

No. 126, Original

In The
Supreme Court of the United States

DEPOSITION OF STEVEN P. LARSON

STATE OF KANSAS,

Plaintiff,

v.

STATE OF NEBRASKA

and

STATE OF COLORADO,

Defendants.

Monday, April 9, 2012

2:38 P.M.

PURSUANT TO NOTICE and the Federal Rules of Civil Procedure, the above-entitled deposition was taken on behalf of Defendant State of Nebraska at 1525 Sherman Street, 7th Floor, Denver, Colorado, before K. Michelle Dittmer, Registered Merit Reporter and Notary Public within Colorado.

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Jesse Bradley
Marc Groff
Brian Dunnigan

Donna Ormerod

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(Attached to original and electronic and/or copy
23 transcripts where requested.)

24

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4

1 PROCEEDINGS

2 STEVEN P. LARSON,

3 having been first duly sworn, was examined and

4 testified as follows:

5 (Deposition Exhibits 1 and 2 were marked.)

6 EXAMINATION

7 BY MR. WILMOTH:

8 Q Good afternoon, Mr. Larson. Thank you for
9 coming today.

10 A Good afternoon.

11 Q Let's see if we can get a couple
12 preliminaries out of the way by handing you a copy of
13 the Notice of Deposition, which we've premarked as
14 Exhibit 1.

15 Do you recognize this document?

16 A Yes.

17 Q Mr. Larson, have you brought any supporting
18 materials with you today in response to the request in
19 the second paragraph?

20 A No, I didn't bring any more materials.

21 Q Thank you.

22 And, Mr. Larson, is this a copy of your

23 expert report? I guess Mr. Draper has provided us with
24 copies that have a Bates number. We have premarked this
25 as Exhibit 2.

5

1 Does that look like a complete copy of your
2 report?

3 A Yes, it does.

4 Q Thank you.

5 So occasionally I'll just refer to that as
6 "Exhibit 2" --

7 A Okay.

8 Q -- or "your report." I realize you
9 coauthored that with Mr. Book; is that correct?

10 A Yes.

11 Q And can you just generally tell me, are
12 there large portions of the report for which you're
13 solely responsible and other portions for which Mr. Book
14 is solely responsible, or is it truly a joint endeavor?

15 A Well, I would call it a joint endeavor, but
16 I think I wrote most of the text. There's probably a
17 few paragraphs here or there that were mainly Mr. Book's
18 work, but most of it -- most of it was my writing.

19 Q All right. Thank you.

20 Is there any portion of it specifically
21 that you would disclaim as Mr. Book's work solely?

22 A No. I think -- I think it was more of a

23 joint effort.

24 Q Okay. Thank you.

25 This is our second time, at least, together

6

1 in the last few years, so I'll probably not go through
2 all the formalities of your resume, which I'm sure will
3 make everyone happy.

4 Has anything significant changed in regard
5 to your credentials since the last time we spoke last
6 month? Any new projects or degrees awarded or anything
7 we need to know about?

8 A No. I think I did give one more deposition
9 in another case, but other than that . . .

10 Q I have to ask this because Mr. Schreuder
11 seems to have a new Ph.D. every time I meet with him, so
12 I want to know what's going on here.

13 Mr. Larson, your expertise is in
14 groundwater modeling; is that right? Would you consider
15 yourself an expert in that field?

16 A I would consider myself someone who has
17 expertise in modeling. I think I consider myself a
18 hydrologist, emphasizing work in groundwater, but a
19 hydrologist is my general expertise.

20 Q And did you participate in developing the
21 Republican River Compact Administration's Groundwater

22 Model?

23 A Yes, I did.

24 Q What role did you play in that regard?

25 A Well, I would characterize it as the sort

7

1 of primary modeling expert on Kansas' behalf in that
2 work.

3 Q Were there any other individuals that
4 worked with you in that role?

5 A Well, Mr. Book obviously was involved in
6 that, although I think most of the modeling work was
7 done in my office; that is, the modeling work that we
8 did separately from the group.

9 And there were people from the State of
10 Kansas that assisted from time to time or participated
11 from time to time.

12 Q And what was your understanding of your
13 objective in developing the model? What was your
14 paramount goal?

15 A Well, I think the general objective was to
16 develop a tool that could be used to make estimates of
17 the effects of pumping by the different states for
18 purposes of feeding into the accounting process.

19 Q And you mentioned estimates of these
20 effects. The effects are not directly measured, though,
21 are they? Is that why the model is needed?

22 A Well, I'm not sure that that's totally
23 accurate. The effects of the -- the combined effects of
24 pumping and other impacts on the basin are measured by
25 conditions in the basin with regard to groundwater

8

1 levels and streamflows that were used as part of the
2 calibration process of the model. But the effects of
3 any one particular state, for example, are not directly
4 measured.

5 Q Okay. So the total effects on the system
6 by all of these different influences are measurable in
7 some cases, but the individual state's impacts from
8 groundwater pumping or the imported water supply credit,
9 I assume, are not directly measured; is that right?

10 A I would characterize it a little bit
11 differently.

12 The impacts of things like pumping, the
13 impacts of things like the imported water supply, the
14 impacts of things like precipitation, the impacts of
15 evapotranspiration, all those things are components of
16 what impact the hydrologic system.

17 The effect of all those things are
18 indicated by measurements of streamflows and groundwater
19 levels in terms of the impacts that they have had on
20 those systems.

21 Q So how is the model employed then to
22 estimate the impacts of pumping or the imported water
23 supply credit?

24 A The way the model is used to make those
25 determinations is as described in the FSS. For pumping,

9

1 for example, the pumping for each state is sequentially
2 turned off and an alternate -- and a model run is made
3 under that circumstance and compared against the
4 conditions -- the baseline condition, which is the
5 condition that the model was calibrated for, and the
6 difference in those are calculated as impacts. And the
7 same thing applies to the imported water supply credit.

8 Q Have you ever identified any flaws in the
9 model subsequent to its completion?

10 A I don't recall personally ever doing that.
11 There were some -- I do recall some issues at some point
12 about calculational points within the model -- and I
13 can't remember all the details -- associated with one of
14 the reservoirs, as to where calculations were being
15 made. And there were some adjustments, I think, made to
16 that.

17 Q Do you recall the nature of those
18 adjustments?

19 A Not off the top of my head, no.

20 Q Are you presently aware of any flaws in the

21 model?

22 A Well, a model by its very nature is an
23 idealization, so it's not a perfect -- it's not a --
24 it's not perfect because it's a model, and so there
25 obviously are some idealizations that are made.

10

1 I wouldn't call them flaws. I mean, that's
2 what the modeling process is, is constructing an
3 idealization that's sufficient for the purpose that it's
4 being used.

5 Q So if I'm understanding you, the model
6 doesn't always represent what it purports to perfectly,
7 but there's no mechanical or numerical flaw in the model
8 itself; is that -- is that a fair characterization?

9 A Well, first of all, the model's not perfect
10 because it's a model. Secondly, the -- as part of that
11 process, the differential equations that constitute the
12 model are solved numerically, and there are certain
13 levels of approximation that are inherent in that
14 process as well.

15 I wouldn't call them flaws because those
16 are the process that you go through as a scientist to
17 actually make these kind of calculations.

18 Q So what is it that makes a model a good
19 model or an effective model in your view?

20 A Well, generally, the way the model's
21 performance is judged, or at least one way that it's
22 judged, is through the calibration process.

23 Q And how does that calibration process lead
24 you to determine whether the model is good or bad or
25 indifferent?

11

1 A Well, the calibration process is a process
2 where model results are compared to certain measurements
3 of different kinds; in this case, measurements of
4 groundwater levels and changes in those groundwater
5 levels over time; or streamflows, in this case base
6 flows, and how those base flows may have changed over
7 time.

8 Now, the base flows themselves aren't
9 directly measured, but are estimated from records of
10 streamflow measurements.

11 And the model's results are compared to at
12 least those two metrics to judge how well it's
13 performing.

14 Q So if the model reflects what's going on in
15 reality in the system, it's being calibrated to that
16 system and it's being judged as performing well; is that
17 what you're saying?

18 A Well, the comparison of the model to that
19 information is what it is, and judgments are made about

20 whether that's sufficient or not sufficient.

21 Q Sure.

22 And so in your experience, how would you
23 make a determination as to whether the model is
24 performing as anticipated or not, whether it was, in
25 fact, performing as you intended?

12

1 A Well, there are sort of two levels to that.
2 One is trying to be sure that the model structure and
3 inputs are consistent with general understandings of the
4 physical system itself; and then secondly, by comparing
5 it -- comparing model results to things like estimates
6 of base flow and changes in base flow, estimates of
7 groundwater levels -- or measurements of groundwater
8 levels and changes in those groundwater levels over
9 time.

10 Q So the things you can measure that we
11 talked about before, for example? You're trying to
12 determine how the model outputs relate to those things
13 that you can measure?

14 A Well, those are the comparisons we can make
15 to provide some level of confidence that we think the
16 model is performing sufficiently.

17 Q And it's performing sufficiently if it is
18 strongly correlated to those things you can measure; is

19 that what you're saying?

20 I'm understanding, I think, what your test
21 is. I'm not hearing or understanding what makes it good
22 or bad.

23 A So the question is, what makes it good or
24 bad?

25 Q Yes.

13

1 A I don't think there's a clear bright line
2 that says one thing is good and one thing is bad. In
3 this case, the experts from the different states got
4 together and went through a calibration process and
5 collectively determined that the calibration that we had
6 was sufficient for the purpose for which the model was
7 going to be used. And that's how the judgment was made
8 in that case.

9 Q So you don't have an opinion as to whether
10 the RRCA Groundwater Model is a good model or a bad
11 model, but it serves its purpose; is that what you're
12 saying?

13 A Well, I think -- personally, I think it
14 performs quite well, given the complexities and the
15 extent of the model. And in the end, like I said, I
16 think the groups of experts decided that it was
17 sufficient for the purpose that it was going to be used
18 for.

19 Q And when you say "it performs quite well,"
20 I just want to make sure I understand what you mean by
21 that.

22 Do you mean it reflects what's going on in
23 the system as can be measured?

24 A Yes.

25 Q Okay. We had served some interrogatories

14

1 on the State of Kansas last fall, and Kansas stated its
2 understanding at that time that the -- its understanding
3 of the construction tendencies and outputs of the model
4 have not changed in any respect since 2003.

5 Do you agree with that statement?

6 A Could you read that to me again?

7 Q Certainly.

8 In response to certain interrogatories,
9 Kansas indicated that its understanding of the
10 construction tendencies and outputs of the groundwater
11 model have not changed in any respect since 2003.

12 Would you agree with that statement, or has
13 your understanding changed in any regard?

14 A I don't think my understanding has changed
15 in any way. So I'd say no, my understanding isn't
16 changed.

17 Q So you haven't been surprised by any of the

18 model's outputs since it was finalized?

19 A No, I wouldn't say I've been surprised.

20 Q Okay. Let's turn to the accounting

21 procedures.

22 Now, if I understand correctly, you served

23 on the modeling committee; is that right --

24 A That's right.

25 Q -- when the model was being developed?

15

1 A That's correct.

2 Q Okay. And was there ever an accounting

3 procedures committee or anything like that?

4 A There was a group of people who were

5 focusing on the accounting procedures, was my

6 understanding.

7 Q Did you serve on that group at all?

8 A No, I did not.

9 Q And during the arbitration hearing, you had

10 testified that you did not consider yourself an expert

11 on the accounting procedures. Is that still the case?

12 A I think I -- I think that's a fair

13 characterization, that I'm not an expert on it. I'm

14 generally familiar with some of the things in it, but I

15 wouldn't consider myself an expert on it.

16 Q And so with respect to the report that's

17 Exhibit 2, can you identify for me where the -- where

18 your modeling expertise in particular is brought to bear
19 in this report?

20 A Well, in the first section that's entitled
21 "All Water in the RRCA Groundwater Model is Accounted
22 For," I think my expertise is brought to bear in that
23 section.

24 In the next section regarding the use of a
25 baseline that's not calibrated, I would say my modeling

16

1 expertise is brought to bear there.

