

STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION COMMISSION

APPLICATION OF LIGHTNING DOCK GEOTHERMAL H1-10, LLC
FOR APPROVAL TO INJECT INTO A GEOTHERMAL AQUIFER
THROUGH THREE PROPOSED GEOTHERMAL INJECTION WELLS AT
THE SITE OF THE PROPOSED LIGHTNING DOCK GEOTHERMAL
POWER PROJECT, HIDALGO COUNTY, NEW MEXICO

CASE NO. 15357

APPLICATION OF LIGHTNING DOCK GEOTHERMAL H1-01, LLC
TO PLACE WELL NO. 63A-7 ON INJECTION-GEOTHERMAL
RESOURCES AREA, HIDALGO COUNTY, NEW MEXICO

CASE NO. 15365

VOLUME 2

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COMMISSION MEMBERS: Bob Balch, Patrick Padilla
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16 INDEX

17 THE WITNESSES:

PAGE:

18 D.L. SANDERS

19 Direct Examination by Ms. Henrie.....4

20 Cross-Examination by Mr. Lakins.....13

21 Cross-Examination by Ms. Marks.....17

22 Examination by the Commission.....21

23 GREG MILLER

24 Direct Examination by Ms. Henrie.....36

25

1 INDEX CONTINUED

2 THE WITNESSES: PAGE:

3 GREG MILLER

4 Cross-Examination by Mr. Lakins.....108

5 Cross-Examination by Ms. Marks.....143

6 Cross-Examination by Ms. Shannon....144

7 Examination by the Commission.....146

8 Reporter's Certificate.....204

9

10 EXHIBITS

11 PAGE ADMITTED

12 7. Report.....191

13 8. Report.....191

14 9. Report.....191

15 10. Report.....191

16 11. Report.....191

17 12. Report.....202

18 13. Report.....202

19 14C. Confidential.....202

20

21

22

23

24

25

1 (Note: In session at 10:38.)

2 CHAIRMAN CATANACH: We will call the
3 hearing back to order. This is a continuation of
4 yesterday's hearing in Cases No. 15357 and 15365. I
5 believe Ms. Henrie was still putting on her direct
6 case.

7 MS. HENRIE: I would like to call a
8 rebuttal witness first with regard to the testimony
9 we heard yesterday from Charles Jackson. I would
10 like to recall Roger Bowers. I have got some
11 materials I would like to submit to the commission
12 in response to questions received yesterday. I
13 would like to call Monte Morrison to clarify an
14 issue. I think this will go very fast. And then I
15 would like to call Mr. Miller, our final witness.
16 With that, D.L. Sanders.

17 D.L. SANDERS
18 after having been first duly sworn under oath,
19 was questioned and testified as follows:

20 MS. HENRIE: I'm going to move to qualify
21 D.L. as an expert in water rights and qualify him as
22 an expert.

23 DIRECT EXAMINATION

24 BY MS. HENRIE:

25 Q. Will you please state your name for the

1 record and give your qualifications on water rights?

2 A. Yes. My name is D.L. Sanders. I am the
3 former Chief Counsel of the New Mexico State
4 Engineer. I worked for the state engineer for 24
5 years. I held positions from a staff attorney
6 litigating cases both in the adjudications that the
7 State conducts as well as administrative hearings
8 before the state engineer.

9 I also -- then I became a special counsel
10 of the state engineer overseeing the state
11 engineer's hearing unit. I was then made deputy
12 chief counsel and then I became chief counsel.
13 During my 24 years there.

14 As chief counsel I served both as the
15 chief legal advisor to the state engineer overseeing
16 all water rights, administration decisions. I
17 advised the state engineer on all hearings, much as
18 Mr. Brancard does for this commission.

19 I also was the chief advisor of the state
20 engineer as far as making policy and executing on
21 that policy.

22 MS. HENRIE: With that, I would tender
23 Mr. Sanders as an expert in water rights.

24 CHAIRMAN CATANACH: Objections?

25 MR. LAKINS: No, sir. I would like to

1 pose an objection as this is not necessarily true
2 rebuttal, because we disclosed early on correlative
3 rights, impairment to water rights and the issue of
4 our water rights. So any testimony was anticipated.
5 There was no surprise testimony from Mr. Jackson
6 yesterday that could be qualified as unanticipated.
7 And all of those matters were on the table well
8 before the hearing. This is not true rebuttal.
9 This is bringing in a late witness.

10 MS HENRIE: Mr. Chairman, the day that the
11 prehearing statements were due, September 3rd, was
12 the first time we heard what the hearing was about,
13 and that was the same day that Mr. Jackson was
14 disclosed as a witness. We didn't know exactly what
15 he was going to be testifying to nor what he would
16 say until yesterday. So I think this is true
17 rebuttal and I am offering you Mr. Sanders as a
18 rebuttal witness.

19 MR. LAKINS: That was in our protest which
20 was filed and a request for hearing on this.

21 MS HENRIE: Let's take a look at that,
22 Charles. You want to take a look at the application
23 for hearing?

24 MS. MARKS: Mr. Chairman, if I may, in
25 support of Mr. Henrie I would like to use

1 Mr. Sanders as a rebuttal witness. I believe
2 Mr. Jackson's testimony was beyond the scope of what
3 was disclosed in the prehearing statement and his
4 testimony was not disclosed as an expert. He was
5 not disclosed as an expert witness before his
6 testimony began. We did not know the scope or
7 nature of what the testimony was until after he
8 finished testifying.

9 As I said yesterday, I didn't know what he
10 was testifying as, as an expert witness, what was an
11 opinion and what was a fact witness. The testimony
12 went on. He talked about policies at the State
13 Engineer's Office, and I would like to examine
14 Mr. Sanders as well regarding happenings at the
15 State Engineer's Office.

16 CHAIRMAN CATANACH: The Commission will
17 allow the witness to testify.

18 MS HENRIE: Thank you, Mr. Chairman.

19 Q. (By Ms. Henrie) Mr. Sanders, did you hear
20 the testimony of Charles Jackson yesterday?

21 A. I did.

22 Q. And he testified about the AmeriCulture
23 permit; is that correct?

24 A. He did.

25 Q. And the allocation of responsibility as

1 between OCD and state engineer for review of that
2 permit; is that correct?

3 A. That's correct.

4 Q. Would you please comment on that?

5 A. Mr. Jackson and I served the state
6 engineer for his entire career. I know him quite
7 well, and he is very good, and I just think he
8 happened to have some misrecollections about the
9 permit to AmeriCulture.

10 First, I do remember that it sounded from
11 his testimony yesterday as if he acted -- the only
12 people involved in the application proceeding for
13 AmeriCulture was the OCD and the District Office of
14 the State Engineer in Deming and that's not correct.
15 In fact, after the hearing yesterday I talked to
16 Tink and asked him. I said, "I remember being
17 involved in this to some degree," and he confirmed
18 that, in fact, I was involved in making the decision
19 with the state engineer that aquaculture is, in
20 fact, the beneficial use of water, one. So it was
21 acted in the state engineer office at the Santa Fe
22 level, which is where all the upper management is.

23 And two, also he reminded me when I raised
24 the issue of why he was serving as hydrologist and
25 determining impairment, he reminded me that, in

1 fact, it was Mike Johnson, who is now head of the
2 hydrology section of the state engineer, he had done
3 the hydrology and made the determination as to
4 effects on surrounding wells. That's what hydrology
5 does at the state engineer. Then they referred back
6 to the administrator to determine whether that
7 constitutes impairment or not, and no impairment was
8 found.

9 So just to be clear on that, it was not
10 just a deferral to the opinion of OCD. The state
11 engineer always acts on geothermal applications. In
12 fact, I served as counsel on one application in the
13 Jemez where the same process was followed.

14 Q. Did you hear the testimony about plan of
15 replacement?

16 A. I did.

17 Q. What is the plan of replacement?

18 A. Well, my understanding, because to my
19 knowledge there's never been an actual plan of
20 replacement approved by OCD or the state engineer,
21 and just by way of quick reference, under the act
22 that provides OCD with jurisdiction to act on
23 geothermal for water over 250 degrees without
24 involvement from the State engineer -- I'm sorry, I
25 lost my train of thought.

1 Q. What is the purpose of the plan of
2 replacement?

3 A. Part B in 71-5-2.1 is an adaptation of
4 existing law in the water code for deep non-potable
5 water. So if you take water from depth and you
6 ultimately -- if you make an impairment -- a
7 decision of no impairment and ultimately there is an
8 effect, there's virtually not -- the normal remedy
9 would be to shut off the junior appropriator and
10 allow the senior appropriator to recapture its
11 water. But because it doesn't work that way in
12 groundwater at that depth, it's not at a meaningful
13 time, they chose to use a plan of replacement so
14 that the person who is deprived of water can get
15 water immediately. And that's the purpose of this
16 section of the act, as I understand it.

17 So since none had been done, the purpose
18 is in what fashion can you create a replacement
19 plan, and I think that's entirely within the
20 discretion of this body that you can allow for
21 either a -- for instance, if LDG were to impair
22 aquaculture's water right in some form, you could
23 require LDG to go out and purchase a water right and
24 transfer it in. It's more senior. But that
25 wouldn't necessarily provide him more water if he

1 already can't get water under this well.

2 You could require his well to be deepened
3 or replaced in order to get water, or I think it's
4 probably entirely within the discretion of this body
5 to allow for Lightning Dock to provide water from
6 its geothermal wells under your jurisdiction and use
7 part of its diversion to supply water to Mr. Damon
8 in the event that the aquaculture water right were
9 impaired. That's my understanding.

10 Q. Okay.

11 A. That was my understanding at the time of
12 the act. I was one of the early drafters of this.
13 In fact, I worked with Mr. Brancard for a while on
14 this process.

15 Q. You talked about an impairment. What are
16 the elements of a water right that can be impaired?
17 Or stated differently, do they include the chemistry
18 and the heat in the water?

19 A. Well, that's another point. And I think
20 Tink was not entirely wrong in the way he
21 characterized it. A judge could find impairment. I
22 can tell you from the state engineer's perspective,
23 and I served for every state engineer since Steve
24 Reynolds except for the current engineer, Tom
25 Blaine.

1 The only element of impairment is your
2 right to receive water in your turn by priority in
3 the amount that you need for beneficial use. That's
4 the standard.

5 With respect to the heat element that Tink
6 carefully tried to characterize as a judge might
7 finding as being impairment, that's incorrect. That
8 has been decided both by the Tenth Circuit Court of
9 Appeals, which was then of that holding that heat is
10 not an element of a water right. It was affirmed by
11 the New Mexico Court of Appeals in a case involving
12 the Burgett water rights.

13 Q. Who was counsel in that case?

14 A. Aside from me, Mr. Lakins.

15 Q. In that case the judge said that heat is
16 not an element of the water right?

17 A. Is not an element of the water right.
18 Also by chemical composition or by -- I believe the
19 Court of Appeals has also -- I know the Court of
20 Appeals has also found that water content, that the
21 chemical makeup of the water, like dissolved solids
22 or suspended solids, are not an element of a water
23 right either, and that was in the Ensenada case, as
24 I recall.

25 Q. Let me ask. Did you hear testimony about

1 the Burgett domestic water supply?

2 A. I did.

3 Q. Do you know anything about the Burgett
4 domestic water supply?

5 MR. LAKINS: Objection. That's not
6 something Mr. Jackson spoke to. That was a
7 different witness.

8 MS HENRIE: Didn't he say he drank water?

9 MR. LAKINS: He drank water there. He
10 didn't talk about Mr. Burgett's use of the water
11 rights. That was Mr. Bowers.

12 CHAIRMAN CATANACH: I will allow it.
13 Let's go forward.

14 A. Yes. I did hear, and I believe because he
15 spoke to drinking the water there, I am aware of,
16 from other negotiations and other discussions, that
17 Lightning Dock acquired a well, a potable water well
18 from the Burgetts, and that well is designated as
19 10. I don't have a pointer, but if you look where
20 the green swath kind of heads to the upper
21 northwest, following the road it's about a mile
22 northwest from the Lightning Dock area.

23 So there are three wells there, I believe.
24 One of them is the one that Lightning Dock acquired
25 as 10. Significant to the discussions and

1 acquisition of that well was the insistence of the
2 Burgetts, who owned the Rosette, that they continue
3 to be able to access one of the other two wells and
4 ensure that it was available for their domestic
5 water they use for the Rosette facility.

6 Q. Do you know if that's a hot well or cold
7 well?

8 A. It's a cold potable water well.

9 MS HENRIE: I have no more questions for
10 the witness.

11 CROSS-EXAMINATION

12 BY MR. LAKINS

13 Q. Just to make sure, Mr. Sanders. You are
14 retired from the State Engineer?

15 A. I am.

16 Q. After you retired, you're doing
17 independent work?

18 A. That's correct.

19 Q. One of your clients is the applicant here?

20 A. That's correct.

21 Q. You also share an office with Ms. Henrie?

22 A. That's correct.

23 Q. In the --

24 A. But to be clear, I also consult with them
25 on all water issues.

1 Q. You do acknowledge that AmeriCulture's
2 permit is valid?

3 A. I can't speak to that. I have not
4 reviewed it. I know it was issued in what, 2002? I
5 also know that the state engineer has been actively
6 pursuing eliminating certain permits that were
7 issued but not developed. And so I don't know the
8 status of it. I don't know if he's put water to
9 beneficial use. I just don't have the answer to the
10 question.

11 Q. But you were involved in that yourself?

12 A. That's right.

13 Q. In the application, and you found there
14 was no impairment at that time?

15 A. That's correct.

16 Q. Right. Now, the plan of replacement that
17 you're talking about, that's from 72-12-A9 the Mine
18 Dewatering Act, right?

19 A. No.

20 Q. Let me make sure I understand because you
21 said that the plan of replacement in 71-5-21B came
22 from another section of the water code?

23 A. Right.

24 Q. What section?

25 A. I think it's -- I have to look at the

1 statute. I think it's 72-12-28, as I recall. It's
2 towards the end of the groundwater code. It's for
3 deep non-potable water, not the Mine Dewatering Act.

4 Q. 72-12 --

5 A. Just to be clear on that, that's what I
6 recall where the section came from, from the
7 discussions within the office. At that point I
8 opted out.

9 Q. But you can't give me that citation for
10 what section it is?

11 A. If I have the water code I can find it in
12 two seconds. I will come over there.

13 Q. I will bring it to you.

14 A. Well, I'll be dang. It should be here. I
15 don't understand why it's not. Do you remember the
16 statute for deep, non-potable water?

17 MS HENRIE: I'm not sure. Does this
18 matter terribly to your case?

19 UNIDENTIFIED SPEAKER: 12-25.

20 A. There it is. Thank you. I don't know how
21 to pull it up, Charles. There we go. Here you go.

22 Q. Got it?

23 A. This was the original genesis of it. I
24 don't know whether this came from there.

25 Q. 72-12-25?

1 A. 25, 26 -- so it's the gist of 28.

2 Q. Thank you. Now, the case that you talked
3 about, you and I actually were involved in?

4 A. Right.

5 Q. It involved heat?

6 A. Right.

7 Q. That was actually the genesis of the
8 current ongoing Animus underground valley water
9 adjudication?

10 A. Right.

11 Q. Correct?

12 A. Yes.

13 Q. And the decision that was made in that
14 case had to do with the aspect of heat being part of
15 water controlled by the State as an element of
16 water, right?

17 A. I think. I may not state it that way but
18 I think I might agree.

19 Q. It didn't touch on water rights of an
20 individual, it was fundamentally about the State's
21 ability -- state engineer's ability to control heat
22 and water?

23 A. No, what it says -- I can tell you what
24 the holding is. "First we reject the holding that
25 temperature is an element of water right that the

1 State must adjudicate." It said it's not an element
2 of a water right. That's what I testified to.

3 Q. So it's not something that will be
4 adjudicated?

5 A. That's correct.

6 Q. Pass the witness.

7 CROSS-EXAMINATION

8 BY MS. MARKS

9 Q. Mr. Sanders, I'm going to show you Exhibit
10 AmeriCulture's Exhibit T which Mr. Jackson referred
11 to yesterday.

12 A. Yes.

13 Q. Mr. Jackson seemed to indicate that this
14 application somehow -- I will paraphrase his
15 testimony but if I do so incorrectly you were in the
16 room -- was indicative of a transfer of water rights
17 and Mr. Seawright's water rights are senior to those
18 who transfer water rights after his permit. Is this
19 correct?

20 A. Not if the water rights transferred in, as
21 approved by the state engineer, are senior to --
22 have a senior priority or earlier in time than the
23 aquaculture priority.

24 Q. So this permit alone is not conclusive
25 evidence of a priority date?

1 A. That's right. Well, it's conclusive
2 evidence of a priority date. It's not conclusive of
3 who it's prior to. You have a string of water
4 rights with priority dates over time. Aquaculture's
5 fits in one section and anything senior or earlier
6 in time to that that gets in then still would have a
7 better right if approved.

8 Q. I just wanted the record to be clear on
9 that. We also discussed 71-5-2.1B, which was put
10 into law in 2012 and prior to that the statute was
11 different. Do you recall how the statute or that
12 section of the Geothermal Resources Conservation Act
13 was prior to the amendment in 2012?

14 A. I believe it was only Section A, and
15 looking at the amendment comment below here, it says
16 that the only thing changed in Section A in 2012 was
17 rather than the number 250, it was spelled out, two
18 hundred and fifty degrees.

19 Q. So in 2012 Sections E, C and D were added;
20 is that correct?

21 A. That's correct.

22 Q. Okay. So Mr. Jackson's testimony was that
23 the state engineer deferred to the OCD regarding
24 impairment of water. Is that correct?

25 A. No. I think as I said earlier, I think

1 Tink would agree that his testimony wasn't fully
2 accurate yesterday; that, in fact, it came to Santa
3 Fe. We reviewed the application as to whether
4 aquaculture was a beneficial use, which I consulted
5 the state engineer on, and also I said, "I can't
6 believe we didn't do a hydrologic analysis because
7 we had the permit with the application," and he
8 mentioned to me that Mike Johnson had actually done
9 the hydrology and evaluated the effects on other
10 wells in the area.

11 Mike Johnson is now the head hydrologist
12 for the State Engineer Office. And then what
13 happened -- at that point that's what's referred
14 back to water rights staff to make a determination
15 as to whether the effects on other wells constitutes
16 impairment.

17 Q. Before I get to my next question, is Tink
18 Charles Jackson?

19 A. I'm sorry, Charles Tink Jackson, which is
20 ironic, I think, that we call him Tink. That
21 suggests a small guy. Everybody in Deming is large.
22 Big guys.

23 Q. So back to the statute. Would you say
24 that the state engineer and the Oil Conservation
25 Division prior to 2012 and now had dual regulation

1 of geothermal energy under 250 degrees?

2 A. Absolutely. What generally, typically the
3 state engineer, if there were other permits
4 required, before we would act on a new
5 appropriation, we would require all other permits be
6 obtained first, which is exactly what Tink described
7 yesterday. Aquaculture had come to obtain the OCD
8 permit. They brought that then to the state
9 engineer as part of the application so we could
10 consider that along with the application and do our
11 own analysis, which was done.

12 Q. And so the only change that the 2012 --
13 the only statutory change made in 2012 was to make
14 it so that the state engineer did not regulate
15 geothermal energy over 250 degrees; is that correct?
16 Among minor other changes?

17 A. That's correct.

18 Q. And to be clear, you're not the Oil
19 Conservation Division's client here today
20 testifying?

21 A. No, I'm not the client nor are they my
22 client.

23 Q. And you did not intend to testify in these
24 proceedings on behalf of Lightning Dock Geothermal,
25 correct?

1 A. I did not. Only after the testimony
2 yesterday.

3 Q. Thank you. I have no further questions.

4 CHAIRMAN CATANACH: Commissioners, any
5 questions?

6 EXAMINATION BY THE COMMISSION

7 MR. BALCH: Are the Burgett fresh water
8 wells on this map or are they off this map?

9 THE WITNESS: I believe they are on the
10 map. You can see where the writing is over there.
11 Are they off the map? I can walk over. Do you mind
12 if I walk behind you? In fact, I was out there on a
13 site visit just recently.

14 Let's see. Here is Lightning Dock right
15 here. They are off the map. They would be -- here
16 is LDG, here is Rosette so one mile out here. They
17 were along Geothermal Road. They are right along
18 the road. You can see them right here.

19 MR. PADILLA: Is there a potable water
20 well on that map that you know of?

21 THE WITNESS: Not that I'm aware of.
22 There could be but I don't know. I was just
23 inspecting these wells. I'm only familiar with them
24 through discussion with the Burgetts.

25 MR. PADILLA: So to your understanding,

1 the house which is the white structure on the bottom
2 there?

3 THE WITNESS: There?

4 MR. PADILLA: I thought it was all the way
5 down. That would have been supplied by one of the
6 potable wells you just referred to outside the map?

7 THE WITNESS: I can only tell you what --
8 is it Ms. Burgett? During the negotiations when she
9 would --

10 MS HENRIE: Paula Thomas.

11 THE WITNESS: Paula Thomas, who is one of
12 the Burgett family. They needed to have access,
13 continued access to to make sure that the well would
14 continue to operate and supply the potable water
15 supply for the area. That's what she impressed upon
16 us as being critical to any deal that we had with
17 her.

18 So I don't know. I heard others say that
19 there may be, but it seems like, given the water
20 quality standards, it's hard to imagine there's a
21 potable water supply.

22 MR. PADILLA: Thank you.

23 MR. BALCH: You spoke at length about heat
24 not being an element of the water right?

25 THE WITNESS: That's correct.

1 MR. BALCH: You also mentioned that
2 chemical composition was impacted -- or did not
3 water rights?

4 THE WITNESS: That's right.

5 MR. BALCH: Could you elaborate on that a
6 little bit?

7 THE WITNESS: Can I see the Ensenada case?
8 I actually -- so the way it's been defined -- the
9 way the Court of Appeals for the State of New Mexico
10 as affirmed by the -- not affirmed. They didn't
11 take issue on this case.

12 MR. LAKINS: Could you give the cite,
13 please?

14 THE WITNESS: Sure. The generic cite is
15 1988-NMCA-030. This was done in 1988. And so in
16 citing these other cases what the Court of Appeals
17 said is both these cases involve claim to diminish
18 water quality from increased salt content in the
19 water. Salt becomes chemically associated with
20 water in solution while silt is physically
21 associated with inspection. Even salt has been held
22 not to be a part of the water in which it is
23 dissolved. Where the proposed appropriation sought
24 water, particularly salt content, so the salt could
25 be extracted for sale.

1 So what they are saying there is they went
2 out and they appropriated salty water. Then they
3 evaporated, used it for salt, and they said by
4 changing this chemical composition we diminished
5 their ability to extract salt from the water. And
6 the Court said that's not part of what the state
7 engineer -- that's not what a water right is for.

8 This case actually involved silt, and the
9 claim was that silt helped seal the fields,
10 fertilize them naturally, that they were entitled to
11 a silt content of the water. And because of the way
12 it was being diverted and used, the silt content was
13 going to be lessened and that would impair their
14 water right. And that was rejected in this case as
15 well.

16 MR. BALCH: But if you had a situation
17 where somebody had potable water and then brine
18 water was released into it making the water unusable
19 for its purpose, that would be impairment?

20 THE WITNESS: It would be a tort. I don't
21 know if it would be impairment. It's never been
22 decided, certainly not been the policy of the state
23 engineer.

24 MR. BALCH: Interesting.

25 THE WITNESS: Past state engineers, I

1 should say. I don't know. A future state engineer
2 might see it differently.

3 MR. BALCH: You mentioned a couple of
4 times greater than 250 degree water. That's
5 Fahrenheit, I presume?

6 THE WITNESS: Yes.

7 MR. BALCH: Not regulated by the State
8 Engineer's Office? That's not part of their water
9 basket that they look at?

10 THE WITNESS: After 2012, water above 250
11 degrees Fahrenheit used for geothermal purposes is
12 not within the state engineer's jurisdiction. If
13 you take it and want to use it for beneficial use
14 and establish a water right by applying it to other
15 uses, then it would be under its jurisdiction for
16 those purpose, not for the geothermal purpose.

17 MR. BALCH: You also mentioned, staying
18 with water rights, that if Lightning Dock were to
19 give geothermal water, greater than 250 not
20 regulated by the state engineer's water, as a
21 replacement, that would be allowed and not blocked
22 by other water right regulations?

23 THE WITNESS: The way I read the changes
24 to the current statute, 72-5-2.1, I believe, the way
25 that reads is replacement plan is within your sole

1 jurisdiction, so if you want to allow water use --
2 geothermal water used for the non-consumptive use by
3 Lightning Dock, you could approve its use as
4 replacement water even though it would go to
5 beneficial use because you're not creating new
6 depletions, you're only providing water that would
7 have been depleted by aquaculture, so the status quo
8 remains unchanged.

9 MR. BALCH: Presumably that replacement
10 water would have to have similar heat chemical
11 composition to the original water?

12 THE WITNESS: I would imagine that would
13 be you all's call and I would imagine you would
14 require something like that.

15 MR. BALCH: Thank you.

16 MR. PADILLA: Just a couple questions for
17 you. I want to go back to the heat elements we
18 discussed earlier.

19 THE WITNESS: Yes.

20 MR. PADILLA: Yesterday when I asked
21 Mr. Jackson to quantify what heat element, what drop
22 in the heat element of the water would constitute
23 impairment, I believe his answer is that would be
24 for the judicial body to decide. Is it your
25 impression that that is not any indicator of

1 impairment? Even if it were to drop from 312
2 degrees to 160?

