE WARDWELL: Yes, they shouldn't have
25 applied --

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1 MR. BACK: It should be the .0002, yes.

2 JUDGE WARDWELL: Right. There's no
3 conversion needed. They made a conversion.

4 MR. BACK: I understand. I understand.

5 JUDGE WARDWELL: Okay. So, the 0.002 is
6 the correct number?

7 MR. BACK: That is correct, Your Honor.

8 JUDGE WARDWELL: And do you know where you
9 got that? I'm not concerned that there's a difference
10 between the 0.00 -- well, no, let me rephrase. I
11 guess I don't know that. Do you know where the source
12 of that came from?

13 MR. BACK: Yes, Your Honor. It's in the
14 same sentence. It's CBR2016, Appendix GG, figure 23.
15 It's 2011 potentiometric surface.

16 JUDGE WARDWELL: Okay. Thank you.

17 NRC Exhibit 014, Answer 10 at 10, says,
18 "Any heterogeneity in a surface aquifer" -- and the
19 Arikaree/Brule is the surficial aquifer we're dealing
20 with, is that not correct, Dr. LaGarry?

21 DR. LaGARRY: Yes, it is.

22 JUDGE WARDWELL: Okay. So, "Any
23 heterogeneity in a surficial aquifer is not germane to
24 the confinement of the Basal Chadron-Chamberlain Pass
25 Formation sandstone aquifer."

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1 And I was wondering, do you concur with
2 that, that any heterogeneity up there really doesn't
3 have much effect on the confinement of using -- of the
4 upper confining unit over the Basal Chadron sandstone,
5 does it?

6 DR. LaGARRY: That's correct, Your Honor.
7 And I want to add that the Sharps and Whitney Members
8 of the Brule happen to be two of the most uniform and
9 consistent units out there. So, they are, by their
10 nature, homogeneous, but they have no bearing on
11 what's going on below.

12 JUDGE WARDWELL: Okay. Thank you.

13 Have we already discussed, Dr. LaGarry,
14 the downward gradients between the Brule and the Basal
15 Chadron or was that Mr. Wireman that testified for
16 that?

17 DR. LaGARRY: It was Mr. --

18 JUDGE WARDWELL: And I asked if you agreed
19 to the --

20 DR. LaGARRY: It was Mr. Wireman, sir.

21 JUDGE WARDWELL: I'm sorry?

22 DR. LaGARRY: It was Mr. Wireman, sir.

23 JUDGE WARDWELL: Okay. Do you dispute
24 that there's a strong downward gradient between the
25 Brule -- or a downward gradient between the Brule and

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1 the Basal Chadron?

2 DR. LaGARRY: I don't dispute that. My
3 expertise is not in that area.

4 JUDGE WARDWELL: That's good. Thank you.

5 Moving on to 1.1.2, Contaminant Pathways,
6 Dr. LaGarry, your testimony in OST010, page 5, says
7 that, "In-situ leach mining in the Marsland area would
8 likely contaminate the groundwater with heavy toxics."
9 This is the same quote I made before where we're
10 listing off the different pathways, the surface leaks,
11 the underground spills and leaks, lack of containment,
12 and a lateral migration in the aquifer where metals
13 would migrate laterally through porous, permeable
14 sandstones into the White and Niobrara Rivers."

15 And I guess the question is, Dr. LaGarry,
16 how would these pathways occur, given the downward
17 gradients between the Brule and the Chamberlain Pass
18 Formation?

19 DR. LaGARRY: Your Honor, my comment in
20 that opinion was in reference to leaks, spills, you
21 know, stuff on the surface. Anything spilled on the
22 surface in that location has a straight shot to the
23 High Plains Aquifer. Apart from the thin skin of
24 grass and a little bit of soil from Aeolian sediment
25 on top of the bedrock, once a spill or some

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1 contaminant gets on the land surface, the next rain
2 event sends it through that thin skift of soil and
3 straight into the bedrock, where, then, it can go
4 through the strong downward gradient right into the
5 remaining water in that pocket of groundwater I
6 mentioned earlier before lunch.

7 JUDGE WARDWELL: In regards to the --
8 well, I think we'll cover that later.

9 Moving on to 1.1.2.1, which you already
10 responded to a bit, it deals with -- now we're getting
11 each of your pathways separately, we're going to talk
12 about. Now we're starting off with the first one you
13 mentioned was the surface leaks and spills that you
14 just commented on. And I think I'll read it out, just
15 so people have it in their minds.

16 In your testimony at 010, "The soils of
17 northwestern Nebraska are thin and directly overly
18 permeable, porous bedrock. The rocks exposed at the
19 surface in the Marsland area are either a formation of
20 the Arikaree Group or of the Ogallala Group. Both are
21 sandstone. Any leaks or spills into the landscape
22 will be transmitted directly to the High Plains
23 Aquifer within a few years. There are no confining
24 layers within this aquifer. In some areas, the water
25 table is within 30 meters of the surface."

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1 And figure 1 that we looked at before
2 shows the interval of the aquifer vulnerable to the
3 surface spills and leaks.

4 NRC Exhibit 006, Environmental Assessment,
5 4.2.2, at 4-9 and 4-11, NRC staff points out that, "In
6 addition to the Safety, Health, and Environmental
7 Quality Management System" -- and they abbreviate that
8 SHEQMS. Is that how you would say it? Or do you
9 spell it out? Or who should I turn to for how I
10 should refer to this? I'll refer to it as SHEQMS for
11 the time being.

12 "CBR has complementary plans in place,
13 including a Spill Prevention, Control, and
14 Countermeasures" -- that's an SPCC -- "Plan to control
15 for accidental discharge reporting, spill response,
16 and cleanup measures, and a Stormwater Pollution
17 Prevention Plan" -- that's the SWPPP -- "requiring the
18 Applicant to develop a stormwater management and spill
19 response plan."

20 And I guess I ought to ask you, Dr.
21 LaGarry, why wouldn't these plans help assure actions
22 are taken to control any of those surface leaks and
23 spills that you have pointed out have a propensity for
24 getting into the High Plains Aquifer quickly?

25 DR. LaGARRY: Your Honor, I'm aware that

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1 at in-situ leach operations there have been undetected
2 leaks that have gone for a year or so, spewing
3 contents onto the land surface or into the shallow
4 subsurface. It's my view --

5 JUDGE WARDWELL: May interrupt you?

6 DR. LaGARRY: Please.

7 JUDGE WARDWELL: If you're referring to an
8 underground leak from a pipeline, could we wait until
9 we get to the next section to deal with that? This
10 here is strictly surface spill where something falls
11 off -- where everyone sees that it falls off, you
12 know, a wagon or there's a surface pipe that breaks
13 that's on the surface that someone can see.

14 DR. LaGARRY: Sure. I recognize that.

15 JUDGE WARDWELL: Can I get your comments
16 on this now and, then, we'll go to the other one
17 later? Go ahead.

18 DR. LaGARRY: Yes. Yes, I recognize that.

19 JUDGE WARDWELL: Okay.

20 DR. LaGARRY: And, you know, a truck could
21 tip over coming to and from. Despite the safety
22 precautions in place, which would likely catch most
23 things, it's still foreseeable that something could
24 happen because they have happened in the past.

25 And this pocket of water, you know, as the

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1 water levels in the High Plains Aquifer continue to
2 diminish, which they are and will, this is going to
3 become a more precious resource. In my mind, if
4 mining goes on for 10, 15, 20 years, little drips and
5 drabs will have a cumulative effect. And after 20
6 years of drips and drabs, in 25 years it's plausible
7 that the water might be less than perfect for feeding
8 to livestock and sprinkling on crops. That's the
9 basis of my concern.

10 JUDGE WARDWELL: And is it your
11 understanding that those programs that were mentioned,
12 the SHEQMS, the SPCC, and the SWPPP, are both
13 preventative, but also how to mitigate any spills,
14 too? Was that your understanding of those or --

15 DR. LaGARRY: Yes, Your Honor, and it's
16 wonderful that such things exist.

17 JUDGE WARDWELL: Okay. Thank you.

18 Crow Butte, in their rebuttal 033, Answer
19 37, at 21, said, "In response to Dr. LaGarry's claims
20 that surface water leaks and spills at Marsland could
21 be transmitted to the High Plains Aquifer within a few
22 years, CBR claimed that Dr. LaGarry's statement is
23 speculation and not supported by any evidence or
24 transport analysis. Boring and well logs of surficial
25 soils and shallow subsurface sediments at the MEA

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1 indicate the site is underlain by more than 30 to more
2 than 100 feet of unsaturated sediments between the
3 ground surface and underlying water table, including
4 a significant thickness of low permeability materials;
5 i.e., silkstones and claystones of the Brule Formation
6 and/or formations of the Arikaree Group across much of
7 the site.

8 "Further, many of the potentially water-
9 bearing units of the Arikaree Group have limited
10 lateral extent and are interbedded with low
11 permeability and mudstone units. The significant
12 thickness of the unsaturated zone and the presence of
13 a significant amount of low permeability materials
14 would significantly reduce the likelihood of downward
15 migration of any spilled mining solutions into the
16 underlying water table."

17 And I would ask CBR, what analyses have
18 you performed to estimate the seepage rate into the
19 ground of a surface spill and how would your programs
20 be able to remediate that before it does actually seep
21 into the ground?

22 MR. PAVLICK: Your Honor, I don't believe
23 we've done any seepage analysis or absorption-into-
24 the-ground analysis. Our programs, if a spill does
25 occur on the ground, are several. So, it would be

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1 initially followed with -- or, initially, there would
2 be isolation of the source of the leak, followed by
3 response from a vacuum truck to suck up any free water
4 pooled up on the ground; identification of the area of
5 the leak. So, we would establish a boundary and
6 survey that boundary. And then, we would mark that on
7 a map and in our reporting documents, so that we could
8 track the possible contamination of that area through
9 the time and through the operation of the site. So,
10 several processes in place to deal with it immediately
11 and, then, track it for ultimate mitigation at end of
12 day.

13 JUDGE WARDWELL: Do you know if your
14 mitigation plan includes any excavation of materials
15 that are visibly representative of the leakage that is
16 seeping down into the ground?

17 MR. PAVLICK: Yes, sir. So, we have
18 picked up dirt from a spill area before on the CBO
19 site. That is an option. And also, there is the
20 effects of attenuation and time that could apply to
21 it.

22 JUDGE WARDWELL: That might be an option.
23 Do you exercise that option --

24 MR. PAVLICK: Which option?

25 JUDGE WARDWELL: -- of your plan? Sorry?

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1 MR. PAVLICK: Which option?

2 JUDGE WARDWELL: I'm sorry, still --

3 MR. PAVLICK: So, picking up the dirt,
4 contaminated dirt, is, yes, an option that we do
5 practice.

6 JUDGE WARDWELL: Thank you.

7 CBR rebuttal 033, A-37, at 21, says, CBR
8 continues that, "In the unlikely scenario of a surface
9 spill migrating through unsaturated sediments into the
10 Arikaree Group water-bearing sands, the leak will be
11 extremely limited in extent both laterally and
12 vertically."

13 CBR, how do you support that statement
14 that appears to be somewhat speculative and an
15 unsupported supposition?

16 MR. STRIVER: The Arikaree at the MEA site
17 is very heterogeneous with claystones, siltstones,
18 alluvium on top, and it's not a consistent sand that's
19 at the surface. That would be from analysis of
20 cuttings and of -- well, geophysical logs are
21 difficult to get at the shallow depth, but from
22 cuttings analysis and review of the surface cuttings
23 that were during borings.

24 JUDGE WARDWELL: Thank you.

25 Dr. LaGarry, for OST, do you have any

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1 comments on that?

2 DR. LaGARRY: Yes, Your Honor. If such a
3 spill were to land on one of these unmapped,
4 undocumented joint sets that I'm talking about, it
5 could transmit the contaminants straight to the
6 aquifer in a very short time.