2 In the next section on the IWS credit, I
3 would say my modeling expertise is brought to bear
4 there.

5 In the next section on the target sets, I
6 would say my modeling expertise is brought to bear there
7 as well.

8 In the next section, some of that deals
9 with the accounting procedures, but there's also issues
10 in that section that deal with my modeling expertise.

11 Similarly, in the next section on future
12 impacts, my modeling expertise is brought to bear.

13 And in the additivity section, I think my
14 modeling expertise is brought to bear.

15 And I guess generally in the conclusions as
16 well.

17 Q Okay. And did you perform any modeling
18 analyses in support of this document -- this report,
19 excuse me?

20 A We did prepare a graphic that was contained
21 on page 5 in which we extracted some information from
22 one of the model runs to show a comparison between what
23 the model was calculating at the Orleans gage versus the
24 actual gage data.

25 Q Is this the only modeling analysis you

17

1 conducted for this report?

2 MR. DRAPER: By "modeling analysis," do you
3 mean model runs?

4 MR. WILMOTH: Yes.

5 A We did do some comparisons, but I don't
6 recall if we had to make new runs or just used existing
7 runs. But I think we provided some worksheets in which
8 whatever work we did was -- was contained.

9 Q (BY MR. WILMOTH) Who assisted you in
10 developing those worksheets?

11 A Alex Spiliotopoulos.

12 Q And do you know when those worksheets were
13 provided to us?

14 A I do not.

15 Q Do you know whether some of it was provided
16 after March 15?

17 A I don't.

18 Q Do you know whether Mr. Spiliotopoulos or
19 anyone else in your firm modified those worksheets after
20 March 15?

21 A I don't.

22 Q Have you examined Dr. Schneider's report
23 and the proposed changes Nebraska is offering to the
24 RRCA accounting procedures?

25 A Which --

18

1 Q This would have been the November 11 --
2 excuse me, November 18, 2011 report.

3 A Yes.

4 Q Is that what your expert report responds
5 to?

6 A Yes.

7 Q Can you tell me how Dr. Schneider's
8 proposal, or the Nebraska proposal, if you will, alters
9 or changes the groundwater model?

10 A As I understand the proposal, the proposal
11 is to make some additional model runs and then use the
12 results from some of those initial -- additional model
13 runs to make alternative calculations.

14 Q But it doesn't alter the model itself; is
15 that right?

16 A I'm not aware of any changes to any of the
17 model parameters.

18 Q And if it doesn't change the model, how
19 would you characterize the proposed changes? Are these
20 changes to the accounting procedures that dictate which
21 runs are to be used, in your view?

22 A Well, there are different sets of runs that
23 are being used, other than the ones that are outlined in
24 the FSS, so there's changes in regard to data sets that
25 are used in the model to make those calculations.

19

1 Q Would you agree that the largest impact of
2 Nebraska's proposed change occurs in the
3 Swanson-to-Harlan reach where the so-called mound occurs
4 or the imported water supply?

5 A I haven't tried to specifically quantify
6 where, but I know that that's a reach where some
7 differences do occur.

8 Q You don't know if those are -- whether, for
9 example, those contain the majority of the differences
10 or not?

11 A I don't know as I sit here, no.

12 Q Do I understand you to agree that the RRCA
13 accounting procedures, not the model itself, determine
14 which runs of the model are made for Compact compliance
15 calculations?

16 A I don't know if it's the accounting
17 procedures, per se. I know the FSS, in the procedures
18 that were worked out as -- as part of the work of the
19 modeling committee, that a certain set of procedures
20 were worked out for making the calculations that the
21 model would be used for.

22 Q Do you know what I generally am referring
23 to when I talk about Dr. Schneider's proposed 16-run
24 scenario?

25 A Yes, I think I do.

20

1 Q Okay. The so-called 16-run proposal that's
2 in Dr. Schneider's report is not the first proposal
3 Nebraska developed to address its concerns about the
4 imported water supply, is it?

5 A No, I don't think so.

6 Q Do you happen to recall the original
7 proposal that Nebraska presented?

8 A Not off the top of my head, no.

9 Q I have a few documents. Hopefully I can
10 refresh your recollection here.

11 I believe this is a copy of an engineering
12 committee report. Does this look familiar to you in any
13 regard?

14 MR. DRAPER: Are you marking this as an

15 exhibit, Tom?

16 MR. WILMOTH: If he --

17 MR. DRAPER: Not yet?

18 MR. WILMOTH: -- can identify it, yeah.

19 A So the question was, does this look

20 familiar to me?

21 Q (BY MR. WILMOTH) Yes. Do you typically

22 keep --

23 A Not exactly.

24 Q Do you participate on the engineering

25 committee?

21

1 A No, I don't.

2 Q You don't? Okay.

3 I'd like to direct your attention here to

4 the second page, bottom paragraph. Could you just read

5 that paragraph for me? We don't need to read it out

6 loud.

7 A This is the one, little "iii" there?

8 Q Yes, sir. "On June 20, 2007."

9 (A pause occurred in the proceedings.)

10 Q (BY MR. WILMOTH) Understanding that you

11 haven't seen this document, does the event referenced in

12 that paragraph ring any bells for you?

13 A I do recall some time ago that there was

14 one, or maybe more than one, proposal that we had

15 reviewed, and I suspect this may have been one of them.

16 MR. WILMOTH: Now we'll go ahead and mark
17 that as Exhibit 3.

18 Q (BY MR. WILMOTH) There's a reference in
19 that paragraph to a document, which I will give you now
20 and ask if you have seen this document, by chance.

21 (Deposition Exhibit 3 was marked.)

22 A Yes, I think I have seen this document.

23 Q (BY MR. WILMOTH) Could you just generally
24 describe your understanding of this document, what it is
25 and when you first laid eyes on it?

22

1 MR. DRAPER: Did you mark this one as an
2 exhibit, Tom?

3 MR. WILMOTH: Yes. Let's go ahead and mark
4 that Exhibit 4, please.

5 (Deposition Exhibit 4 was marked.)

6 A My recollection -- this is from some time
7 ago -- that this was a description of one of the
8 proposals at that time. That's about all I remember
9 about it.

10 Q (BY MR. WILMOTH) Do you recall evaluating
11 that proposal for Kansas or working with the Kansas team
12 to do so?

13 A I do recall working with the Kansas team

14 evaluating different proposals.

15 Q Do you recall working on that particular
16 proposal?

17 A I believe so, yes.

18 Q And do you recall developing a response to
19 that proposal?

20 A Vaguely.

21 Q Do you recall what the Kansas response was?

22 A Not off the top of my head, no.

23 Q Mr. Larson, do you believe the current
24 accounting procedures include imported water supply as
25 part of the virgin water supply?

23

1 A My -- are you asking, do they include the
2 imported water supply credit as part of --

3 Q Do they include imported water as part of
4 the virgin water supply?

5 A My understanding is that imported water
6 supply credit is deducted or subtracted somehow in the
7 calculation process of estimating the computed water
8 supply or whatever. That's my understanding. It's
9 deducted from the gage flow, is my understanding.

10 Q So is your answer no, that the accounting
11 procedures do not include imported water as part of the
12 virgin water supply?

13 A My understanding is that imported water

14 supply credit is deducted from the gage flows as part of
15 the process of estimating the water supply.

16 Q And how do the gage flows relate to the
17 virgin water supply?

18 A Gage flows are among the components that
19 are used to calculate the water supply.

20 Q So do you know whether the imported water
21 supply is included as part of the virgin water supply?

22 A Well, I'm not an expert on the accounting
23 process. My understanding is that it's subtracted from
24 the gage flows.

25 Q Do you know whether the current procedures

24

1 include imported water as part of Nebraska's CBCU,
2 computed beneficial consumptive use?

3 A Well, like I said, my understanding is that
4 the imported water supply credit is deducted from the
5 gage flows.

6 Q So you're not sure?

7 A Well, that's the extent of my
8 understanding.

9 Q Okay. Let me turn you to the top of page 4
10 of Exhibit 4?

11 A Is 4 this Attachment 1?

12 Q Yes. There are some figures there, and

13 then there's a paragraph that reads, "This formula is
14 incorrect . . ."

15 Do you see that paragraph?

16 A Yes.

17 Q I'd like you to read that paragraph and set
18 aside, for purposes of this question, characterizations
19 of correctness or incorrectness. But as a factual
20 matter, do you agree with the statements made in that
21 paragraph; in particular, the first sentence?

22 A I don't know if I can agree or disagree
23 just based on what I've read here.

24 Q Okay. Do you recall preparing any formal
25 response to that proposal?

25

1 A I do recall participating in the
2 preparation of a response. I'm not exactly sure if it
3 was this proposal or not.

4 Q Was a meeting held perhaps in September of
5 '07 of the RRCA engineering committee to address this
6 issue?

7 A I don't know.

8 Q I'm going to hand you a couple of documents
9 here. One is an email transmitting another document and
10 just ask if this refreshes your recollection at all.
11 This will be Exhibit 5, collectively Exhibit 5.

12 (Deposition Exhibit 5 was marked.)

13 A Refresh my recollection about what? About
14 the --

15 Q (BY MR. WILMOTH) Does this refresh your
16 recollection as to whether Kansas ever provided a
17 written response to the proposal I gave you earlier?

18 A Well, it doesn't exactly refresh my
19 recollection, but I do recall participating in the
20 preparation of a response. I don't know exactly how it
21 was transmitted, although this suggests it was
22 transmitted by email.

23 Q Is the document there, entitled "Kansas'
24 Review of Nebraska's Request for Change in Accounting
25 Procedures" the response you recall?

26

1 A This is the one that I recall participating
2 in.

3 Q There's been some discussion as to what
4 exactly this document is. How would you characterize
5 that document?

6 A I would characterize it as a response by
7 the State of Kansas to one of Nebraska's proposals.

8 Q So is it a fair assumption on my part to
9 assume that you received the original proposal in the
10 summer of '07 and you spent some time evaluating it and
11 that is the product of your evaluation?

12 A I do recall working with the people in
13 Kansas to evaluate some of the proposals, and I do
14 recall participating in putting together this response.
15 I don't know exactly which one it was or . . .

16 Q Sure.

17 Could you turn to the top of page 2,
18 please. About halfway down that first paragraph there's
19 a statement that reads: "The states recognized that the
20 sum of the impacts of these individual activities would
21 not necessarily exactly equal the model-computed impact
22 of all of the activities considered simultaneously."

23 Can you tell me where that recognition is
24 reflected?

25 A And by "reflected," you're saying written

27

1 down somewhere?

2 Q Yes, sir.

3 A I don't recall anyplace offhand where it's
4 written down.

5 Q Do you have an understanding of where that
6 recognition is evidenced? Did you observe it
7 personally, for example?

8 A Well, personally, I knew the model was not
9 linear, and because it's not linear, these kinds of
10 things may not add up.

11 Q So when you say "the states" recognized

12 this, you're really saying the State of Kansas

13 recognized this?

14 A Yeah. I think other people probably

15 recognized it as well.

16 Q But you don't know that, though?

17 A Well, I believe Dr. Schreuder has talked

18 about it. I think he clearly recognized it. I would

19 assume anyone who understood the characteristics of the

20 model would recognize it if they thought about it.

21 Q In the next paragraph, there's a discussion

22 of developing a method for apportioning the impact among

23 the various activities.

24 Do you see that?

25 A Yes.

28

1 Q What is the objective of apportioning these

2 impacts?

3 A The objective would be to assign impacts to

4 a specific activity.

5 Q Why would that be important?

6 A My understanding is that that's part of

7 what was needed for the accounting process.

8 Q The accounting process being proposed by

9 Nebraska?

10 A No. The accounting process --

11 Q Okay.

12 A -- under the FSS or the Compact.

13 Q So all impacts should be apportioned

14 somehow; is that what you're saying?

15 A I think my understanding is impacts had to
16 be assigned to certain activities.

17 Q All the impacts? Are there some impacts
18 that aren't properly assigned to any -- or any activity?

19 A Well, my understanding is that certain
20 impacts that prior to the FSS were not being considered
21 needed to be considered; for example, the impacts of
22 pumping.

23 Q And this document indicates it would be
24 necessary to have a method for apportioning the impacts
25 among the various activities.

29

1 Do you read that to mean all the
2 activities -- excuse me, all of the impacts have to be
3 apportioned to some activity?

