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NO. 105, ORIGINAL  
IN THE SUPREME COURT OF THE UNITED STATES  
JUNE TERM 2002

STATE OF KANSAS, )  
 )  
 PLAINTIFF, )  
 )  
 VS. ) VOLUME NO. 239  
 )  
 STATE OF COLORADO, )  
 )  
 DEFENDANT, )  
 )  
 UNITED STATES OF AMERICA, )  
 )  
 INTERVENOR. )

PROCEEDINGS HELD BEFORE  
ARTHUR L. LITTLEWORTH, SPECIAL MASTER

LOCATION: UNITED STATES COURT OF APPEALS  
FOR THE NINTH CIRCUIT  
125 SOUTH GRAND AVENUE  
COURTROOM NO. 3  
PASADENA, CALI FORNIA

DATE AND TIME: MONDAY, AUGUST 19, 2002  
9: 30 A. M.

REPORTED BY:  
STEPHANIE SLONE, CSR, RPR  
(NO. 10609)

KRAUSE COURT REPORTERS  
625 FAIR OAKS AVENUE, SUITE 245  
SOUTH PASADENA, CALI FORNIA 91030

(626) 799-0810

KRAUSE COURT REPORTERS

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APPEARANCES

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I N D E X

WITNESS:	DI RECT EXAMI NATI ON	CROSS EXAMI NATI ON	REDI RECT EXAMI NATI ON
GREGORY K. SULLI VAN	-	5	-

E X H I B I T S

PLAI NTI FF' S	I NTO EVI DENCE	I NTR ODUCE D
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1120* - Annual Margi nal Crop Consumpti ve Use vs. Farm Headgate Water Supply, Col orado Test Model , Kansas Revi sed Model , Kansas Compl i ance Model	4	-

  

DEFENDANT' S	I NTO EVI DENCE	I NTR ODUCE D
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1 PASADENA, CALIFORNIA; MONDAY, AUGUST 19, 2002

2 9:30 A.M.

3 \* \* \*

4 THE REPORTER: Please rise and come  
5 to order for the case of Kansas v. Colorado in  
6 the Supreme Court of the United States, the  
7 Honorable Arthur L. Littleworth, Special Master,  
8 presiding.

9 SPECIAL MASTER: Morning.

10 MR. DRAPER: Good morning,  
11 Your Honor.

12 MR. ROBBINS: Good morning,  
13 Your Honor.

14 SPECIAL MASTER: Mr. Draper.

15 MR. DRAPER: Your Honor, as an  
16 initial matter, I'd like to provide you copies  
17 of Kansas Exhibits 1119\* and 1120\*. These are  
18 the replacement exhibits we talked about on  
19 Friday. I provided Mr. Robbins copies, and I'd  
20 like to provide you these and then move that  
21 they be admitted.

22 SPECIAL MASTER: Any objection to  
23 those?

24 MR. ROBBINS: No, Your Honor.

25 SPECIAL MASTER: All right. Those  
26 will be admitted.

27 MR. DRAPER: Thank you.

28 (Whereupon Plaintiff's Exhibit

1 Nos. 1119\* and 1120\* were admitted  
2 into evidence.)

3 SPECIAL MASTER: All right,  
4 Mr. Robbins.

5 MR. ROBBINS: Thank you, Your Honor.

6  
7 GREGORY K. SULLIVAN,  
8 having been previously duly sworn, was  
9 examined and testified further as follows:

10  
11 CROSS-EXAMINATION (Continued)

12 BY MR. ROBBINS:

13 Q. Good morning, Mr. Sullivan.

14 A. Good morning, Mr. Robbins.

15 Q. I trust you had a pleasant weekend.

16 A. Very pleasant.

17 SPECIAL MASTER: Not worried at all.

18 THE WITNESS: I wouldn't say that.

19 BY MR. ROBBINS:

20 Q. How's your wife?

21 A. She's doing fine.

22 Q. We'll see if we can get this taken care of so  
23 you can attend the things that seem a whole lot  
24 more important.

25 A. Thank you very much.

26 Q. Do you have a copy of Defendant's Exhibit 1353?

27 A. Is that my expert report?

28 Q. No. That's the expert report that Duane

1 Schroeder prepared.

2 A. No, I don' t.

3 Q. Let me hand you one.

4 Do you have one, Your Honor --

5 SPECIAL MASTER: Yes.

6 MR. ROBBINS: -- Defendant' s

7 Exhi bi t 1353?

8 Q. Would you turn to Table 2, please, which is on  
9 page 25. Let' s look at the revised supplemental  
10 acreages that Mr. Schroeder used for calibrating  
11 the model .

12 In the previous versions of the H. I.  
13 model , the acreage irrigated by groundwater had  
14 been determined based on the general assumption  
15 that if there was irrigated acreage in a section  
16 and there was a decreed or permitted well in the  
17 section, all of the acreage was irrigated by  
18 groundwater; isn' t that correct?

19 A. I believe we talked about this some on Friday,  
20 and what you say may have been some of what went  
21 into that. I' m not intimately familiar with how  
22 those acres were determined.

23 Q. Okay. The percentages, however, are shown in  
24 Column 1; is that right?

25 A. Those are the percentages that were used in the  
26 modeling up to this point prior to this current  
27 day.

28 Q. For the 1995-' 96 update, Colorado proposed to

- 1 use the decreed and permitted acreage to  
2 determine the acreage irrigated by groundwater;  
3 isn't that true? Do you recall that?
- 4 A. I believe they considered a number of things. I  
5 don't recall the details of it.
- 6 Q. If that's what the master found in his order at  
7 page 6, would you agree that that is probably  
8 what Colorado was proposing?
- 9 A. For which period?
- 10 Q. '95-'96.
- 11 A. If that's what is in his order, I take your word  
12 for it.
- 13 Q. Okay. Do you know what assumption Colorado used  
14 in the water budgets, which was developed in the  
15 original phase of this trial to estimate acreage  
16 irrigated by groundwater?
- 17 A. No.
- 18 Q. In 1995 and 1996 were you present in court when  
19 that proceeding occurred?
- 20 A. I believe I was, yes.
- 21 Q. Do you recall that Mr. Book opposed making any  
22 changes for the 1995 and 1996 update by saying  
23 that only new data and new studies should be  
24 used to change the original assumption in the  
25 model concerning what acreage should be  
26 considered irrigated by groundwater?
- 27 A. I don't recall that testimony.
- 28 Q. So in 1998 did a survey -- in 1998, however,

- 1 Colorado did a survey of all well owners in the  
2 modeled area; isn't that correct?
- 3 A. The irrigated area survey?
- 4 Q. Well, they did a survey not of irrigated area  
5 but specifically of the well owners and the --  
6 well, the irrigated area, but they also surveyed  
7 whether irrigation wells were used and on what  
8 acres; is that correct?
- 9 A. As a general matter, they did.
- 10 Q. And, in fact, the results of that survey have  
11 been testified to -- is that correct? -- by  
12 Mr. Tyner?
- 13 A. Yes.
- 14 Q. Colorado also did verification interviews of  
15 well owners that Mr. Tyner also testified about;  
16 is that correct?
- 17 A. I recall he testified to that.
- 18 Q. Now, you didn't use the data from the surveys  
19 that were done and the verification interviews  
20 directly in the Kansas version of the model, did  
21 you?
- 22 A. For which period?
- 23 Q. For any period.
- 24 A. We considered it.
- 25 Q. You did not use it, however, in the Kansas  
26 model, did you?
- 27 A. In what way?
- 28 Q. As an input to the model.



- 1 A. Well, it was our opinion that some adjustments  
2 to the acreage needed to be made to account for  
3 some of the simplifications and approximations  
4 that are made with regard to surface water and  
5 groundwater distribution in the model. So --
- 6 Q. As a general response, could I assume that your  
7 answer was "No," you didn't use it directly?
- 8 A. Well, we didn't use all of it directly. I  
9 believe we used the sole source acreages.
- 10 Q. You used the sole source but not as the  
11 supplemental acreage; right?
- 12 A. I believe that's correct.
- 13 Q. And you didn't use Mr. Tyner's acreage even in  
14 1998 directly, the supplemental acreage, did  
15 you?
- 16 A. No.
- 17 Q. For the recalibration of the revised Kansas  
18 model, Mr. Book made a new assumption to  
19 estimate the acreage irrigated by groundwater;  
20 isn't that correct?
- 21 A. He made an assumption.
- 22 Q. A new assumption, different than the assumption  
23 that Kansas had used before to estimate the  
24 acreage irrigated with supplemental groundwater?  
25 And by --
- 26 A. I believe that's correct.
- 27 Q. Okay. Let me ask you if you have a copy of  
28 Plaintiff's Exhibit 1093. That's the Kansas

1           analysis of Colorado compliance, '97-'99.

2           A.     Yes.

3           Q.     Thank you.

4           A.     I have a copy of that.

5           Q.     Thank you.

6                         Would you turn to Table 3 of that  
7           exhibit, please. Do you have that?

8           A.     Yes.

9           Q.     These are the acreages that you inserted into  
10           the data files for the Kansas version of the  
11           H.I. model for the years 1997, 1998, and 1999;  
12           is that correct?

13          A.     That's correct.

14          Q.     As I recall your testimony, Mr. Book was  
15           primarily responsible for reviewing the Colorado  
16           irrigated acreage data and that he compiled the  
17           acreages shown on Table 3 and you were then  
18           responsible for implementing the acreage data in  
19           the model.

20                         Is that a correct understanding?

21          A.     Yes.

22          Q.     Were you here for Mr. Book's testimony?

23          A.     Yes.

24          Q.     At least the testimony so far.

25          A.     Yes.

26          Q.     Mr. Book testified that he did not consider the  
27           mixed or supplemental acreage determined by  
28           Colorado from the surveys and verification

1 interviews to be appropriate for use in the  
2 model, and he said that he made a new assumption  
3 that if there was a well on a farm unit, all of  
4 the land in the farm unit was irrigated by  
5 supplemental groundwater.

6 Do you recall that?

7 A. I don't recall if it was exactly like that, but  
8 we made an assumption regarding the distribution  
9 of water within a farm unit.

10 Q. And did the assumption that I described, that if  
11 there was a well on a farm unit, that all of the  
12 farm unit was irrigated with supplemental  
13 groundwater, with the exception, I suppose, of  
14 sole source acreage, was that a correct  
15 assumption?

16 A. Well, I don't -- for purposes of the model, we  
17 made an assumption such that there wouldn't be  
18 stacking of pump water on top of surface water  
19 that already provided a full supply. So the  
20 assumption that we made was because of the  
21 simplification that the model does in regards to  
22 that simulation. So I don't think that we're  
23 saying that the well necessarily actually  
24 irrigated all the land in the farm.

25 Q. The master asked Mr. Book earlier, "What you're  
26 recommending now is that if there is a well on a  
27 farm unit, all of the land within that unit  
28 should be considered supplemental acreage?"

1                   And the witness, Mr. Book, said "Yes.  
2                   And the purpose for that would be to give  
3                   consideration to the ability of the water user  
4                   to manage the surface and groundwater and  
5                   allocate it where he needs it over the farm and  
6                   not make the assumption that the surface water  
7                   goes uniform over all the fields."

8                   So you did, in fact, make the  
9                   assumption, did you not? You're not disagreeing  
10                  with Mr. Book's previous testimony?

11                A.     No.

12                Q.     Okay. So the acreage shown on Table 3 of  
13                    Exhibit 1093 is based on Mr. Book's estimate of  
14                    mixed or supplemental groundwater acreage; is  
15                    that correct?

16                A.     Well, with the consideration of the factors that  
17                    I just mentioned regarding the distribution of  
18                    water within a farm.

19                Q.     Now, looking at Table 4 of your exhibit, which  
20                    is the next page, the percentages shown on  
21                    Table 4 under the column "Kansas," "Original,"  
22                    which is one of the center columns, are the  
23                    percentages in previous versions of the H.I.  
24                    model of acreages within ditch service areas  
25                    that were served with groundwater; is that  
26                    right?

27                A.     Those are the percentages that were used in the  
28                    prior modeling.

1 Q. Up through 1996; is that right?

2 A. I believe so.

3 Q. The acreage irrigated by wells shown in the  
4 second column, "1969-1994" -- that's the second  
5 column from the left --

6 Do you see that?

7 A. Yes.

8 Q. -- that acreage is the acreage irrigated by  
9 wells that was in previous versions of the H.I.  
10 model based on the percentages under the column  
11 "Kansas," "Original"; is that correct?

12 A. That's correct.

13 SPECIAL MASTER: Let me make sure  
14 the -- looking at Bessemer as the example, the  
15 13,835 figure ties with 100 percent? Those two  
16 figures tie together?

17 THE WITNESS: I think he was  
18 referring to the 19,130.

19 MR. ROBBINS: I was, Your Honor.

20 Q. In the previous versions of the model,  
21 100 percent of the Bessemer acreage, or 19,130  
22 acres, were assumed to be irrigated with  
23 groundwater; is that right?

24 A. Yes.

25 Q. So to the extent there's 100 percent in the  
26 column under "Kansas," "Original," the acreage  
27 in the column "1969-1994" would be the irrigated  
28 acreage under that ditch; is that right?

1 A. Right.

2 SPECIAL MASTER: So the next figure,  
3 then, again, for Bessemer, 13,835, ties with the  
4 68 percent?

5 THE WITNESS: That's correct.

6 BY MR. ROBBINS:

7 Q. Mr. Book then revised the percentages, and they  
8 are, as the master suggested, under the heading  
9 "2001." The new percentages are shown in that  
10 column; right?

11 A. Right.

12 Q. And similarly applying those percentages to the  
13 total acreage irrigated within a ditch service  
14 area produces the acreages contained in the  
15 "Revised" column, third from the left; is that  
16 right?

17 A. Yes.

18 Q. Now, Mr. Book did not suggest to you that you  
19 should use the original percentages that he had  
20 suggested should not be changed during the 1995  
21 update to the model, did he?

22 A. Do you mean for the 1995 through 1996 period?

23 Q. No. For the 1997 to 1999 period.

24 A. That's right.

25 Q. And he determined the percentages that you used  
26 to recalibrate the model based on the decreed  
27 and permitted acreage for all wells in the ditch  
28 service areas; is that correct?

- 1 A. I think that's correct. And that was based on  
2 the need to revise those figures to allow the  
3 model to better distribute the water within  
4 farms more closely to what we would understand  
5 to actually happen under a farm.
- 6 Q. Well, was it then your opinion that the model,  
7 prior to this current recalibration,  
8 inaccurately distributed the water to the farms?
- 9 A. Well, the model distributed the water as the  
10 water had been input to the model and simulated  
11 in the model, and it resulted in stacking of  
12 pumped water beyond the demand in significant  
13 amounts. And the acreage figures that were used  
14 in the revised model were a way to cause the  
15 model to better distribute the water under the  
16 ditches.
- 17 Q. So the prior versions of the model, it's your  
18 testimony, did not accurately distribute the  
19 water; is that right?
- 20 A. Not as accurately as the current model.
- 21 Q. Let's look at Table 4 of Kansas Exhibit 1093  
22 again.
- 23 A. I'm sorry. Which --
- 24 Q. Table 4.
- 25 A. Okay.
- 26 Q. For the 1950 through 1994 recalibration,  
27 Mr. Book determined the percentages that you  
28 used to recalibrate the model based on the

- 1           decreed and permitted acreage for all wells in  
2           each of the ditch service areas; is that  
3           correct?
- 4        A.     I believe that's correct.
- 5        Q.     That was the assumption also that Colorado had  
6           used in its original water budgets; isn't that  
7           correct?
- 8        A.     I don't know.
- 9        Q.     Let's look at Table 2 of Exhibit 1093, if we  
10          could. This table summarizes the decreed and  
11          permitted acreage for wells in the H.I. model  
12          study area; is that right?
- 13       A.     That's one of the column headings.
- 14       Q.     And it shows the information within that column;  
15          is that right?
- 16       A.     Yes. There are values under that column.
- 17       Q.     And as far as you know, those values are  
18          accurate to the best of Mr. Book's ability?
- 19       A.     Well, Mr. Book's probably a better one to  
20          testify about this table.
- 21       Q.     Do you have any reason to think they're not  
22          accurate?
- 23       A.     No.
- 24       Q.     The table also shows the decreed and permitted  
25          acres for the wells that were pumped in 1998;  
26          isn't that right?
- 27       A.     Yes.
- 28       Q.     Now, Mr. Book used the decreed and permitted



1 acreage for all wells in the study area to  
2 determine percentages for the area irrigated  
3 with wells to recalibrate the model over the '50  
4 to '94 period; isn't that right?

5 A. I think I lost you on that.

6 Q. Mr. Book used the decreed and permitted acres  
7 for all wells, not just the wells that were  
8 pumped in 1998, in order to determine  
9 percentages of the area irrigated with wells in  
10 order to recalibrate the model; is that right?

11 A. Yes. Again, to account for improvements we  
12 wanted to make in the uniformity and the  
13 distribution of water.

14 Q. I understand that. But that's what he did for  
15 whatever reason?

16 A. I believe so.

17 Q. Let's assume that Mr. Book had used that  
18 assumption to estimate the acreage irrigated by  
19 wells in the H.I. model study area in 1998,  
20 shall we, and let's look at Table No. 4 again.

21 The revised acreage irrigated by wells  
22 that Mr. Book estimated for the decreed and  
23 permitted acreage was 147,308 acres; is that  
24 right? The bottom of the third column from the  
25 left.

26 A. Yes.

27 Q. Now, looking back at Table 3 --

28 SPECIAL MASTER: Table 3?

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MR. ROBBINS: Table 3.

Q. -- we can see in the "1998" column, using Mr. Book's assumption, supplemental acreage was -- just a second -- let me find it here -- 91,887 acres; is that correct? That's in 1998, the middle set of columns, under the mixed or supplemental acreage; right? Table 3.

A. Under "Mixed"?

Q. Yes.

A. Yes.

Q. Okay. And next to it is the groundwater-only acreage, which is 17,915 acres; right?

A. Yes.

Q. So that totals about 110,000 acres, doesn't it?

A. More or less.

Q. So using the decreed and permitted acreage of all wells, as estimated by Mr. Book, of 147,000 and some to estimate the acreage irrigated by wells in 1998 would have overestimated the acreage irrigated by wells by some 37,000 acres -- isn't that right? -- even using his new assumption?

A. Which new assumption?

Q. The one that caused him to reduce acreage irrigated by wells from 164,000 to 147,000.

Using his new values for the years 1997 through 1999, he is still applying groundwater to 37,000 acres more than were actually

1 irrigated?

2 A. There may have been some other adjustments for  
3 wells that didn't have decreed and permitted  
4 acreage. So I'm not sure.

5 Q. Based upon these charts that would certainly  
6 suggest that that is, in fact, what happened,  
7 wouldn't it?

8 A. That the acreage irrigated by groundwater in  
9 1998 was less than in the past?

10 Q. Was less than was even within -- was less than  
11 what was estimated by Mr. Book.

12 A. For which period?

13 Q. For the calibration period, 1950 through 1994.

14 A. Yes. There's quite a number of inactive wells  
15 currently.

16 Q. Please --

17 SPECIAL MASTER: Let me go through  
18 these figures and make sure I've got this  
19 comparison right.

20 MR. ROBBINS: All right. Thank you.

21 SPECIAL MASTER: In 1998 Table 3,  
22 then, shows supplemental acreage at 91,887;  
23 that's correct?

24 THE WITNESS: Yes.

25 SPECIAL MASTER: And that's out of  
26 Table 3. And then we were going back and forth  
27 with both Table 2 and Table 4, Mr. Robbins, and  
28 I'm not sure I got my notes down fast enough

1 here.

2 You were comparing the 91,000 figure,  
3 then, with which one?

4 MR. ROBBINS: The 91,000 plus the  
5 117- [sic] for 110,000 total. That's the total  
6 groundwater acreage in 1998.

7 SPECIAL MASTER: So we add those,  
8 and that equals the total groundwater acreage.

9 MR. ROBBINS: Right.

10 SPECIAL MASTER: And you were  
11 comparing that with which figure, then?

12 MR. ROBBINS: With the amount of  
13 groundwater acreage that was used to calibrate  
14 the model for the period 1950 through 1994,  
15 which is on Table 4, of 147,000 acres.

16 SPECIAL MASTER: All right. Okay.

17 BY MR. ROBBINS:

18 Q. And the 91,887 for mixed acreage is based on the  
19 assumption that if there was a well on the farm  
20 unit, the whole farm unit was irrigated by  
21 supplemental groundwater; isn't that true?

22 A. No.

23 Q. It's not. And why is that?

24 A. Because we're not saying all the acres were, in  
25 fact, irrigated by groundwater. We made that  
26 assumption to improve the distribution of water,  
27 the simulated distribution of water in the  
28 model.

- 1 Q. So within your model, you will apply -- if there<sup>21</sup>  
2 was a well on the farm unit, you applied the  
3 groundwater as a simulation across the entire  
4 farm unit?  
5 A. Such that the distribution of water within a  
6 farm would be more even and there wouldn't be  
7 stacking of water in the model.  
8 Q. So am I correct in interpreting your answer to  
9 be "Yes," you did, in fact -- if there was a  
10 well on the farm unit, you applied the  
11 assumption that the groundwater was spread  
12 across the entire farm unit in the model?  
13 A. Yes.  
14 Q. Thank you.  
15 Now, when you implemented the new  
16 percentages that Mr. Book had derived -- and  
17 those are the percentages contained in Table 4,  
18 I believe, under the heading "2001," "Percentage  
19 Area Irrigated with Wells," "Kansas," "2001," --  
20 those are the percentages which you used when  
21 you recalibrated; is that right?  
22 A. Yes.  
23 Q. You used those percentages for the entire period  
24 from 1950 to 1994; is that correct?  
25 A. Yes.  
26 Q. So for the Bessemer you used 68 percent in each  
27 year from '50 to '94; correct?  
28 A. Correct.