7 JUDGE WARDWELL: And what do you mean by
8 "very short time"?

9 DR. LaGARRY: Years, like I stated in my
10 opinion.

11 JUDGE WARDWELL: NRC Exhibit 006EA, at
12 Section 4.2.2, at 4-7, says, "In accordance with its
13 NPDES permit issued by NDEQ, that has to be
14 reauthorized every five years, CBR is currently
15 authorized to discharge construction-related
16 stormwater. Also, CBR would not withdraw from, or
17 discharge water to, the Niobrara River during
18 construction, operation, or aquifer restoration
19 phases."

20 Dr. LaGarry, do you have any comments in
21 regards to their NPDES permit and their commitment not
22 to be withdrawing or discharging any water to the
23 Niobrara River?

24 DR. LaGARRY: I applaud that. I don't
25 have any comment on it, sir.

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1 JUDGE WARDWELL: Thank you very much.

2 Moving on to Section 1.1.2.2, Underground
3 Spills and Leaks, Dr. LaGarry testifies that, "In
4 order to reach the uranium in the Chamberlain Pass
5 Formation, injection and extraction wells will need to
6 be drilled through the formations of the Arikaree
7 Group. All of these contain water, and excursion into
8 any one of them would be catastrophe and contaminants
9 quickly spreading through the entire section of the
10 aquifer."

11 And, Dr. LaGarry, I guess I have a
12 question for you in regards to what evidence you might
13 have that CBR's well installation, their abandonment
14 program, their integrity testing, their leak
15 detection, and mitigation plans are ineffective in
16 preventing and controlling the well casing leaks.

17 DR. LaGARRY: Your Honor, I recently
18 participated in another such situation where
19 substandard bore hole plugging, loss of documentation
20 of bore holes, a plethora of issues surrounding the
21 abandoned wells and bore holes was the central focus
22 of that case. I recognize that Crow Butte may have
23 the best of intentions and the best engineers.
24 However, the future is uncertain. Upon abandonment of
25 the site, there may be an incomplete job.

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1 Circumstances might change. My opinion, which I
2 provided to you, was in large part influenced by that
3 prior experience.

4 It's imperfect. Most of the bore holes
5 would work out just fine. They would be cased just
6 fine. But, then, a mis-screened bore hole, you know,
7 a defective pipe or a casing, an undetected
8 underground leak somewhere in a pipe, those things
9 happen. And because those things happen, I opined on
10 it as a potential hazard to the aquifer.

11 JUDGE WARDWELL: Thank you, sir.

12 For Crow Butte, could you step me through
13 the actions that would take place -- and let's
14 simulate it with a failed casing somewhere in the
15 aquifer that happened right this very minute. How
16 would you know that? What's the approximate time
17 before you would discover it? What systems are
18 available to localize it? And what systems, plans, or
19 actions would take place? And how would that be
20 corrected? So, kind of step me through the whole
21 process of what action you would take, starting off
22 with, first, recognizing that has occurred until it's
23 finally mitigated.

24 MR. PAVLICK: Yes, sir. So, there's two
25 cases if a well failed immediately. If the well is

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1 online, so pumping either injection or production
2 water into or out of the ground, most likely it would
3 be noted from pressure changes or flow changes. All
4 wells are monitored, and alarming parameters are set
5 on those -- control parameters are set on those wells
6 to detect that type of failure.

7 If the well was not flowing, if it was
8 idle for a time, say it was the ore had been extracted
9 from that area, and that well was off, it might not be
10 found until the next MIT on that well, mechanical
11 integrity testing, which occurs on a five-year
12 interval, or anytime the well is penetrated or we do
13 maintenance on the well that involves actually sending
14 equipment down the casing.

15 In a case where the well is off, there's
16 no flow in the well, there is static head that may be
17 of issue -- but I'll go with probably the worst case
18 from a spill potential standpoint, which would be a
19 flowing well that was online. If the casing breaks
20 and we detect the failure, immediately the well is
21 shut off to stop the source of further fluid migration
22 outside the well border.

23 The next step is to put a -- pull the
24 internal equipment out of the casing and MIT the well.
25 We may actually camera the well to identify what zone

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1 the leak occurred at. So, if it's a failure of the
2 casing, we want to know what level it took place at.
3 What formation is it in?

4 The next step would be to, after
5 discussions with regulatory bodies, in most cases the
6 state, we would develop a plan to, a drilling plan to
7 surround that well with test holes to determine
8 whether we can detect water, and sample that water and
9 determine its constituents; basically, ring that
10 possible contamination or build a perimeter around it.
11 Then, follow through with that plan to extract that
12 fluid, retreat it or reprocess it, recover the fluid,
13 and restore -- in the case of a upper shallow aquifer
14 event like that, we would recover water until we had
15 return to an establishment of some kind of baseline
16 condition there, although we may not have a baseline
17 shallow aquifer average, so to speak, for that
18 particular well. We would have one close by that we
19 would use for the parameters to establish baseline.

20 JUDGE WARDWELL: In regards your initial
21 detection of that, which I think you mentioned was
22 pressure and flow monitoring --

23 MR. PAVLICK: Yes, sir.

24 JUDGE WARDWELL: -- how large a leak is
25 required before it sets off that system? What's your

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1 sensitivity of that?

2 MR. PAVLICK: So, the control system is
3 set up to see variations. So, we can make it as
4 finely-tuned as we want. However, it has to be
5 something that we can tolerate from an operational
6 standpoint. So, the variation is usually, say, 2 to
7 3 gallons per minute on a, say, nominally, a flowing
8 well of 10 GPM.

9 JUDGE WARDWELL: So, it's flow and not
10 pressure, or is there a pressure also? There's a
11 pressure gauge?

12 MR. PAVLICK: Pressure is probably more --
13 we can fine-tune pressure more so. The operational
14 pressure parameters are more on the trunk lines and on
15 individual wells or laterals going to wells. There
16 isn't continuous pressure monitoring.

17 JUDGE WARDWELL: And did you say that your
18 trunk lines are all buried at your site?

19 MR. PAVLICK: Yes, they are.

20 JUDGE WARDWELL: That's good news and bad
21 news, isn't it? It's good news for traffic
22 protection, but bad news to visually see any leaks
23 that might occur.

24 MR. PAVLICK: It is, but you would be
25 surprised how fast that water comes to the surface, if

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1 there is a failure of a flowing line 5 feet below the
2 surface.

3 JUDGE WARDWELL: But there is some small
4 leak that might occur that you won't detect? Isn't
5 that realistic to --

6 MR. PAVLICK: Yes, that's possible.
7 That's why we do pressure testing on lines before
8 they're put in service. And then, we monitor pressure
9 over time. So, in an operating system there's a
10 little bit of judgment involved, but if we see a
11 pressure difference noted on a line that we've
12 historically got a lot of data on, we'll recognize
13 that and possibly take the line offline and repressure
14 test it.

15 JUDGE WARDWELL: Dr. LaGarry, do you have
16 any comments on their program or suggestions that you
17 would think ought to be implemented to improve the
18 detectability and, then, the resulting mitigation of
19 any of those underground spills from a well?

20 DR. LaGARRY: Sir, I can't comment on
21 that. I'm not an engineer. I don't know anything
22 about it really.

23 JUDGE WARDWELL: That is an answer.

24 DR. LaGARRY: Thank you.

25 JUDGE WARDWELL: Thank you.

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1 MR. PAVLICK: Your Honor, could I add one
2 more thing to that? So, within the area where a well
3 failure would occur, there would be monitor wells in
4 that area as well, both shallow and deep. So, in
5 addition to what I discussed surrounding the well and
6 the possible recovery of fluid, if needed, there is
7 those probably several, extending out from the wells,
8 several monitor wells with which to detect fluid as
9 well, to indicate the extent of the contamination.

10 JUDGE WARDWELL: Thank you.

11 NRC Exhibit 006, Environmental Assessment,
12 at 3.3.3.2, staff pointed out that, "CBR identified
13 one irrigation well that is located within the license
14 area and the AOR, but outside of the MEA itself."

15 NRC008 -- this is an SER -- at Section
16 2.4.3.5, at 55, goes on and says, it talks about, "The
17 well 732 is a high-capacity irrigation well located in
18 the shallow Arikaree-Brule Aquifer about 500 feet east
19 of the nearest MEA ISR wellfield pattern area."

20 Crow Butte 010, Appendix AA1, and CBR011,
21 AA2, notes that, "Because the loss of pipe integrity
22 resulting in a leak may, in turn, impact water quality
23 of an irrigation water well, NRC staff requested CBR
24 to analyze the potential hydraulic impacts to local
25 irrigation wells resulting from a hypothetical shallow

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1 casing leak in the overlying aquifer of the MEA ISR
2 wellfields."

3 Crow Butte Exhibit 006, at 2.9.3.2, which
4 is also the text of the Technical Report -- and that's
5 at 2-118 -- "While details of the model was discussed
6 as part of Concern 3 briefly in December" -- "which
7 will be discussed," we should say, "in Concern 3, in
8 December 2013, an aquifer groundwater flow model was
9 used to simulate groundwater flow in a shallow
10 Arikaree-Brule aquifer at the MEA with particle-
11 tracking techniques used to illustrate the 30-year
12 capture zone of an irrigation well," and that being
13 the No. 732, "to assess whether hypothetical shallow
14 casing leaks from the MEA wells could potentially
15 impact the quality of the irrigation water. This
16 study" -- and that's referring to CBR010, Appendix AA1
17 -- "was revised in 2016 to correct the location of the
18 irrigation well 732, which was originally located
19 approximately 600 feet east of the correct well
20 location."

21 CBR011, Appendix AA2, states that, "This
22 revision started with a calibration of the groundwater
23 flow model using the water level data collected during
24 the 2014 irrigation season, followed by a
25 recalculation of the calibrated 30-year capture zone."

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1 And I guess I'd ask Dr. LaGarry, have you
2 reviewed or have any knowledge of the modeling reports
3 that were submitted in the testimony --

4 DR. LaGARRY: No --

5 JUDGE WARDWELL: -- CBR010 and 011?

6 DR. LaGARRY: No, sir. My training is in
7 stratigraphy and paleontology. And while I'm
8 comfortable opining on structure and faults, that's
9 always been Dr. Kreamer's and Mr. Wireman's area.

10 JUDGE WARDWELL: Thank you.

11 You do state in your Exhibit 010
12 testimony, at 5, that, "Water in the underground
13 aquifers does not stay in the same place. It moves
14 around laterally. If contaminants were to escape into
15 the High Plains Aquifer, but in a few years could be
16 drawn out of the ground and sprayed onto crops at
17 center pivots or be drawn into the surface by stock
18 tanks placed to water cattle or horses" -- and I guess
19 the question I have for you -- I don't understand my
20 question very much. Well, I'll ask it to you because
21 you'll be able to answer it easily.

22 How would the High Plains Aquifer be
23 contaminated, given the strong natural groundwater
24 gradients and inward gradients maintained during MEA
25 operations?

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1 Strike that question. That makes no sense
2 anyhow. I don't know what I was thinking.

3 Do you know of any other irrigation wells
4 that are in the MEA besides this one that's reported
5 by -- do you have any reason to believe Crow Butte's
6 -- is it correct that this is the only one that's
7 located in the MEA?

8 DR. LaGARRY: We drove around there. I
9 didn't see any, you know.

10 JUDGE WARDWELL: And are we ready for a
11 break?

12 CHAIR BOLLWERK: Yes, we are, I think.

13 JUDGE WARDWELL: Because there is a major
14 section coming up on fractures and faults, and that
15 might be the place to break before we do that.

16 CHAIR BOLLWERK: Okay. So, it's about 10
17 'til 3:00. Why don't we break until three o'clock,
18 and we'll come back and start again.

19 (Whereupon, the above-entitled matter went
20 off the record at 2:51 p.m. and resumed at 3:02 p.m.)

