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2 Non-Binding Arbitration Before

3 Jeffrey C. Fereday, Arbitrator

4 Initialed Pursuant to Final Settlement Stipulation

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6 Kansas v. Nebraska & Colorado

7 No. 126, Orig., U.S. Supreme Court

8 Decree of May 29 2003, 538 U.S. 720

9 N-CORPE Augmentation Plan

10 (Arbitration Initiated July 10, 2013)

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14 DEPOSITION OF

15 SAMUEL PARKER PERKINS, P.E.,

16 taken on behalf of the State of Nebraska, pursuant

17 to Notice to Take Deposition, beginning at 8:44

18 a.m. on the 30th day of January, 2014, at the

19 Robert J. Dole United States District Courthouse,

20 500 State Avenue, Courtroom 440, in the City of

21 Kansas City, County of Wyandotte, and State of

22 Kansas, before Douglas Stone, C.C.R., R.P.R.

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25 .

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1 ALSO PRESENT:

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3 Mr. James C. Schneider, Ph.D.

4 Deputy Director, Nebraska Department of

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6 Mr. Jasper Fanning

7 General Manager Upper Republican NRD

8 Mr. Thomas E. Riley, P.E.

9 The Flatwater Group, Inc.

10 Mr. Marc Goff, P.E.

11 The Flatwater Group, Inc.

12 Mr. David Kracman (By telephone)

13 The Flatwater Group, Inc.

14 Mr. Willen Schreuder (By telephone)

15 Mr. Brian Dunnigan (By telephone)

16 Nebraska Department of Natural Resources

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1 SAMUEL PARKER PERKINS,
2 called as a witness on behalf of the State of
3 Nebraska, was sworn and testified as follows:

4 (THEREUPON, Perkins Deposition Exhibit
5 No 1, No 2, and No 3 were marked for
6 identification by the reporter.)

7 DIRECT-EXAMINATION

8 BY MR. WILMOTH:

9 Q. Good morning, Dr. Perkins.

10 A. Good morning.

11 Q. Thank you for coming to Kansas City
12 today, we appreciate your participation. And Dr.
13 Perkins, when was the last time that you were
14 deposed by the State of Nebraska, do you recall?

15 A. It was June, 2013.

16 Q. Okay. Do you recall being deposed in
17 regard to the matter of the Rock Creek
18 Augmentation Project at all?

19 A. No.

20 Q. When we spoke last in June of 2013 the
21 topic was not augmentation but a different matter,
22 correct?

23 A. Correct.

24 Q. Do you recall generally what that matter
25 was?

1 A. It's -- it's about the accounting issue
2 for how to account for water, I guess.

3 Q. I'd like you to highlight for me any
4 material background that you possess and personal
5 experience with augmentation projects.

6 A. I don't have any personal experience with
7 augmentation projects.

8 Q. Have you ever previously done any
9 modeling with respect to a water augmentation
10 project?

11 A. Yes.

12 Q. Could you please describe that for me?

13 A. I've worked on incorporating the pipe
14 flows of augmentation as inputs to groundwater
15 model.

16 Q. Were those theoretical exercises or were
17 you working on a specific augmentation project?

18 A. Those were specific augmentation
19 projects.

20 Q. Could you name those for me?

21 A. Colorado Compliance Pipeline Project.
22 And Rock Creek -- Rock Creek Project and the
23 Medicine Creek N-CORPE Project.

24 Q. So you have performed some modeling work,
25 I understand it, on each of the three projects you

1 just described?

2 A. Yes.

3 Q. Okay. Have you had occasion to work on
4 any other augmentation projects either within the
5 State of Kansas or elsewhere?

6 A. No. I don't -- think that's -- that's
7 about it.

8 Q. Could you describe for me generally the
9 nature of the work that you performed with regard
10 to the N-CORPE project, and before you do that,
11 for the court reporter's benefit, that's N-C O R P
12 E. And that's an acronym which stands for the
13 Nebraska Cooperative Republican Plat Enhancement
14 Augmentation Plan.

15 A. I just tried to incorporate the pipe
16 flows that were described in Nebraska's proposal
17 as inflows to stream system as part of the RRCA
18 groundwater model, and trying to observe the
19 assumptions that were incorporated.

20 Q. What -- what was the purpose of that
21 effort? Were -- what were you trying to achieve
22 by doing that?

23 A. Essentially to see how the pipe flow from
24 the augmentation project would interact along the
25 stream with the groundwater model.

1 Q. Okay. Was that the extent of your
2 efforts in regard to the project?

3 A. Yeah. That's -- that's -- pretty much
4 describes it.

5 Q. Okay. What was your general conclusion?

6 A. Well, there's pretty strong interaction
7 in terms of stream leakage, evaporative
8 transportation and change in storage.

9 Q. Could you explain what you mean by the
10 change in storage?

11 A. Well, that would be mainly just the flow
12 of water into -- into groundwater by way of
13 streambed leakage.

14 Q. And was it a substantial amount of water
15 that ended up in storage?

16 A. Yes.

17 Q. About how much water ends up in storage
18 as a result of the project?

19 A. I think about a -- around a -- about a
20 third -- about -- up to -- up to a third of the
21 water. It depends on the conditions. It -- it's
22 also quite highly dependent on how much you
23 actually put in. If you put in 60,000, you know,
24 it's not going to be -- it's going to be a lower
25 fraction. If you put in less you're going to see

1 a higher fraction going into storage.

2 Q. And this leakage into storage is part of
3 a concept, I think, known as a transit loss, is
4 that correct?

5 A. Yes.

6 Q. Do you recall quantifying the total
7 transit losses associated with the operation of
8 the project at various levels?

9 A. Yes.

10 Q. Could you describe the extent of the
11 losses with respect to each operation that you
12 analyzed?

13 A. Well, I analyze -- assumptions of 10,000
14 acre feet per year, up to 60,000 acre feet per
15 year. According to the -- the schedule of five
16 years on -- with that 60,000 and during the two --
17 2002 to 2006 equivalent years, and -- and no
18 augmentation for the intervening years.

19 And beginning in -- with the lowest, the
20 10,000 acre feet, I saw essentially all of the
21 water leaking into the groundwater within the
22 first few reaches of Medicine Creek putting it in
23 at the top reach. With -- after a few years
24 getting a little bit downstream, but -- but -- and
25 at 20 percent there was --

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1 Q. Excuse me. I think you said 20 percent.

2 Did you mean 20,000 acre feet?

3 A. I meant 20,000 acre feet. Thanks. The
4 losses weren't quite as bad.

5 Q. Do you recall what they were as a
6 percentage of the volume discharged from the
7 pipeline?

8 A. Well, I don't -- I don't recall the exact
9 numbers off the top of my head. But I -- I -- it
10 -- it might have been in the 20 to 30 percent
11 range actually reached Strunk Reservoir.

12 Q. So am I correct then that you're saying
13 it's 70 to 80 percent of water would have been
14 lost between discharge?

15 A. I think that's what it was. I -- I -- it
16 was -- with the -- it might have been low -- low
17 20s or less for the 10,000, but it's -- it
18 averaged over the -- the full cycle since there's
19 a little bit of recovery. A better percentage for
20 the -- much, much better percentage for the 20
21 percent and -- I mean, 20,000. 30,000 it just --
22 the percent that gets down to Strunk increases
23 with each -- with each step up. But from the 0 to
24 20,000 range it looked like there's pretty drastic
25 loss in the first few reaches.

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1 Q. Do you recall what the loss was for the
2 30 and 60,000 acre foot scenarios respectively?

3 A. I think it was in the range of -- I think
4 it was about 30 percent loss for the 60 and about
5 40 -- 40 percent loss -- for the -- for the 30.
6 And I haven't reviewed those numbers for a while
7 so I'm -- I may be -- I may be off on those.

8 Q. I believe yesterday you were contacted
9 and asked to provide some additional material that
10 backed up the report?

11 A. Yeah.

12 Q. I understand you've done that, is that
13 correct?

14 A. That's right.

15 Q. Does that material help answer the
16 questions that I just asked or is that unrelated?

17 A. No. Those were really -- those files
18 were essentially the same as the -- for the
19 baseline conditions. It shouldn't have affected
20 any -- any of the results, I think. Substitute in
21 files that we provided in November of 2011 and
22 should give you the same -- same results.