- 1 Q. And for the Booth you used 100 percent; correct?<sup>22</sup>
- 2 A. Right.
- 3 Q. And so on down the line?
- 4 A. Yes.
- 5 Q. You testified that it is important to include
- 6 the period 1950 to 1969 in the calibration
- 7 period because it is the period closest to the
- 8 compact and the period when there was less
- 9 pumping; is that correct?
- 10 A. Yes.
- 11 Q. You also testified that there were significantly
- 12 fewer wells in 1950 and that they increased up
- 13 through the 1960s; is that correct?
- 14 A. I think that well development occurred in the
- 15 modeling period between 1950 and generally the
- 16 mid 1960s.
- 17 Q. So you will agree there were significantly fewer
- 18 wells in the 1950s and early 1960s than there
- 19 were in the 1970s and '80s; is that right?
- 20 A. Yes.
- 21 Q. That's the reason there was less pumping in the
- 22 1950s and 1960s, isn't it?
- 23 A. Yes.
- 24 Q. And I think the term you used was the wells were
- 25 "ramping up" from 1950 up through the 1960s;
- 26 right?
- 27 A. Yes. The number of wells were increasing during
- 28 that period.

1 Q. If you use a percentage of the area irrigated by  
2 wells based on the decreed and permitted acreage  
3 for all wells in the current well database, the  
4 wells that exist today, all wells, aren't you  
5 defeating the purpose of accurately representing  
6 the period 1950 through the 1960s in the model?

7 A. No.

8 Q. In your calibration of the model, you are  
9 estimating the acreage irrigated by wells based  
10 on the decreed and permitted acreage for wells  
11 that didn't exist in the 1950s and 1960s; isn't  
12 that true?

13 A. I believe that the acreages that are used in the  
14 model for the earlier period are such that there  
15 is less excess pumping during that period. So I  
16 think it would be my opinion that the model is  
17 more reasonably simulating the consumption of  
18 pumping during that period.

19 Q. Well, Mr. Sullivan, if there were significantly  
20 fewer wells -- let's just take the 1950s --  
21 let's not think about the '60s right now --  
22 significantly fewer wells in the 1950s --

23 By a substantial amount. Wouldn't you  
24 agree?

25 A. Sure.

26 Q. And if you take the decreed and permitted  
27 acreage for all of the wells in existence in  
28 1998 and use that acreage in the 1950s --

1 Which is what you did, isn't it?

2 A. Yes.

3 Q. -- how can you feel that that fairly represents  
4 how groundwater would have been distributed in  
5 the 1950s when you have thousands of acres of  
6 land that had no wells on them in the 1950s and  
7 yet you're applying groundwater to them in your  
8 calibration?

9 A. Well, if the farmers are not applying  
10 significantly excess water, then it doesn't  
11 really matter what the acreage is because the  
12 farmers are applying water to meet demand. And  
13 if it turns out that the simulated acreage in  
14 the model is larger than it, in fact, actually  
15 was, as long as the farmers were applying water  
16 that wasn't in excess of demand, you can have  
17 the groundwater acreage larger and it won't have  
18 any impact on results.

19 Q. Well, if you have -- but you apply the water  
20 from the existing wells equally to all of the  
21 simulated acreage, don't you?

22 A. Yes.

23 Q. And you've already testified, I think, that the  
24 more acreage you apply groundwater to, the  
25 higher the consumption; isn't that true?

26 A. If you're simulating a situation that has  
27 substantial excess pumping, then the model --  
28 the results will be sensitive to the acreage,



- 1 but if there's not excess pumping, then it won't<sup>25</sup>  
2 be sensitive to the acreage.
- 3 Q. Now, in discussing your prospective analysis,  
4 you suggested that pumping in the '50s and '60s  
5 were just estimates based on engineering  
6 judgment; is that correct?
- 7 A. No, I don't believe so. They were based on what  
8 data was available, and some engineering  
9 judgment had to be applied, given the lack of  
10 detailed data.
- 11 Q. So you did testify that the estimates were based  
12 upon what data was available, using engineering  
13 judgment?
- 14 A. Some engineering judgment was applied in the  
15 interpretation of what limited data was  
16 available.
- 17 Q. I apologize. I thought that was the question I  
18 had asked.
- 19 There have been some institutional  
20 changes since the 1970s; isn't that correct?
- 21 A. Sure, yes.
- 22 Q. For example, the Fry-Ark Project started to  
23 initially import water into the basin in about  
24 1972, didn't it?
- 25 A. It's my understanding that that's the date that  
26 the project was fully matured. I'm not sure of  
27 the date at which water actually began to be  
28 imported.

- 1 Q. You di dn' t i nvesti gate that?
- 2 A. Not the entire hi story of the project, no.
- 3 Q. So you woul dn' t have any reason to di sagree wi th
- 4 me i f I told you that 1972 was the fi rst time
- 5 any water was i mported by the project?
- 6 A. I don' t have any reason to di sagree wi th that.
- 7 Q. And that the project di dn' t become fully
- 8 operational unti l the late 1970s -- you woul dn' t
- 9 di sagree wi th that? You woul dn' t have any basi s
- 10 to, woul d you?
- 11 A. Well, that' s contrary to my understanding, but I
- 12 guess I haven' t i nvesti gated that i n detail.
- 13 Q. The winter water storage program was i mplemented
- 14 i n the latter half of the 1970s, wasn' t i t?
- 15 A. Yes.
- 16 Q. And i n the vicinity of 1980, the 1980 operati ng
- 17 plan went i nto effect; i sn' t that ri ght?
- 18 A. Yes.
- 19 Q. Now, i f the H.I. model i s bei ng used to
- 20 determi ne depleti ons i n 1997, 1998, and 1999 and
- 21 i s going to be used i n the future, doesn' t i t
- 22 make sense to cal i brate the model i n the way
- 23 Mr. Schroeder di d, over a period i n whi ch the
- 24 i nsti tutional condi ti ons are si mi lar to those i n
- 25 the current period and i nto the future and when
- 26 we have si gni fi cantly better data?
- 27 A. I thi nk we li ke to use al l of the data that we
- 28 can for cal i brati on and i n parti cular because we

1 would like to simulate a period when it was  
2 closer to the compact -- closer to the  
3 conditions when well pumping was not  
4 significantly affecting the river.

5 Q. Well, the thing that puzzles me is that you say  
6 that, but then you turn around and use 1998  
7 supplemental irrigated acreage data as if it  
8 existed in the '50s and '60s.

9 So how is that simulating the conditions  
10 that were observed at that time?

11 A. Well, I believe I testified that that particular  
12 piece of data relates to how much of the pumping  
13 is consumed, and I believe that if the farmers  
14 are not applying excess water, then more of the  
15 water would be being consumed in the earlier  
16 period than was actually simulated. And as long  
17 as there's not excess pumping, then the amount  
18 of the -- the exact amount of groundwater  
19 acreage during that period is not going to be  
20 caused -- the model will not be sensitive to  
21 that acreage.

22 SPECIAL MASTER: Mr. Sullivan, a lot  
23 of your testimony has been on this question of  
24 so-called "excess pumping." I think this is the  
25 first time we've heard about it in this segment  
26 of the trial. Up to this point we've always  
27 talked about pumping.

28 At the very first segment, we had

1 major disagreements about what the total amount  
2 of pumping was. That seemed to be a key factor.  
3 We've reached a decision on that. And in later  
4 years the total amount of pumping has -- the  
5 states have either come closer to or they've in  
6 some cases come to agree upon the total amount  
7 of pumping that would go in the model.

8 How is it that this question of excess  
9 pumping is coming up to the surface now only for  
10 the first time?

11 THE WITNESS: Well, I --

12 SPECIAL MASTER: Why didn't we think  
13 about this? Why weren't we arguing about excess  
14 pumping one and two trial segments ago?

15 THE WITNESS: I believe there's --  
16 in my mind, there's two factors. One is that  
17 our understanding of the model processes and the  
18 exact implications of various assumptions in the  
19 model has matured through time as we better and  
20 better understand the complexities of the model.  
21 So that's one consideration.

22 The second consideration is that now we  
23 are in the position of looking forward, and  
24 we're trying to use the model in such a way to  
25 assist us in developing a compliance plan that's  
26 going to work in the future. And given that we  
27 are now attaining better data on pumping -- and  
28 hopefully we'll get better data on the

1 distribution of water -- and, further, given  
2 that there are more incentives now for the  
3 farmers not to apply excess water, to me it's an  
4 issue that is important now, more important.

5 SPECIAL MASTER: Well, you said  
6 something earlier in your testimony just a few  
7 minutes ago, and I'm not sure I caught it  
8 exactly. And so let me see. It seemed to me  
9 you were saying that the amount of pumping was  
10 not as important in these early years. That's  
11 why you could go back and calibrate with pumping  
12 in the 1950s, which, in fact, did not exist, but  
13 that that was not as important as this question  
14 of whether there was excess pumping and the  
15 reason you could have a larger number in the  
16 early years is because there was not as much  
17 excess? Is that what you were saying?

18 THE WITNESS: I believe we were  
19 talking about acreage, not the pumping. For the  
20 calibration I believe it's important to use  
21 whatever pumping data we had. And I'm not  
22 suggesting that the amount of pumping should be  
23 changed in the calibration.

24 But I think what Colorado is trying to  
25 suggest is that the groundwater acreage that is  
26 simulated in the model should be made less in  
27 the earlier period when the wells were just  
28 developing. And it makes sense that as the

1 wells develop, the groundwater acreage also  
2 developed. But the problem with going -- the  
3 problem with going back and trying to adjust  
4 that acreage is that, as you make it smaller,  
5 you're going to cause this problem of excess  
6 pumping to become even more prevalent in the  
7 earlier period.

8 It's already a problem starting more or  
9 less in about 1965 to the present when  
10 everything was matured. It's a little bit less  
11 of a problem in the earlier period because we  
12 use the same groundwater acreage going back all  
13 the way to 1950. But because the pumping, in  
14 fact, was less, we're applying less pumping to  
15 the same acreage, and as a result there's less  
16 excess pumping.

17 So I guess it would be my testimony that  
18 the excess pumping characteristic of the  
19 historical simulations of the model are less of  
20 a problem in the very early period and are more  
21 of a problem beginning in the 1960s through the  
22 remainder of the period.

23 SPECIAL MASTER: Okay.

24 BY MR. ROBBINS:

25 Q. So, Mr. Sullivan, it's really the model results,  
26 not whether the acreage is accurately  
27 represented that matters; isn't that right?

28 A. No.

- 1 Q. Well, you're talking to the master about excess  
2 pumping, and that's really just a code word,  
3 isn't it, for pumping that doesn't reach the  
4 highest level of consumption that you believe is  
5 appropriate?
- 6 A. I'm not saying there is no excess pumping. I'm  
7 just saying that the models that we've used in  
8 this case thus far for the historical period  
9 exhibit a very high amount of excess pumping and  
10 more than I think is reasonable.
- 11 Q. But excess pumping equates to lower consumption  
12 for that pumping, doesn't it?
- 13 A. Of course.
- 14 Q. And that's the term. When you say "excess  
15 pumping," you mean pumping that is not being  
16 taxed at a rate close to 65 percent that is  
17 being consumed; right?
- 18 A. I don't know if I'd use the word "taxed."
- 19 Q. Well, "assessed," or 65 percent is not consumed.  
20 Therefore you view it as being excess; right?
- 21 A. Yes. As I've defined the term, pumping in  
22 excess of the unmet demand for a crop.
- 23 Q. So that you are looking at spreading the water  
24 in such a way that you get the most consumption  
25 out of the pumped water that is possible; right?
- 26 A. Well, there's still excess pumping in the early  
27 years and perhaps even more than you would  
28 reasonably believe that would happen despite

- 1 using the larger acreage.
- 2 Q. Where did you grow up, sir?
- 3 A. I grew up in El Paso, Texas, and near Denver,
- 4 Colorado.
- 5 Q. Littleton?
- 6 A. Yes.
- 7 Q. Okay. Did you grow up on a farm?
- 8 A. No, sir.
- 9 Q. Do you have any degrees in agronomy?
- 10 A. No, sir.
- 11 Q. Do you have any degrees in agricultural
- 12 engineering?
- 13 A. No.
- 14 Q. So your discussion of how water ought to be
- 15 applied and what is excess application and what
- 16 isn't is just based upon the effect that has in
- 17 the model, isn't it?
- 18 A. No.
- 19 Q. It's based upon your assumption that farmers
- 20 will operate in a way that maximizes the
- 21 consumption of pumped groundwater; isn't that
- 22 right?
- 23 A. In part.
- 24 Q. That doesn't mean that that's what the farmers
- 25 do, does it?
- 26 A. I think farmers will try to operate such to
- 27 maximize their yields and will try to minimize
- 28 their costs. And particularly in basins in



1 which the water supply is limited, they will try  
2 to get the most yield they can out of their  
3 water with what limited water they have  
4 available.

5 Q. That's based upon your opinion, but you don't  
6 have a background or foundation to offer that  
7 opinion to this court, do you?

8 A. Well, it's based on common sense, and it's based  
9 on my experience generally and working in this  
10 field as I have for almost 20 years.

11 Q. Let's look in Appendix A in Kansas Exhibit 1093,  
12 if we could, please. That's the first of the  
13 two yellow sheets.

14 SPECIAL MASTER: I have it.

15 BY MR. ROBBINS:

16 Q. Approximately eight sheets of paper back -- the  
17 first group are stream flow, and then there's a  
18 blue divider, and then the third sheet after the  
19 blue divider is a table that's marked "Analysis  
20 of HIM Output for Diversions."

21 Do you see that?

22 A. Yes.

23 MR. ROBBINS: Do you see it,

24 Your Honor?

25 SPECIAL MASTER: I have it.

26 BY MR. ROBBINS:

27 Q. Looking at the table, the special master pointed  
28 out that the Kansas version of the model

- 1 overpredicts diversions every year from 1952 to  
2 1981 except 1967; is that right?
- 3 A. Yes.
- 4 Q. And then it reverses and underpredicts diversion  
5 every year since 1981; is that right?
- 6 A. Yes.
- 7 Q. You used an automatic calibration process to  
8 adjust the WANT factors to predict most  
9 diversions perfectly over the 45-year period; is  
10 that correct?
- 11 A. Adjusted the WANT factors so that we matched the  
12 average monthly diversions over the '50 to '94  
13 period.
- 14 Q. As we can see from this table, you achieved  
15 long-term calibration of the diversions by  
16 overpredicting before 1980 and underpredicting  
17 after 1980; isn't that right?
- 18 A. Well, there are overpredictions earlier,  
19 underpredictions later.
- 20 Q. And 1980-'81 is sort of the break-off; right?
- 21 A. Well, 1982 is the year that they first go under  
22 100 percent.
- 23 Q. Now, the only period this model is going to be  
24 used to determine compact compliance for are the  
25 years '97, '98, and '99; is that correct?
- 26 A. For this go-around, you mean?
- 27 Q. Yes.
- 28 A. Yes.

- 1 Q. The revised Kansas version of the model  
2 underpredicted diversions in each of those  
3 years, didn't it?
- 4 A. Yes.
- 5 Q. Do you know approximately how much the  
6 underprediction of diversions was in those three  
7 years in acre-feet?
- 8 A. I could compute it.
- 9 Q. Well, if I told you it was in the vicinity of  
10 300,000 thousand acre-feet, would you have any  
11 reason to disagree?
- 12 A. Is that per year?
- 13 Q. No. Total for the three years.
- 14 SPECIAL MASTER: Well, we can -- I  
15 guess you can just compute it from this chart,  
16 can't you?
- 17 MR. ROBBINS: Yes, you can. And I  
18 think it's approximately 300,000 acre-feet.
- 19 SPECIAL MASTER: Approximately.
- 20 BY MR. ROBBINS:
- 21 Q. So for those three years, assuming that the  
22 lawyer math is correct, the model has  
23 underpredicted diversions for about 300,000  
24 acre-feet. Okay?
- 25 A. Okay.
- 26 Q. Do you know whether or not it's true that the  
27 underprediction of diversions in those three  
28 years was just about the same as the pumping

- 1           that occurred in those three years?
- 2       A.     I think the pumping's been in the vicinity of
- 3           100,000 acre-feet per year during those years,
- 4           sometimes more maybe and sometimes less.
- 5       Q.     In fact, if you add up the pumping from your
- 6           Table 6, it's about 303,000 for those same three
- 7           years; right?
- 8       A.     Table -- which table?
- 9       Q.     Table 6 you can get it off of, I think, pumping
- 10          estimates from your model for those three years.
- 11      A.     That looks about right.
- 12      Q.     Okay. Thank you.
- 13                 Now, you calibrated this model over the
- 14          period 1950 through 1994; isn't that right?
- 15      A.     Yes.
- 16      Q.     If we look at the years 1995 through 1999 as a
- 17          test of the ability of the model as you have
- 18          calibrated it to predict diversions, how well
- 19          did it predict diversions in 1995? It looks to
- 20          me like it's an underprediction of about
- 21          22.4 percent; is that right?
- 22      A.     Basin-wide. It varies, of course, user to user.
- 23          But basin-wide in 1995 was 77.6 percent.
- 24      Q.     Or 22.4 percent under?
- 25      A.     Right.
- 26      Q.     Okay. That was worse than any other year in
- 27          your calibration period; isn't that correct?
- 28      A.     Well, during this more recent period, it seems

1 to me that there's something going on in the  
2 operation of the ditches that the farmers are  
3 taking more water than they did in the past, and  
4 I don't know why, but that's what this shows.

5 Q. And it shows that in 1995 it was worse than any  
6 other year during your entire calibration period  
7 as far as the model's predictions; isn't that  
8 true?

9 A. Well, that's the lowest percentage in the total  
10 diversions column.

11 Q. How well did the model predict diversions in  
12 1996?

13 A. It was under. It was under in all five of those  
14 years.

15 Q. In 1996 it was under almost 20 percent; right?

16 A. Yes. Again, I don't know why the farmers were  
17 diverting quite a lot more water than they had  
18 in the past. These were very, very wet years,  
19 and I would agree that the model does not  
20 perform quite as well in the very wet periods.

21 Q. So for all five years after your calibration  
22 period, the model underpredicted and in most  
23 years significantly underpredicted diversions;  
24 isn't that right?

25 A. It underpredicted.

26 Q. And you don't think that 20 percent, 22 percent,  
27 those percentages are significant  
28 underpredictions?

- 1 A. Well, if there's been some change in the  
2 diversion practices, maybe we need to account  
3 for that in the modeling.
- 4 Q. And there's been changes in the number of wells  
5 and acreage irrigated by wells; isn't that true?
- 6 A. How do you mean?
- 7 Q. Well, there have been increases in wells from  
8 your calibration period. The 1990s had more  
9 wells than they did in the '50s and '60s; right?  
10 You already agreed to that.
- 11 A. I don't think I agreed to that.
- 12 Q. Oh, you didn't agree that the wells increased?  
13 I thought we agreed that you testified that the  
14 wells ramped up in the '50s and '60s.
- 15 A. Oh. I thought you were implying with your  
16 question that they were increasing during the  
17 '90s, and I don't think that's correct.
- 18 Q. No, no. I meant that the '90s had significantly  
19 more wells than the first half of your  
20 calibration period.
- 21 A. No. The first half of the calibration period  
22 would go into the 1970s.
- 23 Q. Significantly more wells than existed in the  
24 1950s and '60s.
- 25 A. Well, as I testified, I believe that the wells  
26 were increasing but had matured more or less, at  
27 least when you look at the amount of pumping, by  
28 the mid 1960s.

1                   SPECIAL MASTER: Mr. Sullivan,  
2                   looking at the three years, the 1997 to 1999  
3                   years, what was the significance in the model,  
4                   if there is any significance, that the pumping  
5                   is roughly equal to the amount of the  
6                   underprediction of diversions?

7                   THE WITNESS: I don't think there's  
8                   any significance. I mean, it would be my  
9                   opinion that there's still generally unmet  
10                  demand under certain canals, but as you -- well,  
11                  I believe farmers would be tending to apply the  
12                  water where there was demand. And so if that  
13                  was the case, then that pumped water would be  
14                  consumed at more or less the maximum farm  
15                  efficiency.

16                  Now, during these extremely wet periods,  
17                  particularly with a lot of precipitation, it's  
18                  possible that that wasn't the case always  
19                  because a farmer might pump water and there was  
20                  a lot of rain that came later that could satisfy  
21                  the crop. But generally the model probably is  
22                  exhibiting some pumping excess demand -- to  
23                  demand when you simulate it.

24                  So the fact that the diversions are  
25                  higher than -- well, if the simulated diversions  
26                  are lower, then the simulated consumption of  
27                  that pumping would be higher, everything else  
28                  being equal.

1                   SPECIAL MASTER: What does it mean  
2                   in terms of model results in depletions if the  
3                   model is underpredicting in those three years by  
4                   approximately 300,000 acre-feet?

5                   THE WITNESS: Well, I think you need  
6                   to look at where the underprediction is  
7                   occurring, under which canals.

8                   SPECIAL MASTER: I meant stateline  
9                   depletions.

10                  THE WITNESS: But I'm saying that --  
11                  I'll give an example. If the overprediction --  
12                  or the underprediction of diversions, for  
13                  example, was occurring under a ditch that had no  
14                  wells and no pumping, then that part of the  
15                  underprediction wouldn't have any effect. So  
16                  you need to look at where the underprediction or  
17                  overprediction is occurring and how much pumping  
18                  is on those lands and whether that pumping is  
19                  excess to the demand or excess to the supply.

20                  SPECIAL MASTER: So you can't draw a  
21                  general conclusion that in those three years if  
22                  the model is underpredicting diversions by  
23                  roughly 300,000, that that either tends to  
24                  increase depletions or decrease depletions? You  
25                  can't make a general assumption?

26                  THE WITNESS: Well, I think you can  
27                  make a general assumption.

28                  SPECIAL MASTER: Okay. What's the



1 general assumption?