21 CHAIR BOLLWERK: Okay. Can we go back on
22 the record, please?

23 So we just had an afternoon break. I
24 think the plan at this point, we're going to proceed
25 with the additional questions. And when we reach the

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1 end of that, then I -- we'll have an opportunity for
2 any proposed cross -- any proposed Board questions,
3 and then with that, after we've done that, we'll go
4 ahead and adjourn for the day. So that's kind of
5 where we're headed.

6 Okay. Judge --

7 JUDGE WARDWELL: Yes. Moving on to
8 1.1.2.3, fracture/fault impacts on containment.
9 Dr. LaGarry's rebuttal Exhibit 016, page 1, responds
10 to A.2. A.23 states that in his original opinion he
11 expressed concerns about secondary porosity in the
12 form of joints, fractures, and faults.

13 However, NRC focuses on the Niobrara River
14 and the Pine River faults. These faults have been
15 described as scissor faults, which have variable,
16 sometimes small amounts of displacements. However,
17 the joint sets visible in the bedrock exposed around
18 MEA can be described and evaluated by pedestrian
19 services -- pedestrian survey.

20 And I'd ask you, Dr. LaGarry, what is the
21 difference between a joint, a fracture, and a fault.

22 DR. LaGARRY: Okay. Fundamentally,
23 they're all fractures. If there is displacement, it's
24 recognized as a fault. If there is no displacement,
25 it's recognized as a joint. But otherwise they are

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1 almost the same thing, just one has had motion and one
2 has not.

3 For our purposes, and for my purposes, in
4 talking about contaminant pathways, they are the same.
5 The difference lies, because of that movement, it has
6 historical information that other geologists find
7 useful for other purposes.

8 JUDGE WARDWELL: And you left out a
9 fracture. Is a fracture pretty much the same as a
10 joint?

11 DR. LaGARRY: Joints often occur in
12 parallel sets. Fractures are random orientation,
13 individual happenstance occurrences.

14 JUDGE WARDWELL: But the joints don't have
15 displacement.

16 DR. LaGARRY: That's correct.

17 JUDGE WARDWELL: They're just there in a
18 uniform --

19 DR. LaGARRY: That's correct.

20 JUDGE WARDWELL: -- series of -- of
21 movements.

22 DR. LaGARRY: Two, four, six, 20, 30, 50
23 parallel cracks.

24 JUDGE WARDWELL: Define what a scissor
25 fault is.

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1 DR. LaGARRY: Okay. A scissor fault is a
2 fault where the displacement may have an up and down
3 component, but it also has a lateral component. This
4 lateral component causes flexure of the rocks, and in
5 causing flexure of the rocks what happens is pivot
6 points occur.

7 So if my right finger is one side of the
8 fault, and my left finger is another side of the
9 fault, you can visualize a regular fault having this
10 kind of displacement. A scissor fault --

11 JUDGE WARDWELL: Up and down?

12 DR. LaGARRY: Yeah. One side is up or the
13 -- one side is down. More like probably a planer
14 thing. But for a scissor fault, instead of up and
15 down, that lateral component causes it to do this. So
16 on the left side, on my left, displacement is up. On
17 my right, displacement is down. It gives the
18 appearance of being multiple faults, even though it's
19 the same fault.

20 And if -- and if you're at that pivot
21 point where there is no displacement, it can be
22 misconstrued as a joint.

23 JUDGE WARDWELL: Thank you. And scissor
24 faults can have large displacements just as normal and
25 reverse faults can. And they can have small

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1 displacements, right?

2 DR. LaGARRY: That is entirely correct.

3 JUDGE WARDWELL: And as you said, with the
4 normal and reverse faults, likewise with a scissor
5 fault is -- is really not of interest to us in this
6 setting where we're concerned more about the movement
7 of water through it, whether it's a fault, normal
8 reverse, or scissor or a fracture or a joint. We're
9 concerned about the spacing and what might be in that
10 spacing and the ability of that spacing to provide a
11 preferential pathway for moving water.

12 DR. LaGARRY: That's correct. The extent
13 to which it is a conduit for fluid migration.

14 JUDGE WARDWELL: So we are not really
15 concerned too much. So if we use fracture as just a
16 term for whatever it happens to be, then that's fine.
17 Or if someone says fault, it doesn't give it any more
18 or less credence as to that preferential pathway.

19 DR. LaGARRY: I can accept that, yes.

20 JUDGE WARDWELL: Okay. Good.

21 DR. LaGARRY: Your Honor, since we just
22 touched on the Pine Ridge and Niobrara faults, you
23 asked me to remind you to come back to the Pine Ridge
24 and Niobrara faults.

25 JUDGE WARDWELL: I'm getting -- yeah, I'm

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1 getting to it. And I may not be getting it 'til three
2 or four because I haven't seen what I wanted to see
3 necessarily.

4 DR. LaGARRY: I'll remind you again if I
5 need to.

6 JUDGE WARDWELL: I was hoping I was going
7 to jump right into it.

8 And, likewise, these -- these fractures
9 and -- these fractures, may or not be -- may or may
10 not be filled with material associated with it, such
11 that it -- it oftentimes is called gouge. Isn't it
12 called gouge in regards to what might be in the middle
13 of it? And probably more prevalent in faults than
14 fractures, but fractures can also have --

15 DR. LaGARRY: There is --

16 JUDGE WARDWELL: -- material filled in
17 with it, but -- but that would slow down the
18 transmissivity of it.

19 DR. LaGARRY: That's correct. And
20 examples of both are available and documented in these
21 rocks.

22 JUDGE WARDWELL: So, again, what we're
23 really interested in here, the proof in the pudding,
24 is really whether the preferential pathways exist in
25 geologic strata and not necessarily in regards to

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1 specific delineations of fractures, et cetera. We
2 just want to know what is the net result associated
3 with that --

4 DR. LaGARRY: That's correct.

5 JUDGE WARDWELL: -- fracturing. I thought
6 I was close, but I'm not there. This is still good
7 anyhow. Dr. LaGarry's testimony, page 5 to 6, states
8 that investigations have shown that there are several
9 potential faults in the Marsland area, both north and
10 south of Marsland, and that these fractures allow --
11 may allow transmission of mining fluids to travel up
12 into the overlying aquifers laterally into adjacent
13 areas to the west and east, citing Diffendal, 1994.

14 The faults -- and I -- the faults shown in
15 your Figure 1 -- that's OST 4 -- OST 010 at 4, are
16 those that were large enough to be discovered by
17 Swinehart and others who compiled data from 12,500
18 drilling records in western Nebraska and conducted new
19 drilling at five-mile intervals along the transits
20 shown.

21 You state that "My work over the 25 years
22 has shown there is likelihood of hundreds more that
23 are too small to be shown." And have you provided
24 Diffendal and Swinehart as exhibits?

25 DR. LaGARRY: Your Honor, yes. Not -- not

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1 for this proceeding, Your Honor, but they're in the
2 renewal record.

3 JUDGE WARDWELL: Now --

4 DR. LaGARRY: They're both in ADAMS.
5 Incidentally, Your Honor, while we're looking at this
6 diagram --

7 JUDGE WARDWELL: In answering these
8 questions -- yeah, I'll let you know whether or not
9 we'll want these filed as exhibits. I'm not sure
10 they're -- they're significant enough in regards to
11 the fact that we recognize that faults are there. Now
12 it's more concerned with the preferential pathways
13 through them.

14 And it's fair to say that those -- those
15 reports don't cover any of the -- any of the
16 hydrogeologic preferential pathways that might be a
17 result of those fractures or faults, is that --

18 DR. LaGARRY: That's correct, Your Honor.

19 JUDGE WARDWELL: Thank you.

20 DR. LaGARRY: They're stratigraphic
21 reports.

22 JUDGE WARDWELL: I would like to cover one
23 just comment in regards to lineaments. And could you
24 explain what a lineament is and --

25 DR. LaGARRY: A lineament is any

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1 unexplained straight line feature visible in remotely
2 sensed imagery. So it's when you're looking at an air
3 photo or a satellite image, if there is a straight
4 feature on there, that's a lineament.

5 Typically, in nature, in my experience and
6 in the experience of people who study lineaments,
7 there are few truly straight line -- few straight
8 lines visible in nature. Usually, it's -- you know,
9 it's kind of wiggly or there is some -- something that
10 is not -- it's not a straight line.

11 In modern aerial imagery, typically it's
12 either -- you know, if you have a straight line
13 lineament, the task of the observer is to make sure
14 that that's not an anthropogenic feature, it's not a
15 manmade feature like a highway or a road. But then if
16 you simply overlay a roadmap over it, you can exclude
17 those. So it's a straight line feature on the
18 landscape visible in remotely sensed data.

19 JUDGE WARDWELL: And it may or may not
20 involve a fault; is that correct?

21 DR. LaGARRY: If it's not a road, it's
22 likely --

23 JUDGE WARDWELL: And a fracture. Let's
24 just --

25 DR. LaGARRY: If it's not a road, it's

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1 likely a fracture.

2 JUDGE WARDWELL: But there's no
3 indication, again, of the hydrogeologic performance of
4 that particular fracture.

5 DR. LaGARRY: That would require a visit
6 to that individual fracture and a separate assessment
7 like those discussed by Dr. Kreamer and Mr. Wireman.

8 JUDGE WARDWELL: And while in your
9 statement you say it likely is a fracture, to prove
10 that you would have to do some, at least in the
11 Nebraska area, some field explorations as there are,
12 is that not correct, very few fractures that are
13 exposed at the surface?

14 DR. LaGARRY: There was a -- there was a
15 student at Chadron State College, Jennifer Belmat,
16 whose master's thesis set out to identify and check
17 these lineaments, and she field checked a few and then
18 used statistics to corroborate the rest.

19 I can't speak to that. It has been a
20 while since I read it.

21 JUDGE WARDWELL: Thank you. In your
22 rebuttal 016, you state that "CBR employed geophysical
23 logging of boreholes and constructed cross-sections to
24 demonstrate the absence of faulting in the region.
25 However, such methods do not delineate faults. Better

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1 techniques would have been electro resistivity,
2 seismic reflection, or seismic refraction techniques
3 or possibly ground penetrating radar." And then see
4 OST 019, Lewis and Haeni, 1987.

5 So for Crow Butte, is Dr. LaGarry correct
6 in what are better techniques for logging
7 displacements associated with faults?

8 MR. STRIVER: I believe cross-sections of
9 geophysical logs are a good determination of
10 displacement faults, and there are other techniques of
11 determining faults subsurface. Which one is better?
12 Well, in this situation, looking at cross-sections of
13 geophysical logs to determine if there is faulting.

14 JUDGE WARDWELL: And did you detect any
15 faulting within the MEA in the geophysical logging and
16 the cross-sections that you derived from that?

17 MR. STRIVER: I did not determine any
18 significant offset of bedding. I did not in my
19 examination of the cross-sections.

20 JUDGE WARDWELL: And I'll -- did you
21 consider using these other techniques at any time in
22 addition to your geophysical logging?

23 MR. STRIVER: I did take a look at some
24 other information rather than employing other
25 techniques of determining faulting. Looked at the

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1 core photographs that were taken of the -- from the
2 seven holes that were cored of all the formations from
3 the Arikaree Group down through the Brule, the upper
4 and middle and Chadron down to the pier.

5 I looked at the photographs and did not --
6 I used that method, did not find any evidence of macro
7 fracturing in those core photographs, and some from
8 various geologic reports I looked at. There was no
9 reporting of micro/macro fracturing in those reports.

10 So at that -- I did not go further than
11 that. However, I did take into consideration the
12 hydrologic information showing that the -- the
13 confinement, the lack of communication between the
14 upper aquifer, the overlying aquifer, and the Basal
15 Chadron, the potentiometric surface differences, the
16 age difference of the water, the chemistry of the
17 water, of the upper and lower Brule -- or, excuse me,
18 the upper -- overlying aquifer and Basal Chadron, the
19 differences there.