4 A No. I read that to say that there was a
5 need to assign an impact to different activities as part
6 of the process.

7 Q In the next paragraph, there's a reference
8 to the ultimate goal of the model. Sorry, this may be
9 two paragraphs down.

10 Do you agree with the statement about the

11 ultimate goal of the model?

12 A Yes, I think so.

13 Q And are you familiar with the virgin water
14 supply metric as it's described herein?

15 A Yes.

16 Q Can you just simply summarize what that
17 means?

18 A That if you run the model with all the
19 pumping and recharge removed and look at those impacts,
20 they provide a metric.

21 Q And what is the purpose of that metric?

22 A Well, in this case, it was to judge whether
23 or not the proposal that was being offered at the
24 time -- and I don't remember exactly when it was -- was
25 closer to or further away from that metric than the

30

1 procedure that was spelled out in the FSS.

2 Q And do you recall what the answer to that
3 question was? Was the Nebraska proposal closer to the
4 metric?

5 A I believe it was not.

6 Q Did Nebraska ever develop a proposal that
7 was closer to the metric than the current procedures?

8 A Eventually, yes.

9 Q Is it your position, though, that the

10 metric has no value?

11 A No.

12 Q Do you believe that a proposal that is
13 closer to meeting the metric is more effective at
14 determining the virgin water supply than the current
15 proposals -- current accounting procedures, excuse me?

16 A I don't know if we have a way of knowing
17 that because we don't know what the true impacts are.

18 Q And that's not possible to determine?

19 A I don't know how you would determine it. A
20 true value, you're talking about?

21 Q I'm just --

22 A I was talking about a true value, and I
23 don't know how you would determine the true value.

24 Q And why is it so difficult to do that?

25 A Because it deals with something that never

31

1 happened, and there are no measurements of that because
2 it never happened.

3 Q So if you turn off all the stresses in the
4 model, would the all-off condition represent what
5 streamflow would have been in the absence of the
6 activities of man?

7 A Well, it would represent the impact of
8 whatever activities you turned off.

9 Q Okay. So if we turned them all off, does

10 that then represent what the system would look like
11 without any such influence?

12 A It would represent an estimate of what the
13 system would look like without whatever influences you
14 turned off.

15 Q And I think you answered this, but I want
16 to make sure I understood the answer.

17 Does the Nebraska proposal provide a better
18 approximation of the virgin water supply metric than the
19 current procedure? And to be clear, Mr. Larson, by "the
20 Nebraska proposal," I mean the proposal before the court
21 today, not this one (indicating).

22 A As I understand the proposal, the proposal
23 is structured to create a result that's equal to that
24 metric, whereas the method that's spelled out in the FSS
25 doesn't always do that.

32

1 Q And do you know why Nebraska set out to
2 achieve that result?

3 A Do I know why Nebraska wanted to do that?

4 Q Yes. Did Nebraska ever express, for
5 example, the desire to meet the objectives set forth in
6 this document?

7 A I don't recall if they did or did not, but
8 the method that they proposed does that.

9 Q And if the idea at the time, on
10 September 18, 2007, was to try and achieve that metric,
11 why does Kansas still object to the proposal that does
12 so?

13 A The desire at the time wasn't to achieve
14 that metric. The process at the time was to evaluate
15 the proposal that was on the table against that metric
16 to see if we should consider it further.

17 Q And what was your conclusion?

18 A That it was further from the metric than
19 the method that was spelled out in the FSS.

20 Q And so your resulting action was to elect
21 not to consider it further?

22 A I think we concluded that we didn't need to
23 consider it further, yes.

24 Q Okay. So it didn't surprise you, did it,
25 when Nebraska came back and tried to meet the metric set

33

1 forth in this document, did it?

2 A I can't say I was surprised, no.

3 Q Did Kansas ever propose an alternative
4 solution?

5 A You mean, apart from continuing to use what
6 was spelled out in the FSS?

7 Q Yes, sir.

8 A Not that I recall.

9 Q Do you know why not?

10 A I don't know exactly all the reasons why
11 Kansas may have done that. I can say, from my
12 perspective, my feeling was that the method in the FSS
13 was sufficient.

14 Q And when you looked at -- when you did your
15 analysis culminating in that paper, did you look at
16 subbasins or the whole basin combined?

17 A I don't recall.

18 Q Okay.

19 MR. WILMOTH: Let's take about a 15-minute
20 break, John.

21 MR. DRAPER: Okay.

22 (Recess taken from 3:29 p.m. until
23 3:52 p.m.)

24 Q (BY MR. WILMOTH) Mr. Larson, returning to
25 the virgin water supply metric we discussed earlier, do

34

1 the current accounting procedures pass the test of the
2 virgin water supply metric?

3 A I don't understand "the test." Are you
4 saying --

5 Q The metric that is described as the virgin
6 water supply metric. Do the current procedures meet
7 that metric?

8 A Not in all years, no.

9 Q Do you know why that is?

10 A Well, I think it is because the model is
11 nonlinear.

12 Q And you mentioned that certainly Kansas and
13 Colorado recognize the model is nonlinear, but the
14 accounting procedures use linear equations, don't they?

15 A I don't know if they do or don't.

16 Q Did you ever have any discussions with the
17 folks working on the accounting to inform them of the
18 nonlinearity of the model?

19 A I don't recall whether I did or didn't.

20 Q Do you have any opinion as to why the folks
21 working on the accounting procedures, had they
22 understood the nonlinearity of the model, would have
23 elected to ignore that and develop linear procedures?

24 A I don't know what linear procedures you're
25 talking about.

35

1 Q You mentioned that the accounting
2 procedures don't meet the virgin water supply metric in
3 all years. Do you happen to know which years the
4 accounting procedures do meet the metric?

5 A If I said the accounting procedures, I may
6 have misspoke. I thought we were talking about the sum
7 of the impacts calculated with the groundwater model.

8 Q The sum -- that's what we're talking about.

9 And those meet the metric in some years, you suggested,
10 right?

11 A I think they do in some years, perhaps.

12 Q Do you have any idea which years?

13 A No.

14 Q Okay. And you mentioned that Exhibit 5
15 that we looked at earlier was a response to some
16 Nebraska proposal.

17 I inferred from your answer that there were
18 multiple Nebraska proposals; is that right?

19 MR. DRAPER: Which document is Exhibit 5?

20 MR. WILMOTH: Exhibit 5 is the memorandum,
21 the Kansas review memorandum.

22 MR. DRAPER: Okay. That's been identified
23 as Exhibit 5?

24 MR. WILMOTH: Yes, sir. The --

25 MR. DRAPER: Is that the last one?

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1 MR. WILMOTH: With the cover email.

2 MR. DRAPER: Including the cover email?

3 MR. WILMOTH: Collectively as 5, yes.

4 THE DEPONENT: And what was the question
5 again?

6 MR. WILMOTH: I don't remember. We'll have

7 to read it back.

8 Can you read it back, please?

9 THE COURT REPORTER: Sure.

10 (The following question was read:

11 "Question: And you mentioned that

12 Exhibit 5 that we looked at earlier was a response to

13 some Nebraska proposal.

14 "I inferred from your answer that there

15 were multiple Nebraska proposals; is that right?")

16 A Well, to the best of my recollection, there

17 was one or two or -- before the most recent one.

18 Q (BY MR. WILMOTH) Before the one in the

19 present proceeding?

20 A Correct.

21 Q And the one that we've marked as Exhibit 4

22 is one of those; is that correct?

23 A That's my recollection, yes.

24 Q And do you remember the nature of any of

25 the others?

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1 A Not off the top of my head, no.

2 Q Let's turn to your report, if we may. That

3 is Exhibit No. 2. And if it's all right with you, I'll

4 just refer to the pages of the report --

5 A Sure.

6 Q -- rather than the Bates numbers.

7 Now, in the introductory section here, you
8 mentioned Dr. Schneider has identified what he calls a
9 flaw in the accounting procedures. Do you believe there
10 is any such flaw?

11 A Not that I'm aware of.

12 Q And have you ever identified any flaws in
13 the accounting procedures?

14 A No.

15 Q Are you aware of any -- any flaws in the
16 accounting procedures today?

17 A I'm not, no.

18 Q When is the last time you reviewed the
19 accounting procedures?

20 A I don't think I've ever reviewed them in
21 their entirety.

22 Q In the next section entitled "All Water in
23 the RRCA Groundwater Model is Accounted For," you note
24 that the accounting procedures require the model to be
25 run in certain -- I think you call -- modes; is that

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1 right?

2 A That's my understanding, yeah.

3 Q And so if the accounting --

4 A The FSS requires that.

5 Q And the accounting procedures are an

6 exhibit or an attachment to the FSS, right?

7 A That's my understanding.

8 Q So if the FSS or the accounting procedures
9 within those required certain other runs to be made, the
10 model could be used for that purpose?

11 A The model can make other runs, if that's
12 what your question goes to.

13 Q There's no technical aspect of the model,
14 in other words, that would prohibit it from being used
15 to make the runs that Nebraska has suggested?

16 A In terms of just running the program, no.

17 Q Towards the end of this section, you
18 indicate that all of the water in the model calculations
19 is properly accounted for.

20 Do you see that?

21 A Can you --

22 Q This is at the very bottom of page 1 of
23 your report.

24 A Yeah.

25 Q Do you infer that Nebraska disagrees with

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1 that statement?

2 A I don't know if they do or they don't.

3 Q Do you understand that Nebraska's real
4 concern is that the accounting procedures don't account
5 for all the impacts?

6 A Well, my understanding is that their
7 proposal is to make the calculations using an
8 alternative procedure and it gives different results.

9 Q But it's not intended to find unaccounted
10 water or lost water, is it? It's directed at
11 ascertaining if there are any other accounted impacts
12 and how to address those. Is that consistent with your
13 understanding?

14 I'm just trying to see if we have a
15 semantic debate here or we're talking about the same
16 thing.

17 A That's not totally clear to me based on
18 some of the language in the report. It almost suggests
19 like certain things are unaccounted for.

20 Q Such as water?

21 A Or impacts.

22 Q Okay. And that's my question. Are we on
23 the same page that the issue here is accounting for all
24 the impacts, or do you think the issue is accounting for
25 all the water?

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1 A Well, I'm not sure they're necessarily
2 different because they're both dealing with impacts to
3 water.

4 Q Is it your view that the existing

5 accounting method is the only method that can properly
6 account for changes to streamflow as estimated by the
7 model?

8 A No. I think it's the method that was
9 agreed upon by the three states as being sufficient for
10 their purposes to --

11 Q But barring that agreement, there could be
12 other ways to do so?

13 A I suppose it's possible.

14 Q Do you recall testifying at the arbitration
15 proceedings?

16 A Generally.

17 Q Okay. It's all a blur, right?

18 I believe you testified that the existing
19 accounting method shows the IWS credit to be uniformly
20 increasing. Does that sound familiar?

21 A Not particularly, but . . .

22 Q Do you believe that to be the case?

23 A I believe over some periods of time, it
24 would have been increasing, yes.

25 Q Do you remember which periods?

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1 A No, I don't.

2 Q Do you remember if they were periods in the
3 future?

4 A Not off the top of my head, but --

5 Q They could have been?

6 A Could have been.

7 Q Have you conducted any modeling runs to
8 examine the credit into the future? I know you have
9 some opinions about Dr. Schneider's work, but did you
10 make any evaluations on your own?

11 A Well, I think as part of our earlier work
12 we probably did, if I remember right.

13 Q Is that work that was presented in the
14 arbitration?

15 A Probably there, but also in the previous
16 report in this matter.

17 Q All right. Thank you.

18 You talk a bit in this section about the
19 principle of mass balance. Why is it important to
20 preserve that principle of mass balance in this process?

21 A Well, the differential equations that
22 are -- that are the underpinnings of the model are
23 solved numerically. And as part of that process, a mass
24 balance is used as one of the measures of whether those
25 numerical solutions have been achieved sufficiently,

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1 plus the concept of the differential equations

2 themselves is that mass is conserved.

3 Q So is that similar to saying there's no

4 lost water or lost impacts; inflows equal outflows?