2 THE WITNESS: Well, the general  
3 assumption is that, as less diversions are  
4 predicted, the depletions would generally be  
5 higher compared to a model that had the  
6 diversions predicted right on. But I think  
7 there's another consideration, and that is how  
8 the model is simulating the application of the  
9 water and simulating the distribution of water  
10 on the farm and whether the model is still  
11 simulating excess pumping, or maybe it's not --  
12 it wouldn't reasonably be occurring.

13 SPECIAL MASTER: Well, I understand  
14 that there are a lot of factors that finally  
15 affect what the depletions are, but just looking  
16 at the relationship between predicted and  
17 observed diversions alone, that one factor,  
18 then, that relationship for the three years  
19 would tend to increase depletions?

20 THE WITNESS: Yes.

21 SPECIAL MASTER: Okay.

22 BY MR. ROBBINS:

23 Q. Is it possible that one of the problems is the  
24 model doesn't adequately represent the 1980  
25 operating plan? Because it certainly in the  
26 vicinity of 1980 -- as you pointed out, in 1982  
27 when the model flip-flops and begins to  
28 underpredict diversions significantly.

- 1 A. Well, that's possible. But it's also the period<sup>42</sup>  
2 when we entered a generally much wetter than  
3 normal series of years throughout the early '80s  
4 and much of the '90s. So it's hard to separate  
5 out those.
- 6 Q. Well, let's turn to the first table after the  
7 blue divider following the analysis of the  
8 output for diversions. It's headed "Revised  
9 Kansas H.I.M. (01/02)," and there's a breakdown  
10 by ditch by period.
- 11 Do you see that? It would be the first  
12 sheet after the second blue divider in  
13 Appendix A.
- 14 SPECIAL MASTER: Second divider?  
15 MR. ROBBINS: Yes.
- 16 Q. Let's look at the line up in the summary period  
17 that covers 1995 to 1999, shall we?
- 18 A. Okay.
- 19 Q. How well did the revised Kansas model predict  
20 diversions for the ditches on this sheet during  
21 the '95 through '99 period, starting with the  
22 Bessemer?
- 23 A. They were generally underpredicted on average  
24 over that period.
- 25 Q. And with regard to the Fort Lyon, which appears  
26 to be quite well predicted, that also includes  
27 the Kickingbird water, does it not?
- 28 A. I think that's true, yes.

1 Q. So that's not just a prediction of the Fort Lyon  
2 but actually the Great Plains storage water in  
3 combination; right?

4 A. I think that's all water taken through that  
5 canal.

6 Q. So we have underpredictions generally across the  
7 board there?

8 A. During this limited period, yes.

9 Q. Let's go to the summary sheet for the next group  
10 of ditches, which is about six pages later.

11 Your Honor, did you find the line on the  
12 last page that starts with the Bessemer and runs  
13 across, the '95-'96 line?

14 SPECIAL MASTER: I found the one you  
15 were talking about just before.

16 MR. ROBBINS: Okay.

17 SPECIAL MASTER: We're now looking  
18 at something else. I'm not sure I got that.

19 MR. ROBBINS: Now I want to go to  
20 the next set of ditches.

21 SPECIAL MASTER: Is that the one  
22 that starts with Fort Bent?

23 MR. ROBBINS: Yes, it is.

24 SPECIAL MASTER: Okay. I have that.

25 MR. ROBBINS: Now I have to find it.

26 Q. In looking at the next set of ditches, next  
27 group of ditches for the sheet that starts  
28 Fort Bent, how well did the model predict

- 1           diversions for the ditches on this sheet for the
- 2           '95 through '99 period?
- 3       A.     Well, on average during that period, they were
- 4           underpredicted. I don't think either version of
- 5           the model does particularly well during this
- 6           period.
- 7       Q.     After the next blue divider is a summary sheet;
- 8           is that right? It starts with the Booth Orchard
- 9           Ditch.
- 10      A.     Yes.
- 11      Q.     How well did the model predict diversions for
- 12           the ditches on this sheet for the period '95 to
- 13           '99?
- 14      A.     They were generally underpredicted during that
- 15           period.
- 16      Q.     Now, for the XY-Graham, however, which is the
- 17           second to the last column on the right side,
- 18           your spreadsheet shows that the model
- 19           overpredicted diversions for those five years;
- 20           is that correct?
- 21      A.     Well, I believe that's because the observed
- 22           diversions during the latter part of this period
- 23           were simulated as -- or were actually zero and
- 24           because a plug was put in the ditch and they
- 25           stopped using the ditch because they began using
- 26           it for dry-up purposes. And what is shown in
- 27           the "Predicted" column for the model is the
- 28           diversions that were simulated as water diverted

- 1 in the ditch and then spilled back to the river.
- 2 Q. But you include that percentage in your  
3 statistics, do you not?
- 4 A. Yes. It's listed in there. We weren't  
5 calibrating over this period.
- 6 Q. No. I understand. But this is the period that  
7 the master's going to be making decisions about  
8 Colorado's compliance -- isn't that true? --  
9 using this --
- 10 A. Part of this period.
- 11 Q. Given the model's inaccuracies in predicting  
12 diversions on a monthly or annual basis, do you  
13 think it's reasonable to rely on the model's  
14 predictions of changes in diversions on a  
15 seasonal or annual basis?
- 16 A. It's the best tool that we have, and so yes, I  
17 think it's reasonable to rely on it.
- 18 Q. What makes the short-term predictions reliable  
19 if the model is calibrated over a 45-year term  
20 and is only accurate on a 45-year term?
- 21 A. I don't believe the model's only accurate on a  
22 45-year term.
- 23 Q. Do you consider the percentage of predicted and  
24 observed that we have been looking at for the  
25 last five minutes to represent a model that is  
26 accurately predicting diversions?
- 27 A. Well, if the -- I think you need to consider the  
28 reason that we have the model. It is to predict

- 1 changes. It's not to -- the purpose of the  
2 model is not to predict absolute amounts but  
3 looking at the difference between the two runs.  
4 And so a lot of the error that is present in a  
5 particular run of the model is canceled when you  
6 compare that prediction in another run.
- 7 Q. But now as a modeler, you know that that isn't  
8 true for all error, is it?
- 9 A. Of course not.
- 10 Q. So it doesn't apply to this model in each  
11 instance, does it?
- 12 A. I think it applies in large part in this case.
- 13 Q. However, if you underpredict diversions, as a  
14 general matter the model will calculate higher  
15 depletions at the stateline, will it not? I'm  
16 just confirming --
- 17 A. Yes, it can given -- if all the other  
18 assumptions remain the same.
- 19 Q. And they all have to remain the same in order  
20 for your error-canceling theory to work; right?
- 21 A. No, not all of them. I mean, I'm not saying  
22 that all of the error cancels, but I believe a  
23 large portion of it does.
- 24 Q. Let's go back to Table 4 of your report.
- 25 SPECIAL MASTER: How would you like  
26 to do Table 4 after the morning recess?
- 27 MR. ROBBINS: That would be just  
28 fine. Thank you for alerting me to the time

1 flying by.

2 SPECIAL MASTER: All right.

3 (Recess.)

4 THE REPORTER: Please remain seated.  
5 Court is again in session.

6 SPECIAL MASTER: All right,  
7 Mr. Robbins.

8 MR. ROBBINS: Thank you, Your Honor.

9 Q. Mr. Sullivan, before the break, we were going to  
10 look at Table 4 in your expert report, which is  
11 Plaintiff's Exhibit 1093.

12 Do you have that in front of you?

13 A. Yes.

14 SPECIAL MASTER: I have it.

15 BY MR. ROBBINS:

16 Q. The last column on Table 4 shows the percentage  
17 of the area irrigated with wells used by  
18 Mr. Schroeder in the Colorado test model; is  
19 that correct?

20 A. Yes.

21 Q. You said that it would not be appropriate to use  
22 percentages to calibrate the model based on  
23 current conditions for use in the historic  
24 calibration; is that correct? You criticized  
25 Mr. Schroeder for utilizing the information from  
26 current conditions for calibration backwards; is  
27 that right?

28 A. Well, the specific acreage in 1998 that's

1 reflective of a large number of inactive wells,  
2 yes, I don't think it would be appropriate to  
3 use that information.

4 Q. Why is it appropriate to take percentages based  
5 upon the decreed and permitted acreage for all  
6 wells in the current well database to represent  
7 the '50s and '60s when there were fewer wells,  
8 if that's true?

9 A. Well, we have never differentiated the acreages  
10 earlier in the period in the model, and, as I  
11 testified earlier, I think that the fact that we  
12 are simulating a larger acreage in the earlier  
13 period than might actually have been there when  
14 the wells were being constructed results in less  
15 excess pumping and consumptive use of pumping  
16 that's more reasonable during that period.

17 Q. So the concern here is consumptive use; right?

18 A. That's one of the concerns. I mean, we're using  
19 the model largely to predict depletions as a  
20 result of postcompact well development. So it's  
21 important to get that consumptive use to a range  
22 that is reasonable.

23 Q. Of course you don't know what the consumptive  
24 use was historically, do you?

25 A. No.

26 Q. You don't know how the water was used  
27 historically, do you?

28 A. Well, I have to believe that those farmers



1 drilled the wells and used the water because  
2 they needed it and not to stack it on top of  
3 water that was already being provided by surface  
4 water.

5 Q. Let me ask you, why is it appropriate to take  
6 the percentages based on the decreed and  
7 permitted acreages for all the wells in the well  
8 database to represent the '80s and '90s, as you  
9 have done, when there were good water supplies  
10 and by your own testimony reduced pumping?

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

12 Q. Well, in your calibration, you have taken all of  
13 the wells in the well database, all of the  
14 permitted and decreed acres, and you've applied  
15 it throughout the period 1950 to 1994; right?

16 A. Yes.

17 Q. Okay. And in the 1950s and in the 1960s, there  
18 were fewer wells, but you used the maximum  
19 decreed and permitted acreage from today  
20 throughout that period; right?

21 A. We used the same acreage over the whole period.

22 Q. And you have indicated that your view is that  
23 during that period, that permitted the farmers  
24 to adequately utilize the water which they were  
25 pumping; right? Appropriately use it.

26 A. Yeah.

27 Q. I'm trying to use noncombative terms here. So  
28 bear with me.

1                   But during the '80s and '90s, you've  
2 testified that those were a wet period, very wet  
3 period; right?

4       A.     There were wet years within that period, and  
5 overall the period was wetter than the earlier  
6 period.

7       Q.     So the farmers wouldn't have been -- had  
8 significantly reduced pumping during that  
9 period, didn't they?

10      A.     During which period?

11      Q.     The '80s and '90s.

12      A.     Well, the records speak for themselves.

13      Q.     And by --

14      A.     The pumping, for example, I believe, is lower  
15 for the most part than it was in the 1970s.

16      Q.     And by the use of the total decreed and  
17 permitted acreage, you spread the water that was  
18 pumped in the '80s and '90s across all of that  
19 acreage, which has the effect to increase the  
20 consumption of that water, doesn't it?

21      A.     Well, I think if you look at the results of the  
22 modeling, there is substantial excess pumping  
23 during that period, very much greater than what  
24 I think I would consider reasonable.

25      Q.     I understand. But by spreading it over all of  
26 the decreed and permitted acreage, that has the  
27 effect of increasing the consumption of that  
28 pumped water, does it not?

- 1 A. Well, it would have the -- just by that simple  
2 change, it would cause it to increase. But I  
3 think the consumption still would remain much  
4 less than one would expect.
- 5 Q. Now, in the prospective analysis you used the  
6 same irrigated acreage by wells regardless of  
7 the amount of pumping; isn't that true?
- 8 A. Yes. Our analysis uses the same acreage in each  
9 year of the 45-year study period.
- 10 Q. You base the acreage irrigated by wells on the  
11 decreed and permitted acreage for all wells  
12 existing in the database -- is that right? --  
13 all irrigation wells?
- 14 A. We use the same percentages that are listed  
15 under the "2001" column on Table 4.
- 16 Q. Now, as we've seen, if you had used that  
17 assumption to estimate acreage irrigated by  
18 groundwater in 1998, you would have  
19 significantly overstated the acreage irrigated  
20 by wells, wouldn't you have?
- 21 A. Well, the -- yes, in 1998. The purpose of our  
22 analysis was not to project what might happen  
23 assuming the conditions in 1998 remained the  
24 same but, rather, to simulate a period that we  
25 believe is more reasonable of what could happen  
26 in the long-term future, given that, you know,  
27 for example, these wells have not been abandoned  
28 and there's no limits on irrigated acreage such

1 that it's not going to increase from 1998 and  
2 that -- well, there's any number of reasons why  
3 the acreage is lower in 1998, and I don't think  
4 it's appropriate to just assume that those  
5 conditions will persist indefinitely into the  
6 future.

7 Q. We do know what acres were irrigated by  
8 groundwater in 1998, though, don't we?

9 A. Yes. And hopefully we'll continue to know what  
10 acreage is irrigated into the future if Colorado  
11 does as they say they're going to, and that is  
12 collect good acreage data and good data  
13 regarding water use into the future.

14 The numbers will be what they'll be in  
15 the future, and we'll just simulate whatever  
16 those are. But for purposes of making a  
17 prospective analysis, we needed to assume some  
18 figures and use them, and I believe that the  
19 figures we used are reasonable for the long-term  
20 analysis.

21 Q. What difference does it make if Colorado  
22 collects good data in the future if you don't  
23 use it?

24 A. I just said we would use it.

25 Q. Well, you have good data for '97, '98, and '99  
26 and you didn't use it.

27 A. Well, I think, in addition to the data that they  
28 are collecting, there needs to be some

1 additional data collected if we want to get an  
2 accurate determination of water use in the  
3 basin. I don't think that Colorado is  
4 collecting sufficient data to make that  
5 determination at this point, and therefore we  
6 have -- it was necessary to make some  
7 assumptions regarding the distribution of water.

8 Q. Well, the thing that I find so interesting is  
9 that Mr. Book and the Kansas experts suggested  
10 specific data that needed to be collected in the  
11 last go-around, the master acknowledged that  
12 that was the case, declined to adopt Colorado's  
13 position that they ought to use decreed and  
14 permitted acreage, and when Colorado collects  
15 the data, you decline to use it and suggest that  
16 Colorado didn't collect enough data.

17 Isn't that a fair assessment of what's  
18 gone on so far?

19 A. I think additional data is necessary to  
20 accurately determine the use of water and to be  
21 able to better simulate the use of that water  
22 using the model. I think we had suggested or at  
23 least I had suggested that they -- in some of  
24 the irrigated acreage surveys that there needed  
25 to be some other data collected and they weren't  
26 collecting all of the data that was necessary.  
27 And I don't know why they haven't collected all  
28 the data, particularly regarding surface water

1 use.

2 Q. Well, it might be because this is the first time  
3 Kansas has ever suggested that that was  
4 significant.

5 Isn't it true that the last time you  
6 testified, you felt that the model adequately  
7 represented the hydrology and the irrigation  
8 practices in the basin?

9 A. Yes, probably that was my opinion. But my  
10 opinion now is that I don't -- my understanding  
11 of the model processes has improved, and based  
12 on that I've testified what my opinion is, that  
13 we need better data on the distribution of  
14 water.

15 Q. And that's principally because when data was  
16 developed on where irrigation water was really  
17 used for irrigation wells, it wasn't a  
18 sufficient acreage to raise the depletions to  
19 the level that you thought were appropriate;  
20 isn't that true?

21 A. I think the acreage -- well, if one looks at the  
22 historical period, there is sufficient acreage  
23 and sufficient unmet demand to consume the  
24 pumped water. It's just that the pumping isn't  
25 distributed to that demand.

26 Q. The farmers aren't using the water the way you  
27 would like them to?

28 A. The model is not simulating the pumped water and

1 the consumption of that water the way that I  
2 think it reasonably occurs.

3 Q. Well, the model isn't simulating it either the  
4 way -- in your version the way the farmers use  
5 it, is it?

6 A. During the historical period, you mean?

7 Q. During the historical period or during the  
8 period where we know specifically what they've  
9 done, either one.

10 A. Well, no. I don't think the '97 to '99 period  
11 is a representative long-term period by which we  
12 can evaluate farmers' practices. And they were  
13 very, very wet conditions and I don't think were  
14 representative of the more typical hydrology.

15 Q. Do you have a copy -- I think I gave you one  
16 earlier this morning -- of Mr. Schroeder's  
17 expert report, which is Defendant's  
18 Exhibit 1353? You have to say "Yes" to that or  
19 Lynette will be mad at me.

20 A. I do have one.

21 Q. Thank you.

22 Could you turn to Table 1, which is on  
23 page 24, please.

24 A. Okay.

25 Q. Table 1 shows the supplemental and sole source  
26 acreage determined by Colorado based on the  
27 surveys and verification and interviews in the  
28 middle column, does it not, under the heading

1 "1998 Study of Irrigated Acreage"?

2 A. Columns 6 and 7?

3 Q. Yes. Or column -- yes, Columns 6 and 7.

4 A. Yes.

5 Q. Assume for a moment that the special master were  
6 to conclude that the supplemental acreage  
7 determined from the surveys and verification  
8 interviews is the appropriate data to use in the  
9 model rather than Mr. Book's new assumption to  
10 estimate supplemental or mixed acreage.

11 In 1998 the total acreage irrigated by  
12 supplemental groundwater based on the surveys  
13 and interviews was approximately 78,000 acres;  
14 isn't that correct?

15 A. The supplemental acreage?

16 Q. Yes.

17 A. 78,000 approximately is the acreage that  
18 Colorado determined in its 1998 irrigated area  
19 study.

20 Q. Okay. Thank you.

21 I want to hand you what's been marked as  
22 Colorado Exhibit 1403.

23 I have a copy for Mr. Draper and one for  
24 you, sir. Is there a version in there?

25 SPECIAL MASTER: I've got nothing in  
26 mine.

27 MR. ROBBINS: Well, that explains  
28 it. I'll give you that one. How's that?



1 Q. We printed out the acreage used in your  
2 prospective analysis. That's what this document  
3 represents. It's from the information you've  
4 provided us.

5 If 1998 had been included in your  
6 prospective analysis, you would have assumed  
7 that there were 127,200 acres supplemented with  
8 groundwater; is that correct?

9 SPECIAL MASTER: And that's the  
10 supplemental acreage out of the model which  
11 Kansas used for the prospective compliance?

12 MR. ROBBINS: That's correct.

13 Q. Isn't that correct?

14 A. If 1998 -- I don't understand.

15 Q. If you had simulated -- if you had used -- if  
16 1998 had been included in your prospective  
17 analysis, if you had used -- if you had used  
18 1998 in your analysis, the assumption would have  
19 been that there were 127,200 acres, in round  
20 numbers, supplemented with groundwater; isn't  
21 that correct?

22 A. Well, I mean, I used the -- assuming these  
23 acreages are correct and --

24 Q. Well, we just do the same thing you do. When we  
25 give you data, we push a button, and up it  
26 comes.

27 A. Well, assuming that acreage is correct, if  
28 that's what we used in every year of our study

1 period that had a variety of wet years and dry  
2 years, 1998 was not one of them.

3 Q. Had '98 been included, you would have used this  
4 value; right? You used it in all the other  
5 years.

6 A. Well, yes, I guess.

7 Q. So that's about 50,000 acres difference between  
8 the Kansas acreage used in the revised H.I.M.  
9 and the acreage -- or used in your prospective  
10 analysis and the acreage determined by surveys  
11 and verification interviews; isn't that true?

12 A. Well, it's different, but in our prospective  
13 compliance analysis, that analysis is not  
14 particularly sensitive to the acreage because we  
15 set our pumping generally based on unmet demand  
16 so that even if, for example, even if -- whether  
17 we had used -- whether the acreage was, in fact,  
18 something different or might be different in a  
19 particular year, we would still be computing  
20 some level of pumping to meet the unmet demand  
21 on that acreage.

22 So the -- and I think that's an  
23 important characteristic of our analysis, is  
24 that most of the pumping in the analysis is used  
25 consumptively as -- and we believe that's a  
26 reasonable assumption. So if the acreage would  
27 have changed, then the pumping would have  
28 changed such that we wouldn't be overapplying

1 water in our analysis.

2 Q. Well, if you spread --

3 SPECIAL MASTER: Wait just -- let me  
4 get this 127,000 figure straight before we go  
5 on.

6 MR. ROBBINS: Fine. That would be  
7 fine, Your Honor.

8 SPECIAL MASTER: The figure of  
9 127,281 acres, is that what, in fact, you did  
10 use in the revised model for 1997 to '99?

11 THE WITNESS: No. I think he's  
12 asking me about the prospective compliance  
13 analysis.

14 SPECIAL MASTER: I understood that.  
15 I'm just asking, the 127,000 figure, then, is  
16 not what you actually used in the 1997 to '99 --

17 THE WITNESS: That's right.

18 SPECIAL MASTER: -- model?

19 Do you have that handy?

20 MR. ROBBINS: I have that value,  
21 Your Honor. Mr. Book used about 92,000 acres  
22 that was input into the revised H.I.M.

23 Q. Isn't that correct?

24 A. The acreage for the supplemental groundwater,  
25 yes.

26 SPECIAL MASTER: About 92,000?

27 THE WITNESS: Yes. They're shown in  
28 Table 3 of the Kansas report.

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SPECIAL MASTER: Okay.

BY MR. ROBBINS:

Q. So the Colorado survey suggested about 78,000 acres of supplemental groundwater actually occurred in '98, and Mr. Book estimated about 92,000 acres for the same year; is that right?

A. That was our revised acreage based on the considerations of water distribution within a farm.

Q. And you assumed in the prospective analysis -- or would have, had 1998 been included -- that there would have been 127,200 acres; is that right?

A. Obviously, that's a hypothetical question but --

Q. That's why you --

A. Yes. I used the same acreage in every year because we don't know what the acreage will be in the future. We can only pick a number and simulate it. And I did not have any information of sufficient detail that would allow me to vary the acreage from year to year into the future.