20 Also, other things -- put that into
21 consideration. I didn't think there was additional
22 means of needing to investigate a fracture system.

23 JUDGE WARDWELL: Thank you.

24 Staff, do you -- do you have any comments
25 on these other techniques in regards to their

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1 effectiveness of locating faults?

2 MR. LANCASTER: The data they provided was
3 satisfactory for our -- it was satisfactory.

4 JUDGE WARDWELL: Could you speak up a bit?

5 MR. LANCASTER: The data they provided was
6 satisfactory.

7 JUDGE WARDWELL: I still didn't understand
8 your sentence. I'm sorry.

9 MR. LANCASTER: The data they provided was
10 satisfactory.

11 JUDGE WARDWELL: Thank you.

12 MR. LANCASTER: It may be helpful to bring
13 up that same figure that Dr. Striz was referring to to
14 actually see these cross-sections with the geophysical
15 logs and look at this -- look at what we're -- what we
16 have actually put into our testimony.

17 JUDGE WARDWELL: Thank you for that
18 suggestion.

19 MR. LANCASTER: And -- okay.

20 JUDGE WARDWELL: Dr. LaGarry, do you see
21 anything in the cross-sections that indicate to you
22 that there has been faulting within the -- within the
23 MEA, and specifically within really the upper
24 confining unit, which is the one we're most concerned
25 about?

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1 DR. LaGARRY: Your Honor, if displacement
2 was small, say less than a meter like the majority of
3 the ones that we encountered in --

4 JUDGE WARDWELL: Can you answer the
5 question first?

6 DR. LaGARRY: No.

7 JUDGE WARDWELL: Okay. Thank you. Why is
8 that? Why is that?

9 DR. LaGARRY: Your Honor, with less than
10 one foot -- one meter of displacement, I mean, that's
11 within -- you know, that's the difference between one
12 little blip on the log and another little blip on the
13 log, right? So when you're looking at those little
14 squiggly lines, you try to pick out where the
15 lithology changes and the geophysical properties
16 change, and that's where you put your boundary.

17 You know, a meter of displacement is
18 within the thickness of the pencil or the computer-
19 drawn line on such a diagram. We also agreed that
20 we're talking about fractures, not necessarily faults
21 with displacement.

22 In my experience, and in the experience of
23 the publications I cited, the one, in particular, on
24 alternate geophysical techniques, in an environment
25 where the joints, the fractures, are -- are nearly

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1 vertical, your four or six or eight-inch tube that you
2 drill down would have to intersect it exactly for you
3 to see it in the sides of the hole.

4 If you don't intersect it exactly, you
5 have no idea it's there, which is why you would need
6 some sort of geophysical technique that would focus on
7 that gap, the -- no matter how small it is, the space
8 that -- the open space within the fracture is
9 detectable using the geophysical methods, which makes
10 them superior in such case.

11 JUDGE WARDWELL: Thank you. Would not the
12 undisputed presence of cementite and montmorillonite
13 clay particles in the upper confining unit tend to
14 swell with the additional water?

15 DR. LaGARRY: Your Honor, in response to
16 that question, I would refer you to Maher and Shuster,
17 which I provided with my rebuttal. In that -- in that
18 poster, they -- they describe that -- the Peanut Peak
19 member of the Chadron Formation, the upper confining
20 layer. And they show both open and filled fractures
21 within that unit.

22 They show -- because some of them are
23 filled and some of them are empty, they have
24 hypothesized that the filled ones are one generation.
25 The next generation is unfilled.

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1 So, no, I don't think so. I think -- I
2 think that while the cementite may -- may -- don't
3 want to exclude the possibility -- may seal some
4 fractures, it clearly, based on the bazillion shown by
5 Maher and Shuster, does not seal all fractures.

6 For those of us that want to peruse that
7 particular poster, it's quite large and almost
8 unreadable on a small screen like ours. But if
9 someone were to look at it and blow it up, they have
10 several figures in that document that show the upper
11 confining layer of the Chadron riddled with faults and
12 fractures.

13 Some of these are filled with chalcedony,
14 which was precipitated out of -- out of the
15 groundwater flowing through the cracks. And these
16 chalcedony fracture fills are world famous. They are
17 filled with the Nebraska State Gem, the Nebraska blue
18 agate.

19 So such fractures, their fillings, whether
20 or not they can transmit water or seal up, that has
21 been looked at by many people, and both situations
22 occur. Some fill; some don't.

23 JUDGE WARDWELL: And how did they look at
24 these fractures? Were they on the surface, or were
25 they -- did they excavate down, or did they do --

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1 DR. LaGARRY: As the badlands erode, they
2 are exposed to the surface.

3 JUDGE WARDWELL: And so that's a bit of a
4 different environment than the upper confining layer;
5 is it not?

6 DR. LaGARRY: Well, no, Your Honor,
7 because these -- if you read through the two Maher
8 documents that I have provided, they talk about these
9 fractures reactivating even while buried in the
10 subsurface, that the fractures were formed in the
11 subsurface and then were subsequently exhumed. So
12 these are ancient features that were there in the past
13 and erosion has exhumed them. They are not surface
14 features from modern weathering.

15 JUDGE WARDWELL: No. But haven't they
16 been exposed to -- or release of stress to start with
17 and erosional aspects from rainwater over eons of
18 years; have they not?

19 DR. LaGARRY: About 5,500 years, Your
20 Honor.

21 JUDGE WARDWELL: Right. So, and whereas
22 the upper confining layer has been underground all
23 that time under many hundreds of -- several hundreds
24 of feet of overburdened stress; isn't that correct?

25 DR. LaGARRY: It is, Your Honor. However,

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1 it is not convincing to me. Based on my understanding
2 of Maher's work and Maher and Shuster's work, these
3 things have the potential to fracture at the surface,
4 underground, at different rates and places in the
5 rocks above and below, and can be both open and
6 closed.

7 JUDGE WARDWELL: So your position is is
8 that an observation of a surficial set of fractures is
9 directly related to how those look underground, 3 to
10 400 feet underground, with the stress of the
11 overburden on it, and protected from any erosional
12 rainfall effects.

13 DR. LaGARRY: Your Honor, calcium is very
14 mobile at the surface and plugs up surface cracks. I
15 would argue that the subsurface is a better
16 environment for preserving the integrity of the
17 cracks.

18 JUDGE WARDWELL: So you -- you --

19 DR. LaGARRY: I think the opposite of what
20 you're trying to get at. I think that once the cracks
21 reach the surface, more --

22 JUDGE WARDWELL: Well, my question was --

23 DR. LaGARRY: -- soluble minerals are
24 going to plug them up.

25 JUDGE WARDWELL: Again, please answer the

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1 question, yes or no, and then go on, because I -- I --

2 DR. LaGARRY: I apologize. I thought I
3 had.

4 JUDGE WARDWELL: My question was: so it's
5 your opinion that what you -- what they saw at the
6 surface, being released from overburdened stress, no
7 overburdened stress on it, and exposed to rainfall,
8 snowfall, all the weathering over 5,000-some-odd
9 years, is a good representation of what any fracturing
10 would look like in the upper confining layer being
11 under a stress -- overburdened stress of several
12 hundred feet of material and protected from that. Is
13 that correct, or is it incorrect?

14 DR. LaGARRY: Yes.

15 JUDGE WARDWELL: Representing your
16 position.

17 DR. LaGARRY: Yes. I think they are
18 representative.

19 JUDGE WARDWELL: Thank you.

20 Would anyone from Crow Butte like to
21 respond to that -- the representation of the faults at
22 the surface compared to underground?

23 MR. STRIVER: Well, we don't know exactly
24 what the fracturing looks like underground. Unless we
25 have direct core samples, surface faulting, surface

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1 fracturing, we could have direct observation -- and it
2 is exposed to weathering, where, yeah, we have --
3 those points of weakness are exploited by weathering,
4 and they are much more prevalent at the surface than
5 they may be -- now, it's my opinion they are going to
6 be much more confined and less able to transmit fluid
7 in this case for MEA, in that I don't see anything
8 where joints that may exist in the -- in the area are
9 transmitting fluids based on the hydrologic data.

10 Based on core data, I, you know, have
11 nothing to compare if it's subsurface with the surface
12 because there were no fractures that were observed in
13 the core.

14 JUDGE WARDWELL: In your professional
15 opinion, do you believe the observations of surficial
16 fracturing is representative of what would be the
17 conditions of that and the observations that would be
18 made under several hundred feet of overburdened stress
19 and protected from weathering?

20 MR. STRIVER: No. In my opinion, it would
21 not be the same.

22 MR. LEWIS: Your Honor, I wanted to make
23 a brief comment regarding the geophysical logs that we
24 had discussed. The types of offset and -- that
25 Dr. LaGarry has -- has inferred may exist would be

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1 apparent in -- in the geophysical logs. We have 1,300
2 geophysical logs over a relatively short distance. We
3 have very good well control.

4 If we have compressional faulting, reverse
5 faulting, that expresses itself as a repeating of
6 strata, so you would actually see sandstone, for
7 example, would be repeated twice. If you had
8 extensional faulting or normal faulting, you would get
9 the opposite. Where you are missing strata, you may
10 actually not see the sandstone at all, for example,
11 would be an indication that there was some significant
12 offset.

13 So we don't see that kind of signature in
14 the geophysical logs that would suggest there is
15 significant displacement vertically of sediment.
16 That's an example how you might use the geophysical
17 logs to recognize fractures or faulting.

18 JUDGE WARDWELL: Thank you.

19 NRC staff, back to the discussion of the
20 representation of observations of surficial fractures
21 and their relationship to fractures that are under
22 several hundred feet of water. What is -- what is
23 your opinion?

24 MR. LANCASTER: Yeah. We don't see in the
25 data evidence of fracturing. In fact --

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1 JUDGE WARDWELL: That's not my question of
2 what you see in the data. I'm asking you, what is
3 your professional opinion in regards to using
4 surficial observations of fractures to represent the
5 conditions under several hundred feet of water and
6 protected from weathering? Whether it's a good
7 representation of it or a poor representation of it.

8 MR. LANCASTER: Yeah. I don't -- I don't
9 think that, you know, in my -- my opinion here, my
10 professional opinion, that using fractures at the
11 surface to -- what you see at the surface is what is
12 applied underground. I mean --

13 JUDGE WARDWELL: Okay. Thank you. Now,
14 do you want to respond what you see in the geophysical
15 logs that was just brought up by Mr. Lewis of Crow
16 Butte?

17 MR. LANCASTER: Yeah. I was going to say
18 that, you know, in -- in the data, we don't see any
19 signs of fracturing. And within the confining unit,
20 that's -- that we have stipulated to be a bentonite
21 clay, you know, rich -- rich in bentonite clay, we
22 expect that any fractures that do form will -- if
23 that's the case, which we don't see any evidence of,
24 would -- the high shrink-swell nature of these clays
25 would respond to any water coming into the fracture

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1 and swell.

2 Plus, you also have to consider that this
3 is a plastic, malleable, moldable clay. And so the
4 over -- the weight of the overburden alone will -- you
5 know, will close fractures as well. So we don't -- if
6 there are any, which we don't see any evidence of --
7 this is speculation -- we just don't -- we see that
8 the weight of the overburden and the types of clays --
9 I mean, the clay that we're talking about, this high
10 shrink-swell clay, will seal any fractures in the
11 confining unit.

12 JUDGE WARDWELL: And a follow up, in
13 regards to this material, hasn't those clay particles
14 already seen this water? I mean, it's not that it
15 hasn't had water before. Wouldn't the swelling have
16 already taken place?

17 MR. LANCASTER: Here the overburden would
18 -- you know, that's one thing, the overburden. But
19 the swelling clays, you know, if a fracture opens up
20 in a -- in the condition you're talking about, I would
21 -- I would expect that further -- you know, that
22 further swelling would occur. These clays, some of
23 them can be quite fat and not totally saturated.