5 A Plus storage changes.

6 Q Plus storage changes?

7 A Yes.

8 Q And if the model failed to preserve this

9 water mass balance, would that mean that the model

10 produces an inaccurate result?

11 A Well, what it would mean is that you would

12 probably want to go back and look at your model

13 parameters to make some adjustments so that you were

14 sure that you achieved a satisfactory mass balance.

15 Q Do you think that the principle of mass

16 balance embodies the concept of additivity?

17 A I think we're talking about two different

18 things.

19 Q Could you explain to me the -- why mass

20 balance does not reflect the principle of additivity?

21 A Well, additivity, as we've been talking

22 about it in this matter, relates to the notion that the

23 individually calculated impacts of different activities

24 would necessarily sum to the impact that you would get

25 if you calculated the effect of those activities

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1 simultaneously with the model.

2 And mass balance is just a determination of

3 whether or not, within any particular run of the model,

4 that you have sufficiently solved the equations that
5 describe the model to a sufficient degree.

6 Q But isn't the overarching purpose to ensure
7 there's no lost or unaccounted-for impacts or water?

8 A The purpose of what?

9 Q Of both.

10 A No. I think they're different concepts.

11 Q So you would not agree that the attempt to
12 preserve the total impact mass balance is the same as
13 preserving mass balance within a model run?

14 A I think they're two different concepts.

15 Q And that's not the point that Kansas was
16 trying to make in the virgin water supply metric memo
17 that we looked at earlier?

18 A What was not the point?

19 Q It wasn't the point of the memo in
20 Exhibit 5 to effectuate this mass balance?

21 A No.

22 Q If I wanted to account for depletions to
23 streamflow within each subbasin, does the model allow me
24 to do that with reliable results?

25 A Well, the model would provide -- be able to

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1 provide an estimate of those for you.

2 Q Would you believe that they provide a

3 reliable estimate, that the model provides a reliable
4 estimate?

5 A Well, since we don't have the true values
6 to compare to, we can't really determine whether they
7 were right or wrong. They're estimates and --

8 Q Is that generally true of any estimate?
9 There's no way to measure how far or near it is from the
10 true value?

11 A Not necessarily, no.

12 Q How do you make the determination, if you
13 can't measure true value?

14 A Well, there's --

15 Q Go ahead. I'm sorry.

16 A There are some things where you perhaps
17 have measurements for and you can determine whether or
18 not the model was able to replicate that measurement.

19 Q But if I understand you, there is no way to
20 determine the true value of any of these things?

21 A In this case --

22 Q Right.

23 A -- in terms of the depletions?

24 Q Right.

25 A Not in my mind, no.

1 Q So there's really no way to tell how close
2 or far any particular method is from that true value; is

3 that right, in this case?

4 A For these things that we are calculating --

5 Q True.

6 A -- these impacts? No.

7 Q I just have a question for you on these --

8 kind of in a semantic vein again.

9 Can you describe your view of the
10 difference between residuals, as the term is identified
11 in your report at the bottom of page 1, and unaccounted
12 impacts? Are those the same thing, in the way you're
13 using them?

14 A In -- the way I was using them in this
15 report was that I wanted to make sure that it was clear
16 that, I think in the arbitration process and even in the
17 arbitrator's report, the difference between summing
18 individual impacts and looking at impacts calculated
19 collectively was referred to as a residual, I think, in
20 the earlier report.

21 In the subsequent report by Dr. Schneider
22 it was, I think, referred to as unaccounted impacts.
23 And I wanted to be sure that it was understood that
24 those are the same things.

25 Q Okay. So they're --

1 A At least --

2 Q -- they're the same thing?

3 A -- that was my understanding that those
4 were the same thing.

5 Q Okay. And just to be clear and bring this
6 full circle, did we agree that there's a difference
7 between unaccounted impacts and unaccounted-for water?

8 A I don't know that we agreed on that. My --

9 Q Is there one, then, would be my question.
10 Is there a difference?

11 A Well, there's a difference between mass
12 balances that I talked about in here (indicating) and
13 the unaccounted impacts. The mass balance I'm talking
14 about here (indicating) are within the model
15 calculations.

16 Q Okay. So then kind of spanning into the
17 top of page 2, if I understand it, your view is that
18 there are no unaccounted impacts because the differences
19 in these runs preserve this water mass balance, correct?
20 Is that what you're suggesting?

21 A That the impacts will be contained
22 somewhere within the calculation process.

23 Q Because there's a water mass balance?

24 A Yes.

25 Q And I'm just trying to put the pieces

1 together.

2 If there's a difference between the
3 unaccounted impacts and the water mass balance or
4 unaccounted-for water, why does the statement about the
5 water mass balance ensure that there are no unaccounted
6 impacts?

7 A Because if each of the runs that's used to
8 calculate the impacts preserves the water balance, the
9 differences will also preserve a water balance.

10 Q So there can be no unaccounted impacts by
11 virtue of the preservation of the water mass balance; is
12 that what you're saying?

13 A Yes.

14 Q And that's true in all cases?

15 A Yes, where the model is used for the
16 basis -- as the basis for those differences and where
17 the model mass balance has been satisfactorily achieved.

18 Q Okay. Let's talk about some of these fun
19 scale analogies. I know Dr. Schreuder loves these.

20 I just want to understand this concept of
21 unaccounted impacts and see if we're on the same page
22 here. And if you need to qualify the simplicity of my
23 example, feel free to do so, but I want to see how far
24 apart we might be on understandings here.

25 If you and I are on a scale with a

1 200-pound capacity, and I get off and the scale reads
2 180 pounds, then the mass balance would be preserved,
3 but my impact would only be registered as 20 pounds; is
4 that a fair statement?

5 A I don't understand what you're talking
6 about in terms of a mass balance.

7 Q Well, if the scale has got a capacity of
8 200 pounds, whatever we do needs to add up to 200,
9 right? I mean, isn't that preserving mass balance?

10 A No.

11 Q How would mass balance work in that
12 context?

13 A Well, if we're both on the scale, we
14 obviously weigh more than 200 pounds.

15 Q Uh-huh.

16 A Or I think we do.

17 Q Sure.

18 So how would you determine my impact on
19 that scale?

20 A I don't know if you could.

21 Q And I infer then that you couldn't
22 determine your impact, either, right?

23 A And by "impact," you're trying to say
24 determine my weight?

25 Q No, no, no. I'm just trying to determine

1 how -- what is the impact you're having on that scale.

2 A What's the impact I'm having on the scale?

3 Q Certainly, yes. Because your weight
4 obviously would just be registered as the 20 pounds,
5 let's say, if -- if I weighed 180 pounds. That's not
6 the issue.

7 The issue is, what is your total impact on
8 that scale as you're standing on it with me? Certainly
9 it's not 20 pounds, right?

10 A Well, I think you said that the scale only
11 goes up to 200 and then it stops.

12 Q Right.

13 A So presumably if we both got on, it would
14 read 200.

15 Q Right. But would you agree that
16 collectively, we have a greater impact on that scale
17 than just the 200 pounds?

18 A No. I would agree that we both weigh
19 together more than 200 pounds.

20 Q And you would agree that you can't
21 determine my impact or your impact?

22 A Well, I know if I got -- if we both got off
23 the scale and I got on the scale, I could determine my
24 weight.

25 Q Sure.

1 A Probably yours, too.

2 Q And if I jumped off first, then we could
3 determine my weight, I suppose; is that correct?

4 A I don't think so.

5 Q How would you determine, A, my weight?

6 A Well, assuming you weighed less than
7 200 pounds, I'd get off the scale and you could get on
8 it and we would weigh you.

9 Q But how would you determine our impacts on
10 that scale if we were both standing on it
11 simultaneously? The combined impact is more than
12 200 pounds, is it not?

13 A Our combined weight is more than
14 200 pounds.

15 Q Right. And so we're -- wouldn't we be
16 impacting the scale potentially much greater than
17 200 pounds?

18 A According to your little proposition here,
19 the scale can only read up to 200 pounds.

20 Q So your view then is that that would be the
21 only -- that would be the limit, if you would, of our
22 combined impacts?

23 A No. That would be the limit of that
24 scale's ability to weigh both of us at the same time.

25 Q And if I suggested to you that you were

1 duty-bound to determine our -- our impacts on that
2 scale, our relative impacts on that scale, how would you
3 do it?

4 A I would have us both get off the scale.
5 You would get on the scale, and I would weigh you. And
6 then you would get off the scale, and I'd get on it and
7 I would weigh myself. And assuming that we both weighed
8 less than 200 pounds, I would know what our weights
9 were.

10 Q What if we didn't? What if we each weighed
11 220 pounds?

12 A Then you wouldn't be able to measure either
13 one of our weights because the scale was incapable of
14 doing it.

15 Q Okay. So in your proposal there, then it
16 would matter who got on or who got off first?

17 A Are we assuming we both weighed less than
18 200 pounds?

19 Q Sure.

20 A Then it wouldn't matter. One of us could
21 get on, get weighed; the other one could get on by
22 himself and get weighed.

23 Q But we're both standing on the scale.

24 A If we both stand on the scale, we can't get
25 a weight because the scale can't weigh more than

1 200 pounds.

2 Q So if you wanted to measure my impact on
3 the scale, you would get off first; is that what you're
4 saying?

5 A No. I think I just said that if I wanted
6 to find out how much you would weigh, I would get off
7 the scale and you would get on the scale.

8 Q Right. But if we're both on at the same
9 time, I mean as a matter of fact --

10 A If we're both on at the same time, the
11 scale can't weigh us because it only weighs up to
12 200 pounds.

13 Q If I'm understanding your point then, we
14 ought to just get on individually, separately. And the
15 scale would originally read zero, and we would just take
16 our turns getting on and figure out what our impact was?

17 A If we have a scale that was only able to
18 measure 200 pounds and we both weighed less than 200,
19 that's a way I would recommend that we individually get
20 weighed.

21 Q So why doesn't the model start from an
22 all-off situation and just individually turn states on?

23 A Why doesn't it?

24 Q Yeah.

25 A In my view, it doesn't because you're

1 working from an uncalibrated condition when everything's
2 off, and that's why you shouldn't be using that
3 particular baseline.

4 Q Were you present for Dr. Ahlfeld's
5 testimony at the arbitration hearing?

6 A I think so.

7 Q Do you recall Dr. Ahlfeld testifying that
8 in cases of stream drying, the current accounting method
9 double-counts the storage replenishment component of
10 streamflow recovery?

11 A Not particularly.

12 Q Do you believe the current method does
13 double-count that streamflow recovery, that component of
14 streamflow recovery?

15 A I'm not sure I know exactly what you're
16 talking about.

17 Q I don't have a bunch of copies of this, but
18 I have Dr. Ahlfeld's testimony here. I'm going to try
19 and walk you through the example that he gave and see if
20 you would agree with this or disagree with this.

21 MR. DRAPER: Do you have a cite for that
22 testimony?

23 MR. WILMOTH: Yes. This is the hearing
24 transcript at 1432 and 1433 and 1434, John.

25 MR. DRAPER: Thank you.

1 Q (BY MR. WILMOTH) So Dr. Ahlfeld suggests
2 that the current method operates -- this is to calculate
3 impacts.

4 MR. DRAPER: Are you quoting or
5 paraphrasing?

6 MR. WILMOTH: I'm paraphrasing.

7 Q (BY MR. WILMOTH) You're welcome to read
8 this, if you want, but I think it will be faster if I
9 just give you the example.

10 So the current method starts with the
11 all-on condition, correct? And then you take a run and
12 you subtract it from a run in which Nebraska stays on
13 but we turn off Kansas. Is that right?

14 A That's one of them.

15 Q And what's the physical phenomenon that
16 you're trying to identify when you make that run? Is
17 that this notion of aquifer replenishment?

18 A What we're trying to estimate there are the
19 impacts on base flows associated with turning one
20 state's pumping off.

21 Q Sure.

22 And so when you do that, in theory, then
23 the aquifer is replenished and streamflow returns,
24 correct, base flow returns? And again, I'm in a

25 stream-drying condition, so . . .

55

1 A Well, when you do that, you calculate an
2 alternative condition and you take the difference
3 between that condition and the baseline condition, and
4 that provides a measure of the impacts.

5 Q And let's agree for sake of this discussion
6 that that results in streamflow recovery and there's
7 base flow in the system again. Are you with me?