Q. If you spread groundwater over larger acreage in the model, it is more consumptive, isn't it?

A. It depends on if you are -- if you assume that there's not excess pumping in excess to demand, then the acreage, as you increase it, doesn't have any effect.

Q. But if you don't increase pumping to whatever

1 level you feel is necessary, if you take -- if  
2 you have X amount of pumping, 100 acre-feet of  
3 pumping, and you spread it over 50 acres in one  
4 analysis and spread it over 100 in another  
5 analysis, it is more consumptive in the model  
6 over the larger acreage, is it not?

7 A. Well, it depends. If that were acreage that  
8 wasn't receiving very much surface water, then I  
9 think, based on those figures that you just gave  
10 me, all of the water would be consumed at the  
11 maximum rate in both examples. I think the  
12 figures you gave me would indicate that if there  
13 wasn't very much surface water, that pumping  
14 would be less than a full supply.

15 Q. I didn't say anything about surface water. I  
16 was just trying to get you to acknowledge that  
17 if you spread groundwater or surface water over  
18 a larger acreage, you produce greater  
19 consumption.

20 A. If you move from the situation where you have  
21 water that's being applied excess to the crop  
22 demand into a situation where you've got, you  
23 know, either less excess or even moving to a  
24 situation where you're water-short, then, yes, a  
25 higher percentage of the water's being consumed.

26 Q. Now, the supplemental acreage that you used in  
27 your prospective analysis was even 35,000 acres  
28 more than the supplemental acreage that Mr. Book

1 estimated for the years 1997, 1998, and 1999;

2 isn't that true?

3 A. Yes, assuming these figures are correct.

4 Q. When the special master asked you during your  
5 direct examination why your prospective analysis  
6 showed a shortage at the stateline of 11,000  
7 acre-feet on average, you didn't mention the  
8 supplemental acreage values as being one of the  
9 reasons, did you?

10 A. I don't believe that that has a significant  
11 impact on the shortage.

12 Q. Wouldn't you agree that the supplemental acreage  
13 you input in the prospective analysis is a  
14 factor that increases depletions?

15 A. No.

16 Q. Let's turn --

17 A. Well, not significantly. Because there's not --  
18 because the excess pumping in my analysis is  
19 relatively small -- on the order of 7 or  
20 8 percent on average -- that as you change the  
21 supplemental acreage, you will have some small  
22 impact on the amount of pumping that's consumed  
23 because that -- for example, if you increase the  
24 acreage from that, that 7 or 8 percent would  
25 start to drop a little bit. But because one of  
26 the assumptions we made in our analysis was that  
27 we were matching the pumping pretty well to the  
28 demand, that if we had changed the supplemental

1 acreage, we would have changed the pumping.

2 And so, for example, if we would reduce  
3 the supplemental acreage, then we'd reduce the  
4 pumping, and that would overall lower  
5 depletions, but it would also lower the  
6 replacement supply that we simulated. So as the  
7 depletions go down, the replacement supply goes  
8 down as well.

9 So there were some compensating effects,  
10 as there should be, in our prospective analysis.  
11 You wouldn't assume that the -- in the way we  
12 did the analysis that you would lower the  
13 depletions but put the same replacement supply  
14 into the river. That's not how the analysis was  
15 developed.

16 SPECIAL MASTER: How did you develop  
17 the figure of 127,000 acres for the prospective  
18 analysis? I take it you didn't want to use the  
19 figures in the '97 to '99 period because you  
20 thought that was wet and was not representative  
21 of the future. But how did you come to that  
22 particular amount for the future?

23 THE WITNESS: Well, we started with  
24 the 309,655 total acres, which is the acreage  
25 which was used in the past, the historical  
26 modeling, and then we simply applied the  
27 percentages under the "2001" column heading in  
28 Table 4. Those are the same percentages that we

1 used for our calibration of the model ,  
2 development of the acreages for the calibration  
3 period.

4 SPECIAL MASTER: So that's simply  
5 the result in actual acres of your percentage  
6 allocation, then?

7 THE WITNESS: Yes. It should be.

8 BY MR. ROBBINS:

9 Q. So the answer to my initial question really  
10 should be "Yes, but" instead of "No, but"?

11 A. I guess I forgot your original question.

12 Q. Well, my original question was whether or not  
13 supplemental acreage was also a reason that  
14 shortages of 11,000 acre-feet were predicted at  
15 the stateline. And you said "No." And then you  
16 proceeded to explain why the changes in  
17 supplemental acreage did have an impact on  
18 depletions at the stateline but not as  
19 significant as some other factors.

20 So my question was just shouldn't your  
21 answer be "Yes, but" rather than saying "No."

22 A. Well, the supplemental acreage has some impact  
23 on the results of our analysis, but the analysis  
24 is relatively insensitive to it.

25 Q. It's relatively insensitive because you  
26 redistribute pumping; right?

27 A. Well, given that there's no requirement for  
28 excess pumping in the rules, I think it's a



1 reasonable assumption that farmers will use  
2 pumped water where it's needed to meet crop  
3 demand in most cases.

4 Q. I'll probably get back to that, but now let's  
5 turn to Table 15 in your report, which is the  
6 fold-out table that you discussed concerning  
7 your prospective analysis.

8 Do you have that?

9 A. Yes.

10 SPECIAL MASTER: Wait just one  
11 second.

12 MR. ROBBINS: Yes, sir.

13 SPECIAL MASTER: Okay. Now I have  
14 it.

15 BY MR. ROBBINS:

16 Q. Mr. Sullivan, Column 1 in Table 15 shows the  
17 pumping that was assumed in your prospective  
18 analysis; is that right?

19 A. Yes.

20 Q. Now, there are many years in this column that  
21 the estimated pumping was under 120,000, aren't  
22 there?

23 A. Yes, several of them.

24 Q. In fact, the '80 to '94 average was under  
25 120,000, wasn't it?

26 A. Yes. It was just over 116,000.

27 Q. If we go back quickly to Table 6 of your report,  
28 which is just back a few pages, we can see that

1 pumping for supplemental sources in all three  
2 years was under 120,000 -- isn't that right? --  
3 and total pumping was under 120- in all three  
4 years?

5 A. Yes.

6 Q. Okay. However, in your prospective analysis,  
7 you spread the supplemental groundwater over  
8 127,000 acres regardless of the amount of  
9 pumping; isn't that correct?

10 A. Yes.

11 Q. And that makes the pumping more consumptive,  
12 doesn't it?

13 A. More consumptive than what?

14 Q. More consumptive than spreading it over the  
15 acres it was actually irrigating.

16 A. Which acres that were actually irrigated?

17 Q. Well, by spreading the pumping, whether it is a  
18 large amount or a small amount -- whether it's  
19 200,000 or 78,000 acre-feet of pumping spread  
20 over 127,000 acres -- by doing it that way, the  
21 pumping in the lower years is more consumptive;  
22 is that not true?

23 A. I don't think I caught all those figures that  
24 you cited in your question.

25 Q. I was just reading the minimum and maximum  
26 amount of pumping from the chart, 15. Table 15.

27 A. Well, as I described it in my analysis, we  
28 assumed that the pumping was generally to meet

1 the unmet demand. That's the important  
2 assumption. As long as the acreage is such  
3 that -- well, we used a constant acreage, but  
4 the amount of pumping we simulated each year  
5 varied as some percentage, approximately  
6 70 percent of the unmet demand.

7 Q. Let me move on to another topic for a while.  
8 I'd like to hand you what's been marked as  
9 Colorado Exhibit 1405. We extracted the WANT  
10 factors from the approved version of the model  
11 and the revised version of the Kansas model.

12 Mr. Schroeder refers to the approved  
13 model as the "Papadopoulos-Spronk model" that's  
14 been used in past reports of the master and the  
15 revised version of the Kansas model as the  
16 "revised Papadopoulos-Spronk model." On this  
17 exhibit the WANT factors that are less than  
18 system efficiency are shaded.

19 Looking through the exhibit, the WANT  
20 factors in the revised Kansas model are more  
21 frequently less than the reciprocal of the  
22 system efficiency than in the approved model; is  
23 that correct?

24 A. I'm sorry. Could you repeat your question.

25 MR. ROBBINS: I'd be happy to.

26 SPECIAL MASTER: Before we do that,  
27 let me get the two models we're looking at.

28 What's the first one in terms of which

1 years I --

2 MR. ROBBINS: The P-S model --

3 SPECIAL MASTER: I go with certain  
4 years.

5 MR. ROBBINS: It's the model that  
6 was used --

7 SPECIAL MASTER: '95-'96?

8 MR. ROBBINS: -- '86 to '96.

9 SPECIAL MASTER: So line No. 1 is  
10 the 1986 to '96 model. Okay.

11 MR. ROBBINS: The model that you've  
12 actually utilized.

13 SPECIAL MASTER: Right.

14 MR. ROBBINS: And the second model  
15 is the revisions that have been testified to by  
16 Mr. Sullivan to that model.

17 SPECIAL MASTER: So --

18 MR. ROBBINS: His recalibrated model  
19 with the new PETs and the other changes.

20 SPECIAL MASTER: So this is the  
21 Kansas revised model, then?

22 MR. ROBBINS: Yes, that's correct.

23 SPECIAL MASTER: Okay.

24 BY MR. ROBBINS:

25 Q. And my question to you, Mr. Sullivan, was that  
26 in the revised version of the model, the version  
27 that you are testifying to today, the WANT  
28 factors are less than system efficiency more

- 1 frequently than in the approved version of the  
2 model; is that right?
- 3 A. Well, assuming all these values are correct,  
4 including the reciprocal of efficiency and the  
5 WANT factors, there are more shaded values under  
6 the Kansas revised model rows than in the  
7 approved model.
- 8 Q. This is in part the result of using the  
9 automatic calibration process to adjust the WANT  
10 factors rather than doing it manually, isn't it?
- 11 A. No. You could achieve the same calibration that  
12 we achieved in the revised model by doing it  
13 manually. It would just take you quite a lot  
14 longer.
- 15 Q. And it's important due to the fact that you set  
16 no lower limit on where the WANT factors could  
17 go in the calibration process; right?
- 18 A. We didn't set a lower limit, that's right. We  
19 wanted to calibrate the diversions as best we  
20 could.
- 21 Q. And the diversions are calibrated over the  
22 45-year period; right?
- 23 A. Right.
- 24 Q. So you're calibrating to the average over that  
25 period; right?
- 26 A. Yes. I believe that that's the way that both  
27 states have calibrated the model in the past, is  
28 by calibrating over a long-term average.

- 1 Q. And the effect of that is to produce WANT  
2 factors that permit the ditches to divert water  
3 when the conditions are average; right?
- 4 A. No. When there's more water, the ditches divert  
5 more water. When there's less water, they  
6 divert less water.
- 7 Q. Up to the WANT factor?
- 8 A. The WANT factor is one of the -- well, the  
9 ditches don't divert the WANT factor. I mean,  
10 this is used in computing the demand that goes  
11 into the calculation of the diversion.
- 12 Q. The demand that is one of the governors on how  
13 much water is diverted?
- 14 A. Yes. But the demand varies from month to month,  
15 depending on what the PET is.
- 16 Q. The canal capacity and the WANT factors and  
17 water availability?
- 18 A. Yes. Yes. All those factors go into what the  
19 model predicts as a diversion.
- 20 Q. Now, if you look at the large water-short  
21 ditches -- the Colorado Canal, the Fort Lyon,  
22 and the Amity -- the WANT factors in the revised  
23 model are generally less than the reciprocal of  
24 the system efficiency; is that right?
- 25 A. You said the Colorado Canal --
- 26 Q. The Fort Lyon and the Amity.
- 27 A. Yes. I believe that's always been the case in  
28 the model.

1 Q. Now, for the Colorado Canal in the months of  
2 April, May, August, and September, the WANT  
3 factors are less than 1.0; is that right?

4 A. May, August, and September?

5 Q. April, May, August, and September.

6 A. Yes.

7 SPECIAL MASTER: So what does that  
8 mean?

9 MR. ROBBINS: Well, I'll ask that  
10 question, if I may.

11 Q. That means that in those months the WANT factors  
12 for the Colorado Canal will not allow the canal  
13 to divert enough water to satisfy the crop  
14 demand in those months; isn't that right?

15 A. The WANT factors were set to result in  
16 calibration of the model. Now, if in the past  
17 the canal did not historically divert that  
18 amount of water, we're just trying to calibrate  
19 to that.

20 Q. Well, I know. But I'm asking you a specific  
21 question, which is that in the months where WANT  
22 factors are less than 1, the model will not  
23 allow the Colorado Canal to divert enough water  
24 to satisfy the crop demand in that month; isn't  
25 that true?

26 A. I think that's true, yes.

27 Q. Now, that's assuming that there are no losses in  
28 delivering the water to the crops; right?

- 1 A. When they're less than 1?
- 2 Q. At any time. Whatever the WANT factor is,  
3 system losses come off of that; right?
- 4 A. Come off the WANT factor? Come off the  
5 diversions?
- 6 Q. Come off the diversions predicted by the WANT  
7 factor.
- 8 A. Yes. There's losses in delivering water to the  
9 field.
- 10 Q. So the system losses reduce the amount delivered  
11 to the crops. So there's even less water  
12 available to satisfy crop demand from the river;  
13 isn't that true?
- 14 A. Less water than is at the headgate?
- 15 Q. Yes.
- 16 A. Yes.
- 17 Q. And the water at the headgate is predicted by  
18 the WANT factor, among other things; right?
- 19 A. The water at the headgate is predicted to match  
20 the historical diversions.
- 21 Q. But when the WANT factor is less than 1, the  
22 ditch will not even divert sufficient water to  
23 meet crop demand if there were no system losses;  
24 right?
- 25 A. Given your hypothetical, that's right.
- 26 SPECIAL MASTER: Mr. Sullivan, what  
27 does it mean when the WANT factor is over 1?  
28 We're still looking at the Colorado Canal, and



1 it's 1.7 for each of those. What does that  
2 mean?

3 THE WITNESS: I don't -- in my  
4 opinion, the precise value of the WANT factor --

5 SPECIAL MASTER: I didn't hear that.

6 THE WITNESS: The precise value of  
7 the WANT factor, in my opinion, doesn't have any  
8 direct physical meaning. This is the factor  
9 that it took to cause the diversions to be  
10 calibrated using a long-term average. So this  
11 is simply the factor that's multiplied by the  
12 demand and then given all the other  
13 considerations that go into determining the  
14 predicted diversion results in calibration.

15 SPECIAL MASTER: I thought you said  
16 that the WANT factor is one of the things that  
17 goes into developing crop demand; is that  
18 correct?

19 THE WITNESS: It's the factor that's  
20 multiplied by the acreage times the PET less the  
21 effective precipitation, the equation that we  
22 had up on the butcher paper the other day.

23 SPECIAL MASTER: Right. So it's  
24 part of the factors that go into demand, PET  
25 being another one?

26 THE WITNESS: Well, and I think it  
27 was my testimony that this factor considers a  
28 number of -- well, considers all of the things

1 that affect the historical diversions or that  
2 you could use to relate the historical  
3 diversions to the demand assuming you were just  
4 using the demand as your -- or the PET as your  
5 surrogate for --

6 SPECIAL MASTER: Well, my question  
7 isn't that complex. I'm just trying to get the  
8 relationship between something less than 1 and  
9 something more than 1.

10 You indicated that if the WANT factor is  
11 under 1, then that means that the full crop  
12 demand cannot be met. If it's something over --  
13 and sometimes it's, I see, 1.5; sometimes 1.8;  
14 sometimes 1.1. What does it mean when it's over  
15 1? That's what I'm trying to figure out.

16 THE WITNESS: I don't think there's  
17 any particular distinction when it's over or  
18 under 1.

19 SPECIAL MASTER: So that means full  
20 crop demand can be met, and as soon as you get  
21 to 1, you're meeting full crop demand?

22 THE WITNESS: No.

23 SPECIAL MASTER: Well, then what's  
24 the difference between having a WANT factor of  
25 1.7 and 1.2?

26 THE WITNESS: Well, the difference  
27 between those two is it was necessary to have  
28 1.7, for example, in the one case to result in

1 calibration of the model to result the model  
2 predicting average diversions for that month  
3 equal to what historical occurred, and in  
4 another month it might have only taken 1.2 to  
5 result in that same correspondence between  
6 predicted and observed.

7 SPECIAL MASTER: So it's just a  
8 factor, then, to bring about a closer  
9 correspondence between --

10 THE WITNESS: Yes.

11 SPECIAL MASTER: -- predicted and  
12 observed diversions?

13 THE WITNESS: That's what it is.

14 BY MR. ROBBINS:

15 Q. The WANT factor has to be larger than the  
16 reciprocal of the system efficiency for the  
17 model to deliver enough water to satisfy the  
18 crop demand in the month; isn't that true?

19 A. Well, there's other -- you know, for example,  
20 there's pumping occurring on these lands. Is  
21 that what -- or there's other water on these  
22 lands. This is predicting the surface  
23 diversions of direct flow water, and it doesn't  
24 include other water.

25 Q. Okay. Other water like pumping is an input --  
26 right? -- later?

27 A. Yes.

28 Q. Okay. So the WANT factor has to be larger than

- 1 the reciprocal of the system efficiency for the  
2 model to deliver enough water to satisfy the  
3 crop demand in the month; right?
- 4 A. By itself, assuming you're just looking at that  
5 surface water, yes.
- 6 Q. So if you had --
- 7 A. Well, and I --
- 8 Q. -- only -- if you had only surface water  
9 available in order for the model to give a canal  
10 sufficient water to meet the crop demand, the  
11 WANT factor must be greater than the reciprocal  
12 of the system efficiency; true?
- 13 A. Please restate your question.
- 14 Q. Yes. We're taking pumping out of the equation.  
15 So for the model to operate, to deliver  
16 sufficient water to meet crop demand, the WANT  
17 factor has to be greater than the reciprocal of  
18 the system efficiency; isn't that true?
- 19 A. It would. But if you set it that high, it would  
20 result in an overprediction of diversions. So  
21 in my mind, it was more important to predict  
22 diversions correctly.
- 23 Q. Now, in your mind, would it be important for the  
24 farmers, when they were hypothetically deprived  
25 of all their well water, to be able to satisfy  
26 crop demand when the compact run of the model  
27 occurs?
- 28 A. Well, that's -- you know, we don't know what

1 happens in the compact run, but you can look at  
2 how the model performs during the early part of  
3 the calibration period when there wasn't very  
4 much pumping, and during that period the model  
5 does all right.

6 Q. Well, we're not talking about pumping right now.  
7 We're talking about a WANT factor below the  
8 reciprocal of the system efficiency.

9 In that instance that ditch would not  
10 get sufficient water to satisfy crop demand;  
11 isn't that true?

12 A. By itself?

13 Q. Yes.

14 A. But -- well, as a general matter, that's true.  
15 But I think one thing that we can look at is at  
16 the predicted and observed diversions during the  
17 early part of the period when there wasn't very  
18 much pumping, and the model performs adequately  
19 during that period. Even without the pumping,  
20 the model's predicting diversions that are  
21 reasonable.

22 Q. Now, clearly, if you have the WANT factor set at  
23 1 or below, the model is incapable of delivering  
24 sufficient water to meet crop demand; isn't that  
25 right?

26 A. Well, I mean, you need to consider there's soil  
27 moisture available, things other than in that  
28 particular month, to satisfy the crop demand,

- 1 the direct flow diversions in that month.
- 2 Q. If the reciprocal of the system efficiency is --
- 3 if the WANT factor is throughout the summer
- 4 months below the reciprocal of the system
- 5 efficiency, you aren't able to satisfy crop
- 6 demand throughout the season, are you?
- 7 A. As a general matter, that's the case, but that's
- 8 what it took to achieve calibration.
- 9 Q. Now, if we look at the ditches downstream from
- 10 John Martin Reservoir -- that begins on the
- 11 second page of Exhibit 1405 and goes over to the
- 12 third page -- we see that the WANT factors for
- 13 most of the ditches are less than the reciprocal
- 14 of the system efficiency; is that correct?
- 15 A. Yes. That was a characteristic of the approved
- 16 model as well.
- 17 Q. You testified, did you not, that the Arkansas
- 18 River Basin is chronically water-short?
- 19 A. In most years there's a shortage of supply, yes.
- 20 Q. So that if additional water became available in
- 21 the river, if there were no transmountain
- 22 deliveries and no postcompact well pumping, you
- 23 would expect Colorado ditches that are
- 24 chronically water-short to divert additional
- 25 water, wouldn't you?
- 26 A. Yes.
- 27 Q. However, if you calibrate low WANT factors for
- 28 water-short ditches in ditches below John Martin

1 Reservoir, isn't it possible that what you have  
2 done is to calibrate the model to historical  
3 conditions which will constrain those ditches'  
4 ability to divert additional water in the  
5 compact run?

6 A. The ditches do divert additional water in the  
7 compact run.

8 Q. But not much; right?

9 A. There's not that much additional supply that  
10 comes into the river. The consumptive use of  
11 pumping is a very small percentage of the  
12 overall basin-wide diversions. It's on the  
13 order of -- maybe it's less than 10 percent -- 6  
14 or 7 percent of the overall historical  
15 diversions. So I wouldn't expect the diversions  
16 to come up that much.

17 Q. Do you have a copy of Plaintiff's Exhibit 1116,  
18 the water budget summaries?

19 A. No. Well, I may. No, I don't. I'm sorry.

20 Q. I would be happy to hand you a copy. I'm going  
21 to wait a minute because Mr. Draper --

22 SPECIAL MASTER: He's lost his  
23 helper there. He'll have to fend for himself.

24 MR. ROBBINS: Your Honor, if you  
25 want to break two minutes early, we can take  
26 this up after lunch.

27 SPECIAL MASTER: Why don't we do  
28 that.

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MR. DRAPER: All right.

MR. ROBBINS: I kind of hate to go ahead when my opposing counsel doesn't have the exhibit.