24 JUDGE WARDWELL: Turning to Crow Butte, in
25 your observations of all of the drilling that you did

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1 for all of these boreholes, did you ever experience
2 difficulties with swelling clays as you were drilling
3 these?

4 MR. STRIVER: I was only involved, Your
5 Honor, in a few of the drill holes that were actually
6 monitor wells that were installed at Marsland. And I
7 cannot recall that, no.

8 JUDGE WARDWELL: Okay. Thank you.

9 Dr. LaGarry, would you like to comment?
10 I guess I will let you have free rein of any comments
11 of what you heard rather than ask a question.

12 DR. LaGARRY: Your Honor, can we bring up
13 OST 018, page 2?

14 JUDGE WARDWELL: Sure. We want to go down
15 this to just above -- no, that's -- is that OST 018?
16 No, that's 010. I need 018.

17 You wanted 018; is that correct?

18 DR. LaGARRY: That's correct, sir.

19 Let's go a little farther down, please.
20 All righty. A little bit farther up. Stop right
21 here.

22 So -- so we're talking about the stress
23 and the annealing or the maintaining of closed
24 fractures underground. I wanted to provide this
25 because there is a -- there is a -- you can see blue

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1 text at the bottom of the page. There is a paragraph
2 above that. We want the paragraph above that, the
3 paragraph that says, "It is important to realize."

4 Okay. There it says, "It is important to
5 realize that a geological event may influence loading
6 paths in multiple ways. For example, a change in the
7 tectonic stress field can both increase the
8 differential stress and increase the core pressure in
9 confined units. Burial induces a new vertical load
10 and can increase core pressure and confine." So what
11 this stuff is saying is is that burial can create
12 fractures.

13 Can you scroll up a little bit to the
14 diagram? And the particular emphasis of that previous
15 paragraph was -- was burial and tectonic stresses and
16 loads. So the ongoing -- my point there is the
17 ongoing uplift of the black hills, the presence of
18 overburden, these things can create fractures where
19 none existed before.

20 So, in my view, and in the view of Dr.
21 Maher, who is the author of this, burial can create
22 more fracturing, more pathways. The failure envelope
23 in the production of a fracture is illustrated in this
24 diagram we are looking at.

25 All of these factors -- increasing core

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1 pressure, unconfining the system, changing fluid
2 density, raising or lowering the groundwater table,
3 tectonic compaction, aquathermal pressurization, and
4 on and on -- you can read those. Those are all
5 potential creators of fractures in these rocks.

6 This document, this report, is focused
7 specifically on the White River Group, which includes
8 the Chamberlain Pass, Chadron, Brule, and Sharps. So
9 this is not some sort of left-field theoretical model,
10 you know, that is going to -- that this is derived
11 from and applies exactly to the rocks we are
12 discussing now.

13 And while it's tempting to, you know,
14 because it's underground, we can't see it, let's --
15 you know, let's, for the sake of argument, say it's
16 not there, you know, all of these things that
17 Dr. Maher is working out potentially can produce these
18 fractures.

19 Some of these things on this chart are a
20 known consequence of mining. The mining activity
21 itself can create fractures where none were before.

22 I only provided this diagram in the
23 introduction. However, if we should choose to go into
24 any one of these individual circumstances, the links
25 at the bottom of the document will take us to those

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1 discussions.

2 JUDGE WARDWELL: And based on what we
3 talked about before, it's really not the presence of
4 the fractures but their transmissivity that is of
5 concern.

6 And so I guess this is sufficient
7 information and appreciate you bringing that to our
8 attention in regards to our discussion of fractures.
9 But we will move on to -- rather than cover any more,
10 at least as far as I'm concerned, unless any other
11 board members are interested in pursuing this further,
12 thank you for that reply, Dr. LaGarry.

13 MR. LANCASTER: Your Honor?

14 JUDGE WARDWELL: I'm sorry. Who -- yeah.

15 MR. LANCASTER: Tom Lancaster.

16 JUDGE WARDWELL: Yes?

17 MR. LANCASTER: I would suggest bringing
18 up Exhibit CBR 018. It shows a picture of these clays
19 from the upper Chadron.

20 JUDGE WARDWELL: This is 018; isn't it?

21 DR. LaGARRY: This is OST 018.

22 JUDGE WARDWELL: Oh, CBR 018. I'm sorry.
23 Excuse me.

24 And, I'm sorry, what -- before we bring it
25 up, why -- what is your -- where are you going with

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1 it?

2 MR. LANCASTER: A visual always helps, I
3 think, in my opinion. And a visual of what kind of
4 material we're -- that they -- you know, as far as,
5 you know, this clay material that is being brought up
6 and how it's malleable, moldable, all of that stuff.

7 JUDGE WARDWELL: And this is -- again,
8 what is -- what is the title of this document? And
9 what does it -- was it a sample of it or --

10 MR. LANCASTER: A deep Brule monitoring
11 well installation program.

12 JUDGE WARDWELL: And say again what --
13 CBR 018?

14 MR. LANCASTER: Yeah. Please.

15 JUDGE WARDWELL: Let's go ahead and call
16 it up. Okay. How far down?

17 MR. LANCASTER: I can't tell. It's
18 Figure 4. Excuse me, Figure 4.

19 JUDGE WARDWELL: Is this the figure you're
20 interested in?

21 MR. LANCASTER: Correct. Correct.

22 JUDGE WARDWELL: Get it so it's full size.

23 MR. LANCASTER: So the top picture --

24 JUDGE WARDWELL: Go to the box with the
25 double arrows in it, Joe. Third from your right.

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1 When you come down and you've got the lower -- yeah.
2 The third box from the right. There you go.

3 MR. LANCASTER: Yeah. So --

4 JUDGE WARDWELL: Move your arrow up. That
5 thing should disappear.

6 MR. LANCASTER: This is Crow Butte's
7 document. I mean, they could describe this, but --

8 JUDGE WARDWELL: Can you speak into the
9 mic? I can hear you loud enough. I don't -- the
10 words -- it's probably my hearing that's going. It
11 has nothing to do with age, I'm sure.

12 MR. LANCASTER: Okay. If we go to the --
13 look at the bottom picture, that's the clay of the
14 upper Chadron.

15 JUDGE WARDWELL: And where did these come
16 from?

17 MR. LANCASTER: Clay material.

18 JUDGE WARDWELL: Was this just a pile of
19 it that was on the ground that you discovered, or, I
20 mean, fill us in with what's going on here.

21 MR. LANCASTER: Well, here I think it
22 would be appropriate for Crow Butte to describe this,
23 since it's in their document.

24 JUDGE WARDWELL: But more than likely --
25 Crow Butte, would you like to describe what this is

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1 that we're looking at?

2 MR. STRIVER: Yes, Your Honor. This was
3 the installation of deep Brule monitor well program a
4 couple of years back to investigate whether it was --
5 could be determined an aquifer. We knew that the
6 upper Brule did have -- was an aquifer. We wanted to
7 verify or -- whether or not the lower Brule was an
8 aquifer.

9 So we drilled down below the lower Whitney
10 Ash, down to the base of the Brule, into the upper
11 Chadron where it from like a brownish silty clay into
12 this -- where you see this green clay that is -- that
13 comes up.

14 So what we have is drill cuttings that are
15 taken at the rig that are laid in rows from top left,
16 zero to 100 feet, every five feet. A cutting sample
17 is recovered from the drilling operation, and those
18 samples are laid. And then so you can see it's zero
19 to 100, 100 to 200, and so forth, down to 500 feet is
20 the -- we go down to 520 where we started encountering
21 this green clay.

22 And that's where we determined that was
23 the base of our drilling where we installed the
24 monitor well. So it took -- photographs were taken of
25 the clay to show that that's where we anticipated the

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1 base of the lower Brule.

2 JUDGE WARDWELL: These are considered --
3 as drill cuttings, these are considered to be
4 disturbed samples, right? This isn't representative
5 of what it looks like underground. If we were
6 omnipotent and could see the cross-section down there,
7 it wouldn't look like this because this has been
8 drilled out; is that correct? This is a drill
9 cutting.

10 MR. STRIVER: Yes. Yes, correct. These
11 are drill cuttings from --

12 JUDGE WARDWELL: Almost like taking the
13 material and putting it in the blender in order to get
14 it out of the ground.

15 MR. STRIVER: No, that's correct. Every
16 five feet, we would sample from the mud returns, the
17 drilling mud that is used, circulate the drilling
18 cuttings as we go down through the borehole. And
19 these cuttings are -- were sampled every five feet.
20 That's correct. These are cuttings from -- from
21 underground.

22 JUDGE WARDWELL: This is the formation
23 that has been cut up.

24 MR. STRIVER: That has been cut by the
25 drill bit, and this is the remnants of the formation

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1 at the surface.

2 JUDGE WARDWELL: Thank you.

3 MR. BACK: Your Honor, could I just add
4 one thing on this? And that is, in all of these
5 welds, none of them produced. So there was no water
6 essentially coming out of any of these deep wells when
7 they went to develop them.

8 So if there was a well-developed fracture
9 network delivering water through the system, you could
10 expect to see some water in these wells.

11 JUDGE WARDWELL: Dr. LaGarry, would you
12 like to comment on this photograph?

13 DR. LaGARRY: Yeah. Absolutely, Your
14 Honor. This is the Peanut Peak member of the Chadron
15 Formation, the upper confining layer, and the same one
16 diagrammed by Dr. Maher in the reference I provided.

17 JUDGE WARDWELL: Thank you.

18 Crow Butte rebuttal 033, answer 36 at 20
19 to 21, in response to Dr. LaGarry's assertions that
20 "Mining in the Marsland area would contribute to
21 contamination that would migrate laterally into the
22 White and Niobrara Rivers. CBR believes that this
23 comment is hypothetical, speculative, and unresponsive
24 by data or evidence. Contaminant transport pathways
25 to the White River and Niobrara Rivers from the

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1 Marsland site are implausible given the site
2 conditions and operational practice at the ISR's
3 facility. And Dr. LaGarry's claims are not based on
4 any reasonable transport calculations or historical
5 evidence."

6 And I would ask, Dr. LaGarry, have you
7 performed any transfer calculations or have historical
8 evidence supporting your hypothesis of contaminant
9 transport pathways to the White River and the Niobrara
10 River from the Marsland site?

11 DR. LaGARRY: No, sir.

12 JUDGE WARDWELL: Thank you. Moving down
13 to Section 1.1.2.4, lateral migration, Dr. LaGarry
14 states that "Contamination would likely migrate
15 eastwards -- that's down gradient -- and contaminate
16 the White River, which supplies the towns of Glen,
17 Crawford, Whitney, and Pine Ridge with water. It
18 could quickly find its way into the Niobrara River,
19 which is a national scenic river used by thousands of
20 people for recreation every year."

21 And I guess in regards to this statement
22 I was wondering, are you referring to surface
23 contamination or groundwater contamination?

24 DR. LaGARRY: Sir, in the reference I
25 provided, Hallam and others specifically detailing

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1 that portion of the Niobrara River, contamination of
2 the surface water is guaranteed to contaminate the
3 groundwater. And, likewise, contamination of the
4 groundwater is guaranteed to contaminate the surface
5 water.

6 JUDGE WARDWELL: How is the direction
7 eastward, in a direction towards the White river?

8 DR. LaGARRY: Well, remember, the head of
9 the White River is -- is east of the -- of the site.

10 JUDGE WARDWELL: Of the MEA?

11 DR. LaGARRY: The MEA, yes.

12 JUDGE WARDWELL: Okay. Thank you. And is
13 not the slope of the water table in the High Plains
14 aquifer in a southeasterly direction from the MEA
15 towards the Niobrara River?