8 In other words, you've got a stream-drying
9 situation; you make a run; you turn Kansas off; you see
10 streamflow recover and -- excuse me, you see aquifer
11 replenishment occur and streamflow recovers?

12 A No. I think I would characterize it a
13 little bit differently.

14 You make a run without the pumping in, and
15 you get different streamflow conditions, and the
16 difference between the streamflow conditions under that
17 scenario is compared against the baseline and that
18 difference is the impact.

19 Q Right. And I'm just asking you to assume
20 for this example that that results in base flow
21 occurring again in an otherwise dry stream.

22 A So you're saying there's some stretch of
23 stream where under the baseline condition there was no
24 streamflow?

25 Q What I -- yes. So you've got -- you've got

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1 Kansas and Nebraska, both are pumping; you're trying to
2 ascertain their impacts.

3 So in order to obtain the Kansas impact,
4 you turn off Kansas, correct?

5 A Correct.

6 Q And then I'm suggesting or asking you to
7 assume that the result of that is a recovery of base
8 flow.

9 A Well, what will happen when you turn off
10 the pumping is that base flows will be higher than they
11 were in the -- generally speaking --

12 Q Sure.

13 A -- than in the baseline condition. That
14 difference is the impact.

15 Q Sure.

16 And are you with me in my example that that
17 results in base flow and streamflow?

18 A I don't understand what you're saying when
19 you phrase it that way. That's why I rephrase it.

20 Q Sure.

21 I'm just asking you to assume that that's
22 the effect. You had a condition where there was no base
23 flow. You turn off Kansas, and then the outcome shows

24 there's base flow. Is that possible?

25 A Yes, that's possible.

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1 Q Okay. So assume that.

2 A Okay.

3 Q Okay. Now, let's assume that you do the
4 same thing with Nebraska pumping and you ascertain
5 Nebraska's impact the same way and you see the same
6 phenomenon.

7 You with me in my hypothetical?

8 A You see increased base flows?

9 Q Yes.

10 A Yeah.

11 Q So when you add those two together, do you
12 believe that that results in a double-counting of that
13 physical phenomenon of aquifer replenishment and
14 streamflow recovery?

15 A I don't know if you could determine that
16 since you don't know what the actual impact is. Those
17 estimates --

18 Q The true impact; is that what you're --

19 A Yes.

20 Q -- talking about?

21 But we can't ever determine the true
22 impact, right?

23 A That's correct.

24 Q But we -- we make these runs now, right, to
25 determine the state's relative impacts?

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1 A We make runs to estimate impacts by each
2 state by turning off their pumping individually.

3 Q True.

4 But physically in the system, the
5 groundwater would only be replenished once, right? It
6 wouldn't be physically done twice; it would just be one
7 time?

8 A I don't --

9 Q I'm not talking about the model now. I'm
10 talking about physically in reality. It only happens
11 once, right?

12 A Well, the reality of pumping being off
13 didn't happen.

14 Q That's not my question, though.

15 A Well, then I don't know what reality you're
16 talking about.

17 Q Okay. Do you agree that it is improper to
18 count, in the accounting, the beneficial consumptive use
19 of imported water as CBCU or virgin water supply?

20 A I'm not totally familiar with the
21 accounting in that regard.

22 Q Can you describe for me, getting back to my

23 discussion about Dr. Ahlfeld, how the model presently
24 accounts for all impacts when stream drying occurs?

25 A Well, the way the FSS specifies is that

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1 runs in the model are made without each state's pumping
2 one by one, and those are compared to the baseline
3 condition. And impacts are calculated for each state
4 when they're pumping, and imported water supply credit
5 is calculated in the same way.

6 As the imported water supply is turned off,
7 it is compared against the historical baseline
8 condition. And an impact is calculated and that
9 information is fed into the accounting process.

10 Q So I understand that you weren't
11 necessarily agreeing with me with regard to the question
12 of aquifer replenishment, but did I accurately
13 characterize how those impact calculations are made in
14 terms of determining Kansas' impact and Nebraska's
15 impact?

16 A Yes. Each state's pumping is turned off
17 sequentially.

18 Q Now, in pages 2 and 3, you have a
19 discussion of the arbitrator's views of things. I just
20 want to clarify:

21 This is just your interpretation of what
22 the arbitrator concluded; is that right? I mean, you

23 haven't had any conversations with the arbitrator or
24 anything subsequent to his decision, have you?

25 A I have not.

60

1 Q Okay.

2 A This is my conclusion based on the words
3 that he wrote.

4 Q Okay. And you note that the arbitrator
5 found unreasonable Nebraska's proposal to split the
6 residual; but the arbitrator did recognize the existence
7 of the residuals and that that presented a problem, did
8 he not?

9 A I think he recognized that there was a
10 residual, yes.

11 Q And didn't he suggest that the states work
12 to deal with that residual in some way?

13 A I believe he made a recommendation
14 generally to that effect.

15 Q Okay.

16 MR. WILMOTH: Let's take another 15-minute
17 break.

18 (Recess taken from 4:32 p.m. until
19 4:46 p.m.)

20 Q (BY MR. WILMOTH) Mr. Larson, on page 3,
21 you've got a section in your report entitled "Nebraska's

22 Proposal uses a Baseline that is not Calibrated."

23 Do you see that?

24 A Yes.

25 Q And in this section, you note that the

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1 proposal by Nebraska is akin to splitting the residual
2 between the states that might be contributing to it; is
3 that right?

4 A Yes.

5 Q Isn't distribution of the residual what
6 Kansas was calling for in the Exhibit 5, the virgin
7 water supply memo?

8 A I think in the memo, if I recall correctly,
9 it said that if you calculated a total impact or a --
10 how is it worded there? -- it said if you calculated its
11 impact of removing all the pumping and recharge of
12 imported water, that you would have to have a method for
13 apportioning it or that this result doesn't apportion
14 the impact.

15 Q Sure.

16 So is Kansas presently concerned that the
17 residual is being distributed or that Kansas is being
18 assigned an inappropriate share of the residual under
19 Nebraska's present proposal?

20 A Well, the first thing that we point out
21 here is that basically it's the -- with some minor --

22 relatively minor differences, most of the impacts
23 calculated with the Nebraska proposal boil down to
24 basically looking at just the differences between two
25 baselines, one historical baseline and one the baseline

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1 without any pumping or imported water, and that the
2 proposal basically just splits the difference between
3 those two.

4 Q And is the objection that that
5 difference -- that that division of the residual is
6 inappropriate or that it's being divided at all or that
7 Nebraska is trying to deal with it?

8 A Well, I think my conclusion is that it's
9 inappropriate.

10 Q To split it evenly?

11 A Yes.

12 Q Okay. Is there an appropriate distribution
13 of the residual?

14 A I don't know. That's possible.

15 Q So there could be some way to allocate that
16 residual value that would meet with your approval?

17 A It's possible, but as I point out at the
18 end of the report, I think in the last couple sentences,
19 if you wanted an acceptable distribution, it would
20 require renegotiation and reconsideration of all the

21 factors that allowed the states to reach agreement in
22 the FSS because, in my view, it goes beyond just this
23 sort of singular consideration.

24 Q Okay. So to be clear then, it's not a
25 question of how the residual is distributed; it's that

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1 it's distributed at all? That's the nature of the
2 objection?

3 A No, I don't think that's quite right. I
4 think the conclusion that I've reached is that the
5 distribution that's been proposed is not appropriate.
6 There may be others out there --

7 Q But they're --

8 A -- but -- but --

9 Q But they would require this renegotiation?

10 A It would require a consideration and
11 renegotiation of the things that led to the initial
12 agreement in the FSS.

13 Q Can you identify any of those for me?

14 A Well, some that I have concerns about are
15 things like the amount of irrigation return flows,
16 things like the amount of increased recharge on
17 irrigated land, things like the uncertainty in the
18 amount of recharge from the imported water supply.

19 Those are some of the ones that I certainly
20 think about.

21 Q And to help me understand, these don't bear
22 on whether a residual exists; it's just how you would
23 divide that? Is that correct?

24 A Or what you would agree to in terms of
25 something being acceptable, like it was at the time --

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1 Q As to distribute -- as to the distribution?

2 A As to the mechanics of how you would make
3 the calculations.

4 Q To distribute the residual?

5 A No. To make the calculations of impacts.
6 These are all factors that -- that I believe led to the
7 agreement in the FSS, at least on the part of Kansas.

8 Q Have you considered any distributions that
9 would be appropriate?

10 A I haven't tried to develop any, no.

11 Q Do you know whether Kansas ever has?

12 A You mean apart from what's in the FSS?

13 Q Yes.

14 A I don't recall any.

15 Q You note on this page 3 that the arbitrator
16 agreed with you, I guess, that splitting the residual
17 was inappropriate without consideration of other
18 factors.

19 Are those other factors that you're

20 referencing the things that you just told me about, such
21 as irrigation return flows, et cetera?

22 A No. I think the arbitrator was focused on
23 impacts to groundwater storage as being another factor.

24 Q Okay. And what do you perceive as his
25 concern there?

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1 A Well, my conclusion from reading his
2 findings is that he recognizes that there's a mass
3 balance in the model and, therefore, the effects will be
4 registered somewhere.

5 And so if there's differences, there would
6 be differences in things like groundwater storage
7 perhaps, evapotranspiration, and that those things need
8 to be considered when you're trying to determine how to
9 make modifications.

10 Q Back last fall, in answering some
11 interrogatories presented to the State of Kansas, Kansas
12 explained that the base run that's presently used was
13 selected as a run with all the stresses on because all
14 the experts from the three states agreed to it. Is that
15 the reason?

16 A I think it probably is, as I recall.

17 Q And at page 3 of your report, you note that
18 the Nebraska proposal uses a base condition that has
19 never occurred.

20 To what condition are you referring?

21 A Can you -- can you point me to where you're
22 at here?

23 Q Sure. Midway down the last paragraph.

24 A Oh.

25 Q "The alternative base"; do you see that?

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1 A The condition where pumping and seepage of
2 imported water didn't occur.

3 Q So no stresses, in other words?

4 A No pumping or seepage from imported water,
5 yes.

6 Q And can you tell me when the Compact was
7 entered?

8 A No.

9 Q Do you know when groundwater pumping --

10 A At least not off the top of my head, I
11 can't.

12 Q Do you know when groundwater pumping began
13 developing significantly in the basin?

14 A I want to say '50, '60, '70, somewhere in
15 that neighborhood.

16 Q 1950, '60 or '70?

17 A Well --

18 Q But the 20th Century --

19 A Yes.

20 Q -- for the record?

21 All right. And do you know when surface
22 water importation began?

23 A My recollection is 1940s, but I'd have to
24 look and see, something like that.

25 Q And did --

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1 MR. DRAPER: By "importation," you're
2 referring to the irrigation?

3 MR. WILMOTH: Return flows from the Platte
4 River Basin into the Republican.

5 A That's what I understood your question to
6 go to.

7 Q (BY MR. WILMOTH) And have these activities
8 increased over time, both pumping and water importation?

9 A Pumping has. Imported water grew, but then
10 it -- my recollection is, it sort of plateaued and has
11 dipped, and then I think more recently come back again.

12 Q So these things have been variable?

13 A Yes.

14 Q Does the model calibration period date back
15 to 1918?

16 A Well, the model run that was used in the
17 calibration begins in 1918.

18 Q And in your view, how does the proposed

19 all-off run compare to conditions at that time?

20 A I don't know.

21 Q But we basically talked about when
22 large-scale pumping occurred in earnest and then when
23 water importation occurred. And if I understood your
24 answers correctly, that was sometime between 1940 and
25 the present?

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1 A Roughly.

2 Q So there's some period of time between 1918
3 and that period where those stresses were not
4 significant, I guess; is that right?

5 A Or smaller.

6 Q Or were smaller.
7 So do you think that the all-off run
8 compares favorably to that situation from 1918 to, say,
9 1940?

10 A Well, the all-off run varies from year to
11 year according to variations in precipitation, so I
12 don't know if there's a direct way to compare what
13 you're suggesting.