3 THE WITNESS: The two cases I mentioned,
4 in fact, in the case involving Rosette that Charles
5 and I did, if heat isn't an element of a water right
6 which is the exclusive jurisdiction of the state
7 engineer then, then he doesn't have any jurisdiction
8 to say the loss of heat is impairment.

9 MR. PADILLA: And we also discussed a heat
10 replacement scenario in which Lightning Dock used a
11 closed loop system to furnish aquaculture with heat
12 by exchangers and then return its own water to the
13 facilities. Would the Office of the State Engineer
14 have anything to say about that?

15 THE WITNESS: I'm sorry, could you repeat
16 that for me?

17 MR. PADILLA: If, in the case of Lightning
18 Dock supplying, as a provision of the joint
19 operating agreement or whatever that instrument is
20 called wherein Lightning Dock would have to supply
21 heat in the event of a loss on aquaculture's part
22 due to heat projects carried out by Lightning Dock,
23 if they were to send geothermal water in a closed
24 loop through the exchangers to aquaculture and
25 retrieve or to recapture all of that geothermal

1 water and reinject on the facility, would the Office
2 of the State Engineer have anything to say about
3 that?

4 THE WITNESS: I've never actually -- I'm
5 not familiar with that agreement so I don't know
6 what the genesis and the terms of it are. I don't
7 know -- I don't have enough information to answer
8 accurately.

9 MR. PADILLA: Let me rephrase. If no
10 water was actually going outside the system and it
11 was being used just for heating purposes, would the
12 Office of the State Engineer have anything to say
13 about that?

14 THE WITNESS: I definitely think not, not
15 since 2012.

16 MR. PADILLA: Especially if it was over
17 250 degrees?

18 THE WITNESS: Yeah. If it was over 250
19 degrees when diverted and it stayed in a closed
20 loop, I would say that would be under you all's
21 jurisdiction.

22 MR. BALCH: Just to expand that slightly,
23 the original water would be 312, go through
24 Lightning Dock's cooling facility or their generator
25 facility, cools to as little as 160 or 180. If it

1 then becomes lower than 250, does that change
2 anything with regard to regulation?

3 THE WITNESS: Well, I don't want to
4 testify for the state engineer, but my advice to the
5 state engineer today if I were still his counsel, I
6 would say that it's the point -- what governs is the
7 temperature of the water when diverted. So if it
8 remained -- as long as it didn't drop below 250 or
9 hit 250 or below.

10 MR. BALCH: So they might have to divert
11 some of their hot water?

12 THE WITNESS: That's right.

13 CHAIRMAN CATANACH: Just one.
14 Mr. Sanders, if Lightning Dock actually had to
15 replace actual water to AmeriCulture, do they have a
16 water right to do that?

17 THE WITNESS: Depends on -- Mr. Chairman,
18 I think it depends on what you guys require. If you
19 wanted them to go out and get an alternative
20 source -- I mean, go out and get a new source or get
21 a new well or something as a way of replacing it and
22 that's what you required for whatever reason, then
23 it would be under your jurisdiction. I think the
24 permit, the water they would be seeking to obtain,
25 would be -- I don't know what the temperature of

1 aquifer -- I don't know what the temperature of
2 aquaculture's water is to begin with, so I would
3 probably have a difficult time answering the
4 question.

5 The water provided through the geothermal
6 resource diverted to aquaculture, as long as it was
7 acceptable as a replacement plan, I don't think
8 necessarily the state engineer would have to have
9 any jurisdiction over that at all. If that was the
10 question.

11 CHAIRMAN CATANACH: I mean, do they
12 actually have a right -- would they -- I guess right
13 now they are producing it and they are reinjecting
14 it so they are not actually doing anything else with
15 the closed loop system, but if they had to actually
16 replace that water and give it to AmeriCulture would
17 they have a right to do that? Or would they have to
18 acquire a well or some other source?

19 THE WITNESS: I think if you are talking
20 about water supply, an adequate, sufficiently hot
21 water supply, I believe it's within the jurisdiction
22 under the statute for OCD to let Lightning Dock use
23 its water supply that diverts under your permit to
24 be used as replacement water for aquaculture.
25 Because you are not creating any new depletions in

1 the system, you are merely replacing the depletions
2 that would occur but for the loss of water supply
3 that aquaculture suffered.

4 CHAIRMAN CATANACH: That answers the
5 question.

6 MR. BALCH: There's still mass balances.

7 THE WITNESS: Mass balances, right.

8 MR. BRANCARD: Maybe we can just walk a
9 little bit through the 2012 legislation. I don't
10 know if you have it.

11 THE WITNESS: I have it.

12 MR. BRANCARD: Just so it's clear to the
13 commission exactly what the 2012 legislation
14 decided, okay? The situation in which you do not
15 have to get a permit from the state engineer for
16 diversion involves diverted water over 250. We
17 already discussed that, right?

18 Then it says either the use does not
19 require any diversion, which we're not talking about
20 here, or all diverted groundwater is reinjected as
21 soon as practical under the same water source in
22 which it was diverted resulting in no new net
23 depletions to the source.

24 THE WITNESS: Right.

25 MR. BRANCARD: So it's not just 250. You

1 have to reinject the water back to the same source
2 in order for there not to be a permit required by
3 the state engineer.

4 THE WITNESS: Correct.

5 MR. BRANCARD: In any other situation, the
6 state engineer could step in and say water law
7 applies, you need one.

8 THE WITNESS: Right. And on that phrase,
9 no new net depletions, because you are not creating
10 any new net depletions, by using it as replacement
11 water I think you fall within that provision of the
12 statute.

13 MR. BRANCARD: Now, in this paragraph
14 where it talks about an impairment opinion, the only
15 agency that is directed to give an impairment
16 opinion under the statute is the state engineer,
17 correct?

18 THE WITNESS: That's correct.

19 MR. BRANCARD: The involvement of the OCD
20 would be upon an opinion, an impairment opinion,
21 being delivered by the state engineer and the OCD,
22 the OCD would then require that party that's doing
23 the diversion to provide a plan of replacement.

24 THE WITNESS: Only if it chooses to grant
25 the permit to the applicant. OCD chooses to grant

1 the permit to the applicant knowing that impairment
2 will occur, and the applicant then agrees to do that
3 at the application level. The plan of replacement,
4 I think, would typically occur after the fact
5 generally, but if you anticipate impairment and that
6 person is present and they agree to that, I think
7 that would be fine.

8 MR. BRANCARD: Well, it says here, "The
9 division, OCD, upon receipt of the opinion of the
10 state engineer," which presumably is the impairment
11 opinion, "shall require the owner/operator to submit
12 to the division a plan of replacement."

13 THE WITNESS: That's right.

14 MR. BRANCARD: Then when you get down to
15 the definition of plan of replacement it gives a
16 whole series of options of how that party who is
17 directed to give the plan of replacement, they can
18 choose to figure out and then it's up to OCD to
19 review that plan of replacement.

20 THE WITNESS: That's correct.

21 MR. BRANCARD: There's a second part to
22 the statute. I don't know if you have it in front
23 of you.

24 THE WITNESS: I do not.

25 MR. BRANCARD: It was codified at

1 71-5-21.1. It's only one sentence. 5-21.1.

2 THE WITNESS: I think that's the law
3 anyway, but yes.

4 MR. BRANCARD: "Any water rights owner may
5 bring a de novo action in the district court of the
6 county in which the water rights are located for
7 damages or injunctive relief with respect to any
8 claimed impairment of existing water rights due to
9 development of geothermal resources" pursuant back
10 to what we just talked about, the section.

11 So in other words, if somebody is unhappy,
12 doesn't like the opinion of the state engineer,
13 didn't get an opinion of the state engineer, they
14 can go to court.

15 THE WITNESS: If, once the permit is
16 issued and the diversion does, in fact, cause an
17 impairment, yes. I mean, they have to demonstrate
18 damages, so it would be after the permit had been
19 exercised.

20 MR. PADILLA: The loss of heat would not
21 qualify as impairment according to the Office of the
22 State Engineer?

23 THE WITNESS: Under the water code it
24 would not. I don't know. This is a weird statute.

25 MR. PADILLA: The heat component is not

1 part of the water right?

2 THE WITNESS: Right. But actions for
3 impairment, common law actions for tort and taking,
4 that's -- our case law is rife with those.

5 CHAIRMAN CATANACH: Is there anything
6 further of this witness? This witness may be
7 excused.

8 MS HENRIE: Thank you, Mr. chairman. I
9 would next like to recall Roger Bowers for the
10 purpose of addressing some of the questions the
11 commission had yesterday.

12 CHAIRMAN CATANACH: I would like to advise
13 you, Ms. Henrie, we are running behind. If you can
14 speed this up a little bit.

15 MS HENRIE: I think the next two witnesses
16 will go quickly.

17 MR. LAKINS: I object to the recalling of
18 any witness that already testified.

19 MR. BRANCARD: Well, I guess I would
20 suggest that you finish your direct witnesses and
21 then we can discuss whether anyone needs to be
22 recalled at that point. Again, the other parties
23 have not had a chance to put on any witnesses --
24 well, one witness.

25 MS HENRIE: I would like to get this

1 information to the commission today. With that, we
2 will call Dr. Greg Miller.

3 GREG MILLER

4 after having been first duly sworn under oath,
5 was questioned and testified as follows:

6 DIRECT EXAMINATION

7 BY MS HENRIE

8 Q. We're going to move to qualify -- not
9 right now but we are going to move to qualify
10 Dr. Miller as an expert witness in
11 hydrogeochemistry, and I would like to have him
12 state his qualifications and also tell us what
13 hydrogeochemistry is in the course of doing that,
14 please.

15 A. Thank you to the board for hearing me
16 today. I'm Gregory Paul Miller. Greg Miller is
17 fine for anything today. I'm a professional
18 geochemist, practicing hydrologist. I have been a
19 consultant geochemist for 25 years. I have three
20 degrees from New Mexico Institute of Mining and
21 Technology: A bachelor's of science in geology with
22 honors, a master's in science and geology and a
23 Ph.D. in earth and environmental science with
24 dissertation in geochemistry.

25 I think it's best to kind of explain how

1 we get to this real specialized title of
2 hydrogeochemistry which makes it seem like I am
3 focused laser-like on one topic. Understand that
4 really this is a generalist position that
5 encompasses both the physics, hydrology, chemistry
6 and everything else that I can possibly throw at
7 accomplishing my tasks with my clients.

8 Ultimately, I am a chemical
9 thermodynamicist. I work with the interactions
10 between rock and water at all temperatures from
11 freezing to the surfacing of the sun and exoplanet
12 biology. I have been trained by experts in
13 geothermal systems to use the same tools that
14 geothermal folks use in evaluating ore bodies.

15 So ore bodies, many of them are nothing
16 but fossil geothermal systems and we use the same
17 tools, geothermometers, descriptions of inclusions
18 of fluids trapped in minerals by these systems,
19 thermodynamics, heat flow, chemical model are all
20 the tools that we use to do this work.

21 Now I'm going to back up into my
22 background and experience a little bit on this so
23 you can see how I can apply these tools to the
24 analysis of geothermal systems and have indeed
25 worked on geothermal systems.

1 I transferred into the New Mexico
2 Institute of Mining and Technology in 1985 with 90
3 semester hours of credit from Diablo Valley College
4 in California. At Diablo Valley College I learned
5 that in the geosciences we can explore any field we
6 want. We can go chemistry, we can go physics, we
7 can go structural, we can go geophysics, we can work
8 on other planets, we can work on our own planet, we
9 can work on the atmosphere.

10 This is why my Ph.D is in earth and
11 environmental science. The Institute of New Mexico
12 Mining and Technology has determined that I am
13 competent to work at the research level in earth and
14 environmental science as a generalist or a
15 specialist.

16 So transfer the credit in. Come in. Dave
17 Norman becomes my student advisor. Dave Norman is
18 cited in numerous documents here as both conducting
19 geothermal studies himself on the system of
20 Lightning Dock and having additional graduate
21 students conduct geothermal studies on the system at
22 Lightning Dock.

23 Now, as many advisors at New Mexico Tech
24 will do, Dave had me working on things that were of
25 interest to him in addition to things that were of

1 interest to me. But I completed the master's degree
2 with Dave having developed an interest in mineral
3 equilibria, geothermal systems. I attended the
4 first class taught on geothermometry and
5 hydrodynamics at New Mexico Tech as far as
6 application to geothermometry, and that was from the
7 Society of Economic Geologists, Professional
8 Publication No. 1, Hydrogeochemistry of Geothermal
9 Systems.

10 So Dave gave me an interest level in this.
11 But then I went off and worked on radionucleide
12 contamination cleanup in the Oak Ridge area for
13 about eight or nine years right up until 1996/'97
14 when the budget train wreck occurred and DOE cut off
15 their environmental work.

16 So what was I doing in Oak Ridge? I was
17 working with radiogenic isotopes, I was working with
18 stable isotopes. I was calculating groundwater
19 dates using helium 3 helium 4 dating. I was working
20 with some of the best professionals in the world on
21 that: Kip Solomon, University of Utah and such.

22 So the science that we work on there is to
23 describe water/rock interaction, whether it be
24 contaminants or whether it be common elements such
25 as calcium or fluorene in the environment, but it's

1 considered as a totality. We have to look at the
2 whole periodic table. We have to look at all of the
3 physics. We have to look at thermal which controls
4 everything.

5 Budget train wreck happens. What am I
6 going to do? I worked in construction for a while,
7 I sold water treatment door to door. Have you ever
8 had one of those water softener guys come by your
9 house? That was me.

10 I came back to New Mexico Tech and Dave
11 said, "I want to work on gold off the Canary
12 Islands." I said, "No, Dave, we don't want to do
13 that. Let's work on arsenic because it's going to
14 be front-page news in the New York Times 2000."
15 This was 1997. So Dave Norman and I developed an
16 arsenic research program together, had multiple
17 graduate students working with both me underneath my
18 Ph.D. and underneath his programs. Lots of grant
19 money on it and Dave was really happy. He was ahead
20 of the curve.

21 This doesn't mean Dave left me alone on
22 geothermometry and geochemistry and his science,
23 fluid inclusions and fluid inclusion gas analysis.
24 When we picked my dissertation site to look at
25 arsenic transport in the environment we picked Rio

1 Salado, Rio Caliente west of Guadalajara, Mexico,
2 which is in the middle of the La Primavera
3 geothermal field in the Trans-Mexican Volcanic Belt,
4 possibly one of the largest undeveloped geothermal
5 fields at this time.

6 My dissertation site was 20 kilometers of
7 stream system which headwaters were boiling water
8 springs with one part per million arsenic in it plus
9 good whack of boron and everything like that. I
10 chased the chemistry, the water/rock interaction in
11 the partitioning of all chemicals that I could
12 analyze in this water between the sediments of the
13 stream and the water from 90 degrees Celsius,
14 boiling water, to 20 degrees Celsius 20 kilometers
15 down the stream. This is what thermodynamics does.
16 This is what water/rock interaction geochemistry is,
17 and this is why I call myself a hydrogeochemist,
18 just as I did in exactly my first job that I had in
19 Oak Ridge in 1988.

20 I work on the environment as it includes
21 groundwater, surface water, geothermal, exobiology.
22 Doesn't matter where we are, it's thermodynamics.
23 So I feel well qualified to work in the geothermal
24 field.

25 I have had a lot of consulting roles. I

1 have had a lot of different consulting work.

2 CHAIRMAN CATANACH: Can we -- I appreciate
3 it.

4 THE WITNESS: I'm going to give you one
5 more thing. The last time that I applied my
6 geothermal tools to work on a system using stable
7 isotope chemistry was in 2006 working on permitting
8 for a mineral evaluation in the Monticello Box for
9 BE Resources, a beryllium project there. There were
10 concerns that the warm springs in that valley were
11 going to be impacted by this work. So with New
12 Mexico Tech and graduate students we performed
13 geothermometry on the springs. We performed stable
14 isotope analysis. We did all the things we do in
15 ore deposits or geothermometry to evaluate this.

16 So while my academic training was indeed
17 14 years ago, I am still applying these tools every
18 single day.

19 Finally, I run the codes that are used by
20 the geothermal industry in my industry. I run
21 TOUGH2, which is a Los Alamos developed code for the
22 geothermal industry. I run HST 3D which is the
23 USGS' geothermometry code. I also run Purple X,
24 which is a metamorphic petrology code. So I admit
25 to be qualified as an expert in hydrogeochemistry

1 including geothermometry, although I'm talking
2 Michelle's talk right now.

3 MS HENRIE: Let me please tender Greg
4 Miller as an expert in hydrogeochemistry.

5 CHAIRMAN CATANACH: Any objection?

6 MR. LAKINS: Yes. Based upon Mr. Miller's
7 resume, I have no qualms with him being qualified as
8 a professional geochemist because that's what he
9 says he's done. His dissertation is in
10 geochemistry. His master's and bachelor's were in
11 geology. And calling one's self a hydrogeochemist
12 does not, in my opinion, make one's self one, when
13 his resume is all about geology and his dissertation
14 is geochemistry and it does not go to
15 hydrogeochemistry. So I object to that broad of an
16 expert qualification.

17 MS HENRIE: I have Mr. Miller's transcript
18 from Texas Tech here that shows his hydrology
19 courses. I can offer that to you, Charles, if that
20 would help satisfy your concerns. I can offer it to
21 the commissioners or have Greg speak about it.

22 CHAIRMAN CATANACH: I believe in
23 Mr. Miller's resume of employment history it does
24 list hydrogeochemist for numerous years. In my
25 opinion, that would qualify him as a

1 hydrogeochemist.

2 MR. BALCH: The majority of his projects
3 have to do with hydrology to groundwater.

4 CHAIRMAN CATANACH: The witness is so
5 qualified.

6 MS HENRIE: Thank you, Mr. chairman.

7 Q. (By Ms. Henrie) Briefly, Greg, do you
8 have any licenses in New Mexico?

9 A. I am licensed in five states as a
10 professional geologist. I also used to hold
11 licensure in the state of New Mexico as a Water
12 Systems Operator Level 3. If you're unfamiliar with
13 the scale of the New Mexico systems operators, that
14 entitles me to operate treatment systems for the
15 public to remove substances that are deleterious to
16 human health. It allows me to qualify that the
17 system is providing water that is safe for human
18 consumption. I let that licensure go when I was no
19 longer working for a municipal domestic water firm
20 as a consultant.

21 Q. Dr. Miller, please tell us about how you
22 first got involved with Lightning Dock Geothermal.

23 A. I was asked by your office to perform
24 evaluation of groundwater quality in the vicinity of
25 Lightning Dock Geothermal, specifically to go and

1 contact landowners and sample their wells for a
2 variety of constituents and report those results
3 back to you.

4 Q. And what did the report -- what happened
5 as a result of the report?

6 A. Well, I issued a report that showed that
7 the water quality from the sample wells by
8 comparison was very similar to what we had seen in
9 Circular 177. The reporting was looking to see if
10 we saw indications off-site from a tracer activity
11 that occurred on-site. The results of that were
12 that we found no off-site indications of the tracer
13 work.

14 But one thing that surprised me on the
15 reading of Circular 177 in comparison to my results
16 to it and the actual sampling results themselves was
17 that propensity of fluoride that existed at the
18 Lightning Dock area.

19 So this is a graphical representation of
20 some sampling -- I'm sorry.

21 MS HENRIE: Just a second. This is
22 Exhibit 10 in your binders. It's hard to see the
23 screen.

24 A. It's very hard to see the screen. We have
25 east on the bottom axis, north on the right axis so

1 these samples can be located. These well sites were
2 located by me personally with GPS coordinates. I
3 conducted the sampling myself. The analysis was
4 conducted by the New Mexico Bureau of Geology and
5 Mineral Resources.

6 These are fluoride levels, and what we
7 note right here is the hot wells labeled in red have
8 hot well levels of fluoride in them, running maybe
9 10 to 15 PPM, kind of the range we've seen in the
10 past. And I also noted that we still see fluoride
11 concentrations that greatly exceed drinking water
12 standards up and down the valley.

13 One of the first things to do in something
14 like this is are my results real? So I wanted to
15 compare against other work so I started doing
16 literature research trying to find out what other
17 fluoride results existed out there, and that's how I
18 ended up with Circular 177. Table 2 in Circular 177
19 has some really great fluoride numbers from up and
20 down the valley. There's Figure 6 -- I apologize
21 for not being prepared on that. Figure 12 in the
22 exhibit --

23 CHAIRMAN CATANACH: What are we looking at
24 here?

25 THE WITNESS: Circular 177.

1 CHAIRMAN CATANACH: What exhibit?

2 MS HENRIE: Exhibit 6.

3 A. Page 27 of that. The upper right-hand
4 corner of Page 27 depicts Figure 12 which shows this
5 location of these P series and AN series water
6 samples that were taken by a number of programs,
7 Swanberg, Elston, Logsdon. They are included in the
8 references here in the Circular 177 how and when
9 that data was collected.

10 But I took the Table 2 data and I searched
11 the document for the fluoride contours. I was
12 looking for the fluoride contours. I really
13 expected to find it and I did not find it. So I
14 went ahead and hand-contoured the fluoride myself.
15 We can move to the next slide.

16 Q. That's back at Exhibit 10, Page 2 of
17 Exhibit 10.

18 A. This was done using completely old school
19 stuff. Table 2 does not give the locations of the
20 wells that they sampled so I had to make a
21 transparency and punch holes through it and color
22 the plots. Geologists like working with dirt and
23 crayons. And we come up with this plot here.

24 What we are seeing here is this outside
25 edge roughly contours areas greater than two parts

1 per million fluoride and water. Two parts fluoride
2 in water is significant as determined by the U.S.
3 EPA, the New Mexico Department of Health and the New
4 Mexico Environment Department as the level of
5 fluoride at which dental fluorosis starts. The
6 other contour that exists out here, the inner one
7 here, is levels approximately over four. Now, the
8 level of four parts per million of fluoride is
9 significant because that's the level at which U.S.
10 EPA, New Mexico Department of Health and New Mexico
11 Environment Department say that skeletal fluorosis
12 begins. Damage to your skeleton.

13 So I was greatly surprised to see this.
14 And I was greatly surprised to see, frankly,
15 discussions of potable water involved with water in
16 the lower section of the Animus Valley.

17 Now, this is hard to scale so I'm going to
18 show you an overlay of this with Cotton City, the
19 Lightning Dock leasing areas, so you can get an idea
20 how big this fluoride plume is.

21 MR. LAKINS: Is this an exhibit?

22 MS HENRIE: It is not, Charles. And that
23 was just because we didn't have time to put it
24 together. I can make it an exhibit if you would
25 like.

1 A. So that was georeferenced for me by Roger
2 Bower. He took my overlay and georeferenced to that
3 topographic map right there. But discussion of
4 potable water inside this contoured area is really
5 problematic. The knowledge that this water has been
6 this contaminated has existed for 33 years and
7 people are conversing in this meeting as if this is
8 some pinpoint of contamination.

9 Note that also this extends down to the
10 southwest here. And again, this points back to
11 Logsdon and Deal's original analysis that this
12 geothermal system is also trending to the southwest
13 as you heard today, and we will present additional
14 information on that.

15 So we have this fluoride anomaly here.
16 When we get to the heart of it right here where
17 we're talking about pumping out water that's between
18 10 or 15 PPM and putting it right back in the core
19 of this plume that's 10 or 15 PPM, personally and
20 professionally I find it ridiculous to be talking
21 about the water quality standard.

22 Someone cited the water quality standard
23 yesterday, and that sentence opens up saying, "If
24 you cause it to exceed." Well, that presumes that
25 it's not exceeded already, doesn't it? In my

1 opinion, it does.

2 So we can't cause water to exceed that's
3 already exceeded. And to me, this is an enormous
4 public health problem that nobody who has known
5 about it, but me, has said anything about to this
6 date. I find that entirely surprising because we
7 have talented scientists and engineers in opposition
8 to the project. We have the Hidalgo Soil Commission
9 that has claimed protection of their friends,
10 families and neighbors, and I haven't seen anybody
11 tell anybody they are drinking poison in the Animus
12 value.

13 That is my personal and my professional
14 opinion to a reasonable degree of scientific
15 certainty that consumption of the water in the
16 Animus Valley inside those contours is not advisable
17 from a human health perspective.

18 MR. LAKINS: I object to that opinion
19 because he is not qualified as any sort of medical
20 expert.

21 CHAIRMAN CATANACH: I will agree with
22 that.

23 MS HENRIE: Can I ask Dr. Miller to
24 respond?

25 CHAIRMAN CATANACH: Yes.

1 A. My qualifications as a Water Level
2 Operator System 3 qualified me to determine when
3 human health was affected and when it was not by
4 reference to regulatory standards. And here I am
5 making only reference to regulatory standards. It's
6 not me that says that this water is unsafe to drink.
7 I am merely reiterating the well-founded opinions of
8 the U.S. EPA, the New Mexico Department of Health
9 and the New Mexico Environment Department and
10 speaking to that as a professional qualified to
11 speak about the water of chemistry. That water
12 represents a human health risk.

13 CHAIRMAN CATANACH: Based on the standards
14 already established.

15 THE WITNESS: Based on the standards
16 already set up.

17 CHAIRMAN CATANACH: I will allow that.

18 Q (By Ms Henrie) Dr. Miller, will you
19 characterize, please, the geothermal water at
20 Lightning Dock and in the Animus Valley?

21 A. Okay. We have seen both from the work
22 done by other scientists and confirmatory samples --
23 we need to go to stiffs.