16 DR. LaGARRY: Yes.

17 JUDGE WARDWELL: Thank you. And you
18 stated that you haven't performed any transport
19 analysis that would indicate how long it would take
20 for any water flowing in the Basal Chadron towards the
21 northwest to reach the discharge zones or the White
22 River, or flow under the White River if that's where
23 it's going. Is that correct?

24 DR. LaGARRY: That's correct, sir.

25 JUDGE WARDWELL: Okay. Thank you. Give

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1 me one -- give me one second here. As part of the
2 basis going -- getting back up to Section 1.2.2, which
3 is Opinion 2 of the structural geology, the basis --
4 part of the bases that has been presented -- and this
5 was by Mr. Wireman, but I think we can cover it here
6 with Dr. LaGarry.

7 It is in a structural geology
8 characterization, and I know he referenced you today
9 several times. And I don't know how much you paid
10 him, but I'm sure you appreciate the recognition that
11 he gave you.

12 But in one of his bases he says, "There is
13 a disagreement between CBR and the previous
14 researchers," referencing DeGraw, 1969; Souders, 1981;
15 "as to the existence of two east-west trending faults,
16 the Pine Ridge fault to the north of the Pine Ridge
17 escarpment and the Niobrara fault, which trends
18 parallel to the Niobrara River. CBR concludes that
19 these faults do not exist, and, therefore, there is no
20 discussion of if or how these structures affect
21 groundwater flow in the Arikaree and White River
22 Groups."

23 The Black Hills and Chadron uplifts
24 occurred prior to the deposition of the Chadron
25 Formation. The Pine Ridge escarpment is thought to be

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1 associated with the Black Hills uplift, and,
2 therefore, was uplifted prior to the deposition of the
3 Basal Chadron Chamberlain Pass Formation.

4 And what I -- and that doesn't really
5 relate. It was more the faults that I'm interested
6 in. And CBR's rebuttal at 033, answer 31 at 16 to 17,
7 in response to Mr. Wireman's position, "A
8 characterization of structural geology at the regional
9 level is insufficient to develop an acceptable
10 conceptual model of the site hydrology.

11 "In particular, with respect to the
12 effects of the Pine Ridge escarpments or the
13 groundwater flow, CBR notes that Mr. Wireman did not
14 discuss how the structural geology that he implies
15 existed between" -- cancel. I'll stop that reading.
16 I thought it was getting me where I wanted to go.

17 Here it is. It's under OST Exhibit 004,
18 page 3, Opinion 2. It states that "There is
19 disagreement between CBR and previous researchers as
20 to the existence of the east-west trending faults.
21 The Pine Ridge fault to the north and the Niobrara
22 River to the -- that runs parallel to the Niobrara --
23 the Niobrara River fault, which trends parallel to the
24 Niobrara River."

25 CBR in its rebuttal 033, answer 31 at 17,

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1 says that "Regional cross-sectional sections in the
2 -- in their technical report, Figures 2.6-22 to 24,"
3 and that's CBR 008-R, "extend from south of the
4 Niobrara River, which is south of the MEA, northward
5 towards the Marsland Expansion Area, across a Crow
6 Butte license area, and the north trend license area.
7 Each cross-section crosses the Niobrara River fault,
8 the Cochran Arch, the Pine Ridge fault, and the White
9 River fault." And they reference, see NRC 006
10 Environmental Assessment at pages 3-6 to 3-7.

11 In particular, regional cross-section R1-
12 R1-prime, which is Figure 2.6-23, crosses the Cochran
13 Arch and the Pine Ridge escarpment with an average
14 distance between the boreholes of 1,400 feet through
15 this two-mile area, and indicates no significant
16 discontinuity of the Basal Chadron aquifer.

17 I'll start off by asking Dr. Striz for NRC
18 -- I believe that is the same cross-section that we
19 pulled up where we -- we talked about those features
20 on there; is that correct?

21 MS. STRIZ: That is correct.

22 JUDGE WARDWELL: So we have already seen
23 that, and it's just stating here that their position
24 -- Crow Butte's position is that there was no
25 indication of those faults in there.

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1 They go on in that same rebuttal, go on to
2 say, "The data demonstrates that there is not a large
3 offset fault that could act as a boundary for the
4 groundwater flow and movement that could impact
5 production operations at MEA. Overall, nothing in
6 this -- Mr. Wireman's general and speculative
7 assertions indicate any errors in the discussion of
8 structural geology."

9 So I'll ask Dr. LaGarry if he is willing
10 -- if he is willing to answer this, to -- that do not
11 the strata encountered in the drill holes and the
12 water levels in the wells trump any supposition of
13 water flow that might be derived by strictly a
14 structural analysis of the historical geologic
15 formations of the strata?

16 DR. LaGARRY: That's a lot to unpack, Your
17 Honor. Can you split it into two questions?

18 JUDGE WARDWELL: I doubt it, but I'll give
19 her a try. Basically, it's asking that at the site we
20 have drill holes that don't show any presence of that
21 -- those faults in the MEA. That's what -- "we" being
22 the CBR should -- not me, but CBR has drill holes and
23 has presented water levels to us that show that --
24 that don't show any indication of these two faults
25 within the MEA.

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1 And the question is: isn't that
2 information more important than any hypothesis that
3 might be derived from strictly a structural analysis
4 of historic geologic formations.

5 DR. LaGARRY: Well, in the sentence you
6 read from I believe Crow Butte, they talked about it
7 would have no impact on production. As Mr. Wireman
8 stated, he is not that interested in production. He
9 is interested in contaminant transport and
10 preferential pathways.

11 So whether or not it would impact
12 negatively production, I don't think would be of
13 concern to Mr. Wireman.

14 Can you please bring up OST 010, that one
15 figure again?

16 JUDGE WARDWELL: I'm sorry. Which figure
17 would you like?

18 DR. LaGARRY: Figure 1 from OST 010.

19 JUDGE WARDWELL: Okay.

20 DR. LaGARRY: The one from my opinion from
21 years ago that we have been looking at.

22 JUDGE WARDWELL: Okay. Yeah.

23 DR. LaGARRY: This diagram has both the
24 Niobrara and Pine Ridge faults on it. That's --
25 that's got to be CBR --

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1 JUDGE WARDWELL: That's Crow Butte's. We
2 need OST.

3 DR. LaGARRY: -- 010, not OST.

4 JUDGE WARDWELL: 010.

5 DR. LaGARRY: Yeah. No worries. Ah, yes.
6 Okay.

7 So I am looking at this cross-section, and
8 I see five faults on the cross-section. Starting on
9 the left with fault number 1. Fault number 2 is the
10 Niobrara River fault. It's right adjacent to the
11 Niobrara River.

12 JUDGE WARDWELL: What did you say the
13 first fault was?

14 DR. LaGARRY: The leftmost fault is
15 number 1. Number 2, next to the Niobrara River, is
16 the Niobrara River fault in this diagram. Okay. So
17 let's skip to the right to the fifth and rightmost
18 fault, that's the Pine Ridge fault.

19 Therefore, these guys, this was five or
20 six authors from the Nebraska Geological Survey with
21 their 12,500 drill holes through the Nebraska
22 panhandle all the way through the terrestrial rocks
23 down to the marine pure shale, the green below. They
24 went through all of that. And they were able to pick
25 five faults.

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1 Crow Butte didn't see these faults.
2 Therefore, that's the disagreement that Mr. Wireman
3 was referring to.

4 JUDGE WARDWELL: And isn't his cross-
5 section 30 miles to the west that you stated?

6 DR. LaGARRY: It is, but they provide --
7 they provide cross-sections through Dawes and Box
8 Butte County, and also through Sheridan County, and
9 then those cross-sections, the faults are continuous
10 and appear in all three cross-sections. So the
11 faults, while this diagram shows them 30 miles west,
12 they also occurred in the center of Dawes County,
13 through that cross-section, and also to the east
14 through Sheridan County through that cross-section.

15 JUDGE WARDWELL: Thank you, Dr. LaGarry.

16 Crow Butte, have you seen any other cross-
17 sections like this one that showed the faults as you
18 progress closer to the MEA or past it on the other
19 side?

20 MR. STRIVER: Yeah. Through the
21 literature, there are -- there are faults that are
22 proposed in the literature. But within the MEA, we
23 have three regional cross-sections that were
24 developed, not just the one R1 to R1-prime, but to one
25 located to the east and one located to the west that

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1 transect the same interval as the cross-section that
2 was shown earlier.

3 Also, regarding the Niobrara fault, we
4 have a structural contour map of the base of the pier
5 in the region of the Niobrara that we could pull up to
6 take a look at that to see if there is an existence of
7 offset within the pier. And we also have --

8 JUDGE WARDWELL: Have you seen any offsets
9 in that -- in that suggested diagram you wanted to
10 pull -- that you suggested pulling up?

11 MR. STRIVER: No, sir.

12 JUDGE WARDWELL: Okay. That's all I care
13 about is your testimony of it.

14 And, Crow Butte, you do not have any
15 reference to another cross-section like this one that
16 was -- what's the source of this one? Is that
17 Swinehart?

18 DR. LaGARRY: Swinehart and others.

19 JUDGE WARDWELL: Swinehart.

20 DR. LaGARRY: 1985.

21 JUDGE WARDWELL: You don't have any
22 reference to Swinehart with another cross-section that
23 is closer to the MEA? I just remember -- I can't find
24 my reference to it, but maybe I was dreaming this --

25 MS. STRIZ: Your Honor?

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1 JUDGE WARDWELL: -- which I do at night,
2 and I will get to NRC in a minute. And I just want to
3 go through everyone to see if someone can lead me to
4 where my dream led me, because I thought I had seen
5 some testimony or exhibits that demonstrated a profile
6 just like this from Swinehart that was closer to the
7 MEA. And, no, if you don't, is a very useful answer
8 if you don't know what I'm talking about.

9 MR. STRIVER: Okay. From what I recall in
10 reading through the description in the geology, yes,
11 there are references to Swinehart and proposed faults
12 in the area for other authors also. But for a cross-
13 section that I have seen specifically at the Marsland,
14 no, regarding Swinehart. Close by, I believe there
15 are -- there are interpreted faults.

16 JUDGE WARDWELL: And you have those, yeah.

17 NRC, do you have any idea what I'm talking
18 about in my dream?

19 MS. STRIZ: With respect to the
20 Swinehart --

21 JUDGE WARDWELL: Closer to your -- we
22 can't --

23 MS. STRIZ: With respect to the --

24 JUDGE WARDWELL: Pull it -- pull the whole
25 thing closer to you, just so you've got it, and we

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1 don't have to keep --

2 MS. STRIZ: With respect to the Swinehart
3 report?

4 JUDGE WARDWELL: Yes.

5 MS. STRIZ: I actually have it in my
6 hands, and I would disagree with Dr. LaGarry. It does
7 not state the number of boreholes that he says that it
8 states. It states --

9 JUDGE WARDWELL: Could you limit it? I'm
10 not -- I'm not interested in the -- my only goal now
11 is to try to find a reference to --

12 MR. LANCASTER: The reference --

13 JUDGE WARDWELL: -- a cross-section that
14 went through there --

15 MR. LANCASTER: Yeah.

16 JUDGE WARDWELL: -- that I believe someone
17 stated that this one did not show any faulting within
18 that zone that was closer to the MEA. And I thought
19 it was like seven miles away instead of 30.

20 MR. LANCASTER: Yeah. That's correct,
21 Your Honor. It's NRC 012, and that's the -- that's
22 the article -- the paper she is referring to, and
23 that's where that cross-section came from that
24 Dr. LaGarry -- the Swinehart 1985 paper.

25 JUDGE WARDWELL: And where in that report

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1 does it say that there -- about another cross-section
2 that is closer and doesn't show any faulting; is there
3 one or is there not?