23 Q. Okay. Thank you. Dr. Perkins, can you
24 explain for me that your personal history with
25 Medicine Creek. Have you actually been to the

1 Medicine Creek sub basin before?

2 A. I don't -- I don't believe so.

3 Q. What is the, kind of, basis of
4 familiarity with that sub basin and it's
5 hydrologic components?

6 A. Essentially my work with the -- the RRCA
7 groundwater model.

8 (THEREUPON, a discussion was had off the
9 record.)

10 BY MR. WILMOTH:

11 Q. Dr. Perkins, I'd like to hand you a
12 document we'll mark as Exhibit 4.

13 (THEREUPON, Perkins Deposition Exhibit
14 No 4 was marked for identification by the
15 reporter.)

16 BY MR. WILMOTH:

17 Q. To our deposition. We have not gotten to
18 1 through 3 yet so well take these slightly out of
19 order. I will represent to you, Doctor, that I
20 obtained this exhibit from the website at the
21 address located at the bottom of the page. Have
22 you seen this particular information before?

23 A. That -- I believe I have.

24 Q. Could you describe what it demonstrates?

25 A. Well, it -- this, it looks like it's

1 describing a pretty good match between the base
2 flow component from a base flow separation of --
3 of -- runoff from stream flow -- runoff from base
4 flow with predicted base flow calculated by the
5 groundwater model.

6 Q. Am I correct in understanding that this
7 indicates that Medicine Creek is a base flow
8 dominated stream?

9 A. Off the -- I'm not sure. It -- it's not
10 showing what the total stream flow is, but --

11 Q. Does it --

12 A. -- could be.

13 Q. Okay. Does this indicate to you that
14 Medicine Creek does have a steady base flow?

15 A. Yes. It -- it looks like it.

16 MR. GRUNEWALD: Tom, I -- just for the
17 record, and this is probably catching me up
18 because Sam's the model guy. You have a website
19 address but we've got no not other context in the
20 record. Is this a snapshot in time? I'm just not
21 really clear on what the graph is, when it was
22 produced, that sort of thing. So if we could get,
23 I think, some background that's important to
24 make --

25 MR. WILMOTH: Sure.

1 MR. GRUNEWALD: -- on the record here.

2 MR. WILMOTH: My understanding is that
3 this is a base flow prediction that is part the
4 backup information that supports the RRCA
5 groundwater model.

6 BY MR. WILMOTH:

7 Q. Is -- is that a fair characterization,
8 Doctor?

9 A. Yeah. I think so.

10 Q. Okay. And am I correct in understanding
11 that this would have been something that you
12 worked on as part of your duties in --

13 A. No.

14 Q. No?

15 A. No.

16 Q. Did you participate in developing the
17 RRCA groundwater model?

18 A. No.

19 Q. Okay. What is the -- can -- or can you
20 determine the base flow of Medicine Creek from
21 this material?

22 A. Well, from the graph it might be a little
23 bit difficult. If you want to -- if you had the
24 table you could -- table of numbers you could
25 calculate a mean or statistics from them.

1 Q. Okay. Thank you. Based on your
2 experience how would you characterize the nature
3 of Medicine Creek specifically? Is it a gaining
4 or losing stream?

5 A. I -- I don't think I could tell you from
6 my knowledge of Medicine Creek, but it appears to
7 be a gain -- gaining stream.

8 Q. Have you had any occasion to evaluate
9 groundwater levels in and around the project area?

10 A. No.

11 Q. Do you have an opinion about, for
12 example, the depth to groundwater at the N-CORPE
13 Project site?

14 A. I don't have a -- no. I -- I don't have
15 a personal opinion on that.

16 Q. In ascertaining the extent of losses to
17 the aquifer system as a result of the project
18 operation would the depth to groundwater be a
19 relevant consideration for you?

20 A. Yes.

21 Q. How does the depth to groundwater affect
22 the determination of what I will generally call
23 transit losses? If you want to parse that into
24 components, that's fine. But how does the depth
25 to groundwater affect transit losses in a reach?

1 A. If the groundwater level is below the
2 level of the water in the stream then it's going
3 to show up -- flow from the stream into the
4 groundwater based on the hydraulic -- based on the
5 difference in the levels between the stream and
6 the groundwater. And if the groundwater level's
7 below the streambed you're going to have a dis --
8 disconnect -- still have the flow from the stream
9 -- stream -- through the streambed into the
10 groundwater.

11 **Q. And if the inverse is true and the**
12 **groundwater level is essentially at the surface,**
13 **what's the result?**

14 A. You -- you have on the average an equal
15 interchange or -- or no flow.

16 **Q. No flow into the aquifer, you mean?**

17 A. Right. If you had the groundwater and
18 the stream stage elevations were the same --

19 THE REPORTER: Repeat that. I couldn't
20 hear you.

21 THE WITNESS: You'd have a negligible
22 flow between the two.

23 BY MR. WILMOTH:

24 **Q. Could you explain to me in your**
25 **understanding, how does the model treat Medicine**

1 Creek? Does it street it as a gaining reach?

2 A. Yeah. In general it's -- I think it
3 treats it as a gaining reach -- well, depending on
4 which part of the reach you're looking at, but I
5 think it's -- you're going to see -- just from the
6 results of the model it's -- looks like gaining
7 reach up -- up top down to Strunk Reservoir.

8 Q. Okay. Thank you. I'd like to hand you a
9 couple of exhibits and just get these out of the
10 way so we can refer to them. The first is a
11 notice of deposition --

12 A. Uh-huh.

13 Q. -- which we premarked as Exhibit 1. Have
14 you seen that document, Doctor?

15 A. Yes.

16 Q. And there's a request in that document to
17 bring with any supplemental materials today. Have
18 you done so?

19 A. No.

20 Q. Thank you. Are there any supplemental
21 materials that you intend rely on?

22 A. No. Not that I -- not that I know of.

23 Q. Thank you. I'm also going to had you
24 what we've pre-marked as Exhibit 2, which is the
25 N-CORPE proposal, if you will. I'll use that as a

1 shorthand description of Exhibit 2. Have you seen
2 that document?

3 A. Yes.

4 Q. And you can keep that for your reference.

5 A. Okay.

6 THE WITNESS: Are these yours?

7 BY MR. WILMOTH:

8 Q. And then I'll hand you what we premarked
9 as Exhibit 3 which I believe to be a copy of your
10 expert report in this case --

11 A. Uh-huh.

12 Q. -- is that correct?

13 A. Yes.

14 Q. Thank you. Now I'd like to hand you what
15 we've marked as -- or what we will mark, excuse
16 me, as Exhibit 5 and ask you to review this letter
17 very briefly.

18 (THEREUPON, Perkins Deposition Exhibit
19 No 5 was marked for identification by the
20 reporter.)

21 MR. WILMOTH: For the folks on the phone
22 this is a letter dated January 14, 2013, from Mr.
23 Barfield to Mr. Dunnigan.

24 BY MR. WILMOTH:

25 Q. Have you seen this document which we've

1 marked as Exhibit 5, Doctor?

2 A. I believe I have.

3 Q. And if you look at the middle of the
4 first paragraph on the first page there's a
5 reference to an Imports Document. Do you see
6 that?

7 A. Yes.

8 Q. Do you recall reviewing that document?

9 A. I -- I don't recall seeing that document.

10 Q. Okay. Do you recall performing any work
11 to analyze the concept that is described here as
12 the Imports Document?

13 A. No.

14 Q. Thank you. Okay. Let's turn to what is
15 marked as Exhibit 3 which is a copy of your expert
16 report --

17 A. Okay.

18 Q. -- if you would. Looking at the
19 introduction about halfway down there's -- you
20 note that the Nebraska proposal fails to account
21 for transit losses associated with the project?

22 A. Yes.

23 Q. Do you see that?

24 A. Uh-huh.

25 Q. Could you explain to me how the RRCA

1 accounting procedures presently address transit
2 losses?

3 A. No. I -- I don't think -- I don't think
4 I can give you a good explanation on that right
5 now.

6 Q. Okay. Do you know whether transit losses
7 are addressed in the procedures?

8 A. Well --

9 Q. Let me --

10 A. Yeah. Go ahead.

11 Q. Let me try to give you a specific
12 example. The N-CORPE Project obviously involves
13 the discharge of water through a pipe --

14 A. Uh-huh.

15 Q. -- into the Medicine Creek and then that
16 water travels down the Medicine Creek through the
17 system. And if I understand it, you have
18 expressed some concern or some anticipation that
19 there would be a transit loss associated with
20 that --

21 A. Correct.

22 Q. -- correct?

23 A. Right.

24 Q. And if I understand it you're suggesting
25 that transit loss should be quantified and

1 deducted from the augmentation water supply,
2 correct?