24 Q. The stiffs are an exhibit, Exhibit 8.

25 A. I will need those on the screen in order

1 to point out what's going on. Thank you. All
2 right. The first diagram that we are looking at
3 here is what's called a stiff diagram. You saw an
4 explanation of that the other day in the stiff
5 diagrams that were presented. I will add very
6 little to that in that what we're doing is we're
7 calculating concentrations in molarity, so we're
8 counting atoms. We want to match numbers of atoms
9 and then we weight them by charge.

10 Ions have a charge on them, minus one,
11 minus two, plus one, plus two, so the CAD ions on
12 the left-hand sides of the diagram, the positively
13 charged stuff, and the anions are on the right.

14 Now, what we are trying to do with a
15 diagram like this is take a table full of numbers
16 and force it into a visual representation so that we
17 can pick out differences in characteristics.

18 The geothermal water and the data I
19 plotted here is Well P3 from Elston, et al., 1983.
20 And this is very typical of the geothermal water
21 sample. We see a very low magnesium sulphate
22 signature down near the bottom, very low calcium
23 carbonate signature in the middle portion of these
24 waters, but as a percentage of the amount of
25 chemistry available, it's dominated by sodium

1 potassium and chloride. So this is a sodium
2 chloride water. All of the geothermal waters, when
3 we calculate a water type on them, generally plot
4 right in the sodium chloride water field.

5 Now, waters are different in the Animus
6 Valley. In the upper reaches of the Animus Valley
7 we tend to have more calcium-based waters. It's
8 more fresh infiltration taking place there. As the
9 waters tend to move down, they become more sodic and
10 they also tend to pick up more bicarbonate and this
11 is picked up from the valley sediments. So I picked
12 a very typical basin-fill well, the Valley View
13 Church Well, which is used for references in a lot
14 of work here and is right at the end of geothermal
15 road and the highway. So it's a good representation
16 of what's happening outside in the potable water
17 zone.

18 And this, on the bottom right-hand corner,
19 we still see this sodium potassium signature here
20 but we are starting to pick up on the calcium,
21 magnesium, a little bit of sulphate. And you can
22 see simply from a pictorial perspective how mixed
23 water ends up as an intermediate-shaped figure.
24 That's really the only take-home point from this, is
25 that we can characterize that the geothermal water

1 plots, all with itself in one area, various other
2 plots you're going to see. The more pristine
3 valley-filled aquifers look like another thing and
4 when we come into the zone of mixing that occurs,
5 they are mixed water. And we see the mixing in all
6 kinds of chemistry.

7 Q. Let me try to summarize. The geothermal
8 water signature looks the same. The fresh valley
9 water cold water looks the same and there's a zone
10 of mixing where you can see that it's actually being
11 mixed?

12 A. This is a principle of end points, yes.
13 We have a geothermal water end point that plots very
14 tightly. You will see it on the next slide. We have
15 the Animus Valley basin fill water, which forms
16 another nice endpoint. But lots of things happened
17 in the Animus Valley basin fill, so there's
18 different signatures and different mixtures. This
19 shows up on the next slide. If we could flip to the
20 next exhibit.

21 This one here which plots -- you will see
22 a diamond at the top with two lower triangles. This
23 plot is also plotting in charge-weighted atom
24 counting, so we are matching one atom to another.
25 The bottom left-hand corner of the triangle is our

1 CAD ions. What is plotted in red is geothermal
2 water. What is plotted in blue are previous samples
3 taken in the P series for Lightning Dock. Excuse
4 me, from Elston, et al 1983, and the green samples
5 are what I took in 2012.

6 So from the bottom left-hand diagram we
7 see that the geothermal water, just as on the stiff
8 diagrams, they plot in the bottom right-hand corner
9 high sodium potassium, low calcium. As we move to
10 the right the waters evolve. They evolve through
11 mixing. That is part of the process. There's an
12 additional process all the way down the valley where
13 they evolve from ion exchange to calcium to sodium
14 potassium to calcium.

15 We look at the right-hand diagram and we
16 see something else here. While the geothermal
17 waters are plotting down in the right-hand corner
18 for chloride sulphate and bicarbonate, there's a
19 whole bunch of the P samples and the samples I took
20 that plot right on top of them for anions.

21 Now, what that tells us is that trying to
22 differentiate these two waters based upon chloride
23 may not be the best bet. And Elston et al. offers a
24 theory as to why that takes place. They believe
25 that the valley fill waters are picking up chloride

1 from the valley fill sediments and, in fact, did
2 some calculations looking at gypsum and sulphate to
3 prove out that relationship. And I tend to believe
4 the relationship that chloride is probably not a
5 good mixing end point.

6 Now, you really get an idea of what
7 different paths things can take when you take a look
8 at the upper diagram and you see the geothermal
9 water that plots in this nice tight area in the
10 right-hand corner. Then we see the valley fill
11 waters plotting in all directions. These are
12 different mixing processes taking place. But it
13 starts over on this far right-hand corner in that
14 diamond as mixing from geothermal.

15 The next plot we are going to see, we are
16 going to see what some of the pristine valley fill
17 aquifer water really looks like.

18 Q. Quick question.

19 A. Yes, please.

20 Q. This is a naturally mixing water?

21 A. Well, all processes that are occurring
22 there other than pumping and withdrawal are all
23 natural processes. The fluoride plume is a natural
24 process. The hydrothermal mixing that's taking
25 place in there is a natural process. The advection

1 of water down the valley where it runs into the
2 geothermal plume is completely natural, as is the
3 giant plume of fluoride that extends down the
4 valley. How far, we don't know.

5 Q. So when we look at these samples that were
6 pulled by Elston that are plotted on your exhibit
7 there, those were before the power plant, right?

8 A. Yes, they were. Yes, those would have
9 been prior to the power plant but they would not
10 have been prior to geothermal use because I believe
11 Burgett was operating in the 1980s there. Or not.
12 I could be confused on the date.

13 UNIDENTIFIED SPEAKER: Shallow wells but
14 not deep wells.

15 A. Shallow wells but not deep wells. But the
16 point being really, the take-home point from the
17 slide is mixing is observed. It's observed as a
18 natural process in the valley. My sampling in 2012
19 overlays Elston's sampling. We don't see much
20 change in the hydrogeochemistry of the system
21 between Elston and now.

22 I would like to move to the next exhibit.
23 This is called a modified duroff plot or a
24 confusogram. There's one point I want to illustrate
25 here and this is the right-hand side of this

1 diagram. What we have done is taken a piper plot,
2 which enables us to look at mixing and we added
3 total dissolved solids and pH to it in the
4 right-hand and bottom boxes. Now, if we look at --
5 total salt solids is a conservative parameter. If
6 you mix water with -- you know, X total dissolved
7 solids with Y total dissolved solids it forms a
8 proportionality in mixing. You can calculate it as
9 X fraction of Water A, plus X fraction of Water B
10 will give us this concentration in Water C.

11 When we look at the TDS, the total
12 dissolved solids of the geothermal water, pretty
13 much with one exception we are seeing a plot right
14 around 500 to 1,000 PPM TDS. I want to call your
15 attention to the dots on the left-hand side of the
16 geothermal, the very low TDS water, the purple and
17 green dots there. Those represent our best basin
18 fill pristine water characteristics right there.
19 And as that water moves into the geothermal zone
20 it's changed. But also as that water moves through
21 playa sediments it can be changed, too, and we see
22 the increase in TDS, the increase in sulphate that
23 occurs down the Animus Valley.

24 Basically, the system is operating about
25 the same as it always has based upon my observations

1 and comparisons with Elston, Deal and Logsdon's
2 chemistry of 1983.

3 Q. Let me ask a quick question. We have said
4 that the signature of geothermal water is the same.
5 Does that change if we are looking at shallower
6 geothermal water or deeper geothermal water or
7 geothermal water that's above 300 degrees, which is
8 100 degrees? How does the signature work?

9 A. One of the findings of Elston, Deal and
10 Logsdon was that based on isotope chemistry, based
11 on chemical geothermometers, they believe that a
12 certain amount of mixing takes place right in the
13 outflow zone such that only 25 percent of core
14 confined geothermal aquifer solution is actually
15 mixing with the basin flow waters. So it very much
16 matters where you are in the system.

17 We can't describe the system as, you know,
18 homogeneous thermally or chemically because of these
19 dynamic processes of mixing. Now, hasn't this been
20 about the same since the whole time the system has
21 been operating? We would say yes because it's
22 created this giant plume down the valley of general
23 plume configuration. It's not blobs going down the
24 valley, it's a relatively continuous source. So we
25 assume that the upflow and the mixing has been

1 taking place.

2 Recognize, the mixing is really what we
3 call a fractile process. It's taking place in
4 little tiny fissures but it's also taking place in
5 the unit of upflowing upwelling hot water, rising
6 because of buoyancy, rising because its density is
7 lower than the density of the surrounding water.
8 When this balloon of water comes up something has to
9 come in underneath it. It can't create a vacuum.
10 And so we see mixing at all levels through this
11 system.

12 So if you are in the very center of the
13 best part, hottest, whatever part of the outflow
14 plume that's coming up, you are still in mixed
15 water. So as comparison to the end points of the
16 valley fill water and the deep geothermal sources
17 defined in Elston, Deal and Logsdon 1983.

18 Q. I'm going to ask you two questions and
19 then I would like you to talk about them.

20 A. Okay.

21 Q. You can go ahead and answer the questions
22 if you feel that you have a quick answer. The first
23 question is: In your opinion will the proposed
24 injection contaminate any underground source of
25 drinking water?

1 A. My answer to that is it is my professional
2 opinion within a reasonable degree of scientific
3 certainty that the operations as proposed at
4 Lightning Dock will not contaminate an underground
5 source of drinking water.

6 Q. I'm going to ask you the second question
7 and then if you want to talk a little bit more to
8 this point you can. Will the proposed injection
9 cause the waters of the state of New Mexico to
10 exceed applicable water quality standards?

11 A. Again, this is where this problem comes in
12 answering this question. It is my professional
13 opinion within a reasonable degree of scientific
14 certainty that you can't cause water quality
15 standards to be exceeded where they are already in
16 excess of the regulatory criteria. You may adjust
17 the concentration situation a little bit, but you're
18 not going to change the fact that the standards are
19 already exceeded. This is problematic in the
20 environmental industry and this industry.

21 In regulatory work, as indicated in my
22 resume, I have great experience with contaminated
23 sites. This is always a problem. How do we pull
24 contaminated water out of the ground, do a treatment
25 operation on it which may not be about 100 percent

1 successful, but then return it to the system so we
2 can keep working the system for a number of years
3 and do so without breaking the law. In the
4 strictest sense we can't do so without breaking the
5 law. Strictest sense right here, you are pulling
6 water up above the ground at 10 to 15 parts per
7 million fluoride and then magic happens. And the
8 law says that water is no longer able to be put back
9 into the ground it came out of.

10 On face value it's ridiculous but it's the
11 environment in which we have to deal with. So in
12 the environmental industry we recognize this. We
13 have groundwater non-attainment zones all over Texas
14 where it's recognized that there's no way that this
15 naturally contaminated water will never meet
16 drinking water standards. And if you are doing
17 uranium mining in this naturally occurring water
18 that's never going to meet drinking water standards,
19 how can you ever be expected to return that to the
20 drinking water aquifer quality? You can't.

21 So the regulatory environment is the
22 problem here. It's not the fact that the water is
23 poisonous to drink.

24 Q. So, Greg, do you know whether Lightning
25 Dock has background that's been set with regard to

1 fluoride that has been accepted by OCD? What is
2 that background?

3 A. Oh, excuse me. Yes.

4 Q. I'm sorry, I took your brain away.

5 A. In the environmental industry about 1988
6 during the Resource Conservation Recovery Act 1976
7 as amended, it was determined that the only way we
8 could figure out what's going on in these
9 environmental sites as to whether we have downstream
10 contamination or not is with statistics. Part of
11 the problem here is some of these sites have
12 upstream problems. If XYZ company upstream of you
13 has been contaminating the water with the same thing
14 you have and it's flowing onto your site, how much
15 are you responsible to clean up versus the guy
16 behind you? Or how can you tell if you change the
17 water that's already in kind of bad shape, how can
18 you tell whether it's changed enough downstream?

19 Then we have the incident of the landfill
20 in the Midwest. This is a great problem. It
21 receives 100 percent of its precipitation from
22 above. Where is up-gradient for this landfill?
23 Where am I supposed to measure up-gradient water
24 quality? It's the sky. But again, the regulations
25 are forcing me to do something that science tells me

1 is very hard to do.

2 So we use statistics for a group of
3 samples using a method approved by the U.S. EPA to
4 calculate what's called a background threshold
5 value. A background threshold value is a
6 statistically generated number which we generally
7 have, the way it's calculated, have a 95 percent
8 confidence that -- meaning confidence that we are
9 not seeing a false positive, that if this number is
10 exceeded something has changed.

11 So there is -- and it presents an
12 interesting problem because it says now that we have
13 a fluoride standard of about 17 PPM and some of the
14 highest fluoride has been seen out there a little
15 over 15. So on face value you say, how does that
16 work?

17 Well, we have noise in the data. There's
18 always analytical sampling error. There's always
19 changes, small changes between samples. So the EPA
20 has tried to take the statistical approach into
21 account and has provided us a method for calculating
22 two numbers. One is called an alternate
23 concentration limit and the other is called a
24 background threshold number. The background
25 threshold number is appropriate in this case because

1 we have a contaminated aquifer and we are trying to
2 determine how bad that contamination is. We can't
3 use the MCL as our numerical standard for what we
4 can inject. We have to establish what the
5 characteristics of this water are.

6 So David Janney, with AMEC at the time,
7 contacted me to perform ProUCL statistics for them.
8 This is something I have done many times since 1988.
9 ProUCL wasn't around in 1988. It only showed up in
10 the late 1990s but the EPA set out how we were to do
11 this. We have done it with Excel before. It
12 crunched the numbers for them, told them, "David, we
13 don't have enough data yet to do these monitoring
14 wells. We are in the landfill situation."

15 Your source is right here radially around
16 this. These wells are all going to have their own
17 individual characteristics so we need to establish
18 what their individual backgrounds are as quickly as
19 we can.

20 We can use the whole dataset for
21 everything that's been taken out of the geothermal
22 work, assuming they are reasonably related, to
23 establish what the background value is for the
24 geothermal water. So that's exactly what I have
25 done in 2013 and most recently 2015 is take the

1 datasets, the same ones supplied to OCD, the same
2 ones supplied to everybody else, use ProUCL to
3 perform outlier tests as they indicated I should do,
4 look at the statistical distributions to make sure
5 I'm applying the correct statistical method, look at
6 the background threshold value and then calculate a
7 background threshold level. And that's what was
8 reported here.

9 So the background threshold levels, at
10 face value, yes, they are higher than what we would
11 think would be the normal concentration in the
12 geothermal system, but that's a reasonable approach
13 in environmental monitoring given that we know we
14 will see some variance in the data.

15 So if sampling was to start to approach
16 that background threshold value, Lightning Dock
17 Geothermal has a bright line that they know that
18 indicates this water is exceeding the statistical
19 central tendency of the data of the geothermal
20 water. We're going to see scattered. Background
21 threshold value tells you that no, this is the
22 bright line, and that's what I calculated.

23 Q. Let's switch gears a little bit.
24 AmeriCulture has argued that Lightning Dock is going
25 to cause it to go out of business because Lightning

1 Dock is going to change either the chemistry of the
2 water such that it is unsafe for fish or the
3 temperature of the water. And I want to know do you
4 think -- I'm not going to ask do you think. Have
5 you examined that proposition?

6 A. I have examined that proposition. I took
7 the testimony of Damon Seawright that he needed
8 water to at least 85 degrees Fahrenheit for
9 aquaculture. I took his testimony that the maximum
10 allowable fluoride that he would like in his
11 aquaculture is some level at or below the level in
12 Well A44 of 5.6 milligrams per liter. And we also
13 took into account that the temperature as reported
14 from State Well 1 and 2 of 230, I believe -- I will
15 have it on the chart -- 232 degrees Fahrenheit to
16 see what his mixing opportunities are. What are the
17 management opportunities for water blending here
18 that could end up within those criteria over 85
19 degrees C but below 5.6 milligrams per liter
20 fluoride.

21 Not that one. Keep going. They are
22 backwards. That one. Go up one. There we go. We
23 will start with this one here.

24 MR. LAKINS: Is this an exhibit?

25 MS HENRIE: No, it is not.

1 MR. LAKINS: We would like this an
2 exhibit, too.

3 MS HENRIE: Yes, sir.

4 Q. Before we do that, Dr. Miller, have you
5 visited the AmeriCulture facility?

6 A. I visited the AmeriCulture facility, I
7 believe, three times. It could possibly be four.
8 I'm a little uncertain on that.

9 Q. So you're familiar with how the
10 AmeriCulture wells work in order to serve the
11 AmeriCulture facility?

12 A. Yes. I actually visited the cold water
13 well, which was used to supply the AmeriCulture
14 facility, for my own due diligence.

15 Q. Where is that well?

16 A. That well is in Section 12 off to the west
17 of the AmeriCulture and Lightning Dock facility.
18 It's on the north side of the road. It's pretty
19 much directly across the street from the three Dale
20 Burgett cold water wells, DB 1, 2 and 3, some real
21 high volume wells that were there. I think it's
22 cold water wells, six-inch casing. I did trace the
23 line back to the AmeriCulture facility.

24 When called to sample, I did collect
25 samples at multiple times from a well that I've

1 designated AC cold, which is their cold water. I
2 know AmeriCulture can use different wells for
3 different operations, so at the time I sampled from
4 his mixing tap at his mixing tank what I call AC
5 hot, AmeriCulture hot.

6 So I have seen the mixes operations. He
7 will mix the tempered water with cold water imported
8 to the site.

9 Q. What's the ratios?

10 A. I did not -- I have never been told by Mr.
11 Seawright what his mixing ratios were. I actually
12 did not inquire on that point. There's certain
13 aspects of my visits to AmeriCulture where Mr.
14 Seawright expressed that certain information was
15 business confidential and I respected his request on
16 that so I can't say that I have ever been told what
17 the mixing ratio is, but from this diagram we can
18 see what the potential mixing ratios are based on
19 Mr. Seawright's own criteria.

20 On the right-hand side of the plot here we
21 have fluoride in milligrams per liter. On the
22 left-hand side of the plot we have temperature and
23 degrees Fahrenheit. This bright red line represents
24 temperature equal to or greater than 85 degrees, and
25 this green line right here is fluoride equal or

1 greater than 5.6. So we don't want to go above the
2 green line and we don't want to go below the red
3 line.

4 So this line here calculated by the simple
5 mixing equation that I spoke to you about a while
6 ago, for example, for temperature you would take the
7 fraction of the hot water times the temperature of
8 the hot water plus the fraction of the cold water
9 times the temperature of the cold water, and that
10 will result in the mixed temperature. So the bottom
11 axis is fraction of water from the hot well, so we
12 can see in order to meet minimum temperature
13 requirements here, based on Mr. Seawright's
14 testimony, right here a mixing ration of about .1
15 hot water to 90 percent cold water will achieve his
16 minimum temperature. But over here, this
17 intersection right here, if we put in too much hot
18 water, about 45 percent, we will indicate -- we will
19 exceed the fluoride concentration. Of course, this
20 assumes that hot water that Mr. Seawright generates
21 above the 85 C line would be allowed to cool so he
22 wouldn't be cooking the fish.

23 Q. 85 C?

24 A. Sorry. Just slap me if I do that again.

25 Sorry. Kelvin works. You guys want to work in

1 Kelvin?

2 Q. No.

3 A. Not that one. Go the other way. That
4 one. Okay. So in science you conduct something
5 called the sensitivity analysis. If you make an
6 assumption you say, man, I think it's going to be
7 like this. What if you're wrong? It's always good
8 in science to ask what if you're wrong?

9 Well, what happens if we increase the
10 fluoride concentration 50 percent in State Well 1 or
11 2 and mix we with it with the AC cold well? Sure,
12 it reduces the mixing options. We are still right
13 here. .1. We can do that one always, but right
14 over here in this crossover area is where it starts
15 to end up with less mixing options and you end up
16 with about 27.5 percent hot water is going to be
17 about the most he will be able to use if the
18 fluoride concentration was somehow to increase 50
19 percent over the level which it's maintained for
20 thousands of years now. Next slide.

21 MR. LAKINS: I'm going to object to this
22 entire line of testimony at the moment. This was
23 not disclosed to us in the prehearing statement.
24 None of these slides which are being discussed right
25 now were disclosed as exhibits but were obviously

1 prepared well ahead of time and reviewed and none of
2 this was disclosed as anticipated testimony and none
3 of these were provided to us ahead of time. We are
4 highly prejudiced and even being able to respond to
5 this testimony that's being given on a very lengthy
6 presentation.

7 MS HENRIE: Mr. Chairman, once again, we
8 had no idea what the hearing was going to be about
9 because AmeriCulture didn't tell us until it filed a
10 prehearing statement which was the same day our
11 exhibits were due. So we have had to try to respond
12 to the arguments, 13 pages of arguments that are
13 AmeriCulture's prehearing statement. So I have a
14 hard time knowing how we could have responded when
15 we didn't even know what the argument was going to
16 be.

17 MR. BRANCARD: Can you explain the
18 relevance of the testimony right now?

19 MS HENRIE: Absolutely. As soon as I can
20 find my pleadings. In AmeriCulture's prehearing
21 statement it argues about certain changes that have
22 happened to Well A444, which is the federal well,
23 and it suggests that those changes were caused by
24 Lightning Dock Geothermal. It also suggests that
25 changes are going to happen to State Well 1, which

1 is the current production well, or State Well 2,
2 which is in the same place or the same area as the
3 current production well that will cause AmeriCulture
4 to not be able to function as it currently does as a
5 fish farm.

6 Those are very serious allegations, that
7 we will be driving them out of business and as
8 proposed injections will be driving them out of
9 business or that the current state of the power
10 plant, the current injections happening are, in
11 fact, causing water quality changes or water
12 temperature changes that will drive AmeriCulture out
13 of business.

14 I am trying to show that that is not going
15 to happen because I think those are very wavy
16 allegations. We think there's not a way in the
17 world that they could, in fact, be true.

18 MR. LAKINS: June 20th protest. June 20th
19 included the statement "owing partially to the
20 potential for endangerment of the original
21 geothermal resource, underground water supplies and
22 businesses that rely upon the original geothermal
23 resource." They were in notice in June.

24 MS HENRIE: Of what?

25 MR. LAKINS: Of 2015. June of 2015. This

1 all goes to impact on business and we were not
2 provided any of this ahead of time. The only one
3 that can rebut this is Mr. Seawright. He hasn't
4 even been given it and seen it until this moment to
5 even have a chance to evaluate it to rebut it. It's
6 highly prejudicial to us.

7 MR. BALCH: Can you explain better to us
8 the progression of events? You are saying June
9 20th, she is saying September 3rd. When were each
10 party aware of what the other party was going to
11 present? That's a very general statement.

12 MR. LAKINS: This was prepared well ahead
13 of time. We haven't been given this. We are just
14 prejudiced even being able to rebut this. It was
15 not disclosed in the anticipated testimony.

16 MR. BALCH: It sounds like they didn't
17 know what was going to be presented by you until the
18 last day.

19 MS HENRIE: May I go through the --

20 MR. LAKINS: All it says for Mr. Miller is
21 he may testify as an expert witness hydrogeochemist.
22 That's it. This goes way beyond that.

23 MR. BALCH: This is hydrogeochemistry.

24 MR. LAKINS: The impact on our wells and
25 the use of our wells, how we use our wells, the

1 information that he had from a visit that would have
2 been done several years ago, they had all this
3 information long before the prehearing statement and
4 that's all they talked about.

5 MS HENRIE: Mr. Chairman, if I could go
6 through the chronology. The applications were filed
7 in June and July. The applications for injection.
8 AmeriCulture responded with a protest letter June
9 26th that included that very broad statement of harm
10 to businesses in the area not articulating what that
11 harm was.

12 On July 1st there was an order granting
13 the application setting the hearing and there was
14 also a procedural order after that. According to
15 the procedural order, AmeriCulture needed to file a
16 proper application for hearing that met the
17 regulatory requirements. AmeriCulture did that on
18 August 12th, but that application for hearing states
19 absolutely no reason why to hold a hearing. The
20 hearing had already been set so they got away with
21 that. But as of that point in time, August 12th
22 when the application for hearing was filed, still
23 the only reason we knew of for their objection and
24 for the hearing was that very broad statement of
25 harm to businesses in the area that rely on the

1 resource.

2 It wasn't until -- the prehearing
3 statements were filed on November 3rd, so that's the
4 same day -- September 3rd -- that you had to
5 disclose your witnesses and your exhibits in
6 accordance with the procedural order and what the
7 procedural order told us to do. That was when
8 AmeriCulture for the first time revealed in 13 pages
9 of argument exactly what it was worried about and
10 that's the first time that we got to understand what
11 the harm to the businesses in the area meant.

12 This is Mr. Seawright's own testimony from
13 2013. We feel like they should have made this
14 analysis before making this allegation about us and
15 so we got late notice of what they thought the
16 problem was and we did our best to address why we
17 think it's not a problem.

18 CHAIRMAN CATANACH: Mr. Lakins, this
19 doesn't appear to be an overly complex calculation
20 here. It seems very simple. You will have the
21 opportunity, albeit a brief opportunity, during
22 lunch to review this material and if you so desire
23 you can rebut it on direct. So I think it's
24 relevant to the proceeding and I think we need to
25 hear it.

1 MR. BRANCARD: Let me just make a point
2 here, though. I think Lightning Dock keeps
3 referring to having to respond to their allegations.
4 In fact, you're the applicant in this case so you
5 have to put on a case that meets the standards of
6 the geothermal regulations including the injection
7 rule you presented as Exhibit 8 in your statement
8 which says that you have to show that you're going
9 to prevent waste, you're going to protect
10 correlative rights, there will be no danger to any
11 natural resource including geothermal resources,
12 underground water supplies. That's your burden in
13 the application, okay? You are presenting your
14 application.