SPECIAL MASTER: All right. We'll take the noon recess.

MR. DRAPER: Thank you.

MR. ROBBINS: Okay.

(Lunch recess.)



1 PASADENA, CALIFORNIA; MONDAY, AUGUST 19, 2002

2 1:32 P.M.

3 \* \* \*

4 THE REPORTER: Please remain seated.  
5 Court is again in session.

6 SPECIAL MASTER: Mr. Robbins, I  
7 trust you now all have Plaintiff's  
8 Exhibit 1116 --

9 MR. ROBBINS: I hope so, Your Honor.

10 SPECIAL MASTER: -- if that's where  
11 you're going to begin.

12 MR. ROBBINS: Yes, it is.

13 Q. You do have a copy of Plaintiff's 1116,  
14 Mr. Sullivan?

15 A. Yes, I do.

16 Q. And these are the canal water budget summaries  
17 for the revised Kansas model; is that right?

18 A. Yes.

19 Q. Let's turn to the third sheet in those summaries  
20 if we could, please. This shows the difference  
21 between the historical and the compact runs for  
22 the Kansas version of the H.I. model; is that  
23 right?

24 A. Yes.

25 Q. Column 1 shows the change in direct diversions  
26 by the canals in Colorado; is that correct?

27 A. Right.

28 Q. In this column you didn't subtract the

- 1 transmountain deliveries from the historical  
2 diversions when you calculated the change in  
3 diversions; is that correct?
- 4 A. No. It's just the difference between the two  
5 runs.
- 6 Q. So some of the upstream ditches like the  
7 Colorado Canal show larger decreases in  
8 diversions because the Colorado Canal received  
9 large transmountain deliveries in the historical  
10 run; is that correct?
- 11 A. Colorado Canal actually has an increase in  
12 diversions. The Colorado Canal gets more water  
13 in the historical run because of the  
14 transmountain.
- 15 Q. Similarly, the Bessemer increases, the Rocky  
16 Ford Highline increases, the Fort Lyon  
17 increases; is that right?
- 18 A. Right.
- 19 Q. And each of those canals are canals that enjoyed  
20 transmountain water in the historical run; is  
21 that right?
- 22 A. Yes.
- 23 Q. Now, downstream from John Martin Reservoir, the  
24 ditches did not receive transmountain deliveries  
25 as a general matter; is that right?
- 26 A. Not directly. They would have benefitted from  
27 transmountain return flows.
- 28 Q. Let me be sure I understand. The parentheses

1 are i ncreases or decreases i n di versi on?

2 A. The values i n thi s table are determi ned by  
3 taki ng the values i n the hi stori cal run mi nus  
4 the compact. So a posi ti ve val ue means that  
5 that val ue was greater i n the hi stori cal run,  
6 and, conversely, a negati ve val ue means that  
7 that parameter was greater i n the compact run.

8 SPECIAL MASTER: I have notes to  
9 that very effect.

10 BY MR. ROBBINS:

11 Q. So i n thi s anal ysi s the canal wi th the l arge st  
12 decrease i n di versi ons between the runs i s the  
13 Ami ty -- i s that ri ght? -- or i s that the  
14 l arge st i ncrease i n di versi ons?

15 A. Wel l , goi ng whi ch way?

16 Q. I n the compact run whi ch canal showed the  
17 l arge st i ncrease i n di versi ons?

18 A. That woul d be the Ami ty, on average.

19 Q. And the canal that had the l arge st decrease i n  
20 di versi ons was whi ch canal ?

21 A. Col orado Canal .

22 Q. So the other canals that showed decreases i n  
23 di versi ons i nclude the Bessemer, the Rocky Ford  
24 Hi gh l i ne, the Fort Lyon, and the Hol brook;  
25 ri ght?

26 A. I ' m sorry. You sai d four di tches?

27 Q. The canals that had l arge decreases i n  
28 di versi ons i ncluded the Col orado Canal , the Fort

1 Lyon, the Holbrook, the Rocky Ford Highline, and  
2 the Bessemer; right?

3 A. Yeah.

4 Q. And those are the canals that had transmountain  
5 deliveries in the historical run; is that right?

6 A. They're among those canals.

7 Q. Now, the Amity water rights have diversion  
8 reduction factors applied to them so that a  
9 percentage of any additional water available for  
10 diversion by the Amity in the compact run gets  
11 bypassed directly to the stateline in the months  
12 the diversion reduction factors are operating;  
13 is that right?

14 A. A portion of the what?

15 Q. The increased diversion, the additional water  
16 available for diversion.

17 A. In the compact run?

18 Q. Yes.

19 A. Yes.

20 Q. And the Amity enjoyed the largest amount of  
21 increase in direct diversions in the compact  
22 run; is that right?

23 A. Yes.

24 Q. Now, if we look at other ditches below John  
25 Martin Reservoir that have WANT factors that are  
26 less than the system efficiency -- the Fort  
27 Bent, the Keesee, the Hyde, the XY-Graham, the  
28 Buffalo, and the Sisson -- their diversions

- 1           increase a little bit but not as much as the  
2           Lamar-Manvel and the Amity; isn't that correct?
- 3       A.     The Lamar-Manvel and the Amity are very large  
4           canals, relatively speaking. If it's a smaller  
5           canal, I wouldn't expect it would get more  
6           diversions than the Amity, for example.
- 7       Q.     Is it possible that you've calibrated low WANT  
8           factors on these ditches because those are  
9           water-short ditches that historically did not  
10          have a full supply?
- 11      A.     The diversions were calibrated to the historic  
12          diversions. That was the point.
- 13      Q.     So if a ditch historically was short of water,  
14          you would calibrate potentially at quite a low  
15          WANT factor?
- 16      A.     Well, if the ditch historically did not divert  
17          water, then the ditch diverted whatever it  
18          diverted, and we calibrated to that.
- 19      Q.     And that --
- 20      A.     For whatever reason they didn't have water,  
21          that's what we calibrated to.
- 22      Q.     And the WANT factor, then, in the compact run  
23          restrains how much water the ditch would take;  
24          right?
- 25      A.     If you relaxed the WANT factor, in the  
26          historical run it will divert more water. The  
27          model simulates the system more perfectly, and  
28          it doesn't explicitly simulate all of the

1 processes that affect diversions.

2 I think in my testimony earlier I went  
3 through many of the reasons why the WANT factors  
4 are necessary, why they need to be set where  
5 they are to achieve calibration. That's why  
6 they need to be set there. If you relax them in  
7 the historical run, the diversions will come up.  
8 If you relax them in the compact run, the  
9 diversions will come up. They need to be there  
10 to achieve calibration and to have the model  
11 operate correctly.

12 Q. But they will prevent the water-short ditches  
13 from taking as much supply as they might take to  
14 replace forgone well pumping; isn't that true?

15 A. Well, the amount of well pumping and the  
16 consumptive use of well pumping is a small  
17 percentage of the overall water supply in  
18 Colorado. So when that additional water supply  
19 is made available, I would expect a small  
20 increase in diversions. I wouldn't expect a  
21 large increase because the amount of pumping  
22 consumptive use is relatively small in  
23 comparison to the supply in Colorado. It's a  
24 much larger percentage of the stateline flows,  
25 for example, but in terms of the supply in  
26 Colorado, it's relatively small.

27 Q. Would you expect these farmers to try to  
28 recapture the water that they had formerly used

- 1 through direct diversion if it were available at  
2 the headgate if they didn't have their wells?
- 3 A. They do. They have a small increase in supply.  
4 They have a small increase that's, I believe,  
5 consistent with the small increase in supply.  
6 They have a small increase in diversions.
- 7 Q. Let's look at the Lamar-Manvel Canal.  
8 That is the one ditch below the John  
9 Martin Reservoir that does not have WANT factors  
10 below the reciprocal of the system efficiency in  
11 the revised Kansas model; is that right?
- 12 A. Yes.
- 13 Q. In the compact run the diversions by the  
14 Lamar-Manvel increased more than any of the  
15 ditches except the Amity; isn't that right?
- 16 A. Well, as a percentage of its supply, it's  
17 relatively small. The Lamar-Manvel diverts a  
18 lot more water than some of these other ditches.
- 19 Q. It also has a higher WANT factor, does it not?
- 20 A. Yes, it does.
- 21 Q. Let's look at Column 9.  
22 You show the average amount of pumping  
23 that was removed in the compact run; is that  
24 right?
- 25 A. Yes. That's the change in pumping between two  
26 runs.
- 27 Q. So in other words, that's the pumping that is  
28 forgone on average by each of the canals; right?

- 1 A. Ri ght.
- 2 Q. In the case of the XY-Graham, as an example,  
3 which is down near the bottom of the chart,  
4 there is an average of 9,543 acre-feet of  
5 pumping removed in the compact run; is that  
6 right?
- 7 A. Ri ght.
- 8 Q. But di versi ons by the XY-Graham Di tch only  
9 i ncreased by an average of 591 acre-feet in the  
10 compact run; isn't that right?
- 11 A. Ri ght.
- 12 Q. The average of 9,543 acre-feet of pumpi ng that  
13 was removed in the compact run i ncludes pumpi ng  
14 by the Graham wells that were decreed as new  
15 points of di versi on for the Graham water ri ght;  
16 is that correct?
- 17 A. It i ncludes all of the estimated pumpi ng for the  
18 XY-Graham user.
- 19 Q. I ncluding the Graham al ternate poi nt wells?
- 20 A. I ncluding the Graham wells.
- 21 Q. When Mr. Schroeder revised the model to account  
22 for the change of the Graham water ri ghts to  
23 wells in 1997, hi s change allowed the XY-Graham  
24 Di tch to i ncrease di versi ons i n the compact run;  
25 is that ri ght?
- 26 A. Yes.
- 27 Q. I believe you testi fied that thi s change allowed  
28 the XY-Graham Di tch to i ncrease di versi ons on



1 the order of about 3,500 acre-feet.

2 Does that sound right?

3 A. Increase over which run?

4 Q. The compact run. Mr. Schroeder's compact run  
5 showed increased diversions, I think you said,  
6 of about 3,500 acre-feet.

7 A. Over what, though?

8 Q. Over the historical.

9 A. In the Schroeder model?

10 Q. Yes.

11 A. That sounds like it's in the ballpark. I think  
12 we had an exhibit that showed some of that.

13 Q. I was just trying to capture the exhibit without  
14 dragging it out and spending the time handing it  
15 to you. But it's about 3,500 acre-feet, I  
16 think.

17 So if you increase the WANT factors for  
18 the XY-Graham Ditch, the model will predict  
19 higher diversions in the compact run; isn't that  
20 right? Mr. Schroeder had higher WANT factors.

21 A. Well, the reason that his -- in his model the  
22 reason the ditch predicts more water in the  
23 compact run is because when he modified the  
24 formula that computes the demand -- and as you  
25 recall, for the XY, in addition to the formula  
26 that we had before, he also subtracted the  
27 pumping from the demand in the calculation of  
28 the demand. So by adding that extra term into

- 1           that equation, when the pumping is removed in  
2           the compact run, that results in a greater  
3           demand in the model for just that user. The  
4           WANT factors are the same between the two runs.  
5           It's just that he's subtracted the -- he's added  
6           that extra element to the calculation of the  
7           demand.
- 8        Q.    In effect, he increased the WANT factors in the  
9           compact run; right?
- 10       A.    No. The WANT factors are the same.
- 11       Q.    The effect's about the same?
- 12       A.    The same as what?
- 13       Q.    As increasing the WANT factors.
- 14       A.    He increased the demand in the compact run, and  
15           that results in more water being diverted.
- 16       Q.    Based upon your water budget summaries, you do  
17           agree that you took 9,500 acre-feet of pumping  
18           away from the XY-Graham in the compact run;  
19           right?
- 20       A.    I didn't take it away. That's --
- 21       Q.    You eliminated it --
- 22       A.    That's what happens --
- 23       Q.    -- as part of the analysis?
- 24       A.    In the compact run we set the pumping to the  
25           precompact pumping assigned to that user.
- 26       Q.    Which eliminated 9,500 acre-feet of pumping, in  
27           round numbers?
- 28       A.    About, yes.

1 Q. 9,543.

2 A. Yes.

3 Q. And the model then predicted that in replacement  
4 for that, there would be an average of 591  
5 acre-feet of additional diversion; is that  
6 right?

7 A. Well, that's right. When the pumping is removed  
8 in that run, there's not a one-for-one  
9 correspondence with where the additional water  
10 goes. It depends on the consumptive use of  
11 pumping, and then it depends on the allocation  
12 processes in the model, simulating which  
13 priorities are calling, therefore which ditches  
14 are going to get the water.

15 Q. Let's look at Colorado Exhibit 1405 again, if we  
16 could, please. That's the Table 4 comparison of  
17 demand factors used in the Papadopoulos-Spronk  
18 model and the demand factors used in the revised  
19 Papadopoulos-Spronk model.

20 On the third page of that exhibit, what  
21 were the WANT factors you calibrated for the  
22 XY-Graham Canal for the revised model?

23 A. What were they?

24 Q. Yes.

25 A. Do you want me to read the values?

26 Q. I think I can just simply ask you.

27 They're all less than 1 except for one  
28 month during the summer season; isn't that

- 1 correct?
- 2 A. You mean two months?
- 3 Q. It appears to me that in the XY-Graham from  
4 April to August, they are less than 1, and only  
5 in September are they greater.
- 6 A. And October.
- 7 Q. And in October as well, yes.
- 8 A. Okay.
- 9 Q. But for the heart of the growth season, April  
10 through August, they're less than 1, are they  
11 not?
- 12 A. Well, if that's how you want to characterize the  
13 growth season. Usually we look at the  
14 irrigation season April through October.
- 15 Q. But they're less than 1 for April, May, June,  
16 July, and August; correct?
- 17 A. Yes.
- 18 Q. And that means that the model will not permit  
19 the XY-Graham to divert enough water in those  
20 months to satisfy crop demand; isn't that true?
- 21 A. Because it didn't divert that much water  
22 historically.
- 23 Q. However, even in the compact run, even if water  
24 were available at the headgate, the model will  
25 not permit the XY-Graham to divert -- in your  
26 calibration of it will not permit the XY-Graham  
27 to divert sufficient water to satisfy crop  
28 demand; isn't that true?

- 1 A. It won't do that in either of the runs, the  
2 historical or the compact. These levels of  
3 calibration factors are necessary to result in  
4 calibration. In the historical run if you raise  
5 the values higher than these levels, the ditch  
6 would divert more water.
- 7 Q. Now, there are other ways to calibrate a model  
8 other than just adjusting WANT factors and SEVs,  
9 aren't there?
- 10 A. Well, for a model that's predicting diversions,  
11 you need something in the way of demand, and you  
12 need -- typically models will have something  
13 that will account for other processes, other  
14 nonbeneficial consumptive uses, for example, if  
15 those uses aren't otherwise explicitly  
16 simulated.
- 17 Q. If you remove all of the postcompact well  
18 pumping from the XY-Graham Ditch including  
19 pumping by wells that were decreed as points of  
20 diversion for the Graham water right, doesn't it  
21 make sense that the XY-Graham would want to  
22 divert additional water that is available for  
23 diversion even though it didn't do it  
24 historically?
- 25 A. I believe that even with pumping, the XY-Graham  
26 user was still very short of water, and it would  
27 have wanted to divert all the water that it  
28 could, but, in fact, historically it got what it

1 got. It diverted what it could. And I would  
2 imagine that it wanted more water.

3 Q. Let's look at Section 6 of your report, shall  
4 we. That starts on page 49. That's  
5 Exhibit 1093.

6 SPECIAL MASTER: What page was that?

7 MR. ROBBINS: Page 49, Your Honor,  
8 of 1093.

9 Q. At the top of the page, this section of the  
10 report states "The performance of Colorado's Use  
11 Rules since they were implemented in 1996 is not  
12 a reliable indicator of the long-term  
13 effectiveness of the Rules."

14 Do you see that?

15 A. Yes.

16 Q. And in the last sentence of the paragraph above  
17 the next section, 6.1, the last sentence says,  
18 "The original study was revised as described  
19 herein to address comments provided in a May 5,  
20 2000 report by Duane Schroeder and Helton and  
21 Williamson, P.C., as well as to make other  
22 appropriate modifications to the analysis."

23 Do you see that?

24 A. Yes.

25 Q. The May 5, 2000 report by Mr. Schroeder is  
26 Colorado Exhibit 1363, and he testified to that  
27 earlier. Mr. Schroeder testified that you had  
28 made some basic mistakes that, in his opinion,

1           i nval idated the earl ier anal ysi s.

2                   Do you recal l that?

3       A.    Yes.

4       Q.    The earl ier anal ysi s was done usi ng what you  
5           referred to as the approved versi on of the model  
6           that was used to determi ne depleti ons to usable  
7           statel i ne fl ows for 1986 to 1994; i s that  
8           correct?

9       A.    Yes.

10      Q.    What were the other appropri ate modi fi cati ons to  
11           the anal ysi s that you made?

12      A.    You mean i n addi ti on to usi ng the new model ?

13      Q.    You addressed comments by Mr. Schroeder i n hi s  
14           report, and then you made other appropri ate  
15           modi fi cati ons.

16                   What were the other appropri ate  
17           modi fi cati ons?

18      A.    I f you gi ve me a mi nute, I can probabl y go  
19           through here and try to i sol ate those.

20      Q.    Weren' t some of the i mportant ones that you  
21           modi fi ed the PET to refl ect the resul ts of  
22           Mr. Franzoy' s advi ce on the Penman-Montei th?

23      A.    Well , I woul d consider that part of the new  
24           model , but yes.

25      Q.    And you al so changed the suppl emental acreage i n  
26           the new model , di d you not?

27      A.    Agai n, that' s part of the new model .

28      Q.    And you al so changed the di stri buti on of

- 1           pumpi ng, di d you not?
- 2           A.     Yes.
- 3           Q.     And those are certainly some of the other
- 4           modi fi cations that you made; is that right?
- 5           A.     Yes.
- 6           Q.     On page 51 of Exhi bi t 1093 in the second
- 7           paragraph of the secti on headed "Descripti on of
- 8           Anal ysi s" you say, "When repl acement water is
- 9           deli vered to the stream, it is possi ble that the
- 10          water suppli es for certain surface water users
- 11          are expanded beyond what they would be in the
- 12          absence of pumpi ng, while the stream depleti ons
- 13          from pumpi ng conti nue to adversely affect other
- 14          water users or stateli ne fl ows."
- 15                    Do you see that?
- 16          A.     I recal l that. But I didn' t get exactly where
- 17          you were.
- 18          Q.     All right. I' m in the second paragraph of
- 19          Secti on 6.2, and I was reading a sentence that
- 20          began at the end of the second li ne.
- 21          A.     Okay.
- 22          Q.     Do you see that?
- 23          A.     Yes.
- 24          Q.     Why is it possi ble when repl acement water is
- 25          deli vered to the stream that the water suppli es
- 26          for certain surface water users are expanded
- 27          beyond what they would be in the absence of
- 28          pumpi ng?



1 A. Well, in the absence of pumping, that implies a  
2 certain distribution of a change in water  
3 supply, and even if the depletions are fully  
4 replaced but the distribution is different than  
5 the distribution of the depletions, it's  
6 possible that the model would simulate those two  
7 alternatives slightly differently.

8 In an extreme example, just to make the  
9 point, if there was a depletion way up high in  
10 the river and the replacement water is delivered  
11 down low in the river, the model would simulate  
12 the allocation of that water differently. They  
13 might be the same change, but the model would  
14 redistribute it perhaps differently because the  
15 geographic difference in the change in supply.

16 Q. If the H.I. model does not accurately predict  
17 diversions by Colorado ditches on a monthly  
18 basis, how do we know that the model will  
19 accurately predict which surface users in  
20 Colorado will benefit from the additional  
21 replacement water that's made available?

22 A. How do we know -- I'm sorry.

23 Q. How do we know that the model -- if we're not  
24 accurately predicting diversions on a monthly  
25 basis, how do we know the model will accurately  
26 predict which surface user in Colorado will  
27 benefit from additional replacement water when  
28 it's made available?

- 1 A. Well, I don't think we're trying to predict  
2 which user is benefiting, which user in  
3 Colorado.
- 4 Q. You're only trying to predict what the  
5 consequence is at the stateline?
- 6 A. Ultimately, that's what we're trying to predict.
- 7 Q. Let's look at Table 1 of Kansas Exhibit 1093.  
8 That's Table 1 in the same exhibit we're looking  
9 at now.
- 10 For the prospective analysis, you used  
11 the same acres irrigated in each ditch service  
12 area as the 1995-'96 H.I. model irrigated  
13 acreage on Table 1; is that correct? That is in  
14 the first column with numbers from the left.
- 15 A. Pretty close to that.
- 16 Q. That's what you used in your prospective  
17 analysis?
- 18 A. Well, in the exhibit you gave me, the figures  
19 add up to 309,655, in Exhibit 1403.
- 20 Q. Okay. But looking at Exhibit 1093, that's the  
21 column that you use, generally; right?
- 22 A. Yes, generally.
- 23 Q. Now, those are different than the Kansas revised  
24 acreages shown in the last column of Table 1,  
25 which is based on the work that Colorado and  
26 Mr. Book did to revise irrigated acreage; is  
27 that correct?
- 28 A. That's correct.

1 Q. For a prospective analysis doesn't it make more  
2 sense to use the best current data on irrigated  
3 acreage?

4 A. Well, the figures are obviously very close,  
5 300,000 versus 309,000. Some of the current  
6 reduction in acreage can have to do with the  
7 inactive wells, just as we discussed earlier  
8 regarding the difference -- or the current  
9 reduction in groundwater acreage that is seen in  
10 the valley now.

11 So in terms of a long-term value, I  
12 thought that the value that was used  
13 historically was a reasonable value. Frankly,  
14 if we had used 300,000 instead of 309- and then  
15 proceeded to develop that data and conduct the  
16 analysis, I doubt it would have had that much  
17 effect on it.