4 MR. LANCASTER: Yes, there is. It's seven
5 and a half miles to the east of Marsland, and it does
6 not show faults.

7 JUDGE WARDWELL: And what page --

8 MR. LANCASTER: Niobrara River fault, that
9 is.

10 JUDGE WARDWELL: What page from that
11 document --

12 MR. LANCASTER: Page 215.

13 JUDGE WARDWELL: Thank you. We got
14 through that. And so I didn't dream it.

15 CHAIR BOLLWERK: You're looking at it. I
16 guess not.

17 JUDGE WARDWELL: All right. Good.

18 CHAIR BOLLWERK: It's there. I mean,
19 there's a cross-section on page 215, so --

20 JUDGE WARDWELL: Dr. LaGarry, would you
21 like to comment about that cross-section that
22 supposedly exists in the Swinehart paper closer to the
23 MEA that didn't show any faulting similar to what Crow
24 Butte has referenced in regards to their
25 cross-sections that run through the MEA also?

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1 DR. LaGARRY: I -- if I had it to look at,
2 I could comment on it. I don't have it to look at,
3 but, you know, at face value, if --

4 JUDGE WARDWELL: Oh.

5 DR. LaGARRY: These guys are awesome. I
6 now have it in front of me to look at.

7 JUDGE WARDWELL: Okay. Could you repeat
8 the -- repeat -- will you --

9 CHAIR BOLLWERK: It's NRC 012 on page 215,
10 and it's actually the last page of the document in
11 terms of the PDF. Go all the way to the end. That's
12 page 215.

13 DR. LaGARRY: Okay. So that's -- what we
14 want --

15 CHAIR BOLLWERK: Shrink it slightly.

16 DR. LaGARRY: We want cross-section B to
17 B-prime.

18 MR. LANCASTER: Your Honor, I need to
19 correct myself. It was page 214 where Dr. LaGarry got
20 his figure.

21 DR. LaGARRY: We have -- there we have B
22 to B-prime in the center of the page. Five faults
23 have collapsed to two faults, Your Honor. I stand
24 behind cross-section B to B-prime.

25 JUDGE WARDWELL: And where in B and

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1 B-prime is the Niobrara fault, and where in B-B-prime
2 is the Pine Ridge fault?

3 DR. LaGARRY: Apparently, I stand
4 corrected. When I said that the -- the Niobrara fault
5 was continuous, apparently it does not follow that
6 far. However, the Pine Ridge fault does.

7 JUDGE WARDWELL: And that would be, again,
8 the farthest --

9 DR. LaGARRY: The furthest, rightmost one.

10 CHAIR BOLLWERK: Are we looking at --
11 which one of these three? Are they all -- are they
12 all relevant? There's three different cross-sections
13 on this page. Top, middle, or bottom, or all?

14 DR. LaGARRY: The middle, B to B-prime.

15 CHAIR BOLLWERK: Thank you. Sorry.
16 Question?

17 MR. STRIVER: Your Honor, may I make a
18 comment?

19 JUDGE WARDWELL: And how do you know that
20 that farthest right-hand fault in B-prime-B is in fact
21 the Pine Ridge fault?

22 DR. LaGARRY: It is the first fault
23 encountered after the face of the Pine Ridge, Your
24 honor. These, remember, you may recall I discussed
25 the scissoring. This fault is one that is famous

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1 locally for that -- that feature. And it's -- there
2 is these -- the access upon which the scissor pivots,
3 those places are numerous.

4 You know, in our experience over the years
5 looking for the fault and mapping it, access is
6 limited, you have to stick to the roads, and there is
7 only a few roads, and it's hard to see any place with
8 lots of displacement.

9 A lot of times when you see it it's merely
10 a fracture or appears on its face to be merely a
11 fracture. But this -- Mr. Swinehart and his
12 colleagues, DeGraw, Souders, and Diffendal, really
13 thought there was a fault there based on all of their
14 drilling.

15 JUDGE WARDWELL: Joe, could you drop the
16 diagram down just a skosh, so we can see all of
17 A-prime also. There you go.

18 DR. LaGARRY: A to A-prime is the original
19 from which I redrew mine, sir.

20 JUDGE WARDWELL: And if I remember
21 correctly, you superimposed where the MEA was --

22 DR. LaGARRY: That's correct, sir.

23 JUDGE WARDWELL: -- and it was a very
24 small area on the right-hand side of the Niobrara
25 River; is that correct?

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1 DR. LaGARRY: That's correct, sir.

2 JUDGE WARDWELL: So, in fact, the Pine --
3 on these cross-sections, at least where that MEA is
4 laterally, none of the faults underlie the MEA.

5 DR. LaGARRY: Well, we know that none of
6 the fault -- those faults don't underlie B to B-prime.
7 They may have attenuated a mile from B to B-prime, two
8 miles, five miles, yeah, it's somewhere.

9 JUDGE WARDWELL: I understand that. I
10 know that it wasn't -- these cross-sections aren't
11 directly under the MEA. But as far as perpendicular
12 extensions on either side, it shows that the fault
13 isn't under -- the Pine Ridge fault isn't under the
14 MEA.

15 DR. LaGARRY: That's true.

16 JUDGE WARDWELL: Okay. Thank you.

17 MR. LANCASTER: Your Honor?

18 JUDGE WARDWELL: Thank you for your
19 assistance in finding that for me.

20 MR. LANCASTER: Your Honor, in --

21 JUDGE WARDWELL: Maintain my sanity. No,
22 I never had it. A lot of people suffer from insanity.
23 I quite relish it, but go ahead.

24 MR. LANCASTER: If we could bring up
25 page 211 of that exhibit, it shows the density of

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1 points --

2 MR. STRIVER: Your Honor, can we look at
3 that --

4 MR. LANCASTER: -- data points used to
5 make -- go ahead.

6 JUDGE WARDWELL: Mr. Lancaster -- Mr.
7 Lancaster, right?

8 MR. LANCASTER: Yeah. Yeah, Mr.
9 Lancaster.

10 JUDGE WARDWELL: What are you -- what are
11 you starting to -- where are you going with this?
12 Under what question did I ask you that you're
13 responding to?

14 MR. LANCASTER: We have no comment, I
15 guess, at this point.

16 JUDGE WARDWELL: Thank you.

17 Did I hear someone over here --

18 MR. STRIVER: Yes. Yes, Your Honor.

19 JUDGE WARDWELL: And what question are you
20 responding to?

21 MR. STRIVER: A comment on the cross-
22 section that we're looking at, presently B to B-prime.
23 On the northern end, those two faults are dashed,
24 indicating they are inferred.

25 Secondly, you'll see the dotted line that

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1 goes from the left to the right is -- I'm expecting
2 that to be one of the marker beds, perhaps one of the
3 Whitney Ash, which in our analysis continued to cross
4 without any displacement to -- right to the edge of
5 the outcrop.

6 JUDGE WARDWELL: Dr. LaGarry, would you
7 like to have a final word on any comments you might
8 have of what people have discussed in regards to the
9 Swinehart profiles?

10 DR. LaGARRY: Yes. CBR's point is well
11 taken. They are dashed lines. The evidence was less
12 clear for them in this cross-section than in the prior
13 one.

14 One thing I want to add is on Section B to
15 B-prime, which is closer to the MEA, you may notice
16 that there is a stippled stratum labeled E. In this
17 diagram, the High Plains aquifer, Ogallala Group, is
18 present at about the position Marsland would be, or
19 the MEA would be.

20 And that's my final comment. Thank you.

21 JUDGE WARDWELL: Okay. Thank you. I
22 appreciate you filling in for Mr. Wireman, who I have
23 -- I had overlooked that this morning and went by this
24 discussion, and I -- I wanted to do, and so I
25 appreciate that.

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1 DR. LaGARRY: I'll do my best, sir.

2 JUDGE WARDWELL: Just verifying that we've
3 got everything covered here.

4 (Pause.)

5 JUDGE WARDWELL: Dr. LaGarry, in your
6 testimony, Exhibit 010, "Based on the arguments
7 presented above regarding the movement of water in the
8 aquifers, it is my expert opinion that ISL mining in
9 the Marsland, Nebraska, area should not be allowed.
10 Of greatest concern is its proximity to the Niobrara
11 River, a national scenic river, which is used for
12 recreation by thousands of people each year.
13 Unfortunately, if the High Plains aquifer were to
14 become contaminated, the effects would be irreversible
15 and catastrophic for the local agricultural economy,
16 and it would likely lead to the depopulation of the --
17 of the region."

18 CBR rebuttal 033, answer 40 at 24, "In
19 response to Dr. LaGarry's speculation that
20 contaminated water could be drawn up in agricultural
21 wells or released into rivers, Dr. LaGarry's comment
22 is unfounded conjecture."

23 And so I will ask, Dr. LaGarry, if you'd
24 like to elaborate more on any evidence or personal
25 experience -- professional experience backing your

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1 speculation that contaminated water could be drawn up
2 by the agricultural wells and released into the
3 rivers.

4 DR. LaGARRY: Sir, I share the same
5 concerns expressed by the paper. I cited Hallam and
6 others. They go to great lengths to talk about the
7 difficult circumstance agriculture is in because of
8 the complete and total communication between ground
9 and surface water.

10 You know, it's -- the agrichemicals
11 spilled on the land surface would be just as damaging.
12 And while their focus isn't necessarily mitigating or
13 intervening against uranium, they share my concern
14 about the fragility of the resource.

15 To the best of my knowledge, you know,
16 there is -- you know, there is no other industry, you
17 know, like this that is -- apart from agriculture that
18 is -- you know, that has the potential to contaminate
19 an aquifer for hundreds of thousands of years.

20 You know, in light of things like
21 Fukushima and whatnot, people don't -- people aren't
22 going to want to, in my opinion, in my view, you know,
23 once the water was contaminated, it would be really
24 bad. I wouldn't want my kids swimming in it in an
25 inner tube like people do along the Niobrara.

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1 So, you know, it's -- that's the real
2 situation, my real concern, that -- that, you know,
3 when I -- when I wrote my opinion years ago, it was
4 before this -- this paper came out, but this paper
5 confirms my concerns that based on my estimation at
6 the time we mapped it, it seemed to me an obvious
7 place for total communication between ground and
8 surface water.

9 And so, you know, it's a double-whammy.
10 You have to really be concerned about both things,
11 because rather than, you know, if -- if half the
12 leakage is on the surface and half is under the
13 groundwater, in the case of the Niobrara River, it
14 would receive 100 percent.

15 And that's -- that's not a typical
16 situation. Such a thing doesn't occur at the main
17 facility, but it could occur here.

18 JUDGE WARDWELL: Thank you. In regards to
19 lateral flow in the Basal Chadron Chamberlain Pass
20 Formation, that's lateral flow within the aquifer
21 itself, do you agree that the Niobrara River will not
22 be impacted because the aquifer flows northwest
23 towards the White River?

24 DR. LaGARRY: I think that's likely true,
25 sir.

1 JUDGE WARDWELL: Thank you.

2 NRC, do you agree with Crow Butte that
3 Dr. LaGarry's initial statement in regards to the
4 potential contamination is unfounded conjecture?

5 MR. BACK: I am sorry. I didn't hear the
6 last part of that -- that statement.

7 JUDGE WARDWELL: Do you agree that
8 Dr. LaGarry's statement on page 6 of his testimony,
9 Exhibit 010, is unfounded conjecture as Crow Butte has
10 stated?

11 MR. BACK: Yes, Your Honor.

12 JUDGE WARDWELL: Okay. But didn't you ask
13 CBR to look at the very scenario of irrigation wells
14 being impacted from a leaky production injection well
15 on a minefield?

16 MR. BACK: Yes, Your Honor.

17 JUDGE WARDWELL: So it's not really
18 unfounded, is it, if in fact you are concerned about
19 it.

20 MR. BACK: It is now, Your Honor.

21 JUDGE WARDWELL: Okay. Thank you.

22 The next section is 1.2, affected
23 environment, from Mr. Wireman, which is where we
24 started this wonderful day. Thought so. Scared you
25 for a minute, didn't I?