15 MS HENRIE: I wholly agree.

16 MR. BRANCARD: I am concerned that there
17 are exhibits here that you're submitting that were
18 not -- you had a burden to file the exhibits that
19 you are not submitting. That is a problem, and I
20 think to the extent that we allow these exhibits to
21 be admitted, I think Mr. Lakins and his client
22 should have some opportunity to review these and
23 respond to these at some point. So that's my
24 concern. But you have the burden not to respond to
25 their allegations but to prove that this well can

1 meet the standards of the state regulation, and
2 those are pretty broad standards what you have to
3 show.

4 MS HENRIE: I agree, Mr. Brancard. The
5 problem that we have had in the way this unfolded is
6 we have to make our case first. And we're trying to
7 defend from something that we think they are going
8 to say based on the prehearing statement. If I
9 don't give it all to you now, I'm not sure that I
10 will have the opportunity.

11 MR. BRANCARD: Yes, but you do have the
12 ability to have rebuttal witnesses. If something
13 comes up in their testimony that you were not
14 anticipating, you can request to have a rebuttal
15 witness. This material can be presented in
16 rebuttal. That's another way to look at this.

17 But you also have the burden to meet the
18 requirements under the rule for a permit to be
19 granted and that's pretty broad as to what you need
20 to show here.

21 MS HENRIE: Okay. What would you like me
22 to do?

23 MR. BRANCARD: Go forward.

24 CHAIRMAN CATANACH: Let's go forward.

25 MR. LAKINS: We just want to ensure that

1 prior to breaking for lunch we are provided with
2 every exhibit that is discussed.

3 MR. BRANCARD: And any more that you may
4 have.

5 MR. LAKINS: Thank you, yes.

6 MS HENRIE: It's clear we weren't planning
7 to submit this as an exhibit. We were planning to
8 use it to help articulate to the commissioners and
9 explain what Greg is saying. That was the intended
10 purpose of this.

11 MR. BRANCARD: But even as a demonstrative
12 exhibit -- we were joking this morning that we
13 wished counsel had all participated in the 9:00
14 o'clock hearing. It was brief and dealt with
15 injection wells and the PowerPoint presentations
16 were presubmitted as exhibits so the commissioners
17 were well versed in advance about what they were
18 going to see. I mean, I'm concerned with
19 Mr. Lakins' clients but I'm more concerned about the
20 commissioners not having the information in advance,
21 too, because they have to make the decision.

22 MS HENRIE: Perhaps before lunch we could
23 use the computer --

24 MR. BRANCARD: Whatever you want to
25 arrange.

1 MR. LAKINS: That would be satisfactory.

2 CHAIRMAN CATANACH: Let's move forward
3 then.

4 MS HENRIE: I forgot where we were. We
5 were talking about sort of the windows of where harm
6 might occur.

7 CHAIRMAN CATANACH: Do you have much
8 further direct?

9 MS HENRIE: Fifteen or 20 minutes.

10 MR. BALCH: And more slides presumably.

11 MS HENRIE: Yes. Do you want to break?

12 CHAIRMAN CATANACH: Yes. Why don't we
13 break for lunch and get the documents to everybody
14 now.

15 (Note: The hearing stood in recess at
16 12:22 to 1:47.)

17 CHAIRMAN CATANACH: We will call the
18 hearing back to order. At this time just a couple
19 of announcements. It's obvious we are not going to
20 finish the case today, so you might want to start
21 checking your calendars to see your availability for
22 future extra day. Also we probably -- if we can get
23 to a good place to stop we probably don't want to go
24 past 5:00 today, but we will see how that goes. We
25 can probably break at 5:00, but hopefully we will be

1 in a place where it will be a good place to stop.

2 With that, I turn it back over to you.

3 MS HENRIE: Mr. Chairman, I'm happy to try
4 to set a schedule for today and figure out when we
5 can meet next week if you would like to do that
6 first.

7 MR. BALCH: Next week is completely out.
8 Mr. Brancard is out and we are looking at the 21st.

9 MR. LAKINS: I have a federal court
10 mandatory settlement conference on the 21st.

11 MR. BALCH: After that, we are looking at
12 the 1st and 2nd of October.

13 MS HENRIE: I'm going to get an earful
14 tonight.

15 MR. BALCH: I'm sorry, the 1st, not the
16 2nd.

17 MS HENRIE: The 1st works for me.

18 MR. LAKINS: I don't think I have
19 anything. I need to call my office to verify but I
20 think that would work for me.

21 CHAIRMAN CATANACH: Well, do you think one
22 more day is going to be enough?

23 MR. LAKINS: Yes, sir.

24 CHAIRMAN CATANACH: Okay. If you can
25 verify that, I think the 1st would probably be the

1 logical choice here.

2 MR. LAKINS: At our next break I will do
3 that.

4 MS HENRIE: Mr. Chairman, with that, we
5 have Greg Miller still on the stand and he was
6 explaining the charts that are now in front of you.
7 So we will let him continue.

8 A. Mr. Chairman of the Board, returning from
9 where we were before, this was based upon testimony
10 given by Mr. Seawright regarding the temperature and
11 the fluoride range in which he can conduct
12 operations.

13 One of the other wells that was mentioned
14 in that testimony that could be used for operations
15 was known as -- I refer to it by the state well
16 number as A444. Sometimes I will say A4444 or only
17 two 4s, but I'm referring to A444. This well is
18 quite a bit cooler. As reported by Mr. Seawright,
19 it has a temperature of 110 to 111 degrees and also
20 has a low fluoride concentration of 5.6 milligrams
21 per liter. The graphics of the same fluoride is on
22 the right, temperature in degrees Fahrenheit is on
23 the left, and the fraction of the water from the hot
24 well is what's on the bottom axis.

25 The equation that I showed before still

1 applies here. It's a simple linear mixing equation.
2 So we can see that the amount of A44 that can be
3 used could be 100 percent based on its fluoride
4 level. Based upon temperature level, you wouldn't
5 be able to import cold water into the basin and mix
6 with it at greater than 35 percent. Otherwise, the
7 water would be too cold.

8 Next slide. On this one I also did a
9 hypothetical, a sensitivity analysis on the basis of
10 fluoride. And so what would happen if the fluoride
11 level in A444 had 4.6 milligrams per liter added to
12 it? If A444 returned to the condition that it was
13 reported -- the waters were reported to be at in the
14 past history.

15 What happens there is, of course, with the
16 higher fluoride concentration, the mix ratio applies
17 here and you can only put in 55 percent, .55 of the
18 hot water, and with the temperature consideration
19 here it's still at about 35 percent. So the window
20 narrows, but what I've tried to present here is even
21 given upset conditions in fluoride, even given
22 differences in temperature between the A444 and the
23 state wells of about 120 degrees Fahrenheit, there's
24 still mix ratios available to AmeriCulture to
25 produce water that Mr. Seawright testified meets

1 certain criteria. So on the basis of this, there
2 are opportunities to mix given the existing
3 situation and opportunities to mix given upset
4 conditions which we actually don't believe will take
5 place.

6 Q. Thank you, Dr. Miller. Moving to the next
7 set of slides, the question for you would be have
8 you reviewed Mr. Witcher's report from 2001
9 describing a well test of AmeriCulture State Well 1?

10 A. Yes, I have reviewed that document. When
11 I came across Elston and Deal, when I was looking at
12 fluoride concentrations, there's a theory for the
13 occurrence of the geothermal system that is
14 presented in Elston and Deal. Mr. Witcher in 2001
15 has published a competing theory regarding some
16 aspects of the Elston and Deal hypothesis.

17 So what I want to do is present, just in a
18 cartoon-like manner, my interpretation of these
19 hypotheses so we can see what we're talking about
20 here. We're going to run through these here.

21 Ground surface is in brown. This is not
22 to scale. It is generally agreed on that there is a
23 confined geothermal aquifer. There is some sort of
24 a window, most probably created by intersecting
25 tectonic features creating a large volume of

1 fractured rock with fractures that may well extend
2 deep into this geohydrologic window. And we have
3 wells that are sampling water and trying to produce
4 and use water that are upflowing out of this
5 geothermal window.

6 The giant white space represents both
7 fractured bedrock and the alluvial fill aquifer. I
8 just left it open and undifferentiated to try to
9 keep it simple here. So we have some sort of flow
10 coming towards the geohydrologic window and there's
11 upflow out of this window.

12 Now, from a hydrologic perspective it's
13 very interesting what conditions we need to actually
14 cause this upflow. In hydrology and in nature we
15 measure fluid flow, rock's ability to transmit fluid
16 using a parameter called hydraulic conductivity.
17 Hydraulic conductivity has units of velocity. In
18 nature we find 13 orders of magnitude of variation
19 in hydraulic conductivity between very tight clays
20 and, say, big talus slopes out of old mountains full
21 of boulders. So there's 13 orders of magnitude
22 observed in nature.

23 To divert 81 percent of the flow out of
24 the confined geothermal aquifer upwards in that
25 window requires one order of magnitude hydraulic

1 conductivity difference, one out of ten to the 13th
2 or an order of hydraulic conductivity difference
3 will cause 81 percent of the flow to flow up. That
4 is aside from any considerations of buoyancy due to
5 heat because this water is rising because it's less
6 dense than the water surrounding it. Heat is making
7 it less dense.

8 If it was rising, if it was a bubble of
9 fresh water in an ocean of salt water it would also
10 rise because it was less dense.

11 Next slide. So as I understand it, from
12 Witcher 2001, the hypothesis is that the confined
13 geothermal aquifer has a reservoir temperature that
14 is equal to the temperature of the hottest wells
15 that we sampled in the Lightning Dock Geothermal
16 Resource. This water moves up and convects out into
17 the plume and there's relatively little mixing that
18 takes place in that upflowing and outflow plume.

19 Next slide. We know that when water rises
20 upward it is creating, in essence, a pressure vacuum
21 underneath it. We know that shattered fractured
22 rock systems are not shattered with perfectly
23 vertical fractures. There are anaphoretic fractures
24 all through this system.

25 At some point we get to the point where

1 the fractured rock looks like boulders and this is
2 why it's called representative porous media. The
3 basin fill aquifer system and the fractured bedrock
4 next to it, not underneath it, is acting as an
5 unconfined system. In an unconfined system, there
6 aren't any barriers for cold water flowing in from
7 the outside not to mix with this water rising up.
8 In fact, it's a physical impossibility in a porous
9 system for water not to enter from the sides as this
10 water rises up.

11 But as I interpret the hypothesis from
12 Mr. Witcher and from the diagram that I have seen in
13 Exhibit 5, there is a complete pipe from the
14 geohydrologic window to some point in the aquifer
15 system, and only above that point does the plume
16 spread and mix.

17 I would suggest that that doesn't take
18 into account the same hydrologic conditions that are
19 supposed to cause this system to be here. If we
20 have highly fractured rock we have representative
21 porous media. If we have representative porous
22 media it will be mixing from the outflow zone to the
23 surface. It's a fractile process. Little mixing
24 happening will be happening all the way along the
25 way.

1 Next side. This is a hypothesis of my
2 interpretation that we see that Elston, Deal and
3 Logsdon have put forward. There is a geohydrologic
4 window caused by the intersection of tectonic
5 features. It created a lot of shattered rock.
6 Using geothermometry and other chemical
7 techniques -- I have explained to you before that I
8 have some proficiency in and that are explained very
9 clearly in Elston, Deal and Logsdon, they have
10 evidence that the confined geothermal aquifer
11 actually has a much higher temperature than is
12 observed in the Lightning Dock well field.

13 This makes sense from the perspective that
14 if you consider that as soon as water is exiting the
15 hydrogeologic window it's subject to mixing, and
16 it's subject to mixing because otherwise it has to
17 violate the laws of physics. You can't rise that
18 water without pulling water in from the other sides.
19 It's simply impossible.

20 So Elston, Deal and Logsdon say that
21 confined geothermal aquifer is providing water
22 that's 250 degrees Celsius and that only 25 percent
23 of that water is actually reaching the currently
24 tapped portion of the Lightning Dock Geothermal
25 field because 75 percent of the lower basin flow

1 aquifer is mixing with it.

2 Now, part of the evidence that they have
3 for this is chemical in nature, but one of the
4 things that is also a major contrast between Witcher
5 2001 and Elston, Deal and Logsdon is the size of
6 this geothermal system. That's a point that is
7 extremely important in this proceedings. So what I
8 would like to refer the board to first is Figure 9.

9 Q. Which exhibit?

10 A. Page 24 of Circular 177.

11 Q. That's Exhibit 4?

12 A. Exhibit 4. Thank you.

13 Q. No, it's Exhibit 6?

14 A. Exhibit 6. I stand corrected.

15 Q. Which page, please?

16 A. 24, please. Figure 9. Are we there? In
17 Exhibit 5 of AmeriCulture's exhibits Mr. Witcher
18 presents that the outflow zone for the geothermal
19 system for consideration for heat flow and other
20 considerations is approximately one kilometer in
21 dimension.

22 First looking at Figure 24, we notice this
23 southwestern trending anomalous temperature.
24 Elston, Deal and Logsdon explain this southwest
25 trending anomalous feature as being due to some sort

1 of structural control letting this leaky geothermal
2 aquifer -- because that's what it is, it's a leaky
3 confined aquifer -- well, it's leaky somewhere else,
4 too, and they see evidence to the southwest of this.

5 If we refer to -- flipping to Page 31 of
6 the same exhibit -- Figure 17 first on the right,
7 Elston, Deal and Logsdon have used a total of nine
8 geothermometers to calculate an estimated best
9 bottom hole temperature, provided citations and
10 their data for all of their calculations, what
11 thermodynamics were used. They presented their
12 calculations and this map. And what we're seeing
13 here off to the southwest is these bottom hole
14 temperatures of 55, 70, 80, 71.

15 It's their hypothesis that this leaky
16 geothermal aquifer leaks in more places than just
17 the Lightning Dock system, which means that the heat
18 outflow signature of this is much larger than we
19 will see portrayed in Witcher 2001 and in his
20 testimony today.

21 We use stable isotopes, particularly
22 oxygen, to look at subsurface processes. One of the
23 things that heavy oxygen suggests is that boiling is
24 taking place in the subsurface. So in Figure 16
25 Elston, Deal and Logsdon contour the Delta 18-0

1 values for their P series wells and we see this high
2 negative center.

3 So they are saying that we are seeing
4 additional signs of the geothermal system and the
5 size of it from the stable isotopes. They also use
6 that in part of their determination that the
7 geothermal reservoir is a much higher temperature
8 than reportedly calculated by Witcher in 2001.

9 Next slide. This is a slide that
10 tabulates the stable isotope measurements that I
11 have been able to obtain from materials that have
12 been submitted to OCD. Elston, Deal and Logsdon
13 didn't just make a prediction regarding the deep
14 temperature of 250 degrees C, they also made a
15 prediction regarding what we should expect to see in
16 the deuterium hydrogen ratio and the 18-0/16-0
17 ratio, heavy oxygen in the deep aquifer of minus 97
18 and minus 13. They predicted we would find that if
19 their theory worked.

20 Lo and behold, we drill deeper in 55-7, we
21 sample stable isotopes and we find stable isotope
22 numbers trending in exactly the direction as
23 predicted by Elston, Deal and Logsdon.

24 In my review of Witcher 2001, it is my
25 considered professional opinion that the level of

1 that document does not rise to the level of
2 overturning the hypothesis of Elston, Deal and
3 Logsdon. It does not present its calculations which
4 purports to overturn the hypothesis of Elston, Deal
5 and Logsdon. I found no evidence in Mr. Witcher's
6 reporting that would cause me to feel that downhole
7 temperatures of the downhole reservoir temperature
8 predicted of 250 degrees Celsius is inaccurate.

9 I looked at other people publishing on
10 this deal looking at geothermometer calculated
11 levels, and Shandler Smith in 1978 published his own
12 calculations of temperatures that he expected to
13 find in geothermal reservoirs all over the
14 Southwestern New Mexico/Arizona area, and his
15 numbers agree with Elston, Deal and Logsdon.

16 So again, I can't emphasize enough that
17 Elston, Deal and Logsdon is still the order of the
18 day. There has not been the scientific effort
19 published or presented by Mr. Witcher to overturn
20 the aspects of Elston, Deal and Logsdon which lead
21 others, such as Cyrq, to believe that this
22 geothermal reservoir is much larger in size than
23 represented by Mr. Witcher.

24 Q. So Dr. Miller, two more questions really
25 for you. One now that Commissioner Shannon is here.

1 Do you believe that either the Lightning Dock
2 project or the proposed injection wells would harm
3 Commissioner Shannon's well, just for example?
4 Someone else's well in the valley?

5 A. No, I do not believe it will. The valley
6 aquifer in the region of the Lightning Dock project
7 and AmeriCulture project is in the middle of a large
8 plume of fluoride contamination, fluoride levels
9 exceeding all New Mexico drinking water standards,
10 all federal drinking water standards. I would not
11 characterize the aquifer in the area of Lightning
12 Dock as being suitable for human consumption. In my
13 professional opinion, it is not a drinking water
14 aquifer any more than pouring toxic chemicals in a
15 drinking water glass makes that drinking water.

16 So what I would hope in the future is that
17 there is some public communication of this to the
18 residents so that they can act appropriately if
19 indeed their water has problems. This represents a
20 public health problem, in my opinion, and I was
21 formally certified as a Water Treatment Operator
22 Level 3 for the state of New Mexico. I operated
23 treatment systems that protected public health. I
24 was on the board of the Buckman Diversion Evaluation
25 evaluating whether or not Los Alamos presents a

1 radiologic threat to this community's water. I
2 speak firmly and forcefully on this that I hope you
3 take the information that's existed for a long time
4 and make sure it gets to the public so they can make
5 their decisions.

6 Q. Dr. Miller, will you explain the slide and
7 we definitely want to hear the questions of the
8 commissioner.

9 A. What I did to produce the slide was I
10 hand-contoured the information presented in this
11 publication, Circular 177, Ms. Dar, from 1983. This
12 was some efforts by scientists to characterize the
13 water quality in and around the Lightning Dock
14 Geothermal System.

15 When I contoured the information that they
16 supplied me, what I did is the outside contour
17 around the pink area, that represents areas that are
18 above about 2 PPM fluoride, and at 2 PPM our
19 national and state health agencies become concerned
20 about dental fluorosis.

21 The inside contour that's plotted there
22 that emanates right from the Lightning Dock
23 geothermal area, that indicates an area of fluoride
24 above 4 PPM, and 4 PPM is the level recognized by
25 health agencies as potential for causing skeletal

1 fluorosis and represents the U.S. EPA maximum MCL
2 for fluoride in the United States.

3 So that water, in my professional opinion,
4 should not be used for drinking, and while we can
5 refer to it as a drinking water aquifer, truly it's
6 not in the area where the fluoride contamination
7 exists.

8 Now, this is naturally occurring. It's
9 been happening for thousands of years. That's why
10 it's developed so much. But one of the things folks
11 have thought about in the Animus Valley for so long
12 is the geothermal influence is only up there near
13 Lightning Dock. But if you look at the fluoride
14 plume going down through Cotton City and the numbers
15 associated with that, Elston, Deal and Logsdon have
16 attributed that to leakage coming up out of this
17 confined geothermal aquifer. They say it's much
18 bigger.

19 Here we have the fluoride evidence from
20 the geothermal aquifer and it's rendered that water
21 undrinkable, in my professional opinion.

22 I am, in this circumstance, on any
23 mechanism of questioning that the board would
24 consider, I am completely happy with, if Ms. Dar has
25 any questions whatsoever. I realize this is

1 disturbing information for her.

2 MS HENRIE: Mr. Chairman, let me move
3 forward. We did want to alert the commissioner to
4 what Dr. Miller has found and we will probably have
5 further communications about it and questions after
6 we rest. We will work on that.

7 Q. The other thing I wanted to ask Dr. Miller
8 is about Well A444, which you have talked about
9 previously. Can you show the commissioners on the
10 aerial where that well is located?

11 A. Right about there is where I have seen it
12 plotted as existing. Boy, my shakes are worse than
13 anybody here. Where it's plotted by Mr. Seawright,
14 where I see it plotted on various well applications.
15 So it exists down in the southwestern corner of the
16 box. Right about there.

17 Q. Okay. And you mentioned earlier to the
18 commission that the well is unusual. It's right in
19 the middle of your pink fluoride zone but it doesn't
20 act like any other well is what I heard you say?

21 A. It's anomalous. Anomalous means something
22 outside of what we expected to see. If I was
23 looking at that fluoride map that I just showed you
24 from Elston, Deal and Logsdon, I don't expect to
25 find 5.6 milligrams per liter fluoride in the middle

1 of an upflow zone that we know runs 10 to 15
2 milligrams per liter fluoride. Something is
3 changing something. Something is happening to make
4 things different.

5 So we try to take a look at multiple ways
6 on what could be making this different. Is this
7 area blocked from upflow? When we look at its
8 historic records, there's temperatures reported for
9 this well in the record of 198 to 215 degrees C but
10 now it's 110 to 111.

11 I look at water discharge, I look at data
12 on importation of cold water, low fluoride water
13 just as I did with the mixing diagrams into this
14 valley. I look at the discharge, the pumping
15 records for the hot wells that supply that facility
16 that suggest 10 to 20 acre feet per month is being
17 pumped, the cold wells that supply that facility
18 that suggest 100 to 175 acre feet per month are
19 being pumped.

20 Q. Per month or per year?

21 A. I have to look at the record to tell you
22 for sure. I think those are monthly records that
23 are seeing that. No, that's the annual total.
24 Please put the record in front of me. Thank you. I
25 don't want to misstate because this is the state

1 well records. I believe these have been submitted.

2 Q. I don't.

3 A. Okay. They contain a summary table.

4 MR. LAKINS: Where are we looking?

5 A. I misspoke. Yeah, it's on the order of 10

6 --

7 MR. LAKINS: What are we looking at? Is
8 that an exhibit?

9 MS HENRIE: No, it's not. I'm refreshing
10 his memory as to things that he's looked at before.

11 A. I misspoke. That is per year.

12 MR. LAKINS: Could I look at that?

13 MS HENRIE: Sure.

14 A. So I looked at these records and then I
15 did kind of a seat-of-the-pants calculation. I
16 assumed a porosity for valley fill aquifer, took an
17 area a little bigger than the giant green area you
18 see right there of 100 feet by 1,000 feet. It's 60
19 feet to the water table there. If you calculate how
20 much saturated porosity is there, it's about 17
21 million gallons or about 50 acre feet.

22 Sure, some of it will spread laterally.
23 It's unsaturated zone, hydrology will move that
24 water laterally. But what it tells me is that from
25 the operation of this well in its inception, when

1 Beall was running it they pumped water into the
2 greenhouse and they pumped it on the ground. They
3 imported cold water in the valley and they pumped it
4 on the ground.

5 Q. That was prior to AmeriCulture?

6 A. Prior to AmeriCulture. They have imported
7 cold water to the valley, mixed it with hot water
8 and discharged it behind the facility. This water,
9 by simple calculation, it's very easy to see the 50
10 acre feet of water can communicate directly from the
11 ground to the water table to 60 feet. We have the
12 prior reports of Roger Bowers indicating that he
13 believed from a thermal perspective there was a
14 casing problem with that well.

15 I have a theory. My theory is within a
16 reasonable degree of scientific certainty that the
17 reason that low fluoride exists at Well A444 is
18 because it has been diluted by groundwater discharge
19 from AmeriCulture operations. My hypothesis as to
20 why that well has declined in temperature to 110 or
21 111 degrees is because AmeriCulture has quenched the
22 geothermal resource of well A444 by discharging cold
23 water directly to the geothermal aquifer by a Class
24 5 injection well, which is an aerial groundwater
25 discharge. So next slide unless you have a

1 question.

2 Q. I do have a question. Do you know -- can
3 you just talk about the temperatures of the water
4 when it comes from the ground, the cold or the hot
5 well, the blend when it goes into AmeriCulture's
6 fish tanks and what the effluent -- the temperature
7 of the effluent when it goes on the ground.

8 A. Based upon testimony and observations,
9 they're blending water about 60 to 70 degrees
10 Fahrenheit -- which I would have to refer to my
11 sampling records to make sure I have the exact
12 temperature number -- with water that's about 200,
13 230 degrees Fahrenheit. So this water is tempered.
14 There's some cooling that's allowed to take place to
15 the geothermal water before it's mixed
16 volumetrically by two outflow pipes.

17 This water, according to Mr. Seawright's
18 testimony, needs to be 85 degrees for certain
19 processes, down to 75 degrees for other processes
20 and at some point is discharged. So based upon
21 that, I would assume that the discharge temperature
22 of water from AmeriCulture is 75 degrees or less
23 because it no longer has thermal value for him for
24 aquaculture. And the fluoride concentration of that
25 water will be whatever the proportional blend is, as

1 I demonstrated with that linear equation, between
2 the blend between his cold water that he is
3 introducing and the hot water that he is using.

4 Based upon review the records, it's just
5 about ten to one, the cold water that is imported
6 versus the hot water that's used based upon the
7 pumping records that I reviewed from Office of the
8 State Engineer. And that's been reasonably
9 consistent over the history of those pumping
10 records.

11 So again, to restate, it is my
12 professional opinion within a reasonable degree of
13 scientific certainty that the results that we see
14 for fluoride, low fluoride concentrations in a sea
15 of high fluoride and low water temperatures in a sea
16 of hot water are related to discharge of low
17 fluoride cold water to a groundwater infiltration
18 area that exists west of AmeriCulture.