18 Q. Let's look at the bottom of page 11 of  
19 Exhibit 1093, if we could, please.

20 A. Which one is 1093 again?

21 Q. Yes. 1093 is your report.

22 A. Page 11?

23 Q. Bottom of page 11. That Section 2.3.3.3 begins  
24 with the statement that "The acreage irrigated  
25 by ground water for a long-term analysis should  
26 be based on the entire acreage served by wells,  
27 unless a commitment is made to discontinue  
28 irrigation of portions of the acreage with

1 ground water. "

2 Do you see that?

3 A. Yes.

4 Q. When you say "long-term analysis," you mean the  
5 prospective analysis of Colorado's replacement  
6 plans; is that correct?

7 A. Yes, I think that's what we were referring to.

8 Q. Were you present for the testimony of Mr. Evans  
9 and Mr. Eck and Mr. Baker and Mr. Higbee and  
10 Mr. Grasmick?

11 A. Yes.

12 Q. They testified in 2002 they were reducing the  
13 acreage they could have irrigated with surface  
14 and groundwater because surface water supplies  
15 were reduced and replacement water wasn't  
16 available.

17 Do you recall that?

18 A. I think so, yes.

19 Q. In your prospective analysis, in dry years you  
20 assumed that the farmers would spread surface  
21 water over all of the acreage in the ditch  
22 service area and spread groundwater over all of  
23 the decreed and permitted acreage in the ditch  
24 service area; isn't that correct?

25 A. Well, we assumed that it would be spread over  
26 all of the acreage in our analysis.

27 Q. In your prospective analysis?

28 A. Yes.

1 Q. Now, that assumption isn't consistent with the  
2 actual management practices of the farmers in  
3 Colorado, is it?

4 A. Well, I think it's consistent with the practice  
5 of not overirrigating, not applying excess  
6 water, which particularly in a year like this I  
7 would n' t expect.

8 Q. Spreading it over all of the acreage, however,  
9 isn't consistent with what the testimony of the  
10 farmers suggest, is it?

11 A. As long as the pumped water is spread over land  
12 such that the pumping is less than or equal to  
13 the demand, it doesn't matter if the acreage is  
14 greater.

15 Q. As long as the pumping is consumed at a rate  
16 that you consider to be reasonable; right?

17 A. Right. And the rate at which those farmers that  
18 you referred to testified. I believe they  
19 testified that they don't apply excess water.

20 Q. Well, let's look at Table 15 of Kansas  
21 Exhibit 1093, if we could, please. That's the  
22 pull-out table again.

23 SPECIAL MASTER: Mr. Sullivan,  
24 before we go on to another subject, the farmers  
25 all testified that in a dry year they  
26 concentrated their well water on sort of their  
27 best crops, their crops which were most likely  
28 to produce a good income. And in your

1 prospective analysis in a dry year you've just  
2 said that the model in that analysis spreads it  
3 over all of the land.

4 Am I to understand that the  
5 supplemental -- that's the same as supplemental  
6 acreage, isn't it? When you spread the  
7 groundwater, that's the same as a supplemental  
8 acreage figure, isn't it?

9 THE WITNESS: Well, I think that's  
10 the acreage that we're focusing on --

11 SPECIAL MASTER: Yeah.

12 THE WITNESS: -- for this issue.

13 SPECIAL MASTER: So am I to  
14 understand that, from your point of view on how  
15 the model operates, it really doesn't make any  
16 difference how many acres the groundwater is  
17 spread over so long as there is what you  
18 consider no excess pumping? Is that what it  
19 comes down to?

20 THE WITNESS: Yes. For example, if  
21 the unmet demand -- let me try to get this  
22 example right. If the unmet demand, just using  
23 round numbers, was, say, 100 acre-feet and the  
24 analysis is -- and we're assuming there's 100  
25 acre-feet of pumping. So say it's right at the  
26 unmet demand.

27 Whether you simulate that pumping so  
28 that it results in, say, two feet of water per

1 acre versus a half a foot of water per acre  
2 because of a difference in acreage assumption,  
3 as long as that application is less than the  
4 demand, that water will be consumed at close to  
5 or at the maximum farm efficiency, the  
6 65 percent. And it doesn't matter that the  
7 model spread it over more acreage as long as it  
8 wasn't applied in excess of demand, and  
9 essentially there's no difference in how the  
10 model would simulate it.

11 BY MR. ROBBINS:

12 Q. But it's possible, is it not, based upon the  
13 testimony of these witnesses that they, in fact,  
14 do pump water and place it only on high value  
15 crops even if that means that there's some  
16 inefficiency associated with it?

17 A. Well, yes, it's possible. And just as in my  
18 prospective analysis, the analysis doesn't  
19 reflect full consumption of all the pumped  
20 water. There is excess pumping in my analysis,  
21 just not to the level that we saw in the  
22 historical runs of the model.

23 Q. The historical runs were based upon the best  
24 engineering judgment of Mr. Book and others for  
25 the years 1950 through 1996; right?

26 A. The pumping data was, but the distribution and  
27 application of that water within the model did  
28 not match the demand very well.

1 Q. But that was the way in which Mr. Book and  
2 Mr. Larson and the Kansas team simulated it for  
3 the period 1950 through 1996; isn't that true?

4 A. Yes, it was.

5 Q. And at the time they testified that that was an  
6 appropriate simulation; isn't that true?

7 A. Well, I believe it was conservative.

8 Q. Let's look at Table 15 of Kansas Exhibit 1093,  
9 shall we. That's the pull-out table again that  
10 shows your prospective analysis. Column 1 --

11 SPECIAL MASTER: I'm not quite there  
12 yet.

13 MR. ROBBINS: Yes, Your Honor.

14 SPECIAL MASTER: Okay.

15 BY MR. ROBBINS:

16 Q. Column 1 in the table shows the pumping values  
17 you assumed for the prospective analysis; is  
18 that right?

19 A. Yes.

20 Q. You assumed that well owners in Colorado would  
21 be allowed to pump 200,000 acre-feet in very dry  
22 years like 1954, 1956, 1963 and '4, and 1977; is  
23 that right?

24 A. Yes. But at the same time we assumed that there  
25 would be replacement water available to replace  
26 the resulting depletions.

27 Q. And you assumed that the surface water that was  
28 available would be spread uniformly over all of



- 1 the acreage in the ditch service area in a dry  
2 year like that; is that correct?
- 3 A. Yes.
- 4 Q. And the model then spreads the groundwater over  
5 all of the acreage identified as supplemental  
6 acreage in the model; is that correct?
- 7 A. Yes.
- 8 Q. Now, that isn't exactly consistent, though, with  
9 what the Colorado farmers testified to when they  
10 said they reduced the acreage on which they  
11 applied surface water and they reduced the  
12 acreage on which they applied groundwater and  
13 only irrigated the higher value crops to the  
14 fullest extent and then irrigated whatever else  
15 they could with what was left; isn't that right?
- 16 A. I believe it's consistent where it counts, and  
17 that is that they didn't apply excess water.  
18 And certainly in any year that they wouldn't  
19 apply excess water would be these dry years.
- 20 Q. Now, to the extent that your definition of  
21 excess water and the definition used by the  
22 Colorado farmers are different, your analysis  
23 may or may not be correct; isn't that right?
- 24 A. Well, I'm not sure what you mean.
- 25 Q. Well, you're looking at it purely from the  
26 standpoint of hypothetical crop demand; right?
- 27 A. No. I mean, it's the crop demand that's  
28 calculated based on best estimates of the PET

1 and the acreage and what have you.

2 Q. A calculated crop demand?

3 A. Yes.

4 Q. And when a farmer is asked "Do you pump extra  
5 water?" the farmer says "No"; right?

6 A. Well, I mean, they said what they said.

7 SPECIAL MASTER: I think all the  
8 farmers were asked essentially that question,  
9 basically "Do you put more water on any field  
10 than the crop requires?" and they all said, "No,  
11 at least not knowingly. We try not to do that."  
12 And that makes sense.

13 I take it what you're saying, though, in  
14 terms of that may be the farmers' definition of  
15 excess water, your definition is simply an  
16 application as to what the model does?

17 THE WITNESS: No. I think I'm going  
18 more with what the farmers say. What they  
19 testified to is what makes sense to me, and I  
20 believe and I think we should be endeavoring to  
21 get the model to do that as best we can.

22 Now, historically the model wasn't quite  
23 doing that.

24 SPECIAL MASTER: I understand that  
25 to be your testimony.

26 BY MR. ROBBINS:

27 Q. Let's look at Exhibit 1403, Defendant's  
28 Exhibit 1403 again. Now, with this exhibit,

1           Looking at User 1 --

2                       Which is the Bessemer, is it not?

3       A.    Yes.

4       Q.    You assumed that the acreage irrigated by  
5            supplemental groundwater in the Bessemer Ditch  
6            service area would be 11,508 acres in each year  
7            regardless of the amount of pumping in the ditch  
8            service area in any year; is that correct?

9       A.    Yes.

10      Q.    Do you think it's reasonable to assume that  
11            supplemental groundwater would be spread over  
12            11,508 acres in years when there is only a small  
13            amount of supplemental pumping in the ditch  
14            service area?

15      A.    Well, as I testified earlier, as long as the  
16            pumping was not excess to the demand or not  
17            substantially in excess of the demand, it  
18            doesn't matter if the acreage is larger than  
19            what they are actually doing in any particular  
20            year.

21      Q.    Let me hand you what's been marked as Colorado  
22            Exhibit 1404. Now, Exhibit 1404 is the  
23            supplemental pumping that was assumed in the  
24            Kansas prospective compact analysis, and this is  
25            a printout of the information that was used.

26                       Do you want to check it against your  
27            information?

28      A.    Okay.

1 Q. Tell me when you're ready.

2 A. In the materials that I have, I don't have it  
3 broken out by supplemental separately.

4 Q. We believe that this accurately represents the  
5 information --

6 SPECIAL MASTER: Why don't you make  
7 the assumption that this is true, and you can  
8 check it later. If it's not, then we can come  
9 back to it.

10 THE WITNESS: Okay.

11 BY MR. ROBBINS:

12 Q. Now, looking at the Bessemer, which is the first  
13 column on the left after the date, in many years  
14 you didn't estimate any supplemental pumping in  
15 the Bessemer Ditch service area, did you?

16 A. Right.

17 Q. But there's been supplemental pumping on the  
18 Bessemer service area in every year from 1950  
19 on, hasn't there been, in reality?

20 A. I think that's what the historical record shows.

21 Q. Isn't it true that the Bessemer Ditch has a  
22 large number of small vegetable farms?

23 A. Yes.

24 Q. And there are a large number of relatively  
25 small-capacity wells on those farms, aren't  
26 there?

27 A. I'm not sure.

28 Q. Do you think it's reasonable in the future to

1 assume that the Bessemer Ditch will have years  
2 where those farmers don't perform on those small  
3 farms the way they have in the past?

4 A. Well, I think you're focusing on the trees  
5 rather than the forest of our analysis, and we  
6 were doing a prospective analysis not knowing  
7 what the future would bring. We made an  
8 estimate of pumping distribution for the future  
9 that largely got rid of the excess pumping.

10 Now, I'm sure you can quibble about  
11 where the excess pumping is located in one ditch  
12 versus another, but overall I think it's  
13 reasonable, and given that we're simulating a  
14 condition in the future, you know, we're not  
15 using actual historical data.

16 SPECIAL MASTER: Mr. Sullivan, was  
17 your prospective compact compliance analysis  
18 intended basically to see whether the Use Rules  
19 would produce compliance?

20 THE WITNESS: Yes, for the most  
21 part.

22 SPECIAL MASTER: Okay. And to do  
23 that you looked ahead and made a number of  
24 assumptions, what pumping might be, what the  
25 supplemental acreage might be, what the sole  
26 source pumping might be, what the PET value  
27 might be, and so forth?

28 THE WITNESS: (Witness nods head.)

1                   SPECIAL MASTER: Am I right,  
2                   however, that if we were back here, heaven  
3                   forbid, five years from now and we are trying to  
4                   find out whether there has been actual  
5                   compliance, that at that point you would look at  
6                   actual pumping, you would look at actual  
7                   supplemental acreage, you would look at actual  
8                   sole source acreage, pumping, and so forth?  
9                   Would you at that time be looking at actual  
10                  figures or at least what historically was  
11                  occurring at that time?

12                  THE WITNESS: Yes. And hopefully  
13                  even some other data that --

14                  SPECIAL MASTER: I understand. I  
15                  didn't go through the list. But just so I'm  
16                  seeing what you're doing here, you've made a  
17                  projection with a number of assumptions. Under  
18                  the basis of those assumptions, you come to the  
19                  conclusion that the Use Rules are not adequate,  
20                  that they produce depletions on the average of  
21                  11,000 acre-feet a year.

22                  But in terms of actual testing, if we  
23                  were around and we were going to be checking,  
24                  you would be using actual data. You wouldn't be  
25                  using these projected figures?

26                  THE WITNESS: Right. I think the  
27                  proposals by both states so far is that we would  
28                  use the model in some fashion to check things

1           periodically in the future.

2       BY MR. ROBBINS:

3       Q.     But for the years 1997, '98, and '99, you  
4           haven't used the actual data, have you?

5       A.     Well, as I've said, we -- I assume that you're  
6           alluding to the irrigated area data.

7       Q.     Certainly.

8       A.     And we made some additional assumptions  
9           regarding that area to reflect that we don't  
10          have all the data that we need to accurately  
11          characterize the distribution of water on the  
12          farms.

13      Q.     Well, then, just as in these years, you can't  
14          really assure the master that you would use  
15          actual data in the future, can you? Certainly  
16          not if the data didn't establish a level of  
17          depletion from wells that you believe to be  
18          appropriate; isn't that true?

19      A.     Oh, no. That's not correct.

20      Q.     Well, let me just draw your attention back to  
21          your prospective analysis and look at the  
22          Bessemer.

23                   Now, the Bessemer from 1950 to the  
24          present has had significant supplemental pumping  
25          in every year, hasn't it, even in the early  
26          times there were wells on the Bessemer; right?

27      A.     It seems like some of the earlier well  
28          development was concentrated up that way.

1 Q. And yet in your analysis, you had quite a number  
2 of years where you assumed that there was no  
3 pumping; is that right?

4 A. Well, as I testified, our analysis was intended  
5 to simulate a situation in which the excess  
6 pumping was reduced from what appeared in the  
7 historical records, and you might be able to  
8 quibble about a particular distribution to one  
9 ditch versus another, but I think it's  
10 reasonable overall. The amount of excess  
11 pumping reflected in our analysis overall is  
12 around 7 or 8 percent, and I think that's a  
13 reasonable level.

14 Now, on the Bessemer, for example, if  
15 Colorado were to institute a condition, for  
16 example, in which they would ensure that excess  
17 pumping would occur on the Bessemer lands every  
18 year, then it would be appropriate to simulate  
19 that differently, but I don't think that kind of  
20 requirement is in the rules. And what the  
21 Bessemer may have done in the past or might have  
22 done in 1997 through '99 is no guarantee of what  
23 they're going to do in the future. And I think  
24 that the rules need to allow for less excess  
25 pumping because there's significant incentives  
26 for there not to be excess pumping.

27 SPECIAL MASTER: Mr. Sullivan, I'm  
28 confused by that answer because it seemed to me



1 that in that answer you were beginning to equate  
2 what the farmers really do, what they can do  
3 under the rules, with how the model portrays  
4 this. It seems to me that you don't have to  
5 have a rule to tell the farmer not to put water  
6 on the field which is basically going to be  
7 wasted.

8 I don't know what Colorado law provides  
9 generally, but in California that would be  
10 unlawful. I mean, if you're not putting it to a  
11 beneficial use, you don't get a water right  
12 really or you're outside of your water right.  
13 So it doesn't seem to me you need to be doing  
14 that by way of rules.

15 Now, what the farmer actually does, I  
16 have been thinking it was quite different  
17 from -- I shouldn't say was -- it could be  
18 different than how the application of the  
19 farmer's pumping gets reflected in the model.  
20 In your answer you suddenly were, I thought,  
21 making just the same wave, you've got to have  
22 rules that stop the farmer from using excess  
23 water, and I don't understand that.

24 THE WITNESS: Well, I think I was  
25 trying to allow for the occurrence of what  
26 Mr. Robbins was suggesting, that despite the  
27 common sense thought that farmers wouldn't be  
28 applying excess water, maybe -- for some reason

1 he's suggesting that it might be happening under  
2 the Bessemer, I believe.

3 SPECIAL MASTER: Okay.

4 THE WITNESS: Maybe I mi sunderstood  
5 hi m.

6 BY MR. ROBBINS:

7 Q. Well, there's clearly pumpi ng that occurs under  
8 the Rocky Ford in the hi storical record; ri ght?

9 A. There's some, although in the work that I did on  
10 the Rocky Ford, the way all the people that I  
11 talked to -- and I worked on that transfer -- it  
12 didn't sound like there was very much.

13 Q. Well, there are a lot of wells in the Rocky Ford  
14 that have been reflected in the hi storical  
15 record as pumpi ng; ri ght?

16 A. Yes.

17 Q. And the Rocky Ford has a very seni or water  
18 ri ght; ri ght?

19 A. Yes.

20 Q. And the Catlin has a fai rly seni or water ri ght,  
21 and it experiences pumpi ng in each year and has  
22 for many, many years in the hi storical record;  
23 isn't that true?

24 A. The hi storical fi le shows pumpi ng under the  
25 Catlin.

26 Q. And that's true under the Bessemer, seni or water  
27 ri ghts wi th a signi fi cant amount of hi storical  
28 pumpi ng; ri ght?

- 1 A. The Bessemer?
- 2 Q. Yes.
- 3 A. There's data in the historical pumping file  
4 under those users.
- 5 Q. Now, in your prospective analysis you show many  
6 years under those canals where, in fact, under  
7 the Rocky Ford, you show no pumping even though  
8 historically there was significant pumping and  
9 under the Bessemer and under the Catlin many  
10 years with no pumping.
- 11 A. Well, that's because in the model, the model  
12 simulates there not being unmet demand to any  
13 great extent under those ditches.
- 14 Q. And there wasn't unmet demand in many of the  
15 years where there was pumping in the historical  
16 record; right?
- 17 A. Well, the historical record is what it is.
- 18 Q. And so what you have done in your analysis is  
19 you've transferred the pumping from those canals  
20 in your prospective analysis and assigned it to  
21 canals where there was lower pumping  
22 historically but where there was unmet demand;  
23 right?
- 24 A. Well, when you say "transferred," I don't know  
25 that that's a correct characterization because I  
26 don't think we know exactly where all the  
27 pumping was historically. We made some -- some  
28 estimates were made of that, the best estimates

1 that could be made with the limited data. But  
2 yes, in my analysis I assumed that there  
3 wouldn't be very much excess pumping, only on  
4 the order on average about 7 or 8 percent  
5 basin-wide.

6 Q. So without regard to where your partner and  
7 Mr. Larson and other experts have determined  
8 that pumping occurred during the 1950 through  
9 1996 period, you have assumed that all of those  
10 well owners, if they were under a ditch that had  
11 a senior water right, would no longer pump and  
12 you were free to assign that pumping to  
13 water-short ditches; is that right?

14 A. Well, whether or not they did it in the past, it  
15 seems to me that there's substantial incentive  
16 for them to not do it in the future, and, in  
17 fact, they couldn't do it in the future if what  
18 Colorado says is true, that they only have a  
19 limited amount of replacement supply. The  
20 pumping has to go down, and it would make sense  
21 that it would go down in these places where it  
22 was simulated as being substantially in excess  
23 of demand.

24 Q. But it's not going to surprise you at all, is  
25 it, if it goes down under the ditches that do  
26 not have good water supplies and aren't raising  
27 valuable crops?

28 A. I could redistribute my pumping so that the

1 7 percent excess occurred in the ditches that  
2 you would like it to be in and redo the  
3 analysis, and it would come out more or less the  
4 same. What is key in the analysis is the  
5 consumption of pumping. The exact ditch under  
6 which it occurs is not crucial to the analysis.

7 Q. What is crucial to me is not -- I don't care  
8 where it goes. I want it to go where it  
9 actually occurred and be applied to the land it  
10 was actually applied to. That's what I'm asking  
11 you about. You have chosen to assume that the  
12 Bessemer owners' wells, people who today belong  
13 to AGUA and CWPDA and are paying good money to  
14 pump wells on a ditch that has a very senior  
15 water right, that they're somehow tomorrow going  
16 to give that all up and let someone under the  
17 Fort Lyon pump their water; isn't that true?

18 A. In my analysis I simulated on the order of, you  
19 know, 10,000 acre-feet, plus or minus, of excess  
20 pumping a year. And we can -- my analysis  
21 reflects a particular distribution of that, but  
22 I don't think it's that crucial where it occurs.  
23 I could put more of it up under the Bessemer.  
24 My analysis does have some excess pumping under  
25 the Bessemer.

26 SPECIAL MASTER: Well, you know,  
27 let's go back to fundamentals a minute. The  
28 model, I suppose, is expected to reproduce

1 historical conditions as accurately as possible,  
2 and thereafter it can be used to project into  
3 the future.

4           When you say that you can shift the  
5 distribution of pumping around, it doesn't  
6 really make much difference in the model where  
7 you put it, you're going to get the same result  
8 or approximately the same result -- and where  
9 clearly you are not reflecting history, Rocky  
10 Ford being a good example that it has just a  
11 whole string of zeroes, and we know that  
12 historically there was pumping and no reason to  
13 think that in the future there wouldn't be  
14 supplemental pumping -- I guess I'm wondering if  
15 we aren't then just playing with a bunch of  
16 dials that you can get any kind of an answer you  
17 want to.

18           THE WITNESS: Well, under the Rocky  
19 Ford I think there is indication that there  
20 wouldn't be any supplemental pumping because  
21 about half of that water right has already been  
22 transferred and the other half is on its way to  
23 being transferred to municipal uses. So the  
24 Rocky Ford Ditch is largely going to shut down.