3 A. Correct.

4 Q. Hypothetically if the water that we're
5 talking about were generated by virtue of shutting
6 down groundwater pumping and the water just
7 accrued to the stream, how would the transit
8 losses associated with that water be measured as
9 they made their way down to the main stem?

10 A. By shutting down wells the -- it -- you
11 -- you'd see it through groundwater level recovery
12 and -- and increased base flow, I imagine.

13 Q. But would you actually utilize some tool
14 to quantify the transit losses and assign them as
15 such to the State of Nebraska?

16 A. Well, if you call that transit loss
17 recovery of groundwater levels which increases
18 base flow, then you have groundwater model as your
19 tool to -- to make the measurement.

20 Q. Okay. So -- so the loss would be
21 quantified using the model, is that what you're
22 saying?

23 A. The increased base flow would be
24 quantified by the model, and so I don't -- I'm not
25 sure I follow how that's --

1 Q. Let's say the base flow then materializes
2 and there's a volume of base flow associated with
3 this 5,000 acre feet. How would you assign
4 transit losses to that volume of base flow that
5 actually manifests itself as it moves down the
6 system?

7 A. I can't tell you off the top of my head
8 how to do that.

9 Q. Is that something that's done today under
10 the RRCA --

11 A. Not that I -- I -- I don't -- I'm
12 familiar with how we evaluate depletions today,
13 but I'm not familiar with how you might translate
14 that into the concept of transit loss.

15 Q. Okay. Further down in this paragraph you
16 indicate that the proposal -- Nebraska's proposal
17 fails to describe how augmentation water would be
18 routed through the remainder of the stream system.
19 Do you see that?

20 MR. GRUNEWALD: I'm sorry. Where is
21 that?

22 MR. WILMOTH: Bottom of the introduction.

23 A. Uh-huh, yes.

24 BY MR. WILMOTH:

25 Q. Do you have an opinion about the manner

1 in which the water associated with the project
2 should be routed? In other words --

3 A. No.

4 Q. -- do you have a preferred routing
5 procedure?

6 A. No.

7 Q. Are you familiar with Nebraska's
8 integrated management plans at all, Doctor?

9 A. Yes.

10 Q. If through those plans or otherwise
11 Nebraska commits to ensuring that the volume of
12 augmentation water supply as calculated actually
13 reaches the state line at Hardy, are you with me
14 in my hypothetical?

15 A. No.

16 Q. So 10,000 acre feet of water is
17 calculated as the augmentation credit, and 10,000
18 acre feet reach the state line at Hardy, do you
19 follow that hypothetical?

20 A. That would be a -- putting 10,000 acre
21 feet in with the augmentation pipe and 10,000 acre
22 feet reach the state line.

23 Q. Correct. That's the hypothetical.

24 A. Okay.

25 Q. So based on that hypothetical, my

1 question is, assuming that were the case, would
2 the routing issue matter to you?

3 A. I don't -- I don't think so, but I'm --
4 I'm not sure.

5 Q. How might it -- the routing be relevant
6 at that point? It -- it occurs to me it would
7 become irrelevant, but perhaps I'm not
8 understanding.

9 A. How will the routing be relevant?

10 Q. Yes. If the same volume that's
11 calculated as the credit actually reaches the
12 state line.

13 A. The retiming might be relevant. It's --
14 that occurs to me that -- possible -- possible
15 problem.

16 Q. And could you explain what you mean by
17 retiming?

18 A. Just the -- providing water at a time
19 that Kansas can use it is preferable to providing
20 it at a time when Kansas can't use it.

21 Q. Okay. So it's a timing issue rather than
22 a volumetric issue?

23 A. Yes. It could be an issue.

24 Q. Okay. Thank you. Let's move on to the
25 next section entitled Hydrologic Concepts

1 Associated With Stream Augmentation. In the
2 second line of the first paragraph you indicate
3 that this water that's discharged from the project
4 will interact with the hydrologic system in the
5 same manner as other stream flow. Do you see
6 that?

7 A. Yes.

8 Q. Could you explain what you mean by that
9 statement?

10 A. Well, I'm a -- I'm a co-author on this
11 and I'm not -- I -- Steve's the lead author, so
12 I'm not going to say it's my words, but as a co-
13 author it's --

14 Q. Sure

15 A. -- I guess you could call it mine in
16 quotes.

17 Q. Well, I guess my question, if --if the
18 water discharged from the project will interact
19 with the hydrologic system in the same manner as
20 other stream flow, are you suggesting that we
21 would just treat this as surface water as any
22 other water in the -- in Medicine Creek, is that
23 the point?

24 A. Yeah. I think that's -- that -- that's
25 fair.

1 Q. The next sentence indicates that the
2 increased stream water level will change the
3 interaction between the stream system. Have you
4 attempted to quantify how and when that would
5 occur?

6 A. Well, just from model runs.

7 Q. The examples you presented in the
8 document?

9 A. Yes.

10 Q. Okay. Thank you. To the best of your
11 knowledge based on your work, will the groundwater
12 levels always increase as a result the project?
13 And I'm referring to the third sentence here in
14 this paragraph.

15 A. Well, I think they'll just generally
16 increase groundwater levels.

17 Q. And if the groundwater is actually
18 manifested at the surface then what happens?

19 A. The groundwater is at the surface?

20 Q. Yes. What happens to the discharge, the
21 augmentation water?

22 A. Well, it's just going to flow down
23 gradient, down -- downstream or -- or flow in and
24 out of the groundwater depending on local
25 gradient.

1 Q. Okay. Beginning of the next paragraph
2 indicates that at least conceptually a relatively
3 small amount of the augmentation water would
4 actually reach Harry Strunk, is that correct, a
5 correct interpretation?

6 A. Right. Correct.

7 Q. When you are talking about a relatively
8 small amount, are you referring to the analysis
9 that we discussed at the beginning the deposition
10 concerning the four scenarios that you ran in the
11 model?

12 A. Yes.

13 Q. Okay. So a relatively small amount with
14 respect to the 10,000 acre foot scenario would be
15 virtually none, I assume?

16 A. No. I -- I think maybe I'll correct
17 that. I would -- I think a relatively small here
18 would mean with respect to the 60,000 acre feet.

19 Q. Okay.

20 A. In which case 10,000 acre feet would be
21 relatively small. And it could be smaller.

22 Q. I want to be sure I understand what
23 you're saying. Are you suggesting under the
24 60,000 acre feet scenario only 10,000 acre feet
25 would reach Harry Strunk?

1 A. No. I'm only saying with respect to the
2 60,000 acre feet a 10,000 acre per year
3 augmentation might be characterized as relatively
4 small amount of -- or maybe I'm missing your
5 question.

6 Q. I understood the meaning of this sentence
7 to be that if you put a lot of water into the
8 system only a small part of that might actually
9 reach Harry Strunk Lake, is that correct? If I'm
10 misinterpreting the sentence just let me know.

11 A. No. This -- the first sentence it's only
12 saying that the amount of augmentation is
13 relatively small as the flow out of the pipe.

14 Q. Is relatively small in comparison to
15 what?

16 A. The proposal 60,000 acre feet, so.

17 Q. So if -- if the proposal were implemented
18 in a manner that only 10,000 were discharged, that
19 would be relatively small compared to the total
20 amount that could be discharged, is that your
21 point?

22 A. Right. That would be -- it's --

23 Q. Okay.

24 A. -- it's describing. I'm just saying
25 10,000 acre-foot would be relatively small

1 compared to 60,000 acre-foot discharge.

2 Q. Okay. But you're not suggesting that
3 only 10,000 acre feet would actually reach the
4 intended destination?

5 A. No.

6 Q. Okay.

7 A. That's --

8 Q. Okay.

9 A. That's not -- I think this amount of
10 augmentation's just describing --

11 Q. Okay.

12 A. -- what the assumed pipe flow would be.

13 Q. Okay. A little bit later on in that same
14 sentence there's an assumption that the amount of
15 augmentation water flow is such that all of the
16 water is lost to the groundwater --

17 A. Uh-huh.

18 Q. -- in a relatively short distance.

19 A. Yeah.

20 Q. I want to try and tie that conclusion
21 with the work that I think you've done that we
22 talked about earlier. Are you referring there to
23 the scenario in which only 10,000 acre feet is
24 pumped and discharged?

25 A. Yeah. That's -- that's referring to the

1 -- that would -- that would be an instance of
2 this.