19 Q. Please talk about two things. The
20 original temperatures of A444 and the current
21 temperatures --

22 A. Oh, we brought up a slide. Thank you.

23 Q. And also the casing of the well. I think
24 you went through those, but let's just really get
25 those numbers in front of people.

1 A. First, I can't report upon the casing of
2 the well specifically itself. I have not evaluated
3 that well structure completion myself. I can say
4 that the data observed of a casing problem would
5 only exacerbate a cold water temperature problem,
6 because if you have a defective casing and you pond
7 surface water around it, it runs down the casing
8 very quickly to the aquifer. You have created a
9 pipeline. Second question.

10 Q. Original temperature as we know it of
11 A444.

12 A. I listed it here. In reviewing testimony
13 and published documents, we have a reported
14 temperatures for Well A444 back in the mid 1970s of
15 198 degrees Fahrenheit. There were two reports of
16 215 degrees Fahrenheit also in the '80s that shows
17 those red diamonds. And I call those red diamonds
18 out for a reason because they are a little bit
19 different than the other trend I observed.

20 We get self-reporting -- I forget the
21 exact number source of the data, but again, from
22 document review and materials previously submitted
23 to OCD, right around 1996/1997, that area, we start
24 to see some indications of temperature decline. And
25 then finally we have self-reporting from

1 AmeriCulture that they measured well temperatures of
2 110 or 111 degrees as reported in 2013. I plotted a
3 linear plot on this, and again, that horizontal red
4 line represents the 85 degrees Fahrenheit, the point
5 at which that well is no longer useful to
6 AmeriCulture, apparently, from testimony.

7 The yellow slope is through the green
8 boxes. Those are the self-reported temperatures,
9 and that indicates that AmeriCulture runs out of hot
10 water sometime after 2018. The red slope is based
11 upon the report of temperatures, and I forgot what
12 the lower red diamond -- I think that might have
13 been a state office that recorded that one. But
14 needless to say, I plotted the slope of the
15 alternate situation which says that we can go out
16 there today and measure that that well is under 100
17 degrees.

18 So again, to reiterate my theory, using
19 evidence that is presented to me by AmeriCulture
20 itself telling me what the concentrations and
21 temperatures are of the well, to me it's an
22 inescapable conclusion that the probable source of
23 this temperature decline and fluoride decrease is
24 quenching a dilution.

25 Q. Dr. Miller, have you looked at isotopes to

1 A444, would they support the cold water discharge
2 that you are theorizing?

3 A. I think all kinds of geochemical data from
4 A444 would have been very useful to use in this
5 work. I know that AmeriCulture has refused offers
6 in the past from Cyrq to perform sampling on this.
7 I think we have in Witcher 2001 requirements that we
8 should be monitoring everything everywhere, and I
9 believe my client has made efforts to do so and has
10 been stymied.

11 MR. LAKINS: Objection, characterization.

12 Q. That's fine. We will stop with the
13 characterization. Another question, Dr. Miller.
14 Would the long-standing open discharge to the
15 surface drainage of hot fluoride-rich geothermal
16 waters by Rosette and more recently cold by
17 AmeriCulture, would that have perhaps exacerbated
18 the fluoride plume? How would that play into the
19 situation? Do you know where the Rosette discharge
20 is?

21 A. I know where the Rosette discharge is, and
22 it's here. Based upon the data density, peripheral
23 to the edge of the plume here, I don't think we
24 actually have many samples out in this area for
25 which to say what the pre-existing 1983 conditions

1 were in that. But however, on a mass balance basis,
2 if you are removing water that's 10 to 15 PPM
3 fluoride and you're allowing it to flash and
4 evaporate, it concentrates the fluoride in the
5 liquid phase. Additional evaporation is going to
6 take place on land surface.

7 Now, there will be some attenuation of
8 fluoride as fluoride migrates through the soil
9 column. Fluoride's a very strong chemical. It's
10 going to bind to the soils and pop off other
11 elements, too, so we might be able to see evidence
12 of that displacement of other elements off the soils
13 by the fluoride if the fluoride itself doesn't show
14 up. But I believe that given the volumes of
15 discharge that have been reported and I have read
16 about, the length of the history of operation,
17 transferring this high fluoride concentration, I
18 believe if we looked, we would find it.

19 So yes. Discharge of high fluoride waters
20 outside of the high fluoride zone expands the high
21 fluoride zone.

22 Q. Thank you. With that I'm going to just
23 quickly ask Dr. Miller if you have anything else you
24 want to say to the commission and then I will pass
25 the witness.

1 A. It's my professional opinion that based
2 upon review of Witcher 2001, which is a narrative of
3 a failed pumping test and an analysis of that
4 pumping test that has been conducted outside the
5 science of hydrology, the review of his
6 geochemistry, I believe that the report should not
7 be relied upon. I believe that Elston, Deal and
8 Logsdon is still the order of the day as amended by
9 studies that have been completed behind it that have
10 collected data, presented interpretations. I
11 conclude.

12 Q. Thank you. With that I will pass the
13 witness, Mr. Chairman.

14 MS. MARKS: The commissioner would like to
15 ask questions at some point if that's okay, if no
16 one has objections. She had some questions during
17 the witness' testimony and I know her attorney is
18 not here, so if that's okay with the commissioners?

19 CHAIRMAN CATANACH: That would be fine.
20 At what point does she want to ask the questions?

21 MS. CARR: Whenever it's my turn.

22 CHAIRMAN CATANACH: We will let Mr. Lakins
23 go first.

24 CROSS-EXAMINATION

25 BY MR. LAKINS

1 Q. Mr. Miller, I want to make sure I
2 understand a few things you said. I understand your
3 last testimony that you're stating that the surface
4 discharge of high fluoride water in this area
5 expanded a high fluoride zone?

6 A. I offered that it had the potential to. I
7 qualified that on the basis that reactions will take
8 place removing fluoride from that, but I do believe
9 that the volume of discharge and the period of
10 discharge were, again, long enough that that high
11 fluoride water could communicate with the water
12 table. Based upon the Elston, Deal and Logsdon
13 sampling, that area is not 10 to 15. It's something
14 less.

15 Q. Okay. Let me ask you your opinion. If
16 you discharge high fluoride water directly into the
17 proposed injection wells, water that is of a higher
18 fluoride content than the existing background, will
19 that result in an increase in the fluoride levels in
20 those wells? In the shallow aquifer where those
21 wells are located, I should say?

22 A. If you're injecting fluoride that's higher
23 in concentration than the zone of fluoride you're
24 injecting to, yes, it's going to increase
25 concentration there.

1 Q. Now, you yourself have not prepared any
2 sort of written report, analysis, paper subject to
3 peer review or anything of that nature yourself
4 concerning the Lightning Dock Geothermal area,
5 right?

6 A. No, I have not.

7 Q. And your theory that you say about
8 AmeriCulture's wells and the lower fluoride in one
9 of the wells, you haven't prepared by modeling for
10 that to present to us today, have you?

11 A. I did present the results of the -- really
12 a back-of-the-envelope numerical calculation you can
13 do involving pore space and compared it with the
14 amount of water that's been imported and discharged
15 there. And to me it's an inescapable conclusion
16 that water reached the water table.

17 Q. Again, you don't have a piece of paper, a
18 model or computer program that you put together or
19 any sort of mathematical data or statistical
20 analysis or anything for us to look at from where
21 your data came from, your theories and your ultimate
22 result, do you?

23 A. My data came from your client's testimony.
24 The theory I'm using is called Darcy's Law. It's
25 expressed as Q equals KIA . Where Q is discharged, K

1 is the hydraulic conductivity, I is the hydraulic
2 gradient and A is the area. Using that relationship
3 and a porosity of 30, 40 percent for valley fill
4 sediments, the known depth of water is 60 feet, we
5 can calculate that the water-saturated porosity that
6 would be required to reach the water table -- and
7 that water-saturated porosity is less than the
8 amount of water discharged by your client. I really
9 don't see the need for a numerical model for that
10 analysis.

11 Q. Did you check with any of the local water
12 districts, for instance the City of Cotton,
13 regarding how bad the water quality is?

14 A. I looked up the public records for the
15 City of Lordsburg which has a multi-million dollar
16 fluoride treatment plant. Most recent notice of
17 violation is in 2013 for failure to operate it
18 properly. But no, I didn't bother checking with the
19 water districts. I did look online to see if I
20 could find any CCD, consumer confidence reports for
21 any utility within Hidalgo County, and the only one
22 I found was Lordsburg.

23 So to me, based upon initial review of
24 information, I wasn't finding groundwater
25 information from any other water districts so that

1 information would not be of utility to me.

2 Q. Well, you have essentially alarmed
3 Commissioner Shannon by your statements that the
4 water in that area is a health hazard. How long
5 have you known that?

6 A. I have known that since 2013 when I
7 presented a report of that effect to the County
8 Commissioner Ben Kerr. I advised the Hidalgo soil
9 and water conservation district of that when I
10 appeared at their meeting in June of 2013. This
11 problem and the evidence for it has been known since
12 the '40s. It's not incumbent upon me, a latecomer,
13 in 2013 to be providing notice on this.

14 Q. In your investigation did you uncover any
15 information whatsoever about any person having
16 consumed the water in the Animus Basin having
17 developed any serious medical problem?

18 A. I did not nor was I tasked to investigate
19 that.

20 Q. Let me see if I can understand what your
21 testimony is about drinking water standards, all
22 right? What I understand your testimony to be is
23 that since the water in the area already exceeds
24 drinking water standards at a fluoride level, you
25 cannot contaminate it? Is that --

1 A. On the pure sense of strict to the
2 definition of contamination, yes. You can't
3 contaminate contaminated water. You can make it
4 more contaminated, you can add a new contaminant,
5 but once it's non-potable, it's non-potable.

6 Q. If you added -- I think you already said
7 this. I want to make sure. If you added water with
8 a higher fluoride content into water that -- scratch
9 that question.

10 Increasing the -- is it your opinion then
11 that just increasing the fluoride level in the water
12 by injecting a higher content fluoride level would
13 make no difference?

14 A. Functionally, it will make no difference.
15 The effects of that will be non-detectable outside
16 of the main geothermal area. Within the geothermal
17 area, as I read what's proposed by Lightning Dock,
18 they are indeed going to alter the distribution of
19 fluoride within this geothermal area. They will be
20 injecting water in zones that had lower fluoride
21 concentrations. They will be injecting water of
22 lower fluoride concentrations in some zones that
23 have higher. Ultimately, they will create a mix.
24 But there's a technical focus here which is kind of
25 a redirect which I think presents a better picture

1 of the situation, and that's mass balance.

2 The operation of the geothermal system is
3 not going to alter the mass balance of fluoride in
4 this system. 100 percent of the fluoride in this
5 system, within a reasonable certainty, is
6 contributed by the geothermal source. What we're
7 doing is taking the upper portion of the geothermal
8 source and creating mixing lines, mixing lines that
9 don't currently exist.

10 The other mixing that's taking place in
11 the system will continue to go on. The geothermal
12 flow out of this system will continue to go on. We
13 will create a hydrologic cell of mixing to
14 extract heat.

15 In that zone the fluoride concentrations
16 are going to change. Will the ultimate mass of
17 fluoride in the Animus Valley system change ever as
18 a result of this closed loop operation? No.

19 Q. Are you familiar with New Mexico's
20 drinking water quality standards?

21 A. I have reviewed the tables. I have seen
22 them. I can't recall them from memory.

23 Q. Is your testimony here today, based upon
24 your understanding of New Mexico's water quality
25 standards?

1 A. With respect to fluoride, yes.

2 Q. How about total dissolved solids?

3 A. I'm not testifying with respect to total
4 dissolved solids.

5 Q. Only fluoride?

6 A. I'm testifying with respect to fluoride
7 today here now.

8 Q. Are you testifying regarding any other
9 aspect of water quality standards whatsoever?

10 A. In the ProUCL statistical calculations
11 which I performed for Lightning Dock to calculate
12 background threshold values and that, I was tasked
13 to calculate for different parameters other than
14 fluoride. If that material is introduced and I'm
15 asked to testify about it, I will be testifying
16 about other parameters than fluoride.

17 Q. Let me have you turn to our Exhibit P.

18 A. I'm there.

19 Q. Were you involved in the gathering of data
20 or the analysis of any of the data that went into
21 this background concentration report?

22 A. I performed the calculations on data
23 provided to me to calculate background threshold
24 levels.

25 Q. Okay. And I would like to draw your

1 attention towards the back. This is not numbered,
2 so I would say about ten pages to the back. First
3 page that looks like this one.

4 A. Okay.

5 Q. There's a number of chart tables.

6 A. Yes.

7 Q. And this page past it.

8 A. Is that in the 2014? I'm not finding it.

9 Q. It's not Exhibit P, it's towards the back,
10 last 10 or 15 pages.

11 A. In this particular copy, I am in
12 Attachment D.

13 Q. Go to the back of the exhibit itself, the
14 back of the whole P. Then go in from the back about
15 ten pages.

16 A. Very good. I found it. I'm there now. I
17 want to make sure I am on the same page as you.

18 Q. The first page that looks like this that
19 follows a table that ends in this.

20 A. Yes. Appendix C of July 14 ProUCL
21 results?

22 Q. I'm waiting for the commissioners. Top of
23 the page, General Background Statistics for Dataset.
24 Do you know exactly how many samples were drawn for
25 this background value? Do you know how many samples

1 were drawn to evaluate and determine the background
2 threshold value?

3 A. I believe I looked at the entire available
4 dataset in 2014 that was in the possession of Cyrq
5 at the time.

6 Q. Down towards the bottom -- or excuse me,
7 one-third of the way up from the bottom, there's a
8 sentence that starts with "Warning. The sample size
9 of N equals 7 may not be adequate enough to compute
10 meaningful and reliable test statistics and
11 estimates." Do you agree with that?

12 A. Yes, right down to the exclamation point
13 at the end of the sentence.

14 Q. Down farther it says, "Warning. There are
15 only seven values in this data. It should be noted
16 that even though bootstrap methods may be performed
17 on this dataset, the resulting calculations may not
18 be reliable enough to draw conclusions." Do you
19 agree with that?

20 A. Yes, I do.

21 Q. Turning to the next page, at the bottom it
22 says there are only four distinct values in that
23 dataset and that dataset, resulting calculations may
24 also not be reliable enough to draw conclusions.
25 True?

1 A. I agree with that.

2 Q. And two pages following, in the middle of
3 the page it says the same thing, that the resulting
4 calculations may not be reliable enough to draw
5 conclusions. Correct?

6 A. Correct.

7 Q. And the following page at the bottom, it
8 says the same thing, doesn't it?

9 A. Yes, it does.

10 Q. So the report data that you looked at and
11 were relying upon for background threshold values,
12 the report indicates that that information may not
13 be reliable enough to draw any conclusions, true?

14 A. True. It suggests the information should
15 be used with caution as of July 2014.

16 Q. Then I ask you to turn to the front of
17 that exhibit to Page 4. And you're familiar with
18 ProUCL?

19 A. Yes, sir.

20 Q. Are you on Page 4?

21 A. Yes.

22 Q. The top in bold says "Background Threshold
23 Values." Are you there?

24 A. Yes.

25 Q. Third paragraph down?

1 A. Yep.

2 Q. The second sentence says, "ProUCL guides
3 suggest at least ten samples are needed to
4 statistically determine the BTV."

5 A. Yes.

6 Q. "An insufficient number of samples of
7 alluvial geothermal groundwater was collected by LDG
8 in December 2013," correct?

9 A. Yes.

10 Q. Do you agree with that?

11 A. Yes.

12 Q. And we're talking about the alluvial area?

13 A. Yes.

14 Q. Where the proposed injection is to occur,
15 correct?

16 A. I haven't evaluated that to whether or not
17 the wells that I used here are specifically
18 reflecting the areas of the proposed injection
19 wells.

20 Q. Let's get back to the contamination
21 aspect. Now, in your exhibit -- I believe it's
22 10 -- there it is. Too many binders here. Now, the
23 first page of your Exhibit 10 is a figure,
24 "Annotative Chloride MG 2012." Is this your data
25 that you collected yourself?

1 A. Yes, it is.

2 Q. And that's a wide range of fluoride in
3 that area?

4 A. Yes, it is.

5 Q. From one to 11-7?

6 A. Yes, that's correct.

7 Q. Could you sort of situate me where the
8 heck is the 11-7 taken? And if it's from this map
9 over this exhibit over here, the demonstrative aid
10 here, can you tell me where that is? I'm not sure
11 where this whole area is.

12 A. Well, during that sampling event -- these
13 are the hot wells, the wells in red. So these are
14 wells within this area.

15 Q. That's a big area. And on the left you've
16 got UTM north and easterlies, but can you pinpoint
17 where that 11-7 is anywhere on this picture?

18 A. I would have to refer to my report which
19 contains a UTM location of that well, an
20 identification number for the well and complete
21 chemistry as I sampled and had analyzed for that
22 well. I don't have that information with me.

23 Q. You don't have it with you?

24 A. No.

25 Q. Well, in this data that you have here if

1 fluoride were injected at a higher rate and made it
2 into any of those wells that were below 2, would
3 that not be a contamination?

4 A. You're speculating such an occurrence
5 would actually occur.

6 Q. Yeah, I am, and you're speculating it
7 won't. I'm asking if it were to occur --

8 A. No, you --

9 Q. Let me finish the question, please. If it
10 were to occur would that not be a contamination?

11 A. Which well zone?

12 Q. Any of these.

13 A. Name the number. If you would, sir,
14 please name the concentration of the well which
15 you're asking me to inject at.

16 Q. I'm not asking you to inject anywhere.
17 What I'm asking is if the injection as proposed of
18 higher fluoride water were to make it to that well
19 that's annotated as 1, would that be a contamination
20 based upon your understanding of New Mexico's water
21 quality standards?

22 A. If the injection caused that well to
23 exceed New Mexico water quality standards, it would
24 have indeed impacted its quality.

25 Q. How about this well right here that's at

1 2.1? In your understanding of New Mexico's water
2 quality standards, if fluoride were injected into
3 that well and it increased the fluoride in that well
4 above that 2.1 number, would that be a
5 contamination?

6 A. As explained before, and this is a
7 difficult point, in the strictest sense that water
8 is already contaminated. So we would not be moving
9 it from a state of non-contamination to
10 contamination by virtue of that injection.

11 From the standpoint of would that water
12 require additional treatment over a 2.1 water for it
13 to achieve the MCL, because that water is not
14 drinkable right now, yes, there would be additional
15 cost involved with that and possibly technical
16 difficulty.

17 But again, turning a contaminated water
18 more contaminated is not the same as taking a not
19 contaminated resource and moving it past numerical
20 standards for health and the environment.

21 Q. Let's flesh out what to you is
22 contaminated.

23 A. Contaminated is -- contamination in a
24 general term implies that a resource has material in
25 it that is not natural and deleterious to health and

1 the environment. So strict sense and applicable
2 sense that I always use is the numerical standards
3 set by local regulatory or federal or state agencies
4 for what to define as contamination.

5 Many years ago a lawyer told me that any
6 time that I said something was contaminated I was
7 practicing law, and 25 years of hydrology has not
8 changed his opinion or mine that I am not. So I use
9 the numerical standards as published. When the
10 standards change, the definition of contamination
11 changes, and many people have grief with that, too.
12 You saw the arsenic standards changed drastically
13 costing millions of dollars in treatment costs for
14 utilities and that. But the number changed. So the
15 new standard is the standard. If the standard
16 changes for fluoride, I would revise my opinion
17 accordingly.

18 Q. So let me make sure I get a good
19 determination of what your understanding here is.
20 This well that's 2.0 versus the well that's 2.1.

21 A. 2.0 is the numerical standard. Therefore,
22 it's contaminated. 1.999 is not, and this is a very
23 difficult thing because when you go and you know
24 these analyses are plus or minus X percent, but in a
25 regulatory agency if I go to them with 9.9 parts per

1 billion arsenic, you are below the drinking water
2 standard. If it's 10.1 you are not. From a
3 realistic standpoint is there a health difference?
4 I can't say, so I use the numerical standard that's
5 published by the government.

6 Q. Are you familiar with New Mexico
7 Administrative Code, Section 20.6.2.31-03?

8 A. No.

9 Q. Would you acknowledge that New Mexico's
10 water quality standards are what control water
11 quality in New Mexico?

12 A. Yes.

13 Q. I ask you to draw your attention to the
14 section right here which says, "Regardless of
15 whether there is one contaminant or more than one
16 contaminant present in groundwater, when an existing
17 pH or concentration of any water contaminant exceeds
18 the standard specified in Subsection A, B or C of
19 this section, the resulting pH or concentration
20 shall be the allowable limit." Were you aware that
21 there's that particular nuance in New Mexico's
22 administrative code?

23 A. This appears to be the analogous standard
24 in the New Mexico code that allows calculation of
25 alternate concentration limits and background

1 limits. This is my first reading of that in detail.

2 Q. So you were unfamiliar with New Mexico
3 water quality law prior to your testimony here
4 today?

5 A. I'm unfamiliar with the specifics of New
6 Mexico water quality law. When making such
7 comparisons of numerical standards, I do hold the
8 numerical standards to make such comparisons.

9 Q. Can we pause a minute for something for
10 Ms. Henrie needs to take care of?

11 (Note: A discussion was held off the
12 record).

13 (Note: The hearing stood in recess at
14 2:57 to 3:10.)

15 MR. LAKINS: Move to admit our Exhibit P.

16 MR. BRANCARD: Any objection?

17 MS HENRIE: On cross?

18 MR. LAKINS: Sorry, right.

19 Q. (By Mr. Lakins) Now, Mr. Miller, do you
20 know what the background threshold value for
21 fluoride is outside of the boundary of geothermal?
22 Is that the demonstration we had up there?

23 A. It wasn't part of my calculation. I don't
24 think that that -- it's an interesting way to apply
25 background threshold value outside of an area that's

1 out of compliance.

2 Q. You don't know what it is?

3 A. I didn't calculate one for it.

4 Q. Okay.

5 A. I did not calculate a background value for
6 anything outside the plume area.

7 Q. Now, do you know if on this demonstrative
8 aid if there's any domestic wells located on there?

9 A. I believe that there are wells that are
10 characterized as domestic wells, yes.

11 Q. And those would be within the boundaries
12 of the geothermal area?

13 A. There's one at least that I know of.

14 Q. Which is that?

15 A. I know there's been characterizations by
16 your client that A444 is a domestic well.

17 Q. And that's up in this area?

18 A. Yeah. You almost had it. Over by the
19 house.

20 Q. By the house?

21 A. Other way. Left, left. There. About in
22 that area.

23 Q. The domestic well?

24 A. Yes.

25 Q. I'm going to turn you back to P, Page 6.

1 Conclusions. Second paragraph. It says, "It is
2 unlikely the fluoride concentrations in alluvial
3 geothermal groundwater would ever exceed the
4 fluoride concentration of 15.46 detected in the
5 greenhouse area." Do you know where that value --
6 what well that value was detected in?

7 A. I'm not certain. If I recall correctly,
8 that was the value that was reported by NMED. I'm
9 not certain on which well or where the value came
10 from.

11 Q. Do you think that that 15.46 applies and
12 is what should be the background value for wells
13 outside the geothermal reservoir?

14 A. No. That would be inappropriate.

15 Q. Do you know what the present fluoride
16 concentration in Well A444 is?

17 A. Not presently.

18 Q. Did you ever?

19 A. I know as reported by Mr. Seawright in his
20 testimony in 2013 of a concentration of 5.6
21 milligrams per liter.

22 Q. You don't know or you just remember that
23 that's what Mr. Seawright said?

24 A. That was 2013. This is -- this isn't. I
25 don't know what the current fluoride concentration

1 is in that well. I know what the concentration was
2 reported by Mr. Seawright in 2013. 5.6 milligrams
3 per liter.

4 Q. Do you know of any changes in the fluoride
5 levels in the monitoring wells located on the
6 property since Lightning Dock's production began?

7 A. I have not evaluated that myself. I have
8 heard of changes in monitoring well concentrations
9 in Mr. Janney's testimony yesterday.

10 Q. And what was it you recall? Which
11 direction were they trending?

12 A. Some wells went up and some wells went
13 down. I forget.

14 Q. Do you yourself know about the water
15 levels in the monitoring wells?

16 A. I have seen a couple of diagrams that show
17 water levels in the monitoring wells. I'm not sure
18 which. They were reported in Exhibit P, I believe.

19 Q. Do you know which way they are trending?

20 A. No, I haven't performed any analysis on
21 that.

22 Q. From your experience and expertise, would
23 you agree that water under pressure is going to take
24 the path of least resistance?

25 A. That's a general valid statement, yes.

1 Q. Would you agree that the geologic
2 conditions of the shallow alluvium, the alluvial
3 flow, would be a path of lower resistance than water
4 being pressured to go down to further depth?

5 A. You presented the key factor there.
6 Pressure. Q equals KIA. If I is higher between the
7 injection wells and the production well, that is the
8 way water is going to flow. It's going to flow
9 along that energy grading. If heads in the alluvial
10 aquifer are not such that water wants to flow from
11 the alluvial well laterally, if it's a bigger head
12 difference going downward, it's going downward. I
13 have heard there's up to 300 feet of drawdown in the
14 production well.

15 Q. 300 feet?

16 A. 300 feet of drawdown in the production
17 well, and under those head conditions it would be my
18 presumption that 300 feet of drawdown in the
19 production well is going to cause a lot of flow
20 gradient between the injection well and the
21 production well.