14 Q As far as --

15 A In the model --

16 Q -- the stresses of groundwater pumping and
17 imported water supply, though, I would assume that since

18 those things weren't happening in 1918, turning those
19 off in the model would sufficiently represent the
20 conditions in 1918, is that fair, as to those stresses?

21 A With respect to those stresses, it would be
22 similar, but obviously things vary from time to time
23 based on the variations of precipitation, and
24 evapotranspiration for that matter.

25 Q But as to those two target sets, if you

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1 will, the period between 1918 and, say, 1940 is
2 essentially a condition that would have occurred if no
3 groundwater pumping was ongoing and there was no seepage
4 from imported water, right?

5 A During that period, pumping effects would
6 have been limited and impacts from the surface water
7 wouldn't have been there if the surface water wasn't
8 there in terms of imported water.

9 Q Now, you explained that the method applied
10 under the FSS employs a historical condition as a base
11 that can be compared to measured or observed data; is
12 that right?

13 A That's right.

14 Q What data have been measured?

15 A Groundwater levels have been measured at
16 various places over various times. Streamflow amounts
17 have been measured at various places at various times.

18 I suspect that pumping may have been at least measured
19 in some areas at some times.

20 Q Are the quality of those data consistent or
21 do they vary over a temporal scale?

22 A Well, there's certainly much more data
23 probably in more recent times than in older times. In
24 fact, there's probably some periods where there is no
25 data.

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1 Q And can you explain the process by which
2 the base condition was calibrated using those measured
3 values?

4 A The groundwater levels at various places at
5 various times were compared -- the measured groundwater
6 levels were compared against what the model was
7 calculating at those locations at those times.

8 The streamflows that were measured at
9 certain places were evaluated to estimate base flow
10 conditions, and those base flow conditions that were
11 estimated from the stream-gaging measurements were
12 compared against the model's calculation of base flow
13 conditions.

14 Q And so the quality of the data vary over
15 space and time in the basin, I assume. Do you just rely
16 on the best available information that you have for any

17 particular period that you're calibrating to go?

18 A Well, I would characterize it a little
19 differently as being that we used the data that we had
20 available. Some of the gaging -- stream-gaging
21 information, as I pointed out, had to be independently
22 evaluated before it could be used as a direct comparison
23 to the model because the model was only computing the
24 base flow portions of streamflow.

25 Q And you mentioned some of this data can be

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1 observed. Which of the data are observable?

2 A The measurements of groundwater levels --

3 Q Okay. So --

4 A -- is an observation. The measurement of
5 streamflows is an observation.

6 Q Okay. So for purposes of this discussion,
7 measurement and observation are equivalent?

8 A Yeah. I wasn't trying to distinguish them.

9 Q In your view, is the model perfectly
10 calibrated at this point?

11 A I'm -- I doubt that any model is -- would
12 ever be perfectly calibrated.

13 Q So do you undertake any ongoing calibration
14 processes to rectify that or address that?

15 A I think those kinds of things were
16 probably -- have probably been considered from time to

17 time. I have looked at it from time to time.

18 Q Is that an ongoing process now in -- within
19 the RRCA?

20 A I don't know.

21 Q And if the model failed to produce a -- or
22 reproduce, I should say, historical condition that
23 actually occurred, what is the consequence of that
24 failure? What does that mean to you?

25 A I don't know. It would depend on what it

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1 is and where it is.

2 Q Does it have any impact on the -- your view
3 of the reliability of the model?

4 A I don't know. It depends on what it would
5 be and where it would be.

6 Q Have you reviewed the Republican River
7 Compact?

8 A No, I wouldn't say I have reviewed it.
9 I've looked at it from time to time, but I wouldn't say
10 that I've reviewed it.

11 Q Do you know how the virgin water supply and
12 the states' allocations, respective allocations, are
13 determined in the Compact?

14 A Only generally.

15 Q Do you know whether those values were

16 measured values, for example?

17 A My understanding is that certain gage flows
18 are used, and presumably at least those flows would be
19 measured.

20 Q Returning to the proposed all-off condition
21 that Nebraska has described, does that only come into
22 play when these so-called unaccounted impacts occur, or
23 is that something that would be used at all times in
24 your understanding?

25 A My understanding of the way the FSS is set

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1 up to calculate impacts is that the all-off condition
2 isn't used.

3 Q Under Nebraska's proposal, though.

4 A And what was the question?

5 Q How would the all-off condition be used
6 under Nebraska's proposal?

7 A It's one of a series of runs that's used to
8 make a calculation.

9 Q And is it only employed when the
10 unaccounted impacts arise, as Nebraska has described?
11 And I understand you don't agree with that
12 characterization.

13 A My understanding is they have proposed a
14 formula, and that particular run is used as part of that
15 formula.

16 Q And do you know whether the Nebraska method
17 proposes results that are comparable, if not identical,
18 to the existing method when there is no stream drying?

19 A I haven't looked at that particular
20 question.

21 Q Turning to your next section, you note that
22 the Nebraska proposal produces imported water supply
23 credits that are higher in certain years; is that right?

24 A Yes.

25 Q How much higher?

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1 A I don't recall offhand.

2 Q But you agree that that is the effect of
3 the Nebraska proposal?

4 A Yes.

5 Q Okay. And so if the Nebraska proposal were
6 adopted, how would the Compact accounting change in the
7 future?

8 A I don't know how it would change.

9 Q Have you evaluated the effect of Nebraska's
10 proposed change if it were applied to the years 2005 and
11 2006?

12 A I suppose indirectly we have. I suspect
13 some -- at some point in time, we've made some
14 calculations like that.

15 Q Do you have any reason to dispute
16 Nebraska's assessment that it would be on the order of
17 10,000 acre-feet annually in those two years?

18 A That the difference --

19 Q Yes.

20 A -- would be? Not as I sit here, no.

21 Q Do you have any reason to dispute
22 Nebraska's assessment that it could be as much as
23 800,000 acre-feet over the next 50 years?

24 A That -- I've seen references to that. I
25 don't remember exactly what the basis for that was,

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1 but . . .

2 Q You haven't conducted any analysis of that
3 question, though?

4 A Not trying to determine that number, no.

5 Q In determining whether it's appropriate to
6 make a change like this, does the magnitude of the
7 change weigh into your consideration?

8 A It's possible it could.

9 Q Is there some threshold, in your view, that
10 is so de minimis as to not warrant consideration?

11 A No.

12 Q Is there some threshold that would
13 necessitate consideration?

14 A Not as I sit here, no.

15 Q A little further down on page 4, you
16 indicate that the Nebraska computations result in IWS
17 credit at times when streamflow does not occur under the
18 actual pumping condition.

19 Do you see that?

20 A Yes.

21 Q What condition is prevalent in the
22 Swanson-to-Harlan reach?

23 A What condition is prevalent?

24 Q Yes. You reference the pumping condition
25 here. I'm wondering what condition are you referring to

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1 there? Isn't the imported water supply also occurring
2 in that reach?

3 A Can you point me to what you're referring
4 to?

5 Q About halfway down the second paragraph.

6 A Oh. In the -- this condition of streamflow
7 not occurring, at least during the dry period, is as
8 prevalent in this reach between Swanson and Harlan
9 County reservoirs.

10 Q Okay. That's the condition to which you're
11 referring?

12 A Yeah.

13 Q Okay. And how often does that occur?

14 A Well, at least during the early 2000s, it
15 was occurring a fair percentage of the time.

16 Q And did you actually employ the Nebraska
17 proposal to make this determination that the
18 computations result in the IWS credit at times when the
19 streamflow does not occur? How did you make that
20 determination?

21 A I guess I looked at the calculations of
22 impacts during this period of time when streamflow
23 wasn't occurring.

24 Q Under the Nebraska method?

25 A Well, under both methods, I guess, or both

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1 conditions.

2 Q Okay. That's what I'm trying to get at. I
3 didn't see that word contained in here. I'm
4 wondering if it's -- is it in the backup material that
5 you provided?

6 A If we used it, it would have been.

7 Q Okay.

8 A But it would also have been among the runs
9 that I think we were provided from Nebraska.

10 Q Okay. That's what, I guess, I'm getting
11 at.

12 Did you simply rely on the runs that
13 Nebraska provided and you compared that to a condition

14 that you observed from the data, or did you actually
15 conduct your own independent runs?

16 A My best recollection is we were looking at
17 results -- well, the result that we portrayed actually
18 on page 5 is historical condition.

19 Q Uh-huh.

20 A But then we looked at the impacts that were
21 being calculated under various scenarios from the runs
22 that we were provided.

23 Q Okay. So you didn't conduct any
24 independent runs?

25 A Not for the purpose of this.

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1 Q Okay. And it's my understanding that
2 Nebraska presented annual values. Did you use those or
3 did you look at something else?

4 A I think I looked at both annual and monthly
5 values.

6 Q And the monthly values are set forth in
7 here?

8 A The monthly values for the historical run
9 are shown on this graphic.

10 Q Okay.

11 A Actually, I think they're bimonthly values,
12 to tell you the truth, but . . .

13 Q So if I understand the point of this
14 analysis, you're suggesting that the IWS credit -- there
15 should be no IWS credit when there's no streamflow being
16 recorded in this reach; is that right?

17 A The point is that when the stream is dry,
18 there will be no IWS credit that reaches that particular
19 location, and we made a graphic to try to illustrate how
20 well the model was predicting whether the dry streamflow
21 conditions occurred at the right times and over the
22 right periods.

23 Q So do you have an opinion about that point
24 I made?

25 A Well, my opinion is that the model

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1 reasonably predicts and calculates when dry conditions
2 occur in that reach, and during that time, IWS credits
3 would not reach those locations.

4 Q And, therefore, there shouldn't be an IWS
5 credit provided; is that your point?

6 A Well, I think --

7 Q Or you don't have an opinion about that
8 piece?

9 A Well, I think from Kansas' point of view,
10 and from my point of view, that was one thing that we
11 wanted to be sure would be achieved if we were going to
12 agree to the IWS credit.

13 Q And your determination is that the Nebraska
14 proposal results in a credit when streamflow drying
15 occurs; when the model predicts no streamflow, in other
16 words?

17 A A portion of the credit would be derived
18 from these reaches where no streamflow was occurring
19 under that proposal.

20 Q And that determination is shown in your
21 graphic here on page 5?

22 A No. The graphic on page 5 illustrates the
23 comparison between what the model is calculating as the
24 streamflow conditions in that reach, at least as
25 indicated by the gage near Orleans, versus what the

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1 model is calculating.

2 Q And I'm trying to locate the analysis that
3 you've got that demonstrates this phenomenon that
4 Nebraska is obtaining a credit when the model predicts a
5 dry stream. Is that analysis contained somewhere else?
6 I see the conclusion. I'm just trying to understand --

7 A Well, the analysis is probably just
8 something that we observed in the results that we were
9 provided. And recognizing that in the alternative
10 Nebraska is proposing, without the pumping, there can be
11 live streamflow conditions in these reaches during

12 periods when historically there was no streamflow.

13 Q At the end of this paragraph, you come back
14 to this notion that it's inappropriate to use a baseline
15 that does not include groundwater pumping; is that -- am
16 I reading that correctly?

17 MR. DRAPER: Which paragraph are you on?

18 MR. WILMOTH: Bottom of second paragraph,
19 page 4.

20 A Yeah. I think we say that when you use
21 that baseline, the credit is not realistically computed.

22 Q (BY MR. WILMOTH) And why is it important to
23 use that baseline to determine the virgin water supply?

24 A Well, generally speaking -- and I can't
25 totally speak for Kansas on this -- but it's to ensure

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1 that if we're going to allow a credit to be given, that
2 it's a credit that is likely to actually be in the
3 stream.

4 Q Are there any runs of the model that do not
5 include groundwater pumping?

6 A I'm not sure I understand your question.

7 Q Are there any runs of the model that don't
8 include groundwater pumping? Do you ever run the model
9 that includes a condition where groundwater pumping is
10 not occurring?

11 A Well, under the FSS, there are runs that

12 are made without Kansas pumping or without Nebraska
13 pumping or without Colorado pumping.

14 Q And why are those any more realistic than a
15 condition where nobody's pumping?

16 A Realistic?

17 Q Yeah.

18 A I don't understand what you mean by
19 "realistic."

20 Q Well, I understand part of your concern
21 about the Nebraska proposal is that it relies on a
22 condition that doesn't include groundwater pumping; is
23 that right?