3 Q. Okay. And so under that scenario, as I
4 understand your point, the augmentation water
5 simply increases groundwater storage and virtually
6 none of it reaches Harry Strunk Lake?

7 A. Correct.

8 Q. Okay. This whole paragraph starts with
9 the term conceptually and so I read that to mean
10 in -- in concept this could happen. Is there a
11 inverse concept in which essentially all the water
12 reaches Harry Strunk Lake that's discharged, and
13 under what facts would that occur?

14 A. Well, one way you could ensure it would
15 be to pipe it to Harry Strunk, conceptually. And
16 the problem seems to be mainly in the top end of
17 the -- top end of the stream where you have a --
18 have a strong loss.

19 Q. This -- this is what the model is showing
20 you?

21 A. Right.

22 Q. That there's a strong loss. In other
23 words there's a disconnect between the stream and
24 the aquifer --

25 A. Right.

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1 Q. -- in the upper portion of the project
2 area?

3 A. Right. I mean -- and so conceptually
4 you'd -- you'd pipe it a little bit farther and
5 get -- get -- get past the part where you're --
6 you're -- you're losing.

7 Q. Kind of bridge over the losing reach and
8 hit it at the headwaters there where it starts to
9 flow, is that the idea?

10 A. Right.

11 Q. Okay.

12 A. Then -- then you've got -- still have
13 some interaction but -- but it's -- but you don't
14 have the heavy losses you see up at the
15 headwaters.

16 Q. When you did your calculations and -- and
17 employed the model in this manner with the four
18 different scenarios --

19 A. Uh-huh.

20 Q. -- do you have any -- or do you have any
21 sense or did you draw any specific conclusions
22 about where those losses generally occur? In
23 other words, let me be real specific.

24 A. Uh-huh.

25 Q. Does the 80 percent of the losses occur

1 in the first couple of miles, for example, of the
2 stream reach below the discharge?

3 A. Well, let's take the 10,000 scenario to
4 start with. For that case it looked like you lost
5 all of it in about the first three reaches or so.

6 Q. First three reaches, do you have any idea
7 how --

8 A. Three -- three -- well, these -- are
9 first three grids all starting from the top.

10 Q. So -- and those are a mile a piece?

11 A. Yeah. The grid cells are a square mile,
12 but the length the stream goes through them. It's
13 kind of -- it's -- it's going to meander.

14 Q. Do you have any idea how many river miles
15 are involved?

16 A. I'm -- I -- I think it might be around
17 five miles.

18 Q. Okay.

19 A. I'm guessing it's around five miles. But
20 that's -- so that's the most drastic case, but at
21 20,000 acre feet, you still lose most of the
22 20,000 acre feet but it -- it gets -- some of it
23 gets down to where it starts --

24 Q. Okay.

25 A. -- flowing better.

1 Q. What is it?

2 A. It also matters which -- which year it is
3 because as the years go by you -- since you're
4 charging the groundwater locally you -- you get a
5 little bit better downstream flow.

6 Q. Better transmission over time?

7 A. Right.

8 Q. Into the future?

9 A. Right.

10 Q. Okay. Could you describe for me what it
11 is about the model or about Medicine Creek as
12 represented in the model that identifies the point
13 where these losses end? In other words, what is
14 it in the model at river mile five below the
15 outlet that changes the loss structure?

16 A. Well, it's -- it's really past river mile
17 five. It's -- I think it might be closer to
18 river mile ten when -- where you reach a point
19 where the groundwater levels are -- are pretty
20 close to the -- to the surfaces.

21 Q. Okay.

22 A. So that you get a -- get a about an even
23 interaction between groundwater and the stream.

24 Q. Perhaps this is too much of a layperson
25 oversimplification, but does that mean that the

1 model is predicting or -- or assuming that the
2 headwaters of Medicine Creek is located somewhere
3 ten miles downstream?

4 A. That -- that sounds -- that sounds like a
5 reasonable --

6 Q. That's where the --

7 A. -- description.

8 Q. -- water starts to come up on the
9 surface? In other words --

10 A. Yeah.

11 Q. Thank you.

12 A. I think that sounds right.

13 Q. That was probably awkward -- awkwardly
14 presented.

15 A. No.

16 Q. But I appreciate you hanging with me.

17 A. Well, my co-author, Steve, he's -- he's
18 done more detailed analysis of this -- this
19 situation. So -- so I -- I defer.

20 Q. But you're familiar with the model
21 structure?

22 A. Right.

23 Q. And kind of what it --

24 A. Right.

25 Q. What it thinks Medicine Creek looks like?

1 A. Right.

2 Q. Okay. If the model demonstrated or
3 predicted or assumed that the headwaters of
4 Medicine Creek started at the discharge point
5 would that affect your analysis at all?

6 A. No --

7 MR. STEINBRECHER: I'm going object to
8 the form of the question. You can answer.

9 BY MR. WILMOTH:

10 Q. Do you understand my question? Why don't
11 I ask the court reporter to read it back.

12 MR. WILMOTH: Could you read it back?

13 THE REPORTER: If the model demonstrated
14 or predicted or assumed that the headwater of
15 Medicine Creek started at the discharge point
16 would that affect your analysis at all.

17 THE WITNESS: It would affect the results
18 but I -- I don't know that it would affect my
19 analysis.

20 BY MR. WILMOTH:

21 Q. Do you have an opinion about how the
22 results might change?

23 A. Okay. That's -- okay. By the headwaters
24 you mean the groundwater level would be --

25 Q. Manifested on --

1 A. -- on the surface then.

2 Q. -- the surface. Yeah.

3 A. Then you'd see a -- you'd see a much less
4 drastic loss, I think --

5 Q. Okay.

6 A. -- for a low -- low augmentation like
7 that.

8 Q. Kind of along the same lines, I'm trying
9 to get at some of the relationships of the model
10 to what's actually going on in Medicine Creek.

11 A. Uh-huh.

12 Q. If the actual groundwater levels at the
13 project area are higher than are represented in
14 the model would that affect your conclusions,
15 potentially?

16 A. In project areas at the area the
17 discharge?

18 Q. Yes, sir.

19 A. Or.

20 Q. Yes, sir.

21 A. Well, they would -- they -- they --
22 they'd affect the results depending on how much
23 higher they were.

24 Q. Am I correct then in understanding based
25 on your prior analysis that the losses might be

1 less if groundwater levels are higher?

2 A. They would be less. It depends on how
3 much higher the groundwater levels are.

4 Q. Okay. Thank you. Doctor, have you
5 actually identified any losing reaches within
6 Medicine Creek? I understand you to say that it's
7 a gaining stream on the whole, but have you
8 identified losing components of that?

9 A. Well, I'd say the -- about first ten
10 model grid cells, around first ten, I'd say those
11 are about always losing. Just --

12 Q. The first ten cells?

13 A. Right.

14 Q. Okay.

15 A. But normally there's no flow so there's
16 nothing to lose, but there's only something to
17 lose when there's augmentation flowing in there.

18 Q. Understood. Could you please turn to
19 page 2 and look at the middle of the first full
20 paragraph. I understand you to recommend that the
21 augmentation water supply credit be adjusted based
22 on transit losses, is that right?

23 A. Right.

24 Q. How would you recommend that be done?

25 A. I don't have a specific recommendation.

1 Q. Would it be feasible to measure the
2 outflow of the augmentation project and compare
3 that to the flows and the gages down stream? In
4 other words, if the -- by way of example, if a
5 discharge were 20,000 acre feet but the gage only
6 read 10,000 acre feet, you would assign a 10,000
7 acre foot transit loss?

8 A. That -- that might do it.

9 Q. Okay. And by the inverse, I assume you
10 could take those same measurements, and if the out
11 -- the discharge were 20 and the gauge actually
12 read 20, could we infer there were no transit
13 losses of any material amount?

14 A. No. Just because you're going to be --
15 it's likely you're going to be gaining base flow
16 anyway so -- so that the 20,000 that's re-gauged
17 doesn't necessarily reflect what came out of the
18 pipe.

19 Q. And we have preexisting measurements of
20 the base flow, don't we?

21 A. Well -- well, we have -- we have models
22 showing computer based flow. We have base flow
23 separations but we have stream flow measurements.

24 Q. And if you have those measurements is it
25 possible to identify the base flow volume and then

1 quantify the amount of augmentation water actually
2 reaching the gauge? In other words, calculating
3 transit losses based on those gauge flows?