22 So while it is absolutely true that as far
23 as K goes, hydraulic conductivity as a generalism,
24 water will tend to flow, as I explained, one order
25 of hydraulic conductivity, 81 percent difference,

1 water will indeed tend to flow the path of least
2 resistance, but that resistance is also governed by
3 the energy line. So we can't evaluate just
4 hydraulic conductivity in isolation. You have to
5 consider head.

6 Q. Well, and in your opinion, the water
7 that's -- the four proposed injection sites. Let's
8 talk about that. Do you understand those are at 150
9 feet -- three are 150 and one is at 500?

10 A. I heard testimony to that effect.

11 Q. And are you familiar with the geologic
12 strata that that proposed injection of 150 foot well
13 is?

14 A. Based on the mapping work, most of it is
15 alluvium. That I know for sure, and then on the
16 testimony from yesterday -- it surfaced it's
17 alluvium. From the yesterday the wells are
18 projected to be in the alluvium.

19 Q. The alluvium fill, right?

20 A. Yes.

21 Q. And are you aware that there exists an
22 underground water flow in that alluvial fill
23 separate from the geologic upflow?

24 A. Yes, there is. The water is advecting to
25 the north/northwest.

1 Q. So when water is injected, for instance,
2 into this well here, proposed injection well here,
3 63.7, and the general flow, as you said, is
4 north/northwest, don't you think that some of that
5 water that's injected is going to follow the general
6 alluvial flow and not necessarily make it down here
7 to the 1500-foot production level?

8 A. Entirely dependent on the head
9 differential. And that can be calculated. You can
10 calculate on the basis of the head differential what
11 amount of flow could possibly escape.

12 Q. Well, let me ask you this: Do you think
13 that that alluvial flow would stop based upon
14 production, proposed maximum production down in
15 these two wells? Do you think that natural alluvial
16 flow of groundwater would stop?

17 A. I haven't performed the calculation but I
18 do believe it to be unlikely.

19 Q. Do you know what's the conductivity of the
20 alluvium versus the deeper formation?

21 A. No, I do not.

22 Q. What's your understanding of an
23 underground drinking water source?

24 A. It's groundwater and it meets drinking
25 water criteria. I would also put in that it's not a

1 source of underground drinking water if you can't
2 get a well to yield very well.

3 Q. Do you know if New Mexico's definition or
4 federal definitions include a TDS component?

5 A. I know that there is a secondary drinking
6 water standard for -- an aesthetic standard for
7 total dissolved solids and New Mexico also has
8 several classification systems for suggested waters
9 for use based upon total dissolved solids.

10 I also know in the southwest we use water
11 all the time that's classified as non-potable based
12 upon its total solids content. In other states 500
13 is the cutoff. So we use water all the time that is
14 1,000 because we have no other choice.

15 Q. But you haven't come here to testify about
16 water quality standards as it relates to TDS as it
17 exists in the proposed site, correct? I think you
18 said that earlier.

19 A. As introduced -- no, my primary point of
20 testimony is fluoride. TDS is an important water
21 quality parameter. There's no doubt about that. I
22 note that in the notice on the meeting, that water
23 quality rise in Well A-444 was alleged to be part of
24 the problem. So in that context, if we wanted to
25 look at well A44 regarding TDS, I would be

1 comfortable doing so.

2 Q. Now, you testified that AmeriCulture's
3 surface discharge was the cause of the anomalously
4 low fluoride level?

5 A. Yes.

6 Q. What's the flow rate being discharged from
7 AmeriCulture's well? Or was their surface
8 discharge?

9 A. There's going to be a certain loss for
10 evaporation in their system and I have not
11 calculated that. Based upon the amount of water
12 that is pumped into their facility, their discharge
13 will be some fraction less than that due to
14 evaporation within their facility. But as a rough
15 estimate, I believe that we can use the production
16 amounts as roughly equivalent to their discharge
17 amounts.

18 Q. You don't know what the exact discharge
19 flow rate is; is that correct?

20 A. I have never measured it. I have observed
21 flow.

22 Q. Well, so your calculation is based on an
23 estimate?

24 A. My calculation is based on a site visit in
25 the operation of AmeriCulture which is a geothermal

1 system which imports cold water to quench hot water
2 to use in its facility, and 100 percent of the water
3 that it produces is discharged.

4 Q. Well, can you give me that number? No? I
5 asked if he can give me that number.

6 A. As in my review of the state pumping
7 records for wells owned by AmeriCulture, I have
8 observed that 10, 15 acre, possibly 20 acre feet per
9 year of hot water are produced and between 100, and
10 I think the peak number was 175, acre feet per year
11 cold water produced. Roughly ten to one.

12 Q. But you can't give me the
13 gallons-per-minute discharge rate?

14 A. I was never allowed to measure nor sample
15 the discharge.

16 Q. Do you know what the present fluoride
17 level is in the federal well?

18 A. No.

19 Q. So you don't know for sure if an
20 introduction of higher level fluoride water would
21 affect that well, make it exceed any standard? You
22 just don't know?

23 A. Fluoride levels were reported in the
24 AmeriCulture federal wells in the 2013 testimony and
25 the fluoride level I used in my calculation of mix

1 was reported from 2013. Again, do I know the
2 fluoride level today? No, I do not.

3 Q. Have you testified previously in any
4 matter concerning geothermal?

5 A. Yes, I have.

6 Q. Tell me about it.

7 A. I testified -- I believe it was Catron
8 County Commission. I forget the year. But it was
9 involving BE Resources, a permit status to construct
10 exploration wells on a beryllium prospect in the
11 Monticello Gap area, which was involved with the
12 thermal springs. There was concern that the
13 exploration project could cause impact to the
14 thermal springs in Monticello Gap, so we did indeed
15 evaluate the geothermometry and the stable isotopes
16 of those springs. That work was performed by the
17 New Mexico Institute of Mining and Technology --
18 well, actually the Bureau of Geology and Mineral
19 Resources and was integrated into a program of
20 permitting that AMEC Earth and Environmental was
21 doing at the time for BE Resources' application for
22 mineral development.

23 Q. If I understand, you said it was before
24 the Catron County Commission?

25 A. I believe so. It was Catron Sierra County

1 Board. I think the meeting was held in Catron. I
2 don't recall all the specifics of where it was.

3 Q. Did you ever testify before any other
4 environmental department, similar type department in
5 any other state regarding geothermal activities or
6 geothermal sites?

7 A. Not that I can recall.

8 Q. Have you ever testified in any court?

9 A. I have never testified as an expert in
10 court.

11 Q. Do you know when the Well A444 was
12 actually drilled?

13 A. It's old. It was drilled by the Tom
14 McCant and I believe sold to Bealle to operate the
15 initial Rose Greenhouse that was at that facility.
16 So decades and decades ago.

17 Q. You don't know the exact year?

18 A. No.

19 Q. Would it surprise you to learn that on
20 your chart you gave us you plotted a data point in
21 1980 which was three years before the well was
22 drilled?

23 A. It would greatly surprise me. If there is
24 a misinformation on that, that would have to be
25 related to the confusion on well number that

1 surrounds that well and its applications. Yes, it
2 would greatly surprise me. If you omitted the point
3 before that well was drilled as somehow erroneous
4 and included in my work, it wouldn't change the
5 other content of the work one iota.

6 Q. So all the data that you relied upon for
7 your testimony today is essentially before Lightning
8 Dock's power plant began operation. Is that
9 correct?

10 A. In my testimony regarding the controversy
11 between Elston et al. and other theories of this
12 geothermal system, yes, that data is from 1983 and
13 before. Regarding the 2012 sampling, I don't
14 believe the power plant started operations at the
15 time.

16 Q. So none of your testimony here today is
17 based upon any data that was obtained by Lightning
18 Dock subsequent to the power plant beginning
19 operations?

20 A. I believe that some of the data that's in
21 the 2015 BTV value and concentration report is after
22 operation.

23 Q. Can you point that out to me because I was
24 looking at the dates and it's 2013.

25 A. Not unless I have my Excel spreadsheets on

1 which I did all those calculations right in front of
2 me.

3 Q. Now, are you aware of the proposed
4 increase in capacity of the Lightning Dock plant?

5 A. Not in specific numbers, sir.

6 Q. What are you aware of?

7 A. I am aware that they want to expand
8 capacity of their power production. I am really not
9 aware of specifics except for the testimony
10 yesterday that I heard of Phase 1, Phase 2, 13
11 megawatts gross. That's what I can recall, but
12 that's what I know of their expansion plans.

13 Q. Do you know how that expansion plan and
14 the amount of the proposed injection relates to
15 proportionally the current production?

16 A. Roughly double, but again, just trying to
17 recall from yesterday.

18 Q. Well, if I told you that it was going to
19 essentially increase 750 percent --

20 A. Seven and a half times.

21 Q. Seven and a half times. Do you think that
22 a seven-and-a-half times increase in the amount of
23 movement of water in that system would have the
24 potential to actually result in more of the injected
25 water moving in the alluvial flow?

1 A. Based upon the premises that I have
2 already presented, that it's my understanding that
3 these geothermal systems are operated as a closed
4 loop by maintaining a differential pressure between
5 injection wells and withdrawal wells such that they
6 do maintain a closed loop, we could increase the
7 amount of water moving. We could scale it .7 times,
8 7.5 times, 75 times.

9 If they are keeping their cell operating
10 in such a way that they maintain those heads,
11 there's an outer perimeter where that mixing is not
12 taking place. So my answer would have to be no, and
13 that answer is based upon operations and the one
14 equation I mentioned to you, Darcy's Law.

15 Q. Darcy's Law doesn't account for mixing,
16 does it?

17 A. No, Darcy's Law does not address mixing.

18 Q. Now, when you use the term closed loop,
19 what's your understanding of closed loop
20 geologically?

21 A. I know there's nomenclature used in the
22 geothermal industry and I'm not certain of the ways
23 they define closed loop. There's two closed loops
24 that I'm aware of here. The first one is the closed
25 loop heating system which indicates that the water

1 is not once through, it's returned to the aquifer
2 and that closes the loop.

3 Q. Let me pause you on that. I don't mean to
4 interrupt. I'm not trying to be rude.

5 A. Sure.

6 Q. But explain to me, is that a natural
7 phenomenon that you're describing?

8 A. No, that's mass in, mass out. This is the
9 geothermal production system. If they are
10 withdrawing the same mass as they are returning,
11 explained by Dr. Shomaker yesterday, we have a mass
12 balance. And they are trying to achieve flow
13 balance. So when you achieve mass and flow balance,
14 you are not affecting the system that's advecting.
15 Granted you are creating a big circulation cell
16 within this system. You're mixing. But you are not
17 altering this giant body of water that is the Animus
18 Valley aquifer moving through the area.

19 Q. Given the mixing that's occurring on the
20 edges, it's not within a solid bubble container that
21 prevents its movement into the greater flow of
22 underground water, true?

23 A. That is absolutely true, but I think
24 what's being missed here is an essential point on
25 mass balance and pressure balance. That while you

1 can create a recirculatory cell inside this outflow,
2 if that process is closed, mass in equals mass out,
3 then you're merely creating a circulation cell
4 within a larger moving body. So I don't see -- so
5 while mixing is taking place, while this circulation
6 cell is being operated, we haven't changed one bit
7 the amount of mass of fluoride that's coming into
8 the system. 100 percent of that is controlled by
9 the geothermal system. We are mixing the amount of
10 fluoride that comes up by the geothermal system
11 within a zone where it's beneficial for heat.

12 Q. The fluoride is moving around?

13 A. The fluoride is moving around. The
14 fluoride has been moving around apparently for
15 thousands of years.

16 Q. Let's try to figure this out from the
17 geologic -- not a mass balance thermodynamics
18 heat/pressure, but from a geologic perspective,
19 okay? From your understanding of the geology of
20 that area -- that's what I want to try to focus
21 on -- is that geology structured in such a way that
22 all of the water recirculates in there in what would
23 be referred to as, in essence, a closed loop, a
24 contained area? Yes or no?

25 A. No. And if you might give me the

1 opportunity.

2 Q. Go ahead.

3 A. Okay. The problem is that there aren't
4 any confined aquifers out there that we know of
5 other than the confined geothermal aquifer. And so
6 --

7 Q. And if I may, I don't want to interrupt,
8 but if you could explain what is your knowledge of a
9 confined geothermal aquifer?

10 A. My knowledge of the confined geothermal
11 aquifer has been expressed by either readings of
12 Mr. Witcher, prior publications of his, Swanberg,
13 other people who have published in this area or are
14 doing basic research on that, and Elston, Deal and
15 Logsdon.

16 Q. Thank you. Please continue.

17 A. No problem at all. Now, the current
18 configuration that we see of the outflow is
19 controlled by the outflow. So if the outflow -- and
20 it is in an unconfined aquifer, which means that
21 that outflow plume is free to expand and contract
22 how it sees fit. Once it's put fluoride into the
23 basin aquifer, if the conditions change in the basin
24 aquifer, say rainfall went up incredibly and we had
25 all kinds of recharge, that's going to spread this

1 naturally occurring plume out, too.

2 The point I'm trying to make, though, is
3 if the geothermal system expands -- and some believe
4 this system is growing -- if the geothermal system
5 expands, so does that plume. That plume is going to
6 expand. That plume is going to envelope. If the
7 geothermal system expanded to the point we see
8 historically from the Travertine Springs, from the
9 calcite vein, from the fluoride veining, from the
10 fact that there's mines on the valley walls of this
11 valley, that fluoride plume is going to be wall to
12 wall, and so is the hot water.

13 So the configuration of the outflow plume
14 is controlled by the flow rate in and the hydraulic
15 properties of the medium in which it's flowing in.
16 And as I presented before, there's a great volume of
17 shattered rock out there. It probably achieves
18 representative porous media quality. We know it
19 behaves in an unconfined matter and we know it's
20 connected on the side of the alluvial fill aquifer.
21 So the giant fractured rock system is in very direct
22 communication with the alluvium. So that system is
23 going to be controlled by what flows up in it and
24 the controls there, recharge from the top. Not a
25 small mixing zone within it. And if we might, I

1 really need a bio break.

2 MR. BRANCARD: Do you have a lot more
3 questions? I'm really concerned because the
4 commissioners have a whole bunch of questions for
5 the witness.

6 MR. LAKINS: I pass the witness.

7 (Note: Witness exits and returns.)

8 CHAIRMAN CATANACH: Ms. Marks? Go ahead.

9 CROSS-EXAMINATION

10 BY MS. MARKS

11 Q. Mr. Miller, I just have a few quick
12 questions for you. You said the aquifer is already
13 contaminated, correct?

14 A. Correct.

15 Q. I wanted to show you what is
16 AmeriCulture's exhibits and I just want to turn your
17 attention to Exhibit K. This is a letter to, I
18 believe, Cyrq's CEO, Mr. Goodman, written by Jim
19 Griswold, the environmental bureau chief for the
20 OCD.

21 A. Yes.

22 Q. And go to the general conditions. One of
23 the conditions Mr. Griswold, the environmental
24 bureau chief of the OCD, recommends for Cyrq is that
25 the OCD must be immediately notified if the measured

1 concentration of any constituent in any sample
2 exceeds the maximum levels provided in 20.6.2.3103
3 NMAC, with the exceptions of fluoride exceeding a
4 concentration of 17 milligrams per liter. I won't
5 read the rest. Do you agree with Mr. Griswold's
6 recommendations to Cyrq?

7 A. I believe Mr. Griswold's recommendations
8 are based on my calculations of background threshold
9 values for the Lightning Dock data and are therefore
10 appropriate.

11 Q. I have no further questions.

12 CHAIRMAN CATANACH: Okay.

13 CROSS-EXAMINATION

14 BY COMMISSIONER SHANNON

15 Q. Thank you very much. I will be quick.
16 Okay, Mr. Miller. I don't have a Ph.D. so dumb it
17 down just a hair for me, please.

18 A. I will help you any way I can.

19 Q. If you would, please. First of all, why
20 have they changed -- if this question has been
21 answered, go quickly. It's because I didn't
22 understand some of the answers. Why are they no
23 longer going to continue reinjecting into the loop
24 system and they are going to start injecting into
25 these shallow water wells?

1 A. My best understanding on this, this is
2 risk reduction on the part of the geothermal
3 company. As testified before, they are looking for
4 permeability. They are looking for a place where
5 they know that they can get the water in because
6 once they pump it out they have to get it back in.
7 They have had some problems at depth.

8 Q. But why can't it just keep going back in
9 like originally planned? What has happened to stop
10 that original loop?

11 A. Well, as far as I know, the loop is not
12 being stopped at all. What's happening is the
13 injection points are being moved out in a little
14 more shallow. The withdrawal points are still down
15 here. So instead of running a tighter loop at
16 depth, they are planning on running a larger loop
17 that injects here, pulls down, has the 300-foot cone
18 of withdrawal so they're injecting out here and
19 you've got 300 feet of head trying to pull it in.

20 Q. Very quickly, I am not here just about
21 fluoride. I have been aware all my life of the
22 heavy fluoride so I don't need you to tell me how
23 bad the fluoride is so we will just drop that. What
24 I am here for is the health, safety and welfare of
25 the people in my community and in my county. Can

1 you guarantee me that there will be no shallow water
2 well that will be used for private use,
3 agricultural, cattle, that will be contaminated with
4 the shallow water wells being injected as being
5 presented? Can you guarantee me that will not
6 happen?

7 A. I cannot guarantee you anything for the
8 operation of Cyrq because I do not operate the
9 company.

10 Q. Thank you. That's all I need to know.
11 Thank you very much, gentlemen.

12 CHAIRMAN CATANACH: Commissioner?

13 MR. BALCH: I have a couple questions,
14 Dr. Miller.

15 THE WITNESS: Yes, sir.

16 MR. BALCH: The fresh water well -- this
17 is going way back to the beginning of your
18 testimony -- that the Burgetts used is about a mile
19 off to the west over here somewhere?

20 THE WITNESS: Section 12.

21 MR. BALCH: Do you have Exhibit 1?

22 THE WITNESS: Mine?

23 MR. BALCH: Yes. It has a little bigger
24 map.

25 THE WITNESS: Thank you. Very good. Yes.

1 MR. BALCH: Where approximately on there
2 is that?

3 THE WITNESS: We can see it. All right.
4 If I may approach? I'll throw the x-ray specs on
5 there.

6 This dot here, that clear area, if my
7 recollection is correct this is the pad area for the
8 Dale Burgett wells, and right across the street by
9 the clump of bushes, if we pull it up on Google
10 Earth we probably see the telephone pole for the
11 cold water well for AmeriCulture.

12 So they are on the road in Section 12.

13 MR. BRANCARD: That's a long geothermal
14 road. North half of Section 12. The witness was
15 pointing to both sides of what's called Geothermal
16 Road about midway across Section 12.

17 MR. BALCH: Looking at your data in
18 Exhibit 10, it looks like that has a fluoride level
19 of just over 1, 1.14?

20 THE WITNESS: 1.14 sounds familiar.

21 MR. BALCH: Looking at your approximate
22 plume boundary, that section just inside the left
23 edge, so it's going to be in the mixing zone, the
24 edge of the mixing zone of the fresh water aquifer
25 and the plume from the geothermal. All right. Just

1 wanted to make sure I knew where that one was.

2 You seem to be indicating that this is a
3 fully connected system, surface to bottom.

4 THE WITNESS: I haven't seen any evidence
5 to indicate otherwise.

6 MR. BALCH: But you do have changing
7 groundwater chemistry as you get closer to the
8 surface and as you get to the edges of the plumes,
9 these mixing zones?

10 THE WITNESS: Well, yes. This plume
11 follows all of the same solid transport laws that
12 every other plume on the planet follows, so there is
13 going to be chemical diffusion at its edges.
14 There's going to be dispersion with time. The plume
15 will continue to get larger with time regardless if
16 the geothermal water changes its flow. The plume
17 will get larger and expand. If the mass into it
18 isn't the same all the time, eventually it will
19 become diffuse and disperse. If the mass of
20 fluoride putting into it continues the same, this is
21 going to keep growing. There's a continual source
22 of contamination being piped into this aquifer by
23 the geothermal system.

24 MR. BALCH: And you have a bunch of other
25 forces working upon that plume. You have the

1 downgradient flow to the north?

2 THE WITNESS: Yes.

3 MR. BALCH: You have mining of water in
4 the Animus Basin, fresh water in the '80s, which is
5 ongoing but stabilized?

6 THE WITNESS: I think it's stabilized. I
7 read some of the reports. Daniel B. Stevens did a
8 groundwater flow model of this site in 1983. The
9 State engineer responded pretty quickly on that, and
10 I am agreeing in the opinion that it is stabilized.
11 The mining of groundwater that historically took
12 place, took place to the south of the facility.

13 MR. BALCH: South of the facility.

14 THE WITNESS: So looking again at the
15 fluoride plume, there's question as to whether
16 there's been redistribution.

17 MR. BALCH: Could that give you a little
18 bit of gradient in the back flow direction?

19 THE WITNESS: We are in an unconfined
20 aquifer. If I put in a big enough well down by
21 Cotton City, I can make the whole thing run
22 backwards.

23 MR. BALCH: So you have those outside
24 factors. You also have inside factors such as the
25 development of Lightning Dock.

1 THE WITNESS: Yes.

2 MR. BALCH: They have a good drawdown in
3 their production well, around 300 feet. It's
4 stabilized for their current rate of production.

5 THE WITNESS: I concur with Dr. Shomaker's
6 analysis.

7 MR. BALCH: The data is pretty clear.
8 It's stabilized at that rate. However, you are
9 mixing down deep at this point. If you start to mix
10 up shallow, what is the potential of impacting
11 somebody else's shallow water?

12 THE WITNESS: Again, because of the
13 recirculation --

14 MR. BALCH: It's still bad water.

15 THE WITNESS: Well, in the principles of
16 the recirculation cell, I still think that we're
17 mixing within this hot geothermal zone. We are not
18 changing the mass. There will be a period of
19 stabilization, but ultimately, every bit of fluoride
20 that comes up goes out. So us recirculating shallow
21 versus deep, yes, if we look at the scale of that
22 picture, we will see it. Of course. If we put in
23 wells even tighter we would see it even more. But
24 as far as the scale of what's happening downgradient
25 of the geothermal lease area, it's my belief within

1 a reasonable degree of scientific certainty that it
2 would be difficult for us to detect any changes one
3 year from now, 30 years from now.

4 MR. BALCH: Or 1,000 years from now.

5 THE WITNESS: Exactly.

6 MR. BALCH: I don't think Mr. Seawright is
7 worried about 1,000 from now.

8 THE WITNESS: Probably not.

9 MR. BALCH: You have the good degree of
10 variability. I think you were saying 2.0. One of
11 the tables indicated more like 1.6.

12 THE WITNESS: I think that's an advisory
13 level. Again, when I make these determinations I go
14 directly to the regs and have it in front of me
15 while I'm doing it.

16 MR. BALCH: But you may have two
17 interesting cases here. If you are recharging the
18 A444 well with relatively fresh water, you could
19 push the fluoride levels in the well below that
20 advisory level or below a warning level.

21 THE WITNESS: We are not recharging well
22 A444. The process that I alluded to and which I
23 believe is an operable theory, yeah, they very well
24 may push the fluoride levels down.

25 MR. BALCH: So you could have a well

1 that's not in fluoride compliance go into fluoride
2 compliance through factors that are outside of the
3 control of Cyrq. You also have Monitoring Well 5
4 here, fluoride level of 1.3. I mean, that's one
5 that could get pushed out of compliance.

6 THE WITNESS: You have a 1.3 level of
7 fluoride underneath a greenhouse that historically
8 discharged cold water into the ground for how long?

9 MR. BALCH: But just like you want to look
10 at the letter of the law when it comes to making a
11 call when you're looking at a regulation, we have to
12 look at the regulation as well. What is the impact
13 of a well that could go into compliance and one that
14 could go out of compliance as a result of a local
15 mixing?

16 THE WITNESS: This is why we do this
17 differently in other states, quite frankly.

18 MR. BALCH: Unfortunately, we are not -- I
19 would say fortunately we are in New Mexico.

20 THE WITNESS: Well, in terms of
21 flexibility, I love being in New Mexico, but in
22 terms of flexibility to deal with situations like
23 this that are complex -- we have a naturally
24 contaminated aquifer that's been manipulated many
25 times by other forces, some anthropogenic, some not.

1 MR. BALCH: There's also the chance that
2 you could do nothing and the concentrations will
3 change. They do change a little bit at times.

4 THE WITNESS: If this facility was never
5 operated and AmeriCulture disappeared and nobody did
6 anything to this system, your downgradient fluoride
7 concentrations are going to change. This plume is
8 evolving. What we are seeing right now is its
9 condition as of today based upon an unknown
10 determined number of years of discharge. It is
11 going to spread laterally. That's physics and
12 chemistry. It doesn't have any opportunity.

13 If hydraulic containment is maintained --
14 and we do this in the environmental industry. We
15 create hydraulic containment cells within other flow
16 cells so that we can operate on the chemistry,
17 inject really interesting chemicals into aquifers to
18 destroy organic compounds, and we do this safely by
19 controlling head, Darcy's Law.

20 MR. BALCH: So what's the legal impact of
21 the A444? If that well goes into compliance in
22 fluoride, it's still probably going to be out of
23 compliance with TDS, but say it goes in compliance
24 for one component, Mr. Lakins pointed out one
25 component is all it takes to change a reading on it.

1 What happens if it then goes out of compliance?

2 THE WITNESS: From a scientific
3 perspective, I don't have a good answer.

4 MR. BALCH: More from the regulatory side.

5 THE WITNESS: I'm not a lawyer.

6 MR. BALCH: What's going to be the impact,
7 though, if you are writing a report to the state
8 engineer or to the OCD? How are we supposed to
9 interpret that?