24 A No. I think it's that part of the
25 calculation of impacts is using a baseline when nobody

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1 is pumping.

2 Q But we run the model all the time where at
3 least one entity is not pumping, right?

4 A We do.

5 Q Okay. But that never occurred in reality,
6 did it?

7 A No, but the departure that we're measuring
8 is a departure from the historical baseline.

9 Q Okay. Getting back to your graphic on the
10 top of page 5, can you tell me what IWS credit

11 Nebraska's proposed method predicted during that time
12 period?

13 A Not without going into some of the backup
14 materials.

15 Q Where would I find that?

16 A Well, it would either be in the materials
17 we provided you recently or in the materials that were
18 provided earlier with regard to our earlier reports.

19 Q The compliance reports?

20 A Yes.

21 Q But you're certain that the Nebraska method
22 did predict streamflow at those locations at all times?

23 A No, I didn't say that.

24 Q So it's possible that the Nebraska proposal
25 didn't predict streamflow during these periods?

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1 A Possible, during some of them.

2 Q So you're not suggesting, then, that in
3 every case, Nebraska's proposal predicted streamflow
4 where it didn't actually manifest?

5 A I'm not suggesting that the Nebraska
6 proposal didn't predict impacts at times when the
7 streamflow was dry even in the no-pumping condition.

8 Q But are you suggesting it did predict the
9 imported water supply credit in each of these cases, or
10 you don't know yet because it's in the backup?

11 A Well, what I don't recall from memory is
12 the comparison of whether there were dry conditions in
13 the Nebraska alternative for the no-pumping scenario.

14 Q I'm just trying to get a feel for how far
15 off of this (indicating) the Nebraska proposal is. The
16 implication is that Nebraska is predicting streamflow in
17 all these conditions, and I'm not hearing you say that.

18 A That's because I'm not saying that.

19 Q Okay. That's what I was asking. Let's
20 move to the next section, that "Target Sets are not of
21 Equal Reliability."

22 And you noted that estimates of pumping are
23 now based on well metered data; is that right?

24 A It's my understanding that at least in more
25 current times, that they're largely based on metered

84

1 date.

2 Q And not all the pumping data are based on
3 meters, though, are they?

4 A I don't think so.

5 Q How was it done before meters were
6 installed in the basin?

7 A Seems to me, if I remember, there were some
8 estimates developed, say, from power records or -- I
9 wonder if some of the estimates may have even been based

10 on crop statistics or something like that. I don't

11 recall all of them.

12 Q So you would look at some other surrogate
13 and extrapolate from that how much pumping it would take
14 to translate into this many kilowatt-hours or this much
15 acreage?

16 A That was my recollection, yes.

17 Q Do you know when Colorado installed meters
18 on its wells in the basin?

19 A No.

20 Q Do you know when Kansas installed meters on
21 its wells in the basin?

22 A No, although sometime in the 1990s sticks
23 in my mind, but I don't know exactly when.

24 Q Can you explain how the recharge values
25 that are input into the model are calculated, irrigation

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1 recharge?

2 A Well, each state makes estimates
3 individually. I think in Nebraska, generally it's
4 assumed to be like 20 percent of the applied water or
5 something in that area.

6 I think in Kansas, estimates are based on
7 irrigation efficiency. I think they typically are
8 smaller, probably down to the 10 to 15 percent range.

9 I'm not exactly sure how Colorado

10 determines theirs.

11 Q Okay. Are these essentially extrapolated
12 from diversion records and on-farm efficiencies and
13 those kinds of things?

14 A I don't know all the details of how people
15 have come up with those numbers.

16 Q Can you explain how the surface water CBCU
17 is calculated?

18 A Not really, no.

19 Q And if I understand your point in this
20 section, you're suggesting that the target set related
21 to imported water is somehow less reliable than the
22 other target sets; is that right?

23 A Yes.

24 Q And the basis for that is, as I understand
25 it, you're relying on these extrapolations of diversions

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1 and return flows and other things; is that right?

2 A That's certainly part of it.

3 Q Yet in the preceding section, you indicated
4 that the model predicted streamflow drying in the
5 Swanson-to-Harlan reach quite accurately, at the bottom
6 of page 4. Why would that have happened if the imported
7 water target set is so unreliable?

8 A Well, the imported water effect is a

9 relatively small effect, so I don't know that there's
10 necessarily any connection between the reliability of
11 the imported water supply and the fact that you -- the
12 model is able to predict these stream conditions
13 reasonably accurately.

14 Q Okay. On page 6, you note that the
15 estimates of net pumping have a relatively narrow band
16 of uncertainty.

17 What does that mean, in your mind? Are we
18 talking 10 percent or 50 percent or 75 percent
19 uncertainty?

20 A Well, I don't have a specific
21 quantification of it, but my notion would be you're on
22 the order of 10 percent when you're dealing with -- more
23 or less, when you're dealing with metered values of
24 pumping.

25 Q Sure.

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1 And do you have a comparable value that
2 you've assigned to the imported water supply?

3 A I haven't, except I would note in terms of
4 the concerns that I've expressed here about them is that
5 the procedures, as I understand them, are taking
6 differences of fairly large numbers and assigning the
7 differences to be the unaccounted water and it's assumed
8 to be seepage loss or groundwater recharge, that that's

9 the way the calculational process works.

10 And what happens when you do that kind of a
11 calculational process is the magnitudes of the
12 uncertainty in the individual components, which are
13 large, are translated in an additive fashion even though
14 you're taking differences to the result. And that leads
15 me to the conclusion that there could be a fairly large
16 range of uncertainty in that result.

17 Q So would that uncertainty be comparable to
18 the uncertainty that one might have in extrapolating
19 groundwater pumping from well meter -- excuse me, from
20 power records? How does that compare?

21 A Well, I haven't quantified that. My
22 suspicion would be it would be a lot larger.

23 Q And the same thing, I suppose, in terms of
24 comparing it to extrapolating surface water diversions
25 from acres irrigated?

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1 A Well, if you're calculating the -- just
2 that portion of return flow, for example, it may have a
3 similar level of uncertainty, but it's a much smaller
4 number, relatively speaking.

5 Q But you haven't made any actual
6 determination as to the level of uncertainty, for
7 example, of seepage losses from the Platte River?

8 A I have not.

9 Q Did you examine any seepage run reports for
10 the Platte River?

11 A Seepage runs for the Platte River? No.

12 Q Have you visited the Platte River and the
13 canal system at issue?

14 A I have not. I visited the Platte River
15 probably in my lifetime, but I don't think -- I don't
16 think I went to those areas, no.

17 Q They are not the most scenic part.

18 Did you visit with the operators of those
19 systems at all, Central Nebraska Public Power and
20 Irrigation?

21 A Not that I'm aware of, no.

22 Q Okay.

23 A I mean, I did some work for Nebraska at one
24 point in the Platte River, but I don't ever remember
25 them being involved.

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1 Q In the last sentence on page 6, you
2 indicate that the skewed residuals are used -- "When the
3 skewed residuals are used as an estimate of canal
4 seepage, they will have a tendency to overestimate the
5 actual seepage."

6 Can you describe the analysis you performed
7 to draw that conclusion?

8 A Well, what I noticed was that in the
9 calculational procedures as described in some worksheets
10 that I examined --

11 Q Were those provided by Nebraska?

12 A Yes -- that they indicated that their
13 operating procedure was to treat negative residuals as
14 zeros. And the conclusion I reached from that is that
15 to the extent that that occurred, that would produce a
16 bias in the result.

17 Q Did you use a particular residual?

18 A No. Just the fact that --

19 Q Or a particular year?

20 A -- it's -- no, I did not.

21 Q That's a stupid question, and I'm not going
22 to ask it.

23 MR. WILMOTH: Let's take a break.

24 (Recess taken from 5:33 p.m. until
25 5:48 p.m.)

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1 Q (BY MR. WILMOTH) Turning to page 7, your
2 section entitled "Components of Virgin Water Supply,"
3 you note there that the surface water CBCU and
4 groundwater CBCU provide an element of the computed
5 water supply and that that's then used to determine each
6 state's allocation in the accounting procedures.

7 Do you see that?

8 A Yes.

9 Q I just want to clarify this. The
10 allocations themselves are established in the Compact,
11 correct?

12 A That's my understanding.

13 Q And through your work and that of the
14 larger RRCA, there's not a redetermination of the basic
15 Compact allocations annually, is there?

16 A Not that I'm aware of, no.

17 Q So the purpose of the Compact accounting is
18 to quantify from year to year the amount of water a
19 state receives under its allocation; is that right?

20 A My understanding is that the accounting
21 determines each state's consumptive use and each state's
22 allocation.

23 Q The accounting determines the allocation or
24 how much water is usable under that allocation?

25 A How much water is allocated to each state.

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1 Q Pursuant to the allocation it received in
2 the Compact, right?

3 A My understanding is the accounting
4 procedures determine how much of the water supply is
5 allocated to each of the states, but then I'm not an
6 expert on the accounting procedures.

7 Q So are you suggesting that the accounting
8 procedures do redetermine the Compact allocations
9 annually? I want to be very specific about this term
10 "allocation" and what it means.

11 A Well, maybe I'm getting confused about --
12 are you talking about the percentages or the amount of
13 water that's allocated each year?

14 Q I'm talking about both and wondering which
15 one you're talking about.

16 A I was talking about the amount of water
17 allocated each year.

18 Q Okay. So if the surface water CBCU or the
19 groundwater CBCU is incorrectly determined, for whatever
20 reason, a reporting error or otherwise, then the
21 computed water supply could be incorrectly determined;
22 is that right?

23 A Well, I guess as a conceptual matter, if
24 you knew that there was -- if you knew what the true
25 value was and you could compare that to the estimates

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1 and they were -- they were different, that might have an
2 impact.

3 Q But you don't know what the true value is?

4 A Correct.

5 Q So you don't ever know if surface water

6 CBCU or groundwater CBCU is correctly determined; is
7 that what you're saying?

8 A Well, I think, as I understand it, the
9 states have agreed to use estimates based on certain
10 procedures --

11 Q Sure.

12 A -- to make these calculations, and the true
13 values are simply unknown and that those estimates are
14 sufficient for their purpose.

15 Q Okay. So if those estimates were incorrect
16 in any regard for any reason, estimates of surface water
17 CBCU or groundwater CBCU, then wouldn't necessarily the
18 computed water supply be in error? Wouldn't that error
19 translate through?

20 A If you somehow knew that it was wrong.

21 Q Yes. I'm giving you that premise as part
22 of my question.

23 A Well, then I would assume it just follows
24 that anything you use that number for could be wrong.

25 Q So then if the computed water supply were

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1 incorrectly determined, is it also true that a state
2 might receive more or less water than it's entitled to
3 under its Compact allocation?

4 A I don't know. I guess it's possible.

5 Q And that would not be consistent with the

6 terms of the Compact, would it, in your view, not as a
7 lawyer?

8 MR. WILMOTH: Beat you to it, John.

9 Q (BY MR. WILMOTH) That would not be
10 consistent with your objectives?

11 A With what objectives?

12 Q As part of your obligations to operate on
13 the engineering committee and work on the Compact
14 accounting and using the model, et cetera, et cetera.

15 A I don't participate in the engineering
16 committee.

17 Q Okay. Well, let me just ask you straight:
18 I mean, if you conduct a model run or work through an
19 accounting procedure that results in one state receiving
20 more water than it's entitled to under its Compact
21 allocation, would that be appropriate?

22 A If you knew for a fact that it was
23 receiving more water than it was entitled to, I would
24 assume it would not be appropriate.

25 Q What parameters were the -- was the model

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1 built to meet? What were you trying to achieve?

2 A Are you talking about the calibration of
3 the model?

4 Q I'm just trying to understand what the

5 model is built to do. The accounting procedures
6 preceded the model, correct?

7 A I don't know if it preceded them. It seems
8 to me they were probably going on at the same time.

9 Q So you don't know if the model was
10 constructed to achieve the goals of the accounting
11 procedures or vice versa?

12 A My understanding was that the model was
13 used to provide estimates of the impacts of pumping and
14 the impacts of the imported water supply for feeding
15 into other calculations that were done in the accounting
16 procedures.