4 A. I -- I think it's kind of difficult to
5 track exactly how much -- how much reaches the
6 gauge, but it's -- I don't -- I don't think it's
7 more -- I -- I can't give you a outline off the
8 top of my head how the -- how to try to evaluate
9 the -- how much actually gets to the gauge.

10 Q. Okay. I'd like to take you down to the
11 last paragraph above the next heading, there's a
12 sentence that begins within the lake. Do you see
13 that?

14 A. Where are you looking at?

15 Q. Right here.

16 MR. GRUNEWALD: Within the lake or --

17 MR. WILMOTH: Within the lake.

18 MR. GRUNEWALD: Within the lake.

19 THE WITNESS: Oh. Within the lake.

20 Okay.

21 BY MR. WILMOTH:

22 Q. And then the next sentence explains that
23 if transit losses are not determined and accounted
24 the proper amount of adjustment to the gauge
25 stream flows cannot be determined. Do you see

1 that?

2 A. Yes. Yes.

3 Q. Understanding that you did some analysis
4 under various scenarios of discharge have you
5 attempted to quantify the actual losses associated
6 with project operations?

7 A. Yes.

8 Q. And is that represented in these
9 calculations we've been discussing about the four
10 different scenarios?

11 A. Yes.

12 Q. Okay. So if I understand what you're
13 saying, based on this work --

14 A. Uh-huh.

15 Q. -- it's the Kansas conclusion or your
16 conclusion on behalf the State of Kansas that if
17 the project were operated at 10,000 acre feet --

18 A. Uh-huh.

19 Q. -- the augmentation water supply credit
20 -- should be essentially zero?

21 A. I -- I don't -- I haven't -- I don't
22 really have that conclusion, I just.

23 Q. Isn't that the logical extent of this
24 statement, though?

25 A. It -- it seems -- seems like a -- that

1 would be reasonable --

2 Q. Okay.

3 A. -- conclusion.

4 Q. Let's look at the first sentence below

5 the next heading. The quantifications of

6 hydrologic impact upstream augmentation and

7 transit loss. Do you see that section?

8 A. Yes.

9 Q. The -- could you read the first sentence
10 out loud for me?

11 A. The RRCA groundwater model provides a
12 tool for evaluating transit losses associated with
13 augmentation water. Left out the extra of.

14 Q. Dr. Perkins, like to hand you what we'll
15 mark as Exhibit 6, and I'll tell you that this is
16 a excerpt of the groundwater model report, and
17 it's only the first of the 11 pages?

18 (THEREUPON, Perkins Deposition Exhibit
19 No 6 was marked for identification by the
20 reporter.)

21 BY MR. WILMOTH:

22 Q. But feel free to have a look at it.
23 Familiarize yourself with it. I'm assuming you've
24 seen this document before.

25 MR. GRUNEWALD: Tom, you said this is the

1 groundwater model documentation. Is this from the
2 Special Master's final report?

3 MR. WILMOTH: There is actually off the
4 same website. The Republican River dot org
5 website that's maintained, it has all this
6 information.

7 MR. GRUNEWALD: Doesn't actually say
8 that, does it?

9 MR. WILMOTH: No. It doesn't.

10 MR. GRUNEWALD: Sorry.

11 MR. WILMOTH: But I'll represent to you
12 that that's the truth and I'd just ask Dr. Perkins
13 if he's familiar with this document generally.
14 It's a fairly lengthy document so I didn't bother
15 to print everything out only because I only have
16 one question.

17 MR. GRUNEWALD: Fair enough. Just a
18 couple things for the record. I notice there's
19 some highlighting in this document. I'm going to
20 guess that that was highlighting you added in this
21 particular version, is that correct?

22 MR. WILMOTH: Correct?

23 MR. GRUNEWALD: And I'm sorry, I probably
24 just not enough coffee this morning. Are you
25 saying this is from -- it's off of the website but

1 it is a reproduction of something out of the
2 Special Master's final report or some other
3 document generated by somebody else?

4 MR. WILMOTH: It's directly off the
5 website. The only modification is my
6 highlighting.

7 MR. GRUNEWALD: Who generated the
8 document on the website?

9 MR. WILMOTH: I believe the RRCA.
10 It's --

11 MR. GRUNEWALD: Well, okay. They don't
12 actually collectively, but maybe we can just do
13 housekeeping off the record. But I just -- so
14 you're not saying this is the groundwater model
15 documentation out of the Special Master's report,
16 you're not saying that?

17 MR. WILMOTH: I'm not saying that.

18 MR. GRUNEWALD: Okay.

19 MR. WILMOTH: I mean, I believe it's a
20 replica of that, but it's from the Republican
21 River Compact dot org website.

22 MR. GRUNEWALD: Okay. I thought it might
23 be the model documentation. But it's just a
24 formatting since it's a different format is all --

25 MR. WILMOTH: Yeah. This is just printed

1 directly off the site.

2 MR. GRUNEWALD: The -- the site's
3 maintained by whom? Maybe -- maybe that will help
4 clear it up for the record.

5 MR. WILMOTH: Principia Mathematica.

6 MR. GRUNEWALD: Okay. Great. Thank you.

7 THE WITNESS: Well, to be honest, I've --
8 I've used the Special Master's Appendix A for my
9 reference.

10 BY MR. WILMOTH:

11 Q. Okay. That's fine. Let me direct your
12 attention to page 11.

13 A. Okay.

14 Q. Do you see the section entitled Streams
15 and Reservoirs?

16 A. Uh-huh.

17 Q. I've highlighted a sentence in this.
18 Could you read that aloud, please?

19 A. It is not a surface water model and total
20 stream flows are not incorporated in its design or
21 calculations.

22 Q. And with respect to it, do you understand
23 this to be referring to the RRCA groundwater
24 model?

25 A. Yes.

1 Q. Okay. Given that caveat, why do you
2 believe that the model provides a good tool to
3 evaluate transit losses in a stream?

4 MR. GRUNEWALD: I -- I'm just going
5 object to form of the question. At this point I
6 haven't heard you confirm that this is the Special
7 Master's report Appendix A, so with that caveat
8 I'm -- I'm not clear whether you're representing
9 that's what it is and you're asking him to adopt
10 that statement and then make a conclusion based
11 upon it. So I just object to that -- the form and
12 the basis for that.

13 MR. WILMOTH: Okay.

14 BY MR. WILMOTH:

15 Q. Do you concur with the statement made in
16 this document here at page 11 that we just read,
17 regardless of the provenance of this document, in
18 other words, do you -- do you concur that the RRCA
19 groundwater model is not a surface water model and
20 total stream flows are not incorporated in its
21 design or calculations?

22 A. Yes.

23 Q. Given that --

24 A. I believe that.

25 Q. I'm sorry. I didn't have mean to

1 interrupt.

2 A. I believe that.

3 Q. Given that, I'll ask again, why is it
4 that you believe that the model is a good tool for
5 evaluating transit losses in a surface stream like
6 Medicine Creek?

7 A. Well, it's -- whether it's stream flow or
8 base flow, it's -- it's going to represent
9 interaction with groundwater through the --
10 through the difference in elevations. Whether you
11 call it stream flow or the base flow component
12 you're still going to have the interactions.

13 Q. Isn't that true with respect to all water
14 that flows on the surface in Nebraska in the
15 Republican River?

16 A. It would be, yes. As far as I -- as far
17 as I know.

18 Q. But we don't calculate and assign transit
19 losses to that water, do we, under the RRCA
20 accounting procedures?

21 A. Well, you account for the interaction and
22 -- and whether you call that transit loss or not,
23 it's -- if -- if what you mean by transit loss is
24 the -- is the interaction that ends up as
25 evapotranspiration --

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1 THE REPORTER: Ends up as what?

2 THE WITNESS: As evapotranspiration or --
3 or storage. Those are -- those are components
4 that are changing what's in the stream flow in the
5 stream.

6 BY MR. WILMOTH:

7 Q. So these losses are inherently baked into
8 the model, is that what you're saying?

9 A. Right.

10 Q. Are transit losses assigned to reservoir
11 releases presently?

12 A. I'm not -- I don't understand quite your
13 use of the term transit loss on that.

14 Q. I'm trying to use it as -- I'm trying to
15 use it as -- in the same vein that you all have
16 used it throughout your report.

17 A. But --

18 Q. Losses to the output.

19 A. Okay. But you're talking about
20 evaluation in the groundwater model?

21 Q. Yeah.

22 A. Well, the groundwater model it's -- all
23 the -- the reservoirs are disconnected so that
24 it's not representing reservoir releases.