10 THE WITNESS: If I were in your position,
11 knowing what I know from the historical recording of
12 fluoride within this system, low fluoride waters are
13 anomalies and they have been caused
14 anthropogenically by discharge of water from outside
15 the fluoride zone. So while we are creating those,
16 I think you end up in the same situation as when you
17 artificially create a wet one.

18 The mitigation of that is generally
19 determined through legal processes because we don't
20 have a good way to draw a bright line on Dale
21 Burgett water or water imported here. You might say
22 the corollary was if cold water importation
23 continued and was just allowed and somebody decided
24 to grow corn on the top of that, and then they
25 stopped, has the corn farmer diluted the water and

1 allowed it to contain to a condition of
2 contamination? So it's difficult.

3 MR. BALCH: Let's try to get more
4 specific. You have Monitoring Well 5 here at 1.3.
5 You also have a proposed injection Well 76.6.

6 THE WITNESS: If monitoring 5 goes over
7 1.3 it will be exceeding water quality criteria.

8 MR. BALCH: What happens to Cyrq in that
9 case?

10 THE WITNESS: I can't predict that.

11 MR. BALCH: They are going to make that
12 report that they pushed the well out of compliance.

13 THE WITNESS: If I were in your position
14 --

15 MR. BALCH: Would you drill the well, I
16 guess is the question.

17 THE WITNESS: Well, in a regulatory
18 position, I would have to consider the totality of
19 the evidence that this is an anomalous water within
20 a high fluoride zone. Eventually, if mounding heats
21 up Well A44 and moves geothermal water over there,
22 have we ruined it or restored it to its original
23 condition?

24 MR. BALCH: Or something closer to it.

25 THE WITNESS: I can't answer that

1 question.

2 MR. BALCH: What about 13.7? I know it's
3 a star on the map. Is it here?

4 THE WITNESS: I don't know. I didn't draw
5 the star and I haven't plotted the well permits.
6 I'm sorry.

7 MR. BALCH: We have maybe another 3,000
8 feet to the edge of the plume there and the edge of
9 the flesh water.

10 THE WITNESS: Again, if we were injecting
11 there and you were pulling real hard, what are the
12 headlines going to look like around the well? The
13 headlines will be big Us because there will be water
14 being pulled in from behind that well in addition to
15 the water that's being injected. If they are
16 operating the system for capture, they're capturing
17 water from the outside edges of the plume and
18 pulling it inward.

19 So part of their water that they are
20 pulling down deep is water that was once lower
21 fluoride and will be higher fluoride. That's the
22 purpose of the mixing zone.

23 MR. BALCH: You know in the '80s and 2012
24 it didn't look like there was a difference in the
25 rate of mixing. It seemed to be roughly happening

1 at the same level. I think that means you didn't
2 see higher fluorides in 2012 than you saw in the
3 1980s.

4 THE WITNESS: I'm uncertain what you're
5 referring to. Are you referring to A44 mixing?

6 MR. BALCH: No, this was earlier in the
7 discussion. We were talking about the entire mixing
8 zone.

9 THE WITNESS: Entire mixing zone. The
10 stable isotope work from 2012. What it does is, in
11 my opinion, validates the predictions of Elston,
12 Deal and Logsdon. They said we should find water
13 close to that Delta D and Delta 18-0. And indeed,
14 when we drilled deeper we did find water that
15 matched their conclusions. I have not performed any
16 calculations whatsoever to evaluate the current
17 state of mixing, geothermometry, whatever. I'm
18 comparing the theories of Elston Deal, et al. to the
19 theories of Witcher 2001.

20 MR. BALCH: Would you agree with Witcher
21 that we need to be doing much more monitoring?

22 THE WITNESS: For the purposes of permit
23 and assuagement of public concern, I would think
24 that more monitoring around the proposed alluvial
25 injection wells would be appropriate. But the

1 mission of Cyrq in geothermal development is not
2 creating papers, it's operating the system
3 sustainably.

4 MR. BALCH: It's also to be compliant with
5 regulations.

6 THE WITNESS: To be compliant with
7 regulations. If this commission felt that
8 continuing validation of the Elston, Deal and
9 Logsdon hypothesis for operation of the system was
10 necessary, that work could indeed be performed by
11 additional chemical analysis, most probably from our
12 existing monitoring centers. The work may have
13 already been performed and I don't know it, because
14 I am not privy to the confidential information of
15 hydrogeologists, geophysicists.

16 MR. BALCH: Welcome to the club.

17 THE WITNESS: Thank you, sir.

18 MR. BALCH: We are also not privy to a lot
19 of that stuff. I wanted to clarify. You were
20 referring to AC hot and AC cold?

21 THE WITNESS: Yes, those were names that I
22 assigned to a cold water tap and hot water tap that
23 was inside the AmeriCulture facility.

24 MR. BALCH: Okay, so it's not directly
25 tied to a particular well?

1 THE WITNESS: I did trace some information
2 that Damon provided me. It is my belief that AC
3 cold is indeed the well that they've identified in
4 Section 12 that they used to bring cold water into
5 their facility.

6 MR. BALCH: That's the well that I had you
7 identify on the map?

8 THE WITNESS: Yes. That was not
9 sampleable at the wellhead.

10 MR. BALCH: You think that's AC cold?

11 THE WITNESS: Yes.

12 MR. BALCH: And AC hot?

13 THE WITNESS: I would have to go back to
14 my records to see which well he was operating at the
15 time, but I believe it's one of the wells off to the
16 east of the facility. I am not certain which well
17 it was, but it was more of a 200-degree well than a
18 --

19 MR. BALCH: So AC 2 or 1?

20 THE WITNESS: I believe so. I'm not sure
21 which was being operated.

22 MR. BALCH: I believe I will get a chance
23 to ask Mr. Seawright later. Thank you for that. I
24 assume there's commercial defluoridation technology?

25 THE WITNESS: Yeah. Gamma activated

1 alumina works real well, even on high temperature
2 water. So it's the original fluoride removal of
3 granular material. So if somebody wanted to treat
4 fluoride they could set up a whole-house filter with
5 changeable filter cartridges relatively
6 inexpensively, under \$100 probably.

7 MR. BALCH: What about for fish farms?

8 THE WITNESS: For fish farm use
9 defluoridation -- that would be a lot of water and
10 so still the preferred treatment that I know of is
11 indeed flow-through media or granular media such as
12 activated alumina. It would take a water treatment
13 plant to go precipitate out fluoride and then
14 readjust chemistries and all this other stuff.

15 MR. BALCH: Probably a good-sized plant?

16 THE WITNESS: Probably a good-sized plant.

17 MR. BALCH: Probably capital intensive?

18 THE WITNESS: Probably capital intensive.

19 MR. BALCH: I appreciated you providing
20 the diagrams for the plume. Kind of
21 back-of-the-envelope thinking, what percentage of
22 that plume is going to recycle through this
23 apparently fully connected system? Half, quarter,
24 third, two-thirds?

25 THE WITNESS: I can't even ballpark that.

1 To do that I would have to look at the true material
2 in place in the alluvial valley. I would have to
3 look at real Ks. We would have to have a water
4 level monitoring program that gave us good gradients
5 around the facility, and that means everybody's
6 well.

7 MR. BALCH: Dr. Shomaker testified
8 essentially that it's going to be a closed loop.
9 Most of the water or all of the water is going to
10 recycle.

11 THE WITNESS: Here is what's happening.
12 We are entraining water and then we're advecting it
13 away. So new water comes in and entrains and it
14 gets advected away. So describing closed loop and
15 open loop is a matter of scale.

16 MR. BALCH: Let me ask it a different way.
17 You have this natural upwelling. There's nobody
18 doing anything there at the surface. There's going
19 to be an influx of fluoride-rich water that is then
20 going to be diluted by the basin aquifer flow. If
21 you start to cycle this water at a shallow level, is
22 it going to change that overall amount of fluoride
23 per year that's going into that shallow mixing?

24 THE WITNESS: Absolutely not. The mass of
25 fluoride is controlled by the geothermal system, not

1 by whether we are doing mixing here, here, here.

2 Now, there is a time lag when all that
3 fluoride comes out and up. So things, you know --
4 we talk about the plume as if it has an edge
5 boundary to it and we talk about a closed system. I
6 can guarantee you some of the water in the system
7 went through the digestion of a dinosaur. I can
8 guarantee that you some of the fluoride molecules in
9 the system are going to end up in Antarctica
10 someday. Everything connects to everything in
11 hydrology. We can't get away from that.

12 So where is the boundary? Is the boundary
13 diffusion of one femtomole of fluoride across a
14 centimeter? Is the boundary -- we're moving towards
15 an MCL out here and we should start to think about
16 that or provide treatment. Or provide treatment.
17 Or -- the plume is collapsing over years. Oh, my
18 gosh. The geothermal source is decreasing in size
19 or less fluoride. So I can't predict all the
20 what-ifs on that. But what we can do is we can use
21 the natural analogue that we observe, and if the
22 contours that we see for Elston, Deal and Logsdon
23 are about the same contours we see 30 years later,
24 we can say on the scale of 30 years we are not
25 changing the system. And I believe on the scale of

1 30 years we are not changing the system.

2 MR. BALCH: Thank you. I just want to be
3 a little clear. My hydrology courses are well in my
4 past and I don't practice hydrology right now.
5 Confined aquifer. Could you give me a bit of a
6 definition of that?

7 THE WITNESS: A confined aquifer is sealed
8 by confining strata. There isn't a fundamental
9 this-many-orders-of-magnitude-difference of
10 hydraulic conductivity --

11 MR. BALCH: You're talking about
12 vertically confined?

13 THE WITNESS: Vertically confined. And so
14 confined aquifers are discovered more operationally
15 than they are by stratigraphic definition in that we
16 pump on a confined aquifer and we will see very
17 rapid propagation of a cone of depression, although
18 it will be very shallow. It's like water in a pipe,
19 and other than the time lag offered by hydraulic
20 conductivity, pressure propagation is instantaneous.

21 This is why there is a mound when we're
22 injecting. Pressure propagation is instantaneous
23 except slowed down by the time lag of hydraulic
24 conductivity. So to come back to your question --

25 MR. BALCH: I'm just looking for the

1 definition of confined aquifer.

2 THE WITNESS: So confined aquifer is not
3 receiving recharge from the surface, does not have a
4 potentiometric surface that is equal to atmospheric
5 pressure.

6 MR. BALCH: So the fluid recharge,
7 presuming there is a fluid recharge, to the deep
8 geothermal reservoir is coming from the south.

9 THE WITNESS: It has to come from
10 somewhere. Elston, Deal and Logsdon suggest the
11 geothermal system trends to the southwest or at
12 least the leakiness of it trends to the southwest.
13 Could the water be coming in from due north? Sure.
14 It's a confined aquifer. We don't have any
15 monitoring points in it. I don't think that --

16 MR. BALCH: Could be coming down the basin
17 sides?

18 THE WITNESS: What we know is it doesn't
19 have a mantle signature in it and we know that from
20 the stable isotopes. So we know there isn't a deep
21 leakage of some mantle-related water coming up.

22 MR. BALCH: No --

23 THE WITNESS: Not right under it. I think
24 Mr. Witcher would agree with me on that.

25 MR. BALCH: So the A44 well currently is

1 low in fluoride. That wasn't always so in the past.

2 THE WITNESS: That's presumptive. I don't
3 have analytical results for it. I wasn't able to
4 pair it exactly with the Elston, Deal and Logsdon
5 sampling because of disparate publications on that.
6 But based upon the contouring, it's right in the
7 middle of the hot well high-fluoride area, and this
8 is right out where they discovered boiling water at
9 the water table when it was first drilled.

10 So my expectation is -- again, why is this
11 anomalous? What are the potential ways this could
12 be anomalous? The geothermal system can't create
13 this; something else had to. Upwelling geothermal
14 water doesn't create a cold zone.

15 MR. BALCH: There's a pretty good
16 variability of what could happen. There's probably
17 going to be some changes to the chemistry, fluoride
18 in particular. I think you gave charts to indicate
19 that those could probably be worked around in most
20 circumstances.

21 THE WITNESS: Well, this is with respect
22 to AmeriCulture's operations.

23 MR. BALCH: Right.

24 THE WITNESS: And based upon
25 Dr. Seawright's testimony regarding what he needs

1 for temperature and what he needs for fluoride, I
2 believe that he has management opportunities to deal
3 with this. There may be some tankage required.
4 There could be capital requirement for cooling when
5 the water is too hot for him, but he has knobs to
6 turn. It's not a pure fixed.

7 MR. BALCH: So there does appear to be
8 some language referring to a replacement plan, water
9 replacement plan.

10 THE WITNESS: I have seen the Joint
11 Facility Operations Agreement. In my layman's
12 reading of it, it says that heat gets replaced.

13 MR. BALCH: I think the water replacement
14 came up somewhere else.

15 THE WITNESS: There's been discussion of
16 that, yeah. But my understanding is that from a
17 geothermal perspective, if the operations of
18 Lightning Dock impact AmeriCulture with respect to
19 heat, Lightning Dock will replace heat for
20 AmeriCulture. That's, again, just my recall of it.

21 MR. BALCH: That's what the Paragraph 3
22 Section B(A)6 of their agreement says.

23 THE WITNESS: Okay. I guess I recalled it
24 correctly then.

25 MR. BALCH: I think the water replacement

1 plan came up in a different context.

2 THE WITNESS: Water replacement is
3 different.

4 MR. BALCH: So if there are these broad
5 ranges where they can turn the knobs and adjust
6 things, what do you think the potential is for this
7 system to go out of that range during the lifetime
8 of AmeriCulture's operation? To get out of that
9 little box?

10 THE WITNESS: To mean there wouldn't be
11 hot enough water available for 85 degree water?

12 MR. BALCH: They wouldn't be able to
13 adjust the temperature and the fluoride at the same
14 time using the resources they had available to them.

15 THE WITNESS: I think having the resources
16 available right now their ranges of adjustment are
17 near infinite because they have that cold water
18 resource they can bring in, as they have for
19 dilution. So they can dilute down any fluoride that
20 they need to. They have water up to 230 degrees. I
21 think they have a large range in the knobs to turn,
22 but there's much more to AmeriCulture management
23 than I know. I'm looking at fluoride and
24 temperature, and in fluoride and temperature I don't
25 see a constraint.

1 MR. BALCH: I'm wrestling still a little
2 bit with the levels of contamination greater than 2
3 being non-drinking water, and then the edges on top
4 of the mixing zone. You could be having that happen
5 dynamically caused by nature continuously.

6 THE WITNESS: Welcome to my world.

7 MR. BALCH: And likely you do. But if you
8 were to monitor every inch of the entire plume you
9 would see short-term variability. The thing is, we
10 live in a world -- the commission -- where we have
11 to look at point data that occurs at a specific time
12 and then we say oh, you are greater than that number
13 or you're less than that number.

14 THE WITNESS: My world isn't any different
15 than that. But what there has to be in this is an
16 understanding of how the system operates. And if
17 the actual physics of the system are outside the way
18 you can accommodate in law, then the science should
19 win, in my humble opinion.

20 MR. BALCH: At least an appeal, right?

21 THE WITNESS: So one of the ways I have
22 tried to look at this is, again, on scale. When we
23 pull back from this and this entire problem in
24 itself, we have two neighbors separated by a fence
25 that both are using a contaminated water resource

1 for their own uses, and in that process they are
2 kind of arguing who is peeing in the cattle yard.
3 Because there is a large body of contamination and
4 it's been present for many, many years and it's
5 moving naturally.

6 So various levels of mixing and
7 introduction of waters from outside the basin and so
8 on and so forth are changing things at the level of
9 that picture, but they are not changing things at
10 the level of the Animus Valley, and that's where I
11 think the concern for the -- most of the concern for
12 the commission should be is are we changing overall
13 the general nature of this system? No, it's hot and
14 full of fluoride and people will be able to continue
15 to use it for years to come.

16 MR. BALCH: Our concern is the resource is
17 not wasted.

18 THE WITNESS: I think that's a valid
19 concern.

20 MR. BALCH: And our concern is that all
21 parties have their correlative rights reserved.
22 Really, that's the number one priority. We also
23 have to look after human health and safety,
24 protection of groundwater, et cetera, but those are
25 subsidiary concerns.

1 The reason you are here in this room is
2 because it's an energy resource and we are a
3 commission that deals with energy.

4 THE WITNESS: On that basis, and again, I
5 will state it, it is my professional opinion within
6 a reasonable degree of scientific certainty that the
7 proposed shallow well injection program is not going
8 to markedly alter the water quality in the Animus
9 Valley.

10 MR. BALCH: How about for AmeriCulture?

11 THE WITNESS: If the current pathway
12 continues, if the trough between the AmeriCulture
13 mounded water and the mounded water that's over here
14 at Lightning Dock that Mr. Seawright testified, if
15 this mound is lost, this water will encroach. That
16 water at the surface is the natural upwelled water
17 from the geothermal system. Yes, it will move over
18 and change A44 back to the way I say it was 20 years
19 ago. Is that a damage or is that a restoration?

20 MR. BALCH: That's a good question.

21 THE WITNESS: I haven't found the answer
22 to that one either.

23 MR. BALCH: So this is my last question.
24 If the system really is fully connected from depth
25 to surface and you have near alluvium -- not near --

1 if it behaves like porous rock because of the
2 fractures all the way from 1500 feet to the surface,
3 is there any reason why you couldn't put the
4 injection wells at an intermediate depth to minimize
5 the impacts on the near surface water table and
6 mixing of chemistries?

7 THE WITNESS: I think, again, the factor
8 is risk. What we found in the situation, and we
9 would like to assume it is a very homogeneous body
10 of fractured rock. That's very simple. They are
11 finding as they drill that in some bodies where
12 their open hole section is, they are not finding the
13 permeability they need. As a general rule,
14 permeability decreases with depth, so an
15 intermediate well approach might be appropriate.

16 From what I understand, their perspective
17 is minimize risk to the degree that we possibly can.
18 Let's put it in the stuff that we know is most
19 permeable so we can get it in and then let's control
20 where it goes via drawdown.

21 MR. BALCH: I believe Mr. Bowers yesterday
22 said you can drill your well and be an inch or two
23 away from a large fracture network and have no
24 permeability.

25 THE WITNESS: I disagree with Mr. Bowers,

1 because I believe that in all these fracture systems
2 we see antithetic fractures an inch or two away, and
3 I believe it's a matter of scale. Because for me,
4 interconnection is water will flow and flow at a
5 rate that makes sense to the time period of question
6 we are asking. For him it's 1000 GPM, and so I have
7 been real close. We almost had it. The well will
8 only pump 100. Well, for me that's a lot as a
9 hydrologist.

10 It's been my experience in mapping in the
11 basin, it's been my experience in the field of
12 geology, I have sat hundreds of wells drilled in the
13 Rio Grande, that we see lots of fractures in the
14 fractured rock. And fracture zones, yes, they can
15 disappear very quickly.

16 MR. BALCH: On the oil side of things we
17 often deal with pre-existing fabrics of natural
18 fractures on a variety of scales. You can try to
19 intersect as many as you can using hydraulic
20 fracturing.

21 THE WITNESS: Yes.

22 MR. BALCH: Is there some reason that's
23 not used in a case like this?

24 THE WITNESS: Mr. Chairman, what --

25 MR. BALCH: I'm not the chairman.

1 THE WITNESS: Well, the body in the chair.

2 What do you believe the response would be if I was
3 to propose well acidification and fracking as a
4 methodology for getting greater hydraulic control
5 out here? While it's completely acceptable from the
6 technical standpoint and it's done many, many places
7 without -- again, we are dealing with people that
8 are very concerned about the effects on their
9 drinking water aquifer. I would suggest to my
10 client that well stimulation activity here is to be
11 avoided. This system has to be drilled and operated
12 naturally or we are going to lose our social license
13 to operate here.

14 MR. BALCH: So in the absence of being
15 able to use hydraulic fracturing, as effective as it
16 would probably be, your next alternative is to
17 deviate the wells or go horizontally?

18 THE WITNESS: And I believe they have done
19 that. I believe they've done some well deviations
20 in the past and drilled some outlegs. Again, we are
21 talking dollars squared per foot, though.

22 MR. BALCH: Right now is a good time to be
23 drilling a well.

24 THE WITNESS: Running rigs have been
25 dropping a little bit.

1 MR. BALCH: It's cheap.

2 THE WITNESS: So to come back to the
3 original question, as far as my understanding, it's
4 a multi-variable program of risk reduction. You are
5 trying to go where you get the most permeability.
6 They have to have some level of certainty going
7 through these permitting processes that extend
8 months that they are going to be able to get the
9 water in.

10 So in a situation where they might be able
11 to rapidly respond with a permitting process, I
12 could see where they might propose all kinds of
13 different phased activities. But in this situation
14 where every permit has been incredibly drawn-out for
15 them, I completely concur with going for maximum
16 risk reduction to operate the facility right here
17 right now. Let's put wells in the highest
18 permeability that we know is there and let's control
19 it by hydraulics because then the company can
20 operate.

21 MR. BALCH: Thank you.

22 MR. PADILLA: Dr. Miller, I have a
23 start-off question for you that I think may be
24 better suited for Mr. Bowers, but since it came up
25 during your testimony I'll throw it out there. We

1 heard that the proposal is for a 750 percent
2 increase in capacity and output. I believe
3 yesterday there was not a corresponding increase in
4 the flow rate of water necessary for the reservoir
5 to reach that. But can you talk about that at all?

6 THE WITNESS: Only vaguely and by
7 recollection. Yesterday, if I recall the testimony
8 correctly, they are going to put in the capacity and
9 increase the flow rate. So the design in capacity
10 for the anticipated eventual flow rate.

11 MR. PADILLA: But there's not necessarily
12 a corresponding increase in flow rate or is that
13 outside your expertise?

14 THE WITNESS: I think we are reaching
15 outside. I think we're into operations there.

16 MR. PADILLA: You also mentioned early on
17 some tracer testing that was done.

18 THE WITNESS: Yes.

19 MR. PADILLA: Can you speak about that and
20 the results?

21 THE WITNESS: I did not conduct the tracer
22 test. I was asked to respond to community concerns
23 that the tracer had gotten out into the alluvial
24 aquifer. So I went and sampled anybody's well who
25 wanted sampling, both for the general water quality

1 parameters that I mentioned but also a fluorescent
2 dye. We did not find the fluorescent dye out of the
3 central geothermal site. We did not find it in any
4 other wells in the alluvial aquifer. But I was
5 called in second-hand on that. That was my initial
6 involvement with the project was that water quality
7 sampling.

8 MR. PADILLA: Okay. You seem to have a
9 really good knowledge of the wells in the area and
10 I'm wondering if the well previously identified by
11 Dr. Balch in Section 12 is, to your knowledge, the
12 closest potable well to the project area.

13 THE WITNESS: I can't say that with
14 certainty, and I think you overestimate my knowledge
15 of recall of the wells out there. I have seen
16 various U.S. geographic topos that show various
17 windmills that have been in the area and that.

18 I cannot answer the question with
19 certainty. I have been to the Section 12 wells,
20 both Dale Burgett's and Dr. Seawright's and have
21 sampled both of those wells in 2012 -- or four of
22 the wells in 2012.

23 MR. PADILLA: Your upset condition
24 scenario from earlier in the presentation used an
25 additional measurement of 4.6 milligrams per liter?

1 Was it milligrams per liter or PPMs?

2 THE WITNESS: I am using milligrams per
3 liter as equivalent to PPM. I am assuming a density
4 of one.

5 MR. PADILLA: Why did you use that factor
6 of 4.6?

7 THE WITNESS: To bring it to 10. It must
8 have been -- it's either 4.6 or his well is 5.4 and
9 I'm confused now. But it was to bring it to 10.

10 MR. PADILLA: Okay. Lastly, another
11 question that came up during your testimony but may
12 be better suited elsewhere. The letter from
13 Mr. Griswold to Mr. Goodman seems to imply, just in
14 the quick reading on my part, that as you and Dr.
15 Balch were discussing measuring Well 5, I believe,
16 which is the one down here, the closed site, the
17 very low fluoride level of 1.2, 1.3 was thrown out.
18 But according to this --

19 THE WITNESS: Thank you for that.
20 Because, you see, really so many things -- I get a
21 little boggled. We have created an alternate
22 concentration level, have we not? We have
23 established the new MCL for this site, this 17
24 milligrams per liter.

25 MR. PADILLA: That was my question.

1 THE WITNESS: So to answer the previous
2 question in context, that would be the number that I
3 got to look to.

4 MR. PADILLA: So unless anything in the
5 project area exceeds 17, you are still within the
6 parameters outlined by Jim Griswold?

7 THE WITNESS: Yes, based upon my
8 understanding of the letter.

9 MR. PADILLA: What's the definition of the
10 project area based on your understanding?

11 THE WITNESS: I believe Dr. Shomaker
12 previously testified in permit hearings on this that
13 they believe the maximum area of effect from this
14 injection and withdrawal would be a half mile to a
15 mile. So that would be my idea of the project area.
16 It would be -- the project area should be equivalent
17 to the central core plus some, a little bit of the
18 upflow plume. What that little bit is, is dependent
19 upon how steeply concentrations dive off.

20 So I think that's a pretty good depiction
21 of the project area. There's some leasing to the
22 southwest and the Rosette lease is to the north so
23 it's hard to define. I think it's been defined in
24 previous permit processes, what they believe the
25 project area to be. One easy definition is the

1 leased area.

2 MR. PADILLA: As far as relating to that
3 17, that number threshold.

4 THE WITNESS: Again, we are getting to
5 Greg talking about regulations and I'm uncomfortable
6 there interpreting what the regulatory
7 interpretation is.