25           SPECIAL MASTER: So that really  
26 reflects what you think is a historical  
27 condition, then -- I shouldn't say historical.  
28 This is what reflects -- in your judgment, is

1 apt to be the future condition, then, if  
2 they're --

3 THE WITNESS: For the Rocky Ford I  
4 think that's --

5 SPECIAL MASTER: Okay.

6 THE WITNESS: There could be some  
7 sole source pumping, I suppose, possibly if the  
8 decree would allow that.

9 SPECIAL MASTER: That's different,  
10 isn't it? We're now talking supplemental.

11 THE WITNESS: Right.

12 BY MR. ROBBINS:

13 Q. But that's not the case for the Bessemer or the  
14 Oxford -- or let's look at the Lamar Manvel.  
15 Right? The Lamar-Manvel is all zeroes except  
16 for one year, is it not?

17 A. Yes.

18 Q. So in your analysis you assumed that the  
19 Lamar-Manvel would effectively have no more  
20 supplemental well pumping; right?

21 A. In my analysis it only had it in one year, yes.

22 Q. Okay. So you assumed there wouldn't be any more  
23 supplemental well pumping under the  
24 Lamar-Manvel; right?

25 A. No. My analysis was a test of the rules. I  
26 wasn't trying to predict the future. It was a  
27 test of the rules.

28 Q. In your test of the rules, you assumed that

- 1           there would be no pumping under the
- 2           Lamar-Manvel ; right?
- 3       A.     Yes, that's right.
- 4       Q.     Now, Mr. Grasmick testified here, didn't he?
- 5       A.     Yes.
- 6       Q.     And he's one of the larger owners under the
- 7           Lamar-Manvel , isn't he?
- 8       A.     Yes.
- 9       Q.     And he has supplemental wells, doesn't he?
- 10      A.     He's the one that runs the West Farm?
- 11      Q.     He runs the West Farm. He runs family farms.
- 12           He has a significant agricultural operation.
- 13      A.     Okay. Yes.
- 14      Q.     And his wells are supplemental , aren't they?
- 15      A.     If he has surface water and groundwater on the
- 16           same lands, yes, he'd have supplemental wells.
- 17      Q.     And that's what he testified, isn't it?
- 18      A.     I don't recall exactly.
- 19      Q.     In fact, he testified that he pumps his wells at
- 20           the same time he receives surface water because
- 21           he can manage it better, didn't he?
- 22      A.     He may have said that.
- 23      Q.     And when he has a good water supply in the Lamar
- 24           Canal , as they did, obviously, in '97, '98, and
- 25           '99, he didn't lease his replacement water, his
- 26           LAWMA shares, to anyone else, did he, people who
- 27           had a poor water supply?
- 28      A.     I don't know.



1 Q. Well, he testified that he ran his wells in  
2 those years, didn't he?  
3 A. I don't recall the details of his testimony.  
4 Q. Mr. Grasmick testified that he grew onions, a  
5 high value crop, and that he wanted to be sure  
6 he got a full supply to his high value crops and  
7 that he used wells in part for convenience  
8 because he could irrigate his fields in less  
9 time with a larger head of water.  
10 Do you recall that?  
11 A. Something like that.  
12 Q. Let's look at Table 6 of Exhibit 1093, shall we.  
13 A. Table 6?  
14 Q. Yes. If we look at the Lamar Canal on that  
15 table, it looks like almost all of the pumping  
16 is supplemental under that canal; isn't that  
17 true?  
18 A. Well, it's been assigned as supplemental.  
19 Q. It's been assigned supplemental based upon the  
20 information that was developed through the  
21 surveys and reports; isn't that true?  
22 SPECIAL MASTER: Well, isn't this  
23 assigned by Kansas?  
24 THE WITNESS: Yes. But I believe  
25 it's based in part on the records that -- well,  
26 let me back up. It's supplemental, and I think  
27 we largely took Colorado's data on the pumping,  
28 although I think --

1                   SPECIAL MASTER: I thought the  
2                   supplemental pumping is what you changed or one  
3                   of the things you changed.

4                   THE WITNESS: I think that was the  
5                   acreage.

6                   SPECIAL MASTER: Oh, okay.

7 BY MR. ROBBINS:

8 Q. Well, the question I have is in '97, '98, and  
9                   '99, you've testified these are very good water  
10                  years, haven't you?

11 A. Yes.

12 Q. And the Lamar Canal has one of the better water  
13                  rights below John Martin, doesn't it?

14 A. Yes.

15 Q. And so even in a year when there was plenty of  
16                  water in the system for the Lamar to serve its  
17                  acreages, there was still a fairly large amount  
18                  of supplemental pumping, wasn't there?

19 A. Well, I believe these were good years from the  
20                  standpoint of surface water and precipitation.  
21                  So obviously you can't predict when you're going  
22                  to have the precipitation. So that would have  
23                  some influence on what was excess.

24                  SPECIAL MASTER: But the 5,677  
25                  acre-feet for Lamar wouldn't have rainfall on  
26                  it, would it?

27                  THE WITNESS: Not the value itself,  
28                  no.

1 SPECIAL MASTER: I mean, that's a  
2 pumpi ng fi gure?

3 THE WITNESS: Yes.

4 BY MR. ROBBINS:

5 Q. So during this period of time, Mr. Grasmick and  
6 his neighbors paid good money to acquire  
7 replacement supplies so they could continue to  
8 pump under a ditch that has a good surface  
9 supply, didn't they?

10 A. Yes.

11 Q. And Mr. Grasmick and his neighbors didn't  
12 transfer their LAWMA shares to somebody under  
13 the Amity or a canal with a less senior water  
14 right, did they?

15 A. Well, I should note that my analysis -- while it  
16 didn't assume much supplemental pumping, for  
17 example, under the Lamar-Manvel, my analysis did  
18 have a fairly substantial amount of excess  
19 pumping under the Amity, you know, right in the  
20 same vicinity. So whether the excess pumping is  
21 on the Amity or on the Lamar, it's in the same  
22 general area and would have the same general  
23 effect on the analysis.

24 Q. Now, Mr. Grasmick has testified that he pumped  
25 his wells at the same time he took surface water  
26 so that he could have a higher efficiency in the  
27 way he irrigated; isn't that right? He'd have a  
28 larger head.

1 A. I'm not sure that that follows. I'm not sure  
2 that he said that. But if he didn't have  
3 surface water, does that mean he wouldn't use  
4 his well water?

5 Q. We're talking about the Lamar where there's  
6 generally surface water. And he testified that  
7 he ran his surface water and well water  
8 together.

9 Do you recall that?

10 A. Not specifically, but, yeah, I'll take your word  
11 for it.

12 Q. And he did it to increase his efficiency of  
13 irrigation so he'd have a bigger head and it  
14 would be easier for him to get the irrigation  
15 done. It was labor-saving.

16 Do you recall that?

17 A. That it increased his irrigation efficiency?

18 Q. I didn't say it increased the irrigation  
19 efficiency. I said it increased the labor  
20 efficiency, the efficiency in the way in which  
21 he irrigated.

22 A. Well, I thought you said increased efficiency --

23 Q. If I did, I meant the labor efficiency.

24 A. Okay.

25 Q. There are more inputs to a farming operation  
26 than just purely the efficiency of how crops use  
27 and need water, aren't there?

28 A. Well, if one has the luxury of excess water,

1           yeah. I mean, other things can come into play.

2           Q. Sometimes it's the luxury of how many farm hands  
3           you can hire in order to move the water, isn't  
4           it?

5           A. That can play into it.

6           Q. And sometimes you can afford to be less  
7           efficient with your water if it allows you to  
8           operate with a lower overhead as far as  
9           personnel costs and the number of employees you  
10          have; isn't that true?

11          A. Well, it would come down to economics, I would  
12          suspect, how much you can save in labor versus  
13          additional yield you can get on your crops.

14          Q. So just a pure analysis that only looks at what  
15          a crop might need and looks purely at the  
16          efficiency of irrigation practices may not  
17          capture how farmers use the water both in wells  
18          and the surface; isn't that true?

19          A. Well, my analysis assumes some excess pumping.  
20          So it would allow for the fact that not all  
21          decisions are purely and 100 percent based on  
22          hydrology water supply.

23                         SPECIAL MASTER: Mr. Sullivan, I get  
24          to ask the last question. One question before  
25          we take the afternoon break.

26                         In your 1970 -- I keep saying 1970 --  
27          1997 to '99 revised version of the model, in  
28          that -- because I know you did this in the

1 prospective one, but in the 1997 to '99 version,  
2 did you make the same distribution changes in  
3 the pumping we're talking about here in order to  
4 eliminate the excess pumping?

5 THE WITNESS: Oh, no. No. We just  
6 used what was reflected in the records, although  
7 the acreage was adjusted to some extent, as  
8 Mr. Book testified, to allow for some  
9 approximations in the modeling of how it treats  
10 actual water distribution on the farm. So I  
11 believe Mr. Book testified that we use the  
12 decreed and permitted acreages for the active  
13 wells, for the groundwater-irrigated acreage.

14 SPECIAL MASTER: So the whole  
15 discussion we're having about excess pumping and  
16 redistributing the pumping relates to the  
17 prospective compliance model?

18 THE WITNESS: Yes.

19 SPECIAL MASTER: Okay. Let's take  
20 our afternoon recess.

21 MR. ROBBINS: Which is the model  
22 that was used to offer opinions about the  
23 adequacy of the Colorado rules.

24 SPECIAL MASTER: I understand that.

25 MR. ROBBINS: Okay.

26 SPECIAL MASTER: I'm just trying to  
27 make sure there's a difference between the  
28 '97-'99 answer and the later one.

1 MR. ROBBINS: Thank you, Your Honor.

2 (Recess.)

3 THE REPORTER: Please remain seated.

4 Court is again in session.

5 SPECIAL MASTER: All right,

6 Mr. Robbins.

7 MR. ROBBINS: Thank you, Your Honor.

8 Q. Just before we leave Exhibit 1404, you indicated  
9 that among the reasons that there are zeroes in  
10 the Rocky Ford column is that that canal has  
11 been sold and most of it will no longer be in  
12 irrigation, much less supplemental irrigation.

13 Do you recall that?

14 A. That's my understanding, when all the water is  
15 transferred largely to Aurora, I believe.

16 Q. Let's just look back to the left a couple of  
17 columns to the Colorado Canal and look at the  
18 supplemental pumping you assigned to that system  
19 in your prospective analysis.

20 Most of the shares of the Colorado Canal  
21 have been sold to Colorado Springs or other  
22 municipalities; is that right?

23 A. A large portion of them have.

24 Q. But you have assigned a significant amount of  
25 pumping, as compared to other ditches, to the  
26 Colorado Canal, have you not?

27 A. Well, it's because we still simulate the  
28 Colorado Canal in the model just as if it's

1 being used for irrigation.

2 Q. Well, shareholders in the Colorado Canal used to  
3 own shares in the Twin Lakes Reservoir and canal  
4 company as well, didn't they?

5 A. Yes.

6 Q. In fact, that was the principal delivery point  
7 for the Twin Lakes water; is that right?

8 A. Yes.

9 Q. And for the prospective analysis, you reduced  
10 the Twin Lakes deliveries because that water is  
11 no longer used for irrigation; is that correct?

12 A. Well, we adjusted the transmountain deliveries  
13 for changes on how that water's used compared to  
14 what happened in the past. And I believe  
15 Mr. Schroeder largely agreed with our analysis  
16 except for one criticism regarding the native  
17 portion of the water, and we made an adjustment  
18 in our analysis for that.

19 Q. Looking at Defendant's Exhibit 1404, you  
20 assigned supplemental pumping in the amounts of  
21 11,000, 9,000, 13,000, 5- and 6,000, 12,000,  
22 15-, 16,000 acre-feet, to the Colorado Canal; is  
23 that right? I was just reading the beginning  
24 numbers. I'm not trying to get them exact.  
25 Fairly large amounts of pumping; is that right?

26 A. Well, there's -- yes. The numbers speak for  
27 themselves.

28 Q. Now, let's look at Table 6 in Exhibit 1093 for a



1 moment, if we could, please.

2 For the years 1997, 1998, and 1999, the  
3 pumping under the Colorado Canal for  
4 supplemental purposes in reality was 1,200 and  
5 as much as 1,400 acre-feet in those three years;  
6 isn't that right?

7 A. As much as how much?

8 Q. Well, it looks to me like it's about 1,200 to  
9 1,400 acre-feet. 1,100 to 1,400 for those three  
10 years; right?

11 A. Sole source?

12 Q. Supplemental.

13 A. It's 1,200, 1,700, and 1,500.

14 Q. Right. Well, fair enough.

15 Now, in the prospective analysis, the  
16 minimum amount of pumping that you project might  
17 occur under the Colorado Canal is in excess of  
18 4,000 acre-feet in 1985 and almost 16,000  
19 acre-feet in 1963; isn't that right?

20 A. Yes.

21 Q. Last Friday you said that you wanted to "get the  
22 model to reflect what is going on" as best you  
23 could.

24 Do you think that assigning all of that  
25 pumping to the Colorado Canal for a prospective  
26 analysis is getting the model to reflect what is  
27 going on as best you can?

28 A. Well, when I made that comment, I'm talking more

1 about what we simulate in terms of actual  
2 practice when those figures are derived, for  
3 example, as we'll update the model through time.  
4 Now, in my prospective analysis -- and  
5 specifically I would consider the Colorado  
6 Canal. Those amounts of pumping are what I  
7 assigned to the Colorado Canal based on my unmet  
8 demand analysis.

9 It's not intended to be a prediction of  
10 how much water is under the Colorado Canal or  
11 going to be pumped under the Colorado Canal in  
12 the future. I just distributed the pumping to  
13 unmet demand, but I could have distributed the  
14 pumping to some other unmet demand under  
15 different canals. The point of my analysis was  
16 to test the Use Rules under a situation when  
17 there wasn't as much excess pumping as there was  
18 historically, and that's what I did, and I think  
19 the analysis is a reasonable test of the rules  
20 under that situation.

21 Q. Well, let's look at the supplemental pumping  
22 just as one more example under the Fort Lyon  
23 Canal in '97, '98, and '99. The pumping looks  
24 to me to be about a little bit less than 13,000  
25 in '97, 9,500 in '98, and 9,500 in '99.

26 Is that about right?

27 A. Yeah.

28 Q. Now, in Exhibit 1404 under the Fort Lyon Canal,

- 1 the way you have distributed the pumping in your  
2 prospective analysis, you have a minimum of  
3 22,778 acre-feet in 1961 -- is that right? --  
4 and a maximum of 62,357 acre-feet in 1981; is  
5 that right?
- 6 A. Right.
- 7 Q. And you believe those are realistic prospective  
8 conditions that you would expect to see under  
9 the Fort Lyon Canal?
- 10 A. Well, most of my -- or a large part of my excess  
11 pumping that I simulated was under the Fort Lyon  
12 Canal. So that could have been redistributed  
13 elsewhere. But, again, in terms of the overall  
14 purpose of the analysis, a test of the rules  
15 under conditions of reasonable levels of excess  
16 pumping, I believe it's a reasonable analysis.
- 17 Q. Reasonable levels of excess pumping, meaning low  
18 levels of excess pumping and higher levels of  
19 pumping that is more consumptive; right?
- 20 A. Well, more consumptive follows from less excess.  
21 But the amounts of excess pumping, for example,  
22 on the Colorado test model when it's  
23 approximately 50 percent of the pumping is  
24 excess of the demand just does not seem  
25 reasonable to me.
- 26 Q. But, in fact, that is what appears to have  
27 happened, isn't it?
- 28 A. That's how Colorado simulated it.

- 1 Q. And that's how prior to your prospective  
2 analysis your partner Mr. Larson simulated it;  
3 isn't that true?
- 4 A. Not with 50 percent excess pumping.
- 5 Q. Significant amounts of excess pumping because  
6 they put the pumping at the location of the  
7 wells that actually pumped; isn't that right?
- 8 A. They put the pumping at the locations and at the  
9 time as best they could, given the limited data  
10 that they had to distribute the pumping.
- 11 Q. So if they -- well, basically, in the  
12 prospective analysis you manipulated the pumping  
13 so that it would be assigned in the manner that  
14 would be as consumptive as possible in the  
15 model; isn't that right?
- 16 A. In a manner that was reasonable.
- 17 Q. And reason equates to consumption?
- 18 A. Reason equates to not substantial amounts of  
19 excess, in my mind, or in my opinion.
- 20 Q. Let's go back to Table 15 in Exhibit 1093.  
21 Now, in Column 14 on that table, you  
22 show the total available credits for LAWMA -- is  
23 that right? -- from direct flow sources?
- 24 A. Yes. From what we call the main stem sources,  
25 but yes.
- 26 Q. And that's 12,021 acre-feet; is that right?
- 27 A. Yes. Those are the figures that came from  
28 LAWMA's replacement plan application and

- 1 approval in 1999.
- 2 Q. So you assumed that the main stem replacement  
3 sources would yield that in each year of your  
4 analysis; is that right?
- 5 A. Yes.
- 6 Q. Now, 1999, I think, as you've said a number of  
7 times over, was one of the wet years; right?
- 8 A. Yes.
- 9 Q. That's why there was low pumping, in your view,  
10 and why a number of conditions exist; right?
- 11 A. Yes.
- 12 Q. Why did you assume -- and LAWMA's water rights  
13 are not all what we would call senior water  
14 rights, are they?
- 15 A. LAWMA's water rights are not senior?
- 16 Q. The ones that LAWMA relies on. The XY-Graham as  
17 an example. The Sisson is another example.
- 18 A. They're not all.
- 19 Q. In fact, the XY-Graham and the Sisson are not  
20 senior; isn't that true?
- 21 A. Those two are not.
- 22 Q. So to the extent that they are part of LAWMA's  
23 portfolio, their opportunities to obtain the  
24 same amount of water in an average or dry year  
25 are less than they would be in a wet year like  
26 1999; isn't that right?
- 27 A. Well, in part.
- 28 Q. Why did you assume that the yield of LAWMA's

1 main stem replacement sources would be the same  
2 in each year?

3 A. Well, I didn't have estimates from LAWMA or  
4 anyone else about how they thought the yield  
5 would vary. And, remember, the purpose of my  
6 analysis was to use estimates of the yield as  
7 they're implemented in the Use Rules. This is  
8 not intended to be an estimate of how I think  
9 the yield would vary, but it's how I think the  
10 Colorado Use Rules would operate.

11 And I think we heard testimony even --  
12 well, in this case that even in this year LAWMA  
13 was still counting on the full yield or at least  
14 an average yield or the yield that they had  
15 projected in their plan for some of these rights  
16 because it might rain later on in this year. So  
17 the other thing is that I assumed the same yield  
18 every year.

19 Now, the yield may be higher in some  
20 years and lower in other years in terms of how  
21 things actually turn out. But I thought it was  
22 reasonable, given that I didn't have any better  
23 information from LAWMA and from Colorado on the  
24 yields of these, to use this figure.

25 Q. Now, the truth is that the LAWMA people  
26 testified they were dealing with average yields  
27 this year because they have 13,000 acre-feet in  
28 Article II storage; isn't that right?

- 1 A. Well, I remember testimony about the possibility  
2 that it could rain and that could add to the  
3 yields later in the year even though they  
4 started out dry.
- 5 Q. Well, if the farmers testified that way, they  
6 would be classic farmers, wouldn't they?  
7 Because it's always going to rain.
- 8 SPECIAL MASTER: We even had rain  
9 today here. I hope you noticed that.
- 10 MR. ROBBINS: I certainly did. I  
11 was amazed.
- 12 Q. In a dry year, you'd agree, would you not, that  
13 LAWMA's main stem sources won't produce 12,000  
14 acre-feet, wouldn't you?
- 15 A. I don't think they will. But the question for  
16 this analysis is what is assumed in the Use  
17 Rules. That's what I was trying to emulate  
18 here.
- 19 Q. Well, certainly the Use Rules don't assume that  
20 LAWMA will get maximum credit for its main stem  
21 water rights in each year, whether it's dry or  
22 wet, do they?
- 23 A. I don't think these figures assume maximum  
24 credit.
- 25 Q. Well, they certainly assume the replacement  
26 supply available on what you have characterized  
27 as a very wet year.
- 28 A. Pardon me? I don't understand.

1 Q. You've used the figures from 1999 for each year.  
2 That's a wet year when LAWMA's main stem sources  
3 have the most likelihood of producing  
4 replacement credits; right?

5 A. I believe the figures in LAWMA's plan have  
6 remained more or less the same from year to  
7 year; that is, they haven't changed, as near as  
8 I can tell, over the limited period that these  
9 plans have been in effect. So I'm just going on  
10 what information I had available.

11 Q. Well, let's look at Exhibit 1403 again, shall  
12 we. These are the acreages used in the Kansas  
13 prospective analysis.

14 How much dry-up did you estimate for  
15 LAWMA's main stem sources?

16 SPECIAL MASTER: Which numbers would  
17 be within LAWMA's purview?

18 MR. ROBBINS: They would be the  
19 entirety of the dry-up acres column.

20 SPECIAL MASTER: Starting with 15?

21 MR. ROBBINS: Yes, 15, 18, and 20.

22 That would be Fort Bent, Lamar, and XY, I  
23 believe.

24 THE WITNESS: Those are the figures  
25 that we had for 1999 that Kansas had recommended  
26 as being approved for that year.

27 BY MR. ROBBINS:

28 Q. So in your prospective analysis, you used 3,068



1           acres as the available dry-up acreage to be used  
2           in the prospective analysis with the model; is  
3           that right?

4       A.    Right.

5       Q.    Now, will 3,068 acres produce an average of  
6           12,000 acre-feet per year of dry-up credit?

7       A.    Well, there's other sources in LAWMA. They're  
8           not all just dry-ups.

9       Q.    These are only -- the 12,000 acres which you  
10           have in your analysis are only the main stem  
11           sources; right? They're not all the sources?