25 Q. Let me turn you to the bottom of page 3.

1 A. Of our report?

2 Q. Yes, sir. Sorry. Do you see the
3 sentence beginning all along the 60-plus mile?

4 A. Yes.

5 Q. You mention in this sentence
6 opportunities for transit loss. Have you made any
7 attempt to identify where those opportunities
8 arise specifically?

9 A. Through model runs, compared stream -- or
10 base flow with and without augmentation.

11 Q. Okay. So --

12 A. Along the -- along that creek.

13 Q. And am I correct in understanding that
14 the losses you've identified are as we talked
15 about earlier in the upper portion of the -- of
16 Medicine Creek?

17 A. That -- that's where the -- that's -- the
18 upper portion is where you see the -- the biggest
19 loss.

20 Q. So it -- so -- when you refer to these
21 opportunities you're referring specifically to
22 that location within the first ten river miles or
23 so of the discharge point?

24 A. There's -- there's -- there can be some
25 losses I think all the way along it, but it's --

1 but that's where you have the -- the -- see the
2 biggest --

3 Q. Okay.

4 A. Biggest losses. And that's above Harry
5 Strunk Lake.

6 Q. And then later -- later down in this
7 paragraph you refer to losses below Harry Strunk,
8 obviously, and all the way down to Harlan County
9 Lake. Do you see that?

10 A. Right.

11 Q. Have you made an effort to quantify those
12 losses?

13 A. Yes.

14 Q. Is that in -- contained in the report
15 somewhere?

16 A. I don't -- I don't -- I don't think -- I
17 don't think they look at that specifically just
18 because the reservoir is disconnected. We don't
19 -- we -- we're not routing stream flow down below
20 the reservoir.

21 Q. Below Harry Strunk?

22 A. Right.

23 Q. Okay.

24 A. So -- so in order to route to see what
25 the affects would be below the dam you might --

1 you might see how much water got down to Strunk
2 and then assume that it's bypassed the reservoir
3 and then route that downstream.

4 Q. But you but haven't done that work and
5 reported in this document?

6 A. No. I haven't -- it's not reported in
7 here.

8 Q. Okay. Do you intend to testify about
9 that work in this proceeding?

10 A. No.

11 Q. Okay.

12 A. I --

13 MR. GRUNEWALD: Let me just at least
14 clarify. You're asking him to testify. We've
15 already put our witness list out and since Dr.
16 Perkins is not on it. So the testimony --

17 MR. WILMOTH: Right.

18 MR. GRUNEWALD: -- is the report and Mr.
19 Larson's listed as testifying witness. I didn't
20 want there to be any confusion --

21 MR. WILMOTH: Okay.

22 MR. GRUNEWALD: -- on that.

23 MR. WILMOTH: All I'm trying to get at is
24 if there's some analysis that we haven't seen in
25 that regard yet that's -- backs up this report or

1 something.

2 MR. GRUNEWALD: Fair enough. Your
3 question went to intended testimony.

4 MR. WILMOTH: Sure. Thank you. That's
5 fine. I -- I assume that I can ask Mr. Larson
6 that question.

7 MR. GRUNEWALD: Absolutely.

8 MR. WILMOTH: Okay.

9 BY MR. WILMOTH:

10 Q. Well, but -- but just so I'm clear, you
11 did perform some work on this matter, you
12 possessed the results of that work?

13 A. Right.

14 Q. Okay.

15 A. I've -- I made -- made a run where I see
16 how much water got down to Strunk and then --

17 Q. Uh-huh.

18 A. -- just put that same amount in below the
19 dam --

20 Q. Okay.

21 A. -- to -- to route it down to see how it
22 -- how it fares on the way down to Harlan County.

23 Q. Can you describe the conclusions you drew
24 from that work?

25 A. We saw some losses from Harry Strunk down

1 to Harlan County.

2 Q. As a percentage basis of the discharge
3 volume do you recall what that number was,
4 roughly?

5 A. It was significant but not -- I can't --
6 I can't tell you off the top of my head.

7 Q. Do you recall whether it was more than
8 half or less than half?

9 A. Well, it was less than half.

10 Q. Less than what was lost?

11 A. Yes. I think it was -- it was a -- and
12 that was just for one scenario, for the 60,000
13 acre foot.

14 Q. Just so I'm clear on how you constructed
15 that. Do I understand that you assumed that all
16 60,000 acre feet made it to Harry Strunk?

17 A. No.

18 Q. Okay. So you just built on the work that
19 you had done previously.

20 A. Right. I took the results from previous
21 run to --

22 Q. I understand. And do you happen to
23 recall the amount of water that you found reached
24 Harlan County relative to the 60,000 discharge?

25 A. I -- I think it was on order of half.

1 Q. About 30,000 acre feet of the 60,000
2 actually made it to Harlan County, is that what
3 you're saying?

4 A. I think -- I think it was about -- about
5 half, roughly.

6 Q. Okay. Let's work our way further down on
7 this page 4, the last full paragraph. Starts to
8 explain your work with these four scenarios,
9 correct?

10 A. Yes.

11 Q. And in the second sentence you indicate
12 that you all used essentially the same model files
13 and augmentation sequence used by Nebraska. Do
14 you see that?

15 A. Yes.

16 Q. Could you explain to me what the
17 relevance of the caveat essentially is, did you
18 make any modifications to those?

19 A. Well, initially thought we'd want to look
20 -- we wanted to look at the budgets, the
21 hydrologic -- the whole -- whole water budget.
22 And so I -- I changed some of the input files,
23 just one -- one indicator switch at the top of the
24 file that tells -- tells whether or not to write
25 out the cell by cell files -- cell by cell flows

1 to a -- to a separate file, so I turned those on
2 so we could get those cell by cell files out.

3 Q. What -- what was the value of doing that
4 in your mind?

5 A. That -- the main -- well, that -- that
6 let's just -- let's just look at what the water
7 budgets are locally, and specifically I used --
8 used the cell by cell streambed leakage flows so
9 that I could see what those were in the reaches
10 all along the stream.

11 Q. Is that what helped you identify this
12 initial area of more significant loss around the
13 proximity --

14 A. Yeah.

15 Q. -- of the discharge?

16 A. Yeah. Yes. Those -- those results where
17 I saw that.

18 Q. And turning these on allowed you to
19 distinguish between each cell, is that the idea?

20 A. Right.

21 Q. Okay.

22 A. So the input files, they're -- that's --
23 that's the only -- that's really the caveat, you
24 know. Other -- other than that one switch they're
25 the same files.

1 Q. Just out of curiosity, was -- was it the
2 case that as you went downstream from the
3 discharge point the leakage was uniformly less?

4 A. No. It was -- it -- generally it was --
5 it was about the -- about the first -- around the
6 first ten -- ten grid cells where most of the loss
7 -- you'd -- you'd see a really big loss, and then
8 you just hit -- just hit a point where it would
9 level out.

10 Q. So it was kind of uniform in the first
11 ten cells, as I understand it that it leveled out?

12 A. It would depend if it's -- it depended on
13 the more water you put in the farther the water
14 would get downstream. If you put in just 10,000
15 acre feet you might only get about three grid
16 cells.

17 Q. Okay.

18 A. And after about 20,000 acre feet then the
19 -- that first -- about the first 20,000 acre foot
20 seemed to provide a -- the conditions to get the
21 rest of it downstream.

22 Q. I'd like you take a look at page 5,
23 Figure 2 of your report. I just have a couple
24 questions about these figures. I think based on
25 our conversation I understand the answer to this,

1 but I just want to put it in this context so I'm
2 sure, are you with me?

3 A. Yes.

4 Q. All right. There are four boxes on this
5 page, and in this figure -- and let's just start
6 at the top. I understand this is the 60,000 acre
7 foot discharge scenario, is that right?

8 A. Right.

9 Q. And what is this -- the -- the time scale
10 here on this figure? Is this a monthly loss or --

11 A. Yes.

12 Q. -- an annual? So this is a monthly --

13 A. It's -- it's showing the monthly --
14 monthly results.

15 Q. And when you created this figure were you
16 assuming that the 60,000 acre feet would be
17 discharged uniformly throughout the year? In
18 other words, did you just divide 60 by 12?

19 A. Well, I didn't create the figure.

20 Q. Okay.

21 A. But that was Steve's work.

22 Q. Okay.

23 A. But -- but the assumption's correct that
24 it's -- it was based on just a steady -- steady
25 flow during the year and that.