8 MR. PADILLA: I will go back to one that's
9 probably more in your bailiwick. When I brought up
10 the increase in plant capacity vis-a-vis an increase
11 in water production and reinjection, is it safe to
12 say, as a very rough summary of your testimony
13 today, that functionally the rate of water through
14 that plant is pretty much irrelevant, in your
15 opinion, due to mass balance?

16 THE WITNESS: To a certain level of scale.
17 At some point if we get to ridiculous levels of
18 pumping we are affecting head farther and farther
19 out. That head field becomes bigger, the drawdown
20 becomes bigger. Within the proposed capacity of one
21 to ten times their current work, I just don't see
22 that there's going to be major changes in water
23 chemistry outside the project area as a result of
24 this. Inside the project area things change because
25 it's a project.

1 MR. PADILLA: Can you qualify ridiculous?

2 THE WITNESS: Did I say ridiculous?

3 MR. PADILLA: Ridiculous increase.

4 THE WITNESS: Above 17. To cause areas
5 outside the project area to come up to this ACL
6 level, that would be ridiculous. We're not going to
7 see that. I apologize for the use of the term. I
8 was a little bit -- that's unprofessional of me.

9 MR. PADILLA: Quite all right. We got a
10 definition. Thank you, Dr. Miller.

11 CHAIRMAN CATANACH: I'm sorry, where did
12 the 17 come from?

13 THE WITNESS: Oh, okay. When we take the
14 fluoride concentrations that have been measured in
15 geothermal waters and I go through the processes of
16 establishing a background threshold value, that 17
17 is the background threshold value.

18 What it is, is you have a bell-shaped
19 curve of probability and tails out on the end. What
20 the 17 does is it says here is the distribution of
21 all the fluorides we have observed, but if we were
22 to go out here on the tail, if we go to 17, at that
23 point we have only a 5 percent probability that that
24 number is a false positive, that that is a false
25 increase over the background concentration.

1 So when we hit 17, we say we can't
2 discount that number as being false. Therefore, we
3 have a problem. So that's what it is, is
4 determining out of the statistical distribution what
5 numbers on a one-tailed test up here towards the
6 high part give us a problem and where it is is the 5
7 percent confidence level.

8 CHAIRMAN CATANACH: On your plume exhibit,
9 I'm a little confused on the scale. Is that plume
10 approximately three miles north/south.

11 THE WITNESS: More like -- from here to
12 here? More like --

13 CHAIRMAN CATANACH: No, I'm sorry.
14 There's a scale there.

15 THE WITNESS: More like 12 top to bottom
16 and open-ended on both sides.

17 CHAIRMAN CATANACH: And you're not
18 suggesting that plume stops. You just don't have
19 data to extend that plume?

20 THE WITNESS: This is the contour of the
21 Elston, Deal and Logsdon A N & P data. There is
22 some LD data that runs farther down, but it was a
23 linear run of well points so I didn't include it.

24 Recalling from what's happened
25 historically, when you start looking for something

1 you will find more. If we start looking for
2 fluoride out there, we will find more. This
3 happened with the arsenic standard long ago. We had
4 the data reported from USGS to go by as to how many
5 communities would be impacted by the new arsenic
6 standards, but their detection limit was 50 PPB so
7 we really didn't have knowledge.

8 And as soon as we looked we found more and
9 the problem became bigger. If we have more wells
10 put in by homeowners, ranchers or anybody else
11 around the periphery of the plume, if they sample we
12 will be able to recontour because we will know more.
13 But we're not going to put more wells out there and
14 find no fluoride. If we put more wells out there we
15 will find more fluoride, some of it below the MCL
16 and some above.

17 CHAIRMAN CATANACH: The area that you
18 contoured that's above four parts per million of
19 fluoride, is the southern end of the plume the area
20 that you determined to be the geothermal uplift
21 area?

22 THE WITNESS: Yes, it is. In this map
23 figure it's overlaid by the leasing area. But the
24 previous figure that shows the contour plume, that
25 bulbous area with 11s and 12s in it, again, those

1 are the hot wells so that's sourced right on the
2 geothermal project area.

3 CHAIRMAN CATANACH: So the lighter colors
4 on the map, the two above two parts per million,
5 that's just as a result of the main plume diffusing
6 into that?

7 THE WITNESS: Well, to the southwest --
8 the hypothesis is to the southwest of Cotton City
9 and to the southwest of the project, that's the
10 geothermal leaky confined aquifer leaking in those
11 areas. That's an extension of the source. The
12 normal groundwater flow here is predominantly to the
13 north.

14 Now, did mining cause some of the
15 migration to the south? I can't say one way or the
16 other. Was there redistribution in the south in the
17 area around Cotton City due to agricultural? I
18 can't say one way or the other.

19 The other indicators of Elston, Deal and
20 Logsdon, the downhill temperatures, the element
21 ratios of sulphate to boron, so on and on forth, I
22 think they are more indicative of the geothermal
23 area to the south, but the plume to the south, I
24 would be hard-pressed to believe that that was
25 pulled backwards from the geothermal area by the

1 overdraft, although looking at the headlines of the
2 overdraft that was achieved, it might be possible.
3 I don't know whether the timing or the hydraulic
4 conductivity would have allowed it.

5 So the simplest explanation, I believe,
6 for the southern projection of the fluoride is
7 leakage from the confined geothermal aquifer.

8 CHAIRMAN CATANACH: You testified that
9 injection into the shallow aquifer will not markedly
10 affect AmeriCulture's wells. What is markedly? How
11 do you confine markedly? Is it going to affect it?
12 Is it going to increase the fluoride in their wells?

13 THE WITNESS: Well, State Well 1 and 2,
14 no, I don't believe that. I don't believe their hot
15 thermal wells, their deeper wells, are going to be
16 affected by this at all.

17 As I testified, A444, yes. Years in the
18 future I do believe if the shallow ejection goes,
19 they are going to form a mixing zone and the water
20 that is on the surface is going to be homogeneous.
21 It will achieve a temperature that will be higher in
22 some areas, lower in others. This is explained by
23 other experts here.

24 If that groundwater divide that currently
25 exists between AmeriCulture's mounding and the

1 Lightning Dock mounding is breached, then we have
2 got mounded water that will move over into A444. If
3 that water is higher fluoride, A444 is going to come
4 back up. It's going to come back up in temperature,
5 too.

6 So again, I come right back to the same
7 place I was. Is this a bug or a feature? Are we
8 restoring this well or damaging this well? Based
9 upon the preproduction geothermal system, we are
10 restoring this well. Based upon anthropogenic
11 importation of cold water into the basin and
12 discharging it for decades, we are hurting this
13 well.

14 CHAIRMAN CATANACH: Would that change in
15 the well be as a result of the injection or would it
16 be as a result of the normal flow to the northwest?

17 THE WITNESS: Some of it is going to
18 result from the flow to the northwest. Now, here is
19 a balancing factor and this would require
20 calculation. Is the normal flow of thermal water to
21 the northwest sufficient to overcome the discharge
22 of cold water? Historically, no. Otherwise, we
23 wouldn't see what we see. So no, the advection is
24 not going to do that. If the mound increases to the
25 point that the amount pushes over, we will see that.

1 Now, again, I'm talking about effects as
2 related on the surface, potentiometric surface. And
3 there may be some things that happen different.
4 Well A44 is anomalous, to start with. And the zone
5 proposed may well cause that well to rebound to more
6 original fluoride concentrations and more original
7 temperatures.

8 MR. BALCH: If they were to drill deeper
9 at the same location as A444, they would find at
10 some point more original heat and --

11 THE WITNESS: That would be my theory,
12 yes. They would also find how deep the area of
13 quenched water is and we could track that
14 chemically.

15 MR. BRANCARD: So along that, just to
16 follow that theory for a second, if your assumption
17 is there's a discharge here from AmeriCulture
18 causing this wonderful green swath in the desert and
19 that discharge is also what's quenching --

20 THE WITNESS: I have observed the
21 discharge.

22 MR. BRANCARD: So if the discharge stops
23 --

24 THE WITNESS: Over some period of time the
25 system would re-equilibrate. Discharge would not be

1 forming a water table mound that is opposing the
2 advection of the normal Animus Valley water
3 geothermal flow through it. So yes, if you stop
4 that discharge, there wasn't a groundwater mound
5 associated with A44, and advection took place, that
6 water is going to return back to the normal
7 geothermal condition. The condition it has right
8 now is maintained by discharge.

9 MR. BRANCARD: Let me totally shift gears.
10 I want to talk about the data, your analysis that
11 was used in the report of April 20, 2015 that is
12 Exhibit P. Some questions were asked of you about
13 this data and about the reliability. Let me just go
14 to Page 4, the third paragraph. Mr. Lakins asked
15 you about the statements in here about that at least
16 ten samples are needed to statistically determine --

17 THE WITNESS: We are in the 2014 or the
18 2015?

19 MR. BRANCARD: 2015, Page 4.

20 THE WITNESS: Very good.

21 MR. BRANCARD: Okay. And you agreed with
22 him that an insufficient number of samples were
23 collected, the seven samples in December of 2013,
24 and you agreed that at least ten samples are needed.

25 THE WITNESS: Yes.

1 MR. BRANCARD: Okay. So if we look down
2 at Table 6 under the third column, F, which I assume
3 means fluoride, there are ten samples there,
4 correct?

5 THE WITNESS: In 2015, yes, we have ten
6 samples.

7 MR. BRANCARD: If you go to Table 8, next
8 page, fourth row, all fluoride number of
9 observations is ten.

10 THE WITNESS: Correct.

11 MR. BRANCARD: If we then flip to
12 Attachment B to this report a few pages later, Table
13 3.

14 THE WITNESS: Yes.

15 MR. BRANCARD: These are your samples,
16 correct? This is where you got your data from?

17 THE WITNESS: No, because this only lists
18 three hot wells. Let me make sure I am referencing
19 the right thing here. I haven't read the report
20 since I wrote it.

21 MR. BRANCARD: Attachment B, Table 3.

22 THE WITNESS: Attachment B, Table 3 does
23 not reflect all of the hot water analyses that were
24 used in this analysis.

25 MR. BRANCARD: I'm confused because there

1 are ten samples. There are actually eleven; one is
2 a duplicate. And the numbers that are listed here
3 under the fluoride, Row 6, are the exact numbers in
4 Table 6 and they are all fluoride.

5 THE WITNESS: I understand now.

6 MR. BRANCARD: So you had seven samples
7 from the monitor wells collected prior to the
8 startup of the project in November/December 2013. I
9 think Mr. Lakins pointed that out. These were prior
10 to the startup of the project?

11 THE WITNESS: Yes.

12 MR. BRANCARD: So the additional three you
13 added to get to the statistically relevant ten were
14 the old samples, is that right?

15 THE WITNESS: Correct.

16 MR. BRANCARD: Burgett 1986, Burgett '93,
17 LCD hot 2008.

18 THE WITNESS: Correct.

19 MR. BRANCARD: This has become significant
20 because those numbers, the monitor wells, if you
21 flip back two pages, the locations of the monitor
22 wells are on this map?

23 THE WITNESS: Yes.

24 MR. BRANCARD: So, for instance, Monitor
25 Well 2 and Monitor Well 3, which appear to be the

1 closest ones to the AmeriCulture property, they both
2 measured -- I saw an 11 and a 12 fluoride.

3 THE WITNESS: I am seeing the same
4 numbers.

5 MR. BRANCARD: If we go to the beginning
6 of the report, Table 1, it gives us the depth of all
7 these monitor wells, 55 to 85 foot depth.

8 THE WITNESS: Correct.

9 MR. BRANCARD: So these are all shallow
10 measurements of fluoride?

11 THE WITNESS: Yes, they are.

12 MR. BRANCARD: And the one that
13 Commissioner Balch pointed out, Monitor Well 5, all
14 the way furthest south is the only one that is at
15 this point within the standard.

16 THE WITNESS: Correct.

17 MR. BRANCARD: Which I will have to
18 correct you. I read the regulations, 3103 which
19 Mr. Lakins pointed out. The fluoride standard is
20 1.6.

21 THE WITNESS: Thank you, sir.

22 CHAIRMAN CATANACH: Any other questions?

23 MS HENRIE: Mr. Chairman, we would like to
24 move Exhibits 7, 8, 9 and 10. We also would like to
25 move the handout as an Exhibit 11. That's the

1 slides that we should have tendered it earlier. Let
2 me stop there for a second.

3 MR. LAKINS: I'm not going to object, but
4 the handout, as it is, is a bit confusing because
5 it's front to back and not numbered pages. If that
6 could be reproduced single pages and numbered.

7 MS. HENRIE: Absolutely.

8 CHAIRMAN CATANACH: So no objection?

9 MR. LAKINS: No, sir.

10 MR. BRANCARD: We will make that -- the
11 next number is 11? So the entire thing will be 11.

12 CHAIRMAN CATANACH: Exhibits 7 through 11
13 will be admitted.

14 (Note: Exhibits 7 through 11 admitted.)

15 MS. MARKS: The OCD would like
16 AmeriCulture's Exhibit K that's been referenced
17 moved into evidence as well.

18 CHAIRMAN CATANACH: Any objection?

19 MS. MARKS: In case it's not later moved
20 and admitted into evidence.

21 MR. LAKINS: I'm just a little stymied
22 because they objected to my admitting an exhibit on
23 cross but I'm not going to object to that. I will
24 eventually get all of mine in. But K?

25 MS. HENRIE: Yes.

1 MR. BRANCARD: We can admit P also because
2 everybody has been talking about it. How about
3 that?

4 MS HENRIE: Yes.

5 MR. LAKINS: Thank you.

6 CHAIRMAN CATANACH: Exhibits K and P will
7 be admitted.

8 (Note: Exhibits K and P admitted.)

9 MS HENRIE: Mr. Chairman, I realize it's
10 almost 5:00 o'clock. I would like to, if the
11 commission allows, recall Roger Bowers and he can
12 identify the materials that he brought with us at
13 the commission's request yesterday. Mr. Bowers, if
14 you are interested, can also stand for questions of
15 the commission and clarify that Lightning Dock
16 intends to rely on the deep injection wells once
17 they open up.

18 MR. LAKINS: I thought the decision was
19 made that all recalls would be after we're done.

20 CHAIRMAN CATANACH: Yeah, and I think in
21 the interest -- I don't think we're going to be able
22 to finish with Mr. Bowers in a reasonable amount of
23 time, so I think it would be better to save room for
24 the next hearing.

25 MS HENRIE: Would the commission like to

1 take administrative notice of the things that I
2 brought?

3 MR. BALCH: Would you like to admit them
4 as exhibits?

5 MS HENRIE: No, I actually don't want them
6 in the record but I would like you all to have a
7 chance to see it. I noticed this morning you took
8 administrative notice of some items.

9 MR. BALCH: You don't want us to take them
10 home and study them for two weeks?

11 MS HENRIE: You can. Absolutely.

12 MR. BALCH: Do you have copies for us to
13 take?

14 CHAIRMAN CATANACH: What are the
15 documents?

16 THE WITNESS: May I be excused?

17 CHAIRMAN CATANACH: Yes.

18 MS HENRIE: We believe this is
19 confidential but we would share with the commission
20 the well log you saw. We would not like to share
21 that with the AmeriCulture. This is a report that
22 Roger Bowers referenced. It's available on the
23 internet so AmeriCulture probably has it. It's the
24 2005 REDW report that summarizes the earlier studies
25 to 2005.

1 The final thing is something again we are
2 happy to share with AmeriCulture. Mr. Bowers
3 plotted all of the data that he could get his hands
4 on down to 100 feet, and again, this is based on a
5 wider field of data over time. This is the outline
6 that you will be seeing AmeriCulture present when it
7 makes its case. We have a comparison of what will
8 be presented and what we think the size of that hot
9 spot is based on Roger's knowledge.

10 MR. BALCH: How do we treat proprietary
11 data?

12 MR. BRANCARD: I mean, the point has been
13 made, and I think it's a valid point, that if all
14 the parties can't have access to this, I don't know
15 if you want to have that be evidence that we look
16 at. Because I think it's important evidence. We
17 would certainly --

18 MR. BALCH: But it removes their chance
19 for rebuttal.

20 MR. BRANCARD: I don't know if there's
21 anything in there to question.

22 MS HENRIE: We would share these with
23 everybody.

24 MR. BALCH: Except for the cross-sections?
25 You can get the logs of the state from the New

1 Mexico Bureau of Geology and make your own
2 cross-sections.

3 MS HENRIE: That is true. We just did the
4 work ourselves. You're right, another person could.
5 We can share all of this, which doesn't mean that we
6 are --

7 MR. BALCH: You don't want it in the
8 public record?

9 MS HENRIE: We don't. So I would suggest
10 you take administrative notice of it, share it with
11 all the parties but don't add it as an exhibit.

12 MR. BRANCARD: I mean, I think we would
13 have to have some sort of simple confidentiality
14 agreement.

15 MR. LAKINS: I think we need to have it.
16 I believe, as was pointed out in my reply, I
17 believe, in my motion, that the commission can hold
18 information confidential even to the point of
19 closing a meeting, but I think the point is made
20 that the underlying data is public data. And this
21 is just a compilation of publicly obtainable data
22 which would, therefore, tell me it's not trade
23 secret. The physical compilation of public data.

24 But aside from all that, I think the way
25 to approach it that we would prefer, we would be

1 happy with a confidentiality agreement. We did one
2 before two years ago and that would seem to work for
3 us. We just would like to have the benefit of being
4 able to analyze the same data that the commission is
5 going to be given and not for us to have to operate
6 in the blind.

7 MS HENRIE: This is also an interpretation
8 of the data. It's a compilation and interpretation.

9 MR. BALCH: That's probably one of the
10 most common things we would get is a cross-section
11 and interpretations.

12 MS HENRIE: Right. So what I'm trying to
13 say not very well is that we are not conceding on
14 our trade secrets.

15 MR. BRANCARD: Can we all agree that the
16 parties will work on a simple confidentiality?

17 MR. LAKINS: I think the one we had before
18 can be cut and pasted.

19 MR. BRANCARD: If you can find it.

20 MR. LAKINS: It's probably in here.

21 MS HENRIE: I believe it says all
22 confidential materials are returned at the end of
23 the hearing, too.

24 MR. LAKINS: We did that.

25 MS HENRIE: I agree.

1 MR. BRANCARD: We can resurrect that.

2 MR. LAKINS: Yes, sir.

3 MR. BRANCARD: Then the second document is
4 a publicly available report.

5 MR. LAKINS: We have that.

6 MR. BRANCARD: Do you object to it being
7 offered as an exhibit?

8 MR. LAKINS: No. For a moment I thought
9 it was that thick.

10 MS HENRIE: It is 96 pages.

11 MR. LAKINS: 1,000 pages is too much.

12 MS HENRIE: Okay. So --

13 MR. BALCH: You have a map that you are
14 also willing to make an exhibit?

15 MS HENRIE: Yes.

16 MR. LAKINS: That's not an issue. We like
17 maps.

18 MR. BRANCARD: Again, I guess I have the
19 same -- I'm going to have a little bit of problem
20 with what you submitted as exhibits earlier today.
21 There's a lot of information -- not a lot -- but
22 information on pieces of paper, you know, without
23 alleging or a scale or a source. So you have a map.
24 It has dots on it, lines on it. Is there an
25 explanation as to what those dots, lines, things

1 mean?

2 MS HENRIE: It has a key. There is a
3 scale in feet. The black dots are TG holes. The
4 sections are numbered and the contours have the
5 degrees -- you will see from this that this is 175
6 degrees Fahrenheit. What it doesn't say -- oh, no,
7 it does. Temperature at 100-foot depth.

8 MR. LAKINS: If we could look at it. As
9 long as my expert can read it and understand it, I'm
10 okay.

11 MR. BRANCARD: Let's admit this report as
12 Exhibit 12.

13 MS HENRIE: Okay.

14 MR. LAKINS: You will give us one of
15 those?

16 MS HENRIE: I prefer to give you one now
17 if the commission is okay.

18 MR. BRANCARD: Make that Exhibit 13. And
19 then we will figure out what to call the
20 cross-sections. Did we have a separate numbering
21 system for the confidential documents in the
22 previous hearing? Do you recall?

23 MR. BALCH: I guess you have to refer to
24 it in the testimony.

25 MR. LAKINS: I don't recall that we did.

1 I would -- I could be wrong. I would just suggest
2 we call it Confidential Exhibit 14.

3 MR. BRANCARD: We will call it Exhibit
4 14C.

5 MS HENRIE: I will get your copies to you
6 as soon as I can.

7 MR. LAKINS: Redo the ones that were
8 printed so they are in numbered sequence?

9 MS HENRIE: I did. Mr. Chairman, before
10 we close, and with apologies, I have heard from my
11 client who objects to moving the hearing to October
12 8th. We filed our applications on June 1st. We
13 were assured by the agency they would be processed,
14 and here it is months later, again, before we get
15 through this process. Is there any way we could try
16 to resume tomorrow? Is there any -- I mean, we now
17 don't have any more witnesses. We are ready to rest
18 and so it's just a question of hearing AmeriCulture
19 and any division witness.

20 MR. LAKINS: I thought you had one more.

21 MS HENRIE: We were going to bring back
22 Roger and Monte.

23 MR. BALCH: Your prehearing statement said
24 seven hours of testimony. We can't help it if it
25 takes two days to do that.

1 MR. BRANCARD: I think the commission is
2 trying its best to get this done as soon as
3 possible. We have other hearings we had to put off
4 to hear this. So our process is what it is. So I
5 think one thing I would suggest is that the parties
6 sort of come prepared for the next hearing. Start
7 thinking already about proposed orders, proposed
8 findings and conclusions, because that's going to be
9 the next step after the commission makes the
10 decision is rendering a decision to try to deal with
11 your concerns about time. That usually adds several
12 months or weeks to the process.

13 MS HENRIE: Could the commission order the
14 parties to do that? We are ready. We have got ours
15 drafted.

16 MR. BRANCARD: Bring it with you then.
17 This morning at the hearing the party came with an
18 order. Obviously, that was a lot quicker.

19 MS HENRIE: I really want to cut down in
20 post-hearing briefing or delays or arguments. We
21 have had a lot of time together and we are going to
22 have more.

23 MR. BRANCARD: Mr. Lakins, how many
24 witnesses do you have?

25 MR. LAKINS: Three.

1 MR. BRANCARD: Do you recall how much time
2 you have?

3 MR. LAKINS: We are going to say four. We
4 are going to start at 1:00 o'clock. On that day we
5 will get through, in my opinion, two for sure that
6 one day. Mr. Seawright will be last. I don't see
7 us taking our presentation part as being four hours.
8 Cross-examination and the commission's questions
9 obviously.

10 MR. BALCH: And rebuttal.

11 MR. LAKINS: Yeah. But from my
12 presentation of my three witnesses, I will do my
13 best to get through all of them as fast as possible.
14 I anticipate the first two on that afternoon for
15 certain.

16 MS MARKS: Just so I don't forget, there
17 was a letter that came in as a public comment
18 yesterday.

19 MR. BRANCARD: Revised version came in
20 today.

21 MS. MARKS: I don't know what you want to
22 do about that but it came in when the hearing was
23 scheduled.

24 MR. BRANCARD: It's non-technical
25 non-party comments.

1 MS. MARKS: I just don't want something
2 not be made part of the record.

3 MR. BRANCARD: Did you have a chance to
4 read it?

5 MR. LAKINS: I have not seen it.

6 MS. MARKS: It did not go to either
7 counsel.

8 MR. BRANCARD: We will forward it. Thumbs
9 up or thumbs down on the comments. Non-technical,
10 non-sworn, non-party comments.

11 CHAIRMAN CATANACH: Mr. Lakins, at the
12 next hearing can you be prepared with a draft order?

13 MR. LAKINS: Yes, sir.

14 MS HENRIE: Thank you.

15 CHAIRMAN CATANACH: Do we have enough
16 copies to distribute those now?

17 MS HENRIE: Yes, we do.

18 CHAIRMAN CATANACH: So that's 12 and 13,
19 right?

20 MS HENRIE: 12, 13 and 14C.

21 CHAIRMAN CATANACH: So at this time we
22 will admit Exhibits 12, 13 and 14C.

23 (Note: Exhibits 12, 13 and 14C admitted.)

24 MS HENRIE: Thank you, Mr. Chairman.

25 MR. BRANCARD: You will get us a better

1 version of Exhibit 11?

2 MS HENRIE: Yes, I will. And shall I
3 e-mail you copies? Would that suffice or shall I
4 bring hard copies or both?

5 MR. LAKINS: If you would e-mail me as
6 soon as possible. Also e-mail me the maps. Yes,
7 please.

8 MR. BRANCARD: If you could, Ms. Henrie,
9 try to send these to Mr. Dominici.

10 MS HENRIE: Yes. I'm just writing exhibit
11 numbers on them. I don't have anything more to
12 present today. I would like to save resting my case
13 and closing argument until next time.

14 CHAIRMAN CATANACH: We will save it. So
15 there being nothing further, we will adjourn the
16 hearing for now and reconvene on October 7th at 1:00
17 p.m.

18 (Note: The hearing was concluded at
19 5:10).

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REPORTER'S CERTIFICATE

I, JAN GIBSON, Certified Court Reporter for the State of New Mexico, do hereby certify that I reported the foregoing proceedings in stenographic shorthand and that the foregoing pages are a true and correct transcript of those proceedings and was reduced to printed form under my direct supervision.

I FURTHER CERTIFY that I am neither employed by nor related to any of the parties or attorneys in this case and that I have no interest in the final disposition of this case.

JAN GIBSON, CCR-RPR-CRR
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