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1 CHAIR BOLLWERK: No, you didn't. I knew
2 we were going to that. Is that it for you at this
3 point?

4 JUDGE WARDWELL: That's it for me.

5 CHAIR BOLLWERK: All right.

6 JUDGE WARDWELL: It's up to you guys.

7 CHAIR BOLLWERK: Judge Hiron, do you have
8 any questions?

9 JUDGE HIRONS: No, I don't.

10 CHAIR BOLLWERK: I don't at this point.
11 So why don't we go ahead and give you all an
12 opportunity to propose any questions you'd like us to
13 ask. It's about quarter after, a little past. Is
14 4:30 enough time? Is that good? 4:30?

15 All right. Why don't we reconvene at
16 4:30, then, and we'll see what questions you might
17 have for us.

18 (Whereupon, the above-entitled matter went
19 off the record at 4:17 p.m. and resumed at 4:31 p.m.)

20 CHAIR BOLLWERK: Okay. Can we go on the
21 record, please? We've just taken a break. It's about
22 4:30. And we've received some proposed questions from
23 the NRC staff, none from Crow Butte, and also we've
24 received some questions from the Oglala Sioux Tribe.

25 So we're going to take just a couple of

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1 minutes here to look through them, and we'll be back.
2 I said I wasn't going to be the liquid police, but I'm
3 not -- I'm not going to be the candy police either to
4 the degree that we put some back there and you're
5 welcome to use it, have it for whatever it's worth.
6 A little Halloween treat, so I -- so help yourself
7 while we're away. And feel free to bring it forward
8 if you want to eat it up here. It doesn't make any
9 difference to me.

10 We'll go off the record again. Thank you.

11 (Whereupon, the above-entitled matter went
12 off the record at 4:32 p.m. and resumed at 4:39 p.m.)

13 CHAIR BOLLWERK: All right. Can we go
14 back on the record, please?

15 Hopefully not everybody is on a sugar
16 high; they can make it through the next 20 minutes.
17 I think Judge Wardwell has some questions.

18 JUDGE WARDWELL: Dr. LaGarry --

19 DR. LaGARRY: Sir.

20 JUDGE WARDWELL: -- you -- we were talking
21 about the -- you were mentioning about the 12,500
22 wells that were used to draw out the cross-sections in
23 the Swinehart report?

24 DR. LaGARRY: Yes.

25 JUDGE WARDWELL: And you did not mean to

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1 say that all of those 12,500 were used to draw
2 A-prime-A; did you? Or did they in fact also be used
3 to draw all three of those cross-sections?

4 DR. LaGARRY: They were used to draw five
5 cross-sections, Your Honor.

6 JUDGE WARDWELL: I'm sorry?

7 DR. LaGARRY: There were five cross-
8 sections on that chart. The 12,500 contributed to all
9 of them.

10 JUDGE WARDWELL: Right. Okay. Thank you.
11 In regards to OST 019, and that's the Haeni and Lewis,
12 if I pronounced the first -- I'm sure I didn't
13 pronounce the first person --

14 DR. LaGARRY: Haeni.

15 JUDGE WARDWELL: Haeni. Yeah. Lewis. At
16 the top of that -- of page 2 of that document, it
17 states that "The surface and borehole geophysical
18 methods both have been successfully used to locate and
19 characterize fractures in bedrock."

20 And I'm just verifying that. Do you
21 remember them saying that in that particular document?

22 DR. LaGARRY: Yes, sir. But the more
23 vertical the crack, the less useful.

24 JUDGE WARDWELL: Thank you. And do any --
25 in regards to page 2 of your Exhibit OST 019, which is

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1 also that same report, do any of the advantages of
2 surface geophysical methods discussed on page 2 of OST
3 019 state that the surface methods give superior
4 results in terms of ability to detect fractures?

5 DR. LaGARRY: I visited most of those
6 papers, Your Honor. And in most of the papers
7 referenced, the best results were found by using a
8 combination of techniques. The most successful ones,
9 particularly where water movement was the focus, most
10 of those use multiple geophysical techniques, and in
11 some cases also use boreholes.

12 JUDGE WARDWELL: But do you remember
13 whether this particular paper stated that surface
14 methods give superior results in terms of the ability
15 to detect fractures or not on page 2? Would you like
16 to refer to that or --

17 DR. LaGARRY: Not -- not in all cases
18 explicitly, no, sir.

19 JUDGE WARDWELL: Thank you. And in the
20 Maher and Shuster work, where were the locations of
21 the areas that -- where the faults, fractures, and
22 joints occurred, in regards to their distances from
23 the MEA? Specifically, Slim Buttes, Pine Hills,
24 Badlands National Park, White Clay Fault, Toadstool
25 Park, and the North Platte River.

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1 DR. LaGARRY: Toadstool Park is the
2 closest, followed by the North Platte River.

3 JUDGE WARDWELL: And about how far are
4 they away? Just roughly.

5 DR. LaGARRY: Thirty miles.

6 JUDGE WARDWELL: And what about the White
7 Clay Fault?

8 DR. LaGARRY: That's about 50 miles east.

9 JUDGE WARDWELL: Okay. And the Badlands?

10 DR. LaGARRY: Are about 100 miles
11 northeast.

12 JUDGE WARDWELL: Okay. And the Pine --
13 Slim Buttes and Pine Hills?

14 DR. LaGARRY: That would be just -- that's
15 north of Hay Springs, Nebraska. That's going to be --
16 or north of Chadron. That's going to be 20 miles
17 north of Chadron, so maybe 50 miles.

18 CHAIR BOLLWERK: Just for the record, that
19 -- the reference you made to what was -- what they --
20 they were just -- did you give an exhibit number?
21 That's I guess my point.

22 JUDGE WARDWELL: Oh, I'm sorry. Yeah.
23 That was -- it was in Figure 2.3-1 of -- of the
24 CBR 008, which is -- dash R, which is the list of
25 figures that came out of the technical report of

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1 CBR's.

2 CHAIR BOLLWERK: Thank you.

3 JUDGE WARDWELL: Where those locations
4 came from that --

5 MS. SIMON: Excuse me. Excuse me,
6 Judge --

7 JUDGE WARDWELL: -- referencing of that.

8 MS. SIMON: Judge Wardwell, I believe that
9 that was from the Maher and Shuster poster, which was
10 Exhibit --

11 DR. LaGARRY: Maher and Shuster, 2012,
12 Your Honor.

13 MS. SIMON: -- OST --

14 JUDGE WARDWELL: Oh, I'm sorry. I read
15 the wrong on. I'm sorry.

16 MS. SIMON: -- 017, I believe.

17 JUDGE WARDWELL: Sorry. Sorry, sorry.
18 Sorry. It's Exhibit OST 017. Is that better?

19 CHAIR BOLLWERK: Thank you.

20 JUDGE WARDWELL: Okay. Now, you testified
21 earlier that the headwaters of the White River are
22 east of the MEA.

23 DR. LaGARRY: That's correct.

24 JUDGE WARDWELL: Referring to Figure 2.3-1
25 of CBR 008-R -- and can we call that up, Joe? We

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1 might as well do that. And while it's -- as we pull
2 that up, does not that -- the White River flow
3 northeast from a point east of Harrison, Nebraska?

4 DR. LaGARRY: Yes, Your Honor. And in
5 that case, it would be now -- now that my -- now that
6 I recall, the White River would actually move from
7 west to generally east, north of the MEA, northwest of
8 the MEA.

9 CHAIR BOLLWERK: Are you looking for the
10 page number?

11 DR. LaGARRY: Yeah.

12 CHAIR BOLLWERK: What is the page number?

13 DR. LaGARRY: It's good that we're looking
14 at it because I think I made a mistake.

15 JUDGE WARDWELL: You want Figure 2.3-1.
16 There.

17 DR. LaGARRY: Northwest, Your Honor,
18 rather than east. I see that.

19 JUDGE WARDWELL: Northwest is where it's
20 located in regards to the MEA?

21 DR. LaGARRY: That's correct.

22 JUDGE WARDWELL: Okay. Fine. Thank you.

23 For CBR, you stated earlier when we got
24 discussing this in regards to the DDWs that there were
25 no U.S. DW aquifers below the injection zone. And I

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1 was wondering, how did you actually determine that?

2 MR. PAVLICK: I can't cite the reference,
3 but in -- okay. The information came from the fact
4 that -- hang on one second.

5 CHAIR BOLLWERK: If you need a second, go
6 ahead and --

7 JUDGE WARDWELL: Yeah. I can move on to
8 another question while you do that.

9 MR. PAVLICK: Yeah, please. Thank you.

10 JUDGE WARDWELL: Yeah. I think Mr.
11 Striver will answer the next question while you're y
12 working on that one. Maybe we'll get him working on
13 this one, too, and then we can leave them here and
14 come back tomorrow morning, see how they're doing on
15 it.

16 This is for Crow Butte. Did you find
17 evidence of the Ogallala Formation within the MEA site
18 based on borehole logging and drill cuttings?

19 MR. STRIVER: Can you repeat that? Did I
20 find what, sir?

21 JUDGE WARDWELL: Evidence of the Ogallala
22 Formation.

23 MR. STRIVER: I don't believe so. No,
24 sir.

25 JUDGE WARDWELL: To the best of your

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1 recollection, you --

2 MR. STRIVER: Yes.

3 JUDGE WARDWELL: -- you do not believe --

4 MR. STRIVER: To the best of my knowledge,
5 I did not -- did not recover Ogallala.

6 JUDGE WARDWELL: Thank you.

7 MR. PAVLICK: Your Honor, regarding the
8 deep well question, so the information came from our
9 Class 1 application for the deep wells at Marsland.
10 And all of the aquifers exhibited TDS above 10,000,
11 and that's where the -- the statement came from.

12 JUDGE WARDWELL: Okay. Thank you.

13 CHAIR BOLLWERK: Do you have a reference
14 in the record where that is, or no? No? Okay.

15 MR. PAVLICK: Yeah, not in the record.

16 CHAIR BOLLWERK: Okay. Is that it? All
17 right.

18 At this point, then, do you have any
19 further questions?

20 JUDGE HIRONS: No.

21 CHAIR BOLLWERK: Okay. And you're all --
22 you're set? All right.

23 So it's a little before 5:00. We're a
24 little bit off on our timing, but pretty -- close
25 enough for government work, as they say.

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1 So we're going to -- we'll adjourn in a
2 second for this afternoon. We have one more day
3 tomorrow. We're going to be looking at Concerns 3 and
4 4, and I -- if Judge Wardwell thinks of anything
5 overnight relative to anything other that we can talk
6 with Dr. Kreamer about, I'm sure we will go back into
7 that as well, although I don't think you anticipate
8 anything like that right now; do you? I don't think
9 so, but we'll see.

10 JUDGE WARDWELL: No, I don't anticipate
11 that.

12 CHAIR BOLLWERK: We'll see what happens
13 overnight. So we're going to go ahead and start at
14 8:00, as I mentioned. Hopefully, we'll be done by the
15 early afternoon tomorrow, if we press ahead and are
16 efficient in our work.

17 At this point, again, thank you,
18 Dr. LaGarry and Mr. Wireman, who is not here, but we
19 appreciate his testimony today, as well as all of the
20 other witnesses.

21 And I hope you all have an interesting
22 evening in Chadron. I have no idea how they celebrate
23 Halloween here, but I guess we'll all find out, or
24 unless you don't leave your hotel room, then you won't
25 find out at all. But that's -- well, we'll just have

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1 to see how things go here.

2 So, but again, we'll be back at 8:00
3 tomorrow morning. I'm anticipating we'll finish up
4 tomorrow. And at this point, unless anybody, counsel,
5 have anything for the Board, then we stand adjourned.

6 Thank you. Have a good evening.

7 (Whereupon, the above-entitled matter went
8 off the record at 4:50 p.m.)

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