17 Q And the model was completed after the
18 accounting procedures were finalized, or you're not
19 sure?

20 A I think ultimately, although -- ultimately,
21 I think that's true.

22 Q On page 8, you indicate that it's unlikely
23 that the combined effect of surface water CBCU and
24 groundwater CBCU would add up to the sum of the two
25 individual values.

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1 Do you see that? It's the second
2 paragraph, page 8.

3 A Yes.

4 Q What do you base that opinion on?

5 A Well, it's based on just the knowledge that
6 those things can affect the model's calculation.

7 Q You haven't conducted that analysis?

8 A No.

9 Q And the second full paragraph on this page
10 is a characterization of the arbitrator's report. I
11 assume, again, that you had no further conversations
12 with the arbitrator and this is just your interpretation
13 of his report; is that right?

14 A That's correct.

15 Q In the second full paragraph on this page,
16 you refer back to this concept of the true values of
17 depletions. And I think I understand you to say the
18 values obtained through the models are just estimates,
19 right? We've covered that ground?

20 A Correct.

21 Q Okay. And since the accounting methodology
22 uses the model data, is the accounting method just an
23 estimate also? Does it just provide estimates?

24 A My understanding is that estimates are used
25 in the accounting procedures.

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1 Q And is the result of the accounting just an
2 estimate of something?

3 A That would be my understanding.

4 Q So if it's an unknowable estimate of an
5 unknowable value, then how do we judge whether
6 Nebraska's proposal is appropriate or not, or does it
7 just boil down to the fact that it wasn't agreed to by
8 those states?

9 A Well, I think, from our perspective, when
10 we look at the proposal and things like the fact that
11 the residuals are evenly divided, generally speaking,
12 those kinds of things, I would consider inappropriate as
13 a fundamental fact -- or a fundamental factor, I should
14 say.

15 Q On page 9, you have a heading entitled
16 "Nebraska's Projection of Future Impacts." You indicate
17 here that, in the first sentence, Nebraska's scenario to
18 demonstrate the reasonableness of existing accounting
19 procedures is not reasonable because the scenario is not
20 likely to occur; is that right? It's not a reasonable
21 test because it's not likely to occur?

22 A Yes.

23 Q How does the likelihood of an event bear on
24 whether to consider a particular methodology or not?

25 A Well, just as a general principle, it would

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1 occur to me that in trying to evaluate plans or
2 whatever, you would want to have an evaluation of things
3 that could occur.

4 Q So if a future event is not likely to
5 occur, it's not reasonable to use that event to make
6 judgments?

7 A Well, if -- if you're fairly certain that
8 it's not likely to occur, it would -- it would tell me
9 that the particular result probably isn't that useful to
10 drawing conclusions.

11 Q And do you have an opinion about how likely
12 a future scenario should be to employ it for analytical
13 purposes?

14 A No.

15 Q Do you know of any peer-reviewed literature
16 that would help us identify that?

17 A No.

18 Q At the last full paragraph on this page,
19 you indicate Dr. Schneider's descriptions of Figure ES-3
20 in his report is a mischaracterization and obviously
21 incorrect.

22 Do you see that?

23 A Yes.

24 Q And on what do you base that opinion?

25 A I base it on a couple of different things.

1 One, looking at the graphic and what it sort of purports
2 to show and comparing that with my understanding of what

3 the effects of mound recharge have been historically and
4 also in looking at groundwater level data from wells in
5 the area of the mound and looking at the trends and
6 changes over time in those groundwater levels.

7 Q Do you understand those figures as trying
8 to show the effects of all past mound recharge or just a
9 continuation of the mound recharge from 2009 forward?

10 A My understanding is that they're -- well,
11 they say base flow, if I remember correctly, but it's
12 actually an impact of removing base flow -- or, I'm
13 sorry, removing imported water supply beginning in the
14 year 2009 and comparing that to what the conditions
15 would be if the imported water supply were continued
16 after 2009.

17 Q And do you believe that the results in
18 Figure ES-2 of Dr. Schneider's report are realistic?

19 A Well, when you look at -- my conclusion is,
20 when you look at -- in detail at what they actually
21 are -- I mean, they all make sense as to what they are,
22 but when you look at what the graph suggests they are,
23 they are not realistic.

24 Q Do you agree that under the current
25 accounting procedures, Nebraska's annual Compact

1 accounting balances are likely to improve if the
2 imported water supply credit is diminished or

3 eliminated?

4 Do you need her to read that back?

5 A No. I'm just trying to understand what
6 you're trying to ask me. Are you asking me if the
7 imported water supply credit diminishes in the future,
8 would Nebraska be better off? Is that what you're
9 asking me?

10 Q That's what I'm asking. Under the current
11 accounting procedures, is that -- is that the case?

12 A Well, my understanding is they're given a
13 credit for the imported water supply to the extent that
14 it produces accretions to stream -- to base flows, and
15 if you're getting -- if you're saying that they may get
16 less in the future, I assume that would have an impact
17 on Nebraska.

18 Q A negative impact from an accounting
19 balance standpoint?

20 A Yes.

21 Q Okay. So you would not expect a reduction
22 in the imported water supply credit to improve
23 Nebraska's balance? I'm trying to just simply say the
24 inverse of what you're saying to make sure I understand
25 it.

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1 A Now I'm totally confused.

2 Q Okay. Let me put it this way: If the
3 imported water supply diminishes --

4 A In the future.

5 Q -- in the future, what effect would you
6 expect that to have on Nebraska's Compact balances?

7 A Well, they wouldn't get as much credit.

8 Q So that would be a negative effect on their
9 balance?

10 A I would assume so, yeah.

11 Q Regarding the section entitled "Assertions
12 Regarding 'Additivity'" on page 10, could you describe
13 for me your understanding of that term, "additivity,"
14 please.

15 A My understanding of the term, the way it's
16 been used here, is whether or not the impacts calculated
17 for the individual state's pumping and the imported
18 water supply credit, that when they -- when you add them
19 up, that they would be the same as the impacts you would
20 calculate with the model if you simultaneously removed
21 each one of those components and compared that to the
22 baseline condition.

23 Q And is that the same concept that Kansas
24 was talking about in the virgin water supply memo,
25 Exhibit 5?

1 A Well, in the virgin water supply memo,

2 Kansas -- and we were comparing how well two different
3 alternatives -- in this case, the FSS procedure on the
4 one hand and the proposal by Nebraska -- how well they
5 compared against that calculation for purposes of trying
6 to judge whether one was closer or further away.

7 Q If you sum Nebraska's subbasin and mainstem
8 allocations, what does that give you under the
9 accounting?

10 A I'm not sure I know.

11 Q In your conclusion section, if I understand
12 this correctly, you suggest that achieving Nebraska's
13 concept of additivity may conceptually be a preferred
14 result.

15 Could you explain why that is the case?

16 A Well, I think, in concept, it would be nice
17 if -- or you might consider it a better -- or a better
18 result if they all added up to the same result that you
19 got by running all of them simultaneously off.

20 Q And if what you call the arbitrary
21 distribution of impacts among the states could be
22 eliminated, would you support the proposed change?

23 A I think, as I've stated in this conclusion,
24 that it would depend upon a number of things because
25 in -- in agreeing to the procedures that are spelled out

1 in the FSS, I think there were a number of factors that
2 were considered by all the states probably in terms of
3 agreeing to those procedures. And I think if an
4 alternative proposal is made for redistributing some of
5 these effects, that those other factors would have to be
6 considered at the same time.

7 Q Do you know whether Kansas has ever
8 articulated its views or beliefs about how those things
9 might need to change?

10 A About the other factors?

11 Q Yes, sir.

12 A I suspect that they probably have, although
13 I'm not sure. But I think they have, for some of them
14 anyway.

15 But I think there's been some discussion
16 about the amount of irrigation return flows associated
17 with pumping. I don't know at what level it's gone to,
18 but I believe there's been some discussion.

19 So that's among the things that I think
20 would be a factor.

21 Q Just to understand the continuing value, if
22 any, of this virgin water supply metric we discussed
23 earlier, is that whole metric just kind of unnecessary
24 at this point? Does it have any real use at this time?

25 In other words, one could draw the

1 conclusion that Nebraska spent some significant time
2 trying to develop a solution that met that metric in
3 response to the virgin water supply memo. And I'm
4 wondering if Nebraska, in your view, should continue to
5 bother. Is there any continuing value to that metric?

6 A I think there could be.

7 Q What would that be?

8 A Well, if you could come up with a proposal
9 that would better achieve that metric but would meet a
10 number of other factors, it may be acceptable.

11 Q In your view, is it necessary to meet that
12 metric?

13 A No.

14 MR. WILMOTH: I don't have anything further
15 unless -- you want me to get into this?

16 I don't have anything further, John.

17 MR. DRAPER: Autumn?

18 MS. BERNHARDT: No questions.

19 MR. DRAPER: That will do it for us, too.

20 MR. WILMOTH: All right.

21 (Whereupon, the deposition concluded at
22 6:09 p.m.)

23

24

25

1 I, STEVEN P. LARSON, do hereby certify that
2 I have read the foregoing transcript and that the same
3 transcript and accompanying correction sheets, if any,
4 constitute a true and complete record of my testimony.

5

6

Deponent

7

8

9 No Changes Amendments attached

10

11 Subscribed and sworn to before me this

12 _____ day of _____ 2012.

13 My commission expires: _____

14

Notary Public

15

16 sd

17 State of Kansas v. State of Nebraska, et al.

18

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1 STATE OF COLORADO)

2)SS. REPORTER'S CERTIFICATE

3 COUNTY OF ARAPAHOE)

4 I, K. MICHELLE DITTMER, do hereby certify
5 that I am a Registered Merit Reporter and Notary Public
6 within the state of Colorado; that previous to the
7 commencement of the examination, the deponent was duly
8 sworn by me to testify to the truth.

9 I further certify that this deposition was
10 taken in shorthand by me at the time and place herein
11 set forth and was thereafter reduced to typewritten
12 form, and that the foregoing constitutes a true and
13 correct transcript.

14 I further certify that I am not related to,
15 employed by, nor counsel of any of the parties or
16 attorneys herein, nor otherwise interested in the
17 result of the within action.

18 I further certify reading and signing not
19 requested pursuant to CRCP Rule 30(e).

20 In witness whereof, I have affixed my
21 signature this 11th day of April, 2012.

22

23

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7
8 Case Name: State of Kansas v. State of Nebraska, et al.
Case No.: No. 126, Original
9 Deposition of: STEVEN P. LARSON

10 The deposition in the above-entitled matter is ready for
reading and signing. Please attend to this matter by
11 complying with ALL blanks checked below.

12 XX arranging with us at (303) 696-7680 to read.
and sign the deposition in our office.

13
14 OR (if applicable),

15 XX have deponent read your copy; signing attached
original signature page and any amendments
sheets.

16
17 read enclosed deposition, sign attached
signature page and any amendment sheets.

18 XX within 30 days of the date of this letter.

19 Please be sure that the signature page and accompanying
amendment sheets, if any, are signed before a notary
20 public and returned to our office at the above address.

21 If this matter has not been taken care of within said
period of time, the deposition will be filed unsigned
22 pursuant to the Rules of Civil Procedure.

23 Thank you.

Enclosures:
24 cc: Tom Wilmoth, Esq; Autumn Bernhardt, Esq.

25

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4 TOM WILMOTH, ESQ.

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6

7 Re: State of Kansas v. State of Nebraska, et al.

Deposition of: STEVEN P. LARSON

8

Dear Mr. Wilmoth:

9 ___ Previously filed. Forwarding signature page and
amendment sheet(s).

10

___ Signed, no changes.

11

___ Signed, with changes, copy of which is enclosed.

12

___ No signature required.

13

14 XX Reading and signing not requested pursuant to CRCP
Rule 30(e)

15

___ Signature waived.

16

17 XX Forwarding original transcript unsigned; signature
page and/or amendments will be forwarded if
received.

18

19 ___ Original exhibits included in ongoing notebook
and will be filed with counsel at conclusion of
discovery.

20

Enclosures: (As above noted)

21 cc: John B. Draper, Esq.; Autumn Bernhardt, Esq.

22

23

24

25