1 Q. Okay. So basically if I understand it,
2 you were -- if I wanted to put the discharge on
3 this graph you would have had an assumed 5,000
4 acre feet a month?

5 A. Yeah. About -- about 5,000 acre feet a
6 month.

7 Q. Okay. And is that true then with respect
8 to each of the figures on -- excuse me. Each of
9 the boxes?

10 A. Yeah.

11 Q. On the figure?

12 A. Yes.

13 Q. Thank you.

14 A. It's all -- it's all steady flow during
15 the year.

16 Q. Thank you very much.

17 MR. WILMOTH: Why don't we -- let's see
18 how much more do we have here? Are you doing
19 okay, Samuel? Do you want to keep going?

20 THE WITNESS: Sure.

21 MR. WILMOTH: You need a break? All
22 right. Do you need a break?

23 MR. GRUNEWALD: I -- I do.

24 MR. WILMOTH: Okay.

25 (THEREUPON, a recess was taken.)

1 BY MR. WILMOTH:

2 Q. Could you look at the middle of page 6,
3 Sam.

4 A. Mm-huh.

5 Q. Excuse me, Dr. Perkins. I apologize.

6 A. That's all right.

7 Q. This is what happens when you spend too
8 much time together. You indicate there as part of
9 the report that the graphs demonstrate that losses
10 increased with increased amount of augmentation
11 water. Do you see that?

12 A. Yes.

13 Q. I may have misunderstood what you said
14 earlier but I thought you had earlier indicated
15 that the losses were greater with smaller volumes
16 of discharge. Could you clarify that for me?

17 A. I think this is consistent that with the
18 smaller augmentation you see a higher percentage
19 of loss, higher fraction of what you -- what the
20 pipe flow is. But as you increase the
21 augmentation your -- the magnitude of the loss
22 will increase but the percentage will go -- will
23 go down.

24 Q. I understand. So it's a volume issue
25 really?

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1 A. Yeah.

2 Q. Larger -- larger volume, smaller
3 percentage still means more water?

4 A. Right.

5 Q. Okay. Thank you. In the next paragraph
6 you indicate -- you indicate that most of the
7 transit losses occur in the upper reaches. Do you
8 see that?

9 A. Yes.

10 Q. Is that because the assumed groundwater
11 levels around the project are lower?

12 A. Yes.

13 Q. And is that in fact reflected on your
14 Figure 4 in the form of these contour lines? Page
15 8.

16 A. Oh, yes. Yeah. I think that's -- that
17 that's correct.

18 Q. I notice that these contour lines in
19 Figure 4 on page 8 represent contours of increased
20 groundwater level that's a result of the discharge
21 pumping, I assume?

22 A. Right. Well, that's --

23 Q. A result of discharge. Excuse me.

24 A. That's -- yeah. It's the result of the
25 discharge there.

1 Q. And so I infer from that that we assume
2 that the current groundwater levels are at least
3 nine feet deep in that area because they can
4 absorb that increase, is that the idea?

5 A. Yeah. They're -- it's that -- that first
6 section where the groundwater levels are quite a
7 bit lower, apparently.

8 Q. Okay. And is that based on something
9 that is contained within the model, those assumed
10 groundwater levels or have you done some --

11 A. Well, they're -- they're the -- just the
12 computed heads.

13 Q. Okay.

14 A. And that's -- this is just -- map is just
15 showing comparison of the scenario with the 10,000
16 acre foot augmentation pumping. But -- but
17 without -- without putting the augmentation in the
18 model versus the same pumping case putting the
19 augmentation water in the model.

20 Q. Okay. Have you conducted any analysis to
21 determine the actual depth of groundwater or the
22 groundwater levels in this area and how they
23 relate to what is represented in the model?

24 A. I don't -- I -- I may have made a
25 comparison of the stream elevations against the

1 computed heads. I -- I don't -- I don't -- but,
2 yeah, I -- I did -- I did do that at least along
3 the stream to see -- pretty sure that -- I did
4 that just to see what the difference was.

5 **Q. These are looking at two different model**
6 **scenarios?**

7 A. No. They're looking at the -- what I was
8 looking at was just I think the streambed
9 elevation versus computed heads. The difference
10 between streambed elevations, computed heads. So
11 that's not exactly the -- that's -- that's taking
12 the streambed elevation that's a little bit --
13 that's a little lower than what the stream
14 elevation would be if -- if there's stream flow.

15 **Q. What was the source of that information?**

16 A. Well, the stream head elevations are just
17 part of the stream input.

18 **Q. To the model?**

19 A. Right. And computed heads are the
20 output --

21 **Q. Okay.**

22 A. -- for the case.

23 **Q. I'd like to turn your attention to your**
24 **summary paragraph, Doctor. And midway through the**
25 **final paragraph you discuss the concept of passing**

1 augmentation water through Harry Strunk Lake. Do
2 you see that?

3 A. I -- I do but I might remind you of one
4 thing, that --

5 Q. Sure.

6 A. -- Steve's primary author on this.

7 Q. Sure. And if you --

8 A. And so I -- I mean, I -- so co-author
9 status, but just want to point out that he was the
10 primary author.

11 Q. Sure. If you don't have an opinion about
12 this matter that's fine too. But I -- I did
13 want --

14 A. -- question --

15 Q. -- ask you --

16 A. Sure.

17 Q. -- whether you believe that augmentation
18 water should be simply passed through Harry Strunk
19 Lake and Harlan County Lake or if you have an
20 opinion about the best way to manage that water?

21 A. No. I don't have a -- don't have a --
22 really don't have an opinion on that. You know,
23 to some extent the water that flows into the
24 reservoir would be represented and accounted by
25 the change in storage, and -- I mean, there's

1 aspects of that that would be represented in the
2 accounting anyway.

3 Q. Okay. Quick question on the stream
4 elevations we talked about earlier.

5 A. Uh-huh.

6 Q. Regarding those stream elevations and the
7 calculated heads you mentioned.

8 A. Uh-huh.

9 Q. Are those on the mile grid cell you
10 mentioned?

11 A. Right.

12 Q. Both -- both are?

13 A. The -- right. Yeah. It's the -- just
14 the cell by cell --

15 THE REPORTER: A cell by cell what?

16 THE WITNESS: Cell by cell elevations.

17 Sorry.

18 BY MR. WILMOTH:

19 Q. And then finally in the -- at the end,
20 the summary, there's a statement included here
21 that Nebraska's assumption that all the
22 augmentation water will pass through this stream
23 gauge is unrealistic. Given your experience, Dr.
24 Perkins, I assume you agree with that statement?

25 A. Yeah.

1 Q. Given your experience of kind of in the
2 -- in the real world, not so much the modeling
3 word, but do you think as a matter of your kind of
4 professional opinion that it's realistic to assume
5 that 10,000 acre feet of water discharged from the
6 pipeline would be lost in the first five miles of
7 the stream?

8 A. Well, that's what the model says.

9 Q. Sure.

10 A. And whether it would or not may -- takes
11 some observation.

12 Q. Sure. Do you have an opinion as a
13 professional -- matter of your professional
14 opinion as to whether or not that's a realistic
15 result notwithstanding what the model indicates?

16 A. I -- it -- it might be depending on the
17 conditions.

18 Q. Okay.

19 MR. WILMOTH: All right. Let's just take
20 a couple of minutes and I'll see if we have any
21 further questions.

22 MR. GRUNEWALD: Okay.

23 MR. WILMOTH: We don't need to break.

24 MR. GRUNEWALD: We can step out if you
25 want.

1 MR. WILMOTH: No, no that's fine. I
2 believe that's all we have.

3 Mr. Steinbrecher, do you have any questions?

4 MR. STEINBRECHER: I do have a few
5 questions.

6 CROSS-EXAMINATION

7 BY MR. STEINBRECHER:

8 Q. Dr. Perkins, are you ready to go? Do you
9 mind if we jump into this?

10 A. Sounds fine.

11 Q. So good morning Dr. Perkins. For the
12 record this is Scott Steinbrecher from the
13 Colorado Attorney General's Office. I have just a
14 few questions for you based on some of the
15 responses you gave to Mr. Wilmoth this morning.

16 A. Okay.

17 Q. Can you hear me okay?

18 A. Yes.

19 Q. If you can't, feel free to interrupt and
20 ask me to speak up.

21 A. Okay.

22 Q. So Dr. Perkins, did you perform model
23 runs in preparing your expert report, which I
24 believe is Exhibit 3?

25 A. Yes.

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1 Q. And -- you performed those model runs
2 yourself?

3 A. Yes.

4 Q. And do those model runs that you
5 performed track losses to the augmentation water
6 from Nebraska's N-CORPE proposal?

7 A. They track -- well, they -- they track --
8 they track losses to -- to the -- yeah. I guess
9 you could say they track losses, just.

10 Q. Okay. And you provided those model runs
11 to the other states, correct?

12 A. Correct.

13 Q. Okay. Is it your testimony that those
14 model runs that we just talked about, that those
15 runs track losses to augmentation flows below
16 Harry Strunk Reservoir?

17 A. No. They don't really show what's going
18 on below because they're -- they're just using the
19 model as is where the Harry Strunk is
20 disconnected, so that there's no flow below Harry
21 Strunk.

22 Q. So the -- can you explain to me why
23 there's no flow below Harry Strunk?

24 A. That's just -- that's just part of the --
25 the way the model was built, that the -- the flows

1 are disconnected at the reservoirs.

2 Q. So is it true that once that water is
3 stored in Harry Strunk Reservoir for the purposes
4 the model that water then becomes surface flow?

5 A. I --

6 Q. The groundwater model would not track
7 that water below the reservoir?

8 A. I don't have an opinion on that. It's --
9 because we -- well, I don't have an opinion on
10 that. We -- we didn't try to represent what
11 happens in the reservoir because of the
12 augmentation flow.

13 Q. I think my question relates more to your
14 understanding of how the model works and the model
15 runs.

16 A. Okay.

17 Q. When that water reaches the reservoir in
18 terms of modeling below the reservoir does the
19 water stored in the reservoir become surface flow
20 so that the groundwater model no longer tracks it,
21 or in the model runs that you've done does the
22 model track those flows below Harry Strunk
23 Reservoir?

24 A. The model does not track the flows below
25 Harry Strunk. It -- you only see the effect that

1 the accounting point -- just because the
2 accounting point's going to take into account the
3 gauge of the -- the gauge flow above the
4 reservoir.

5 Q. And which accounting point are you
6 talking about?

7 A. The Medicine Creek accounting point down
8 at the Republican River.

9 Q. Below the reservoir?

10 A. Yes. The accounting point there is going
11 to be the sum of the gauge flows at -- through
12 Republican River plus the gauge flows at -- above
13 the -- above Strunk. Strunk.

14 Q. So are you saying, Dr. Perkins, that the
15 model removes the flow when it reaches the main
16 stem?

17 A. Well, it disconnects the flow at the
18 reservoir. As far as the flow below the
19 reservoir, the model's not really doing anything
20 further with the -- the augmentation flow. It's
21 -- you only see the effect at the gauge above the
22 reservoir so that -- so that the impacts can be --
23 the impact at the accounting points can be
24 affected by the gauge above Strunk. But the
25 augmentation, that's -- that's the only place you

1 ever see the augmentation effect with the
2 reservoir disconnected.

3 Q. Let me see if I can just cut to the chase
4 here, Dr. Perkins. Have you calculated any losses
5 to the augmentation flows below Harry Strunk
6 Reservoir?

7 A. Yes.

8 Q. How did you do that?

9 A. I did -- I didn't do that for these cases
10 as I -- I told Tom. We -- we did look at a
11 hypothetical bypass, or bypassed whatever flow got
12 to Harry Strunk and put it in the river below
13 Strunk and -- to see how much of that made it down
14 to Harlan County.

15 Q. And have you produced those model runs
16 representing the hypothetical bypass? @

17 A. No. They weren't --

18 Q. Could you do that, please?

19 A. I -- I could do that.

20 MR. GRUNEWALD: Well, this is Chris
21 Grunewald. For the record we'll take a look at --
22 at your request see if it fits. And if -- my
23 understanding from the testimony we've heard today
24 is it's outside the expert report, but we'll take
25 a look at your request and get back to you very

1 quickly.

2 BY MR. STEINBRECHER:

3 Q. Sounds to me like that's what you've done
4 to calculate losses below the -- below Harry
5 Strunk Reservoir. I think that's well within the
6 scope of the report?

7 A. Well --

8 Q. Are those reports summarized in your
9 report anywhere, Dr. Perkins?

10 A. No. They -- they weren't referred to in
11 the report, I don't think. I don't think the
12 report is -- says what those losses are. So --
13 but -- but if it did that's -- that's the type of
14 model run that would have supported that.

15 Q. Can you tell me why you only looked at
16 those losses between Strunk and Harlan County in
17 your hypothetical example?

18 MR. GRUNEWALD: I'm just going to lodge,
19 at least, an initial objection to the extent we're
20 getting into draft expert report material and
21 communications directly between the experts here
22 and their attorneys. Those communications are
23 privileged and you're not entitled to them. To
24 the extent you can answer that question, go ahead.

25 A. Right. We looked at how -- how the water

1 reached all the way down to Harlan County from the
2 pipe flow, not just below Strunk.

3 BY MR. STEINBRECHER:

4 Q. And why did you choose to stop at Harlan
5 County? Why not go, for example, to KBID?

6 A. I don't -- we were interested mainly --
7 we were interested to see how much of it reached
8 Harlan County. We just didn't ask ourselves how
9 much reached KBID.

10 MR. STEINBRECHER: Well, that's all the
11 questions I have. And we'd like to see the model
12 runs for those -- for that hypothetical scenario.

13 THE WITNESS: Okay.

14 MR. WILMOTH: We have nothing further.

15 MR. GRUNEWALD: Kansas has no questions,
16 so I think we're all set.

17 THE REPORTER: Read and sign?

18 MR. WILMOTH: Excellent.

19 MR. GRUNEWALD: Read and sign.

20 (THEREUPON, the deposition concluded at
21 10:50 a.m.)

22 .
23 .
24 .
25 .

1 SIGNATURE

2 .

3 The deposition of SAMUEL PARKER PERKINS,
4 P.E. was taken in the matter, on the date, and at
5 the time and place set out on the title page
6 hereof.

7 .

8 It was requested that the deposition be
9 taken by the reporter and that same be reduced to
10 typewritten form.

11 .

12 It was agreed by and between counsel and
13 the parties that the deponent will read and sign
14 the transcript of said deposition.

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1 AFFIDAVIT

2 .

3 STATE OF _____ :

4 COUNTY/CITY OF _____ :

5 .

6 Before me, this day, personally appeared,
7 SAMUEL PARKER PERKINS, P.E., who, being duly sworn,
8 states that the foregoing transcript of his/her
9 Deposition, taken in the matter, on the date, and at
10 the time and place set out on the title page hereof,
11 constitutes a true and accurate transcript of said
12 deposition, along with the attached Errata Sheet, if
13 changes or corrections were made.

14 .

15 _____

16 SAMUEL PARKER PERKINS, P.E.

17 .

18 SUBSCRIBED and SWORN to before me this _____
19 day of _____, 2014 in the
20 jurisdiction aforesaid.

21 .

22 _____

23 My Commission Expires Notary Public

24 .

25 .

1 DEPOSITION ERRATA SHEET

2 RE: APPINO & BIGGS
3 REPORTING SERVICE, INC.

4 FILE NO.: 33185

5 CASE: Republican River Compact Arbitration
6 Nebraska N-CORPE augmentation plan

7 DEPONENT: SAMUEL PARKER PERKINS, P.E.

8 DEPOSITION DATE: 1/30/2014

9 To the Reporter:

10 I have read the entire transcript of my Deposition taken in the
11 captioned matter or the same has been read to me. I request that
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13 indicated. I have signed my name to the Errata Sheet and the
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1 CERTIFICATE

2 STATE OF KANSAS

3 SS:

4 COUNTY OF SHAWNEE

5 I, Douglas Stone, a Certified Court
6 Reporter, Commissioned as such by the
7 Supreme Court of the State of Kansas, and
8 authorized to take depositions and
9 administer oaths within said State pursuant
10 to K.S.A. 60-228, certify that the foregoing
11 was reported by stenographic means, which
12 matter was held on the date, and the time
13 and place set out on the title page hereof
14 and that the foregoing constitutes a true
15 and accurate transcript of the same.

16 I further certify that I am not related
17 to any of the parties, nor am I an employee
18 of or related to any of the attorneys
19 representing the parties, and I have no
20 financial interest in the outcome of this
21 matter.

22 Given under my hand and seal this
23 _____ day of _____, 2014.

24 _____

25 Douglas Stone, C.C.R. No. 1518