12      A.    Well, there are other sources. Like, I think  
13           LAWMA claims credit from the transit loss  
14           account.

15      Q.    Well, throw the transit loss account credit in.

16                    Taking that with the 3,000 acres, that's  
17           not going to produce 12,000 acre-feet of credit,  
18           is it?

19      A.    Well, you know, there's some other sources. The  
20           Sisson-Stubbs is part of that. So I think you  
21           need to go through and isolate the amounts that  
22           are claimed for these certain ditches that go  
23           along with these dry-ups.

24      Q.    Well, which did you use when you talked about  
25           total available? I'd understood it was just the  
26           main stem sources for which dry-up occurred, the  
27           XY, the Lamar-Manvel, and the Fort Bent.

28                    Was I wrong?

- 1 A. No.
- 2 Q. Your assumption. Not whatever Colorado wanted  
3 done, but your assumption.
- 4 A. Well, you know, one big difference or one factor  
5 you need to consider is for the XY, that  
6 although this is the amount of dry-up acreage  
7 that we found for 1999, the fact is they don't  
8 divert that water right at all. So the  
9 function -- and the function of the credit they  
10 get is a function of the lands that are  
11 irrigated and how much water is put out on the  
12 ground as well. So the fact that they're  
13 spilling all of that ditch back to the river in  
14 the model and in reality they're not diverting  
15 anything into it, into the ditch, goes into what  
16 the actual credit is.
- 17 Q. Wouldn't you agree that you overestimated the  
18 credit that Colorado would get for the amount of  
19 dry-up in the model in your Column No. 17, the  
20 12,021 acre-feet?
- 21 A. That's what Colorado estimated -- that's what  
22 LAWMA estimated, and that's what Colorado  
23 approved.
- 24 Q. Would you agree that it is an overestimation of  
25 the amount of dry-up available from those  
26 sources which you represent as the main stem  
27 sources in most years?
- 28 A. If Colorado and LAWMA are willing to concede

1 that and change their estimates, lower the  
2 estimates of yield that they're going to assume  
3 for those credits, then it would be appropriate  
4 for me to revise my analysis in that regard.

5 Q. Well, as you know, Colorado doesn't give the  
6 credits based upon the plan application and  
7 approval but, rather, upon the end of the year  
8 dry-up; isn't that right? There's a dry-up  
9 affidavit that specifies the specific acreages  
10 for which credit is actually given in the  
11 analysis?

12 A. Well, I think the appropriate perspective to  
13 look at this analysis is what Colorado approves  
14 at the beginning of each year for these plans.  
15 And it's also my understanding that -- or my  
16 belief that the limits, the volumetric limits,  
17 that are in place for these rights will not  
18 limit these rights to historical use. So I  
19 think all those things need to be considered.

20 SPECIAL MASTER: Mr. Sullivan, let's  
21 just assume for a second that the 12,000 is too  
22 high. If it were lower all the time or lower in  
23 dry years, what difference would it make to your  
24 final outcome of the shortage at the stateline?

25 THE WITNESS: Well, it depends. If  
26 it's just a little bit lower in some years,  
27 probably not hardly any difference at all.

28 SPECIAL MASTER: Well, let's just

1 assume it's -- let's assume it's double what it  
2 ought to be. If you took the average, it would  
3 be half of this. What kind of an impact would  
4 it have?

5 THE WITNESS: Well, I think it would  
6 need to be important that that assumption means  
7 that that's all that Colorado will calculate as  
8 available from these sources in their  
9 implementation of the Use Rules.

10 SPECIAL MASTER: Well, just taking  
11 your -- we're going on here about, you know, how  
12 we got to the 12,000, whether it's true or not,  
13 whether it's likely to be true in the future.  
14 I'm just trying to figure out if you'd use the  
15 smaller figure, which is what Colorado is  
16 suggesting should be the case, what kind of  
17 difference would it make? So just assume --

18 THE WITNESS: Okay.

19 SPECIAL MASTER: -- that it's half  
20 of what it's -- you'd use 6,000 instead of  
21 12,000. What kind of difference would it have  
22 made?

23 THE WITNESS: Well, the effect on  
24 the bottom line would be much less than that.  
25 Now, I can't say exactly how much.

26 SPECIAL MASTER: Well, is it going  
27 to increase shortages or decrease them? Look  
28 in --

1 THE WITNESS: I believe --

2 SPECIAL MASTER: Look at Column 32,  
3 shortage at the stateline.

4 THE WITNESS: It will decrease the  
5 shortages.

6 SPECIAL MASTER: Okay.

7 THE WITNESS: Because if that number  
8 is lower, then it would assume that Colorado  
9 would need to come up with more water from other  
10 sources for the offset account funding because  
11 it would be relying less on these sources for --  
12 or pursuant to the implementation of the Use  
13 Rules, the amounts of water that they bring to  
14 the table -- now, the model ultimately simulates  
15 whatever credit is applied, the model or  
16 whatever they put into the offset account.

17 So this number is our assumption for the  
18 yield that Colorado is giving for these rights  
19 in the Use Rules and --

20 SPECIAL MASTER: I understand how  
21 you got it. I'm just trying to figure out if  
22 it's as significant -- Colorado's suggesting  
23 it's too high. I'm just trying to figure out if  
24 it were something less, is that a big deal or  
25 not?

26 THE WITNESS: I don't think so.

27 BY MR. ROBBINS:

28 Q. If it was too high and if it was, as the master

- 1 suggested, half of that, the result of that in  
2 the end in this analysis would be it would  
3 reduce the predicted depletions; isn't that  
4 true?
- 5 A. Well, I think what happens -- in actuality,  
6 Colorado -- in some years Colorado --
- 7 Q. Could you answer my question. You can go ahead  
8 and explain. I'm not going to shut you off.
- 9 But isn't it true that if you reduce the  
10 amount in Column 17, you will reduce the  
11 depletions that your analysis calculates?
- 12 A. In 17 or 14? Which one are we talking about?
- 13 Q. 14. I apologize. In Column 14; isn't that  
14 correct?
- 15 A. Yes. If you lower those figures, if we lower  
16 LAWMA's estimate and Colorado's estimate of the  
17 yield under the Use Rules that are given to  
18 these rights, lower it to what's in 14, it would  
19 have some effect on the results. I can't say  
20 exactly how much but it --
- 21 Q. It would lower the depletions calculated in this  
22 analysis?
- 23 A. Yes.
- 24 Q. Okay. Now, if you had an explanation, I  
25 promised you you could do it. Please.
- 26 A. Well, I guess one more point to make is that I  
27 think Colorado estimates more than this,  
28 computes more yield than this amount from these

1 sources in some years. Colorado testified -- or  
2 someone testified as to all the yield that was  
3 available from the XY and these various rights  
4 in different years, and we limited it to 12,000  
5 for these rights. We didn't assume it would be  
6 higher in the wet years and lower in the dry  
7 years because we didn't have any good  
8 information by which to simulate that in this  
9 analysis. So we just left it the same every  
10 year.

11 SPECIAL MASTER: All right.

12 BY MR. ROBBINS:

13 Q. Let's look at Column 7 on Table 15.

14 Column 7, what does that show?

15 A. Column 7 shows the depletions to usable  
16 stateline flow computed by the model with the  
17 pumping shown in Column 1, with the  
18 transmountain deliveries shown in Column 3, but  
19 without any additional offset account water --  
20 I'm sorry -- not offset but any additional  
21 replacement water delivered to the stream or  
22 without any dry-up.

23 Q. So the total depletions to usable stateline  
24 flows with no replacement from any sources are  
25 897,885 acre-feet over the simulation period,  
26 1950 to 1994, in your prospective analysis; is  
27 that right?

28 A. Yes, that's comparable to the 20,000 acre-feet

- 1 per year on average figure that we've been  
2 di scussi ng.
- 3 Q. And that's with current levels of transmountain  
4 del iveries; is that right?
- 5 A. Well, it's with the adjusted transmountain  
6 del iveries that I had developed. So yes.
- 7 Q. So the version of the model that you used for  
8 the prospective analysis with the new PET  
9 values, the supplemental acreage based on the  
10 decreed and permitted acreage for all wells, and  
11 your distribution of pumping dramatically  
12 increases depletions over that that have been  
13 predicted in the past; isn't that true?
- 14 A. Well, the model is sensitive to the distribution  
15 of pumping.
- 16 Q. It's also sensitive to PET values, isn't it?
- 17 A. Well, it can be.
- 18 Q. It is. Isn't that the conclusion in your --
- 19 A. Well, it's less sensitive if you have limited  
20 excess pumping. But, yes, PET has some  
21 influence on the results as well.
- 22 Q. And the depletions reflected in this analysis  
23 are significantly greater than depletions that  
24 have been predicted in the past for that same  
25 period; isn't that true?
- 26 A. Well, using which model?
- 27 Q. Any of the models.
- 28 A. Well, you need to also consider that we're using



1 fully developed levels of pumping through the  
2 whole period as well, and the historical pumping  
3 data reflects very low pumping starting in 1950  
4 and ramping up with that pumping through the mid  
5 1960s. So it's a little bit apples and oranges  
6 in your comparison.

7 Q. Let's look at page 64 of Exhibit 1093, if we  
8 could, please.

9 SPECIAL MASTER: I didn't catch  
10 that, Mr. Robbins.

11 MR. ROBBINS: Page 64, Your Honor,  
12 of Exhibit 1093.

13 Q. In the first full paragraph, which is about --  
14 oh, I don't know -- six or eight lines -- it  
15 starts six or eight lines down on the page, and  
16 in the fourth line of that paragraph, a sentence  
17 begins -- and I quote -- "An important failing  
18 regarding his application" -- and "his" is  
19 Mr. Schroeder, I believe -- "his application of  
20 the Test Model to the analysis of the PDFs" --  
21 presumptive depletion factors -- "is the  
22 unrealistically low consumption associated with  
23 groundwater pumping in some of the ditch service  
24 areas."

25 Do you see that?

26 A. Yes.

27 Q. Now let's turn to Table 18 of your exhibit.

28 Table 18 shows a summary of the average

1 marginal consumptive use of water for each ditch  
2 for the Colorado test model, the revised Kansas  
3 model, and the compliance model; is that right?

4 A. Yes.

5 Q. Some ditches -- and the Rocky Ford is an  
6 example -- the Colorado test model and the  
7 revised Kansas model show that the marginal  
8 consumptive use is very low, or zero; is that  
9 right?

10 A. Yes.

11 SPECIAL MASTER: Well, maybe you  
12 better tell me what these parentheses and so  
13 forth mean to start with.

14 The first column, "Surface Water," I  
15 guess they're virtually all negative numbers,  
16 aren't they? So what does that mean?

17 THE WITNESS: Well, these figures  
18 are based on the difference between two runs of  
19 the model, not the same two runs we were looking  
20 at in the other exhibit, but these were the  
21 historical runs and the no pumping run; that is,  
22 transmountains on in both runs. So we're  
23 attempting to isolate the impact of the pumping  
24 without impact of the transmountain.

25 SPECIAL MASTER: So a negative  
26 number means what?

27 THE WITNESS: Well, the values are  
28 computed as historical minus no pumping. So a

1 negative number means the value was lower in the  
2 historical run, or is higher in the compact run.  
3 So in this case with the wells pumping in the  
4 historical run, the diversions of surface water  
5 are less.

6 SPECIAL MASTER: So a negative  
7 number is -- the values are higher, then, in the  
8 compact run --

9 THE WITNESS: Right.

10 SPECIAL MASTER: -- than in the  
11 historical?

12 BY MR. ROBBINS:

13 Q. This is for the '50 through '94 period; is that  
14 right?

15 A. Right.

16 Q. Now, there's a zero crop consumptive use or  
17 marginal consumptive use under the Rocky Ford as  
18 an example, for the pumped water; is that right?

19 A. Right.

20 Q. Assuming that the pumping estimates are correct,  
21 do you know any reason why farmers under the  
22 Rocky Ford Ditch pumped groundwater at all?  
23 Because the model indicates that there is little  
24 or no marginal consumptive use from the pumping.

25 SPECIAL MASTER: Does that mean that  
26 the model is saying that all of that pumping  
27 runs off?

28 THE WITNESS: Yes.

1 BY MR. ROBBINS:

2 Q. Do you know any reasons why they would have  
3 pumped? They did. There were wells there;  
4 right?

5 A. Well, some. Again, my -- the Rocky Ford is one  
6 of the ditches that I happen to have done some  
7 work on in my prior life -- that is, my work  
8 prior to working for Spronk Water Engineers --  
9 and that is one where, as I recall, there was  
10 not very much well pumping under that ditch. I  
11 don't recall the exact figures or whether we  
12 even had exact figures, but it's my impression  
13 that it wouldn't have been anywhere near this  
14 high. But in any case -- so this might be an  
15 example of where the assignment to the pumping  
16 to the certain user is based on an  
17 approximation, based on data, the limited data  
18 that was available.

19 Q. Well, there was pumping under the Rocky Ford;  
20 right?

21 A. Oh, there were some wells, and I assume they  
22 were used at some time.

23 Q. In fact, your Exhibit 1093 and plate -- or  
24 Figure 2B shows the service area and shows quite  
25 a number of wells, both not pumped in '98 and  
26 pumped in '98; isn't that true? Under the Rocky  
27 Ford right in the middle of the service area.

28 A. 2B?

1 Q. Yes. The purple is the Rocky Ford.

2 A. Yes.

3 Q. There are quite a number of purple triangles  
4 indicating that the well was pumped in '98;  
5 right?

6 A. I can see some purple triangles in that area.

7 Q. Okay. Well, isn't it possible that things like  
8 those discussed by Mr. Grasmick weigh upon  
9 farmers, things like convenience and building  
10 the head to more efficiently irrigate a field --  
11 matters of that sort -- might cause a farmer to  
12 use a well even on a ditch that has a water  
13 supply like the Rocky Ford?

14 A. Well, you need to remember how the model works  
15 as well, that the model assumes a uniform  
16 distribution of the surface water over all of  
17 the lands under the ditch; that is, every acre  
18 gets precisely the same amount of surface water,  
19 and in reality the farmers own different numbers  
20 of shares in proportion to the lands that they  
21 have. And it's equally possible that one farmer  
22 didn't have, say, enough shares, or had sold his  
23 shares to someone else such that he needed to  
24 pump some water on his land even though the  
25 model, as it simulates things, shows very low  
26 marginal consumption under the Rocky Ford Ditch.

27 SPECIAL MASTER: Mr. Sullivan, you  
28 say that you reached the pumping figure by

1 comparing the two runs. That's how you got the  
2 pumping figure for all of these three analyses?  
3 I can just ask you, then. How did you get the  
4 pumping figure?

5 THE WITNESS: Yes, it's the  
6 difference between two runs. So one with  
7 pumping and then with precompact pumping.

8 SPECIAL MASTER: Since we had  
9 historical data for all of these years, why  
10 didn't you just use that amount?

11 THE WITNESS: That's what's  
12 reflected for the Colorado test model and the  
13 Kansas revised model, the historical pumping,  
14 and in our compliance model, we used different  
15 pumping.

16 SPECIAL MASTER: So that's just the  
17 way of -- I see. They're the same figures,  
18 aren't they? So that's just historical pumping,  
19 then?

20 THE WITNESS: Right.

21 SPECIAL MASTER: You didn't really  
22 need to -- I guess maybe since historical  
23 pumping is an input to the model, that's why I  
24 was wondering why you needed the model to get  
25 it.

26 THE WITNESS: These are just -- you  
27 could have come up with these figures without  
28 the model, but one of the outputs from my water

1 budget is the pumping that's input to the model.

2 SPECIAL MASTER: But anyway, this is  
3 historical pumping in both the Kansas test model  
4 and the revised model.

5 THE WITNESS: Yes. It's actually  
6 the difference between historical and precompact  
7 pumping.

8 BY MR. ROBBINS:

9 Q. Let me give you a copy of Plaintiff's  
10 Exhibit 1159, if I could, please, along these  
11 lines. I assume you don't have one.

12 SPECIAL MASTER: 1159?

13 MR. ROBBINS: You have one. Yes,  
14 Your Honor.

15 THE WITNESS: I have one somewhere,  
16 but not with me.

17 BY MR. ROBBINS:

18 Q. Well, why don't I give you one, and then you  
19 will be sure and have one.

20 This is an exhibit you prepared to  
21 illustrate the concepts behind excess pumping;  
22 is that correct?

23 A. Yes.

24 Q. In this exhibit you have included effective  
25 precipitation before computing the marginal  
26 consumption of groundwater; isn't that correct?

27 A. Well, I think -- yes. The values in Figure 1  
28 would reflect a net demand.

- 1 Q. If you added the pumping to the surface water  
2 and then computed the marginal consumption of  
3 precipitation, the marginal consumption of  
4 precipitation would be very low; isn't that  
5 correct?
- 6 A. Can you go through that again, please.
- 7 Q. Sure. If you take surface water and  
8 precipitation and then compute -- well, let me  
9 start again.
- 10 You include effective precipitation  
11 before computing the marginal consumption of  
12 groundwater; right?
- 13 A. Well, when you say "include," I think it's --  
14 the effective precipitation is subtracted from  
15 the PET. Is that what you mean?
- 16 Q. Yes. Now, if you added the pumping to the  
17 surface water and then computed the marginal  
18 consumption of precipitation, that consumption  
19 would be very low; isn't that correct?
- 20 A. I'm still not quite following you. Could you  
21 point me to some figures? I don't understand  
22 what you're asking me to do because, you know,  
23 in this analysis we have -- some of these  
24 figures reflect a relatively high marginal  
25 consumption of pumping and some reflect lower.
- 26 Q. Well, let me ask it this way: If a farmer  
27 applied surface and groundwater to irrigate a  
28 crop and it rained the next day, the marginal



- 1 consumption of the rainfall might be very small;  
2 is that right?
- 3 A. Well, it depends on how one is calculating  
4 marginal, but usually it's -- the way that we're  
5 doing it here it's the with-and-without  
6 analysis. So if you want to compute marginal  
7 consumption of rainfall, you can compute the  
8 consumptive use with or without the rainfall.
- 9 Q. As a practical matter, if you irrigate a crop  
10 with surface and groundwater and you fill the  
11 soil profile, you give the crops the water they  
12 need, and then it rains, most of the rain runs  
13 off; right?
- 14 A. Or it at least doesn't fill the root zone. I  
15 mean, the root zone is already full of water.  
16 So it either deep percolates or runs off.
- 17 Q. And the marginal consumption is small. The  
18 change in consumption is very small?
- 19 A. With or without -- yeah. Right.
- 20 Q. Right. If a farmer like Mr. Grasmick is growing  
21 a high value crop like onions and he has a well,  
22 is he likely to take the risk of underirrigating  
23 on the hope that it will rain, or will he pump  
24 his well to be sure that his crop receives the  
25 adequate water supply necessary to maximize his  
26 profit?
- 27 A. Well, Mr. Grasmick's probably the better person  
28 to ask that, but my analysis reflects some

1 excess pumping to account for those types of  
2 situations. I haven't assumed that all pumping  
3 is consumed at the maximum rate. I think that  
4 would be unreasonable to assume there would be  
5 zero excess pumping ever, and that's why my  
6 analysis includes some.

7 Q. Now, if the farmer has a field of alfalfa or  
8 sorghum or hay that is underirrigated and it  
9 rains, the rain will be very effective, won't it?  
10

11 A. Under the same scenario that --

12 Q. Yes.

13 A. -- you described for the other?

14 Q. Yes.

15 A. You mean if he had fully irrigated the crop?

16 Q. No. I'm sorry.

17 If he has a field of alfalfa or sorghum  
18 that's underirrigated and he's trying to decide  
19 whether it is worth his money to pump his well  
20 to bring the field up to full water supply or  
21 wait for rain, if he waits for rain, the rain  
22 has a high marginal use, doesn't it?

23 A. Can you say that again. I'm sorry.

24 Q. Sure. If the farmer has an underirrigated field  
25 of alfalfa or sorghum and he hasn't pumped his  
26 well and it rains, the rain is very effective;  
27 right?

28 A. Assuming it enters the root zone and it's not,

1 for example, a thunderstorm where there's  
2 substantial run-off or something, yes.

3 Q. If a farmer is growing a crop like corn that is  
4 sensitive to water stress at particular stages,  
5 the farmer isn't likely to underirrigate the  
6 corn on the hope that it will rain; isn't that  
7 right?

8 A. It depends. You know, if rain is in the  
9 forecast, I can see a farmer deciding to not  
10 pump his well. You know, he has a limited  
11 supply available, limited replacement supplies,  
12 and he's only got a certain amount he can pump  
13 each year. He might wait to see if it's going  
14 to rain.

15 Q. Unless he had a high value crop that he was  
16 depending upon to pay his mortgage; right?

17 A. If the crop was dying in the field or about to  
18 die or suffered some significant damage, he  
19 would probably pump his well if he had supply  
20 available.

21 SPECIAL MASTER: Mr. Sullivan, tell  
22 me this conceptually: You're trying to assign a  
23 consumptive use to one of three different  
24 sources of water. The crop has some rainfall,  
25 it has some surface water, and it has some well  
26 water. And you're trying to assign a  
27 consumptive use to one of those three elements.

28 Now, tell me how you go about that.

1 THE WITNESS: Well, I think we  
2 assign it to all of those elements and --

3 SPECIAL MASTER: You put them all  
4 together, and you can just say, you know, I've  
5 got so much water --

6 THE WITNESS: The way that this has  
7 been done in this case has been to make one run  
8 in the model, and you simulate precipitation,  
9 surface water, and pumping and calculate some  
10 consumptive use for each ditch and each year,  
11 et cetera. And then we have another run of the  
12 model when you take away the pumping, or most of  
13 the pumping, and you calculate consumptive use  
14 again based on the same process. And then if  
15 you want to look at the change in consumptive  
16 use and -- well, the change in consumptive use  
17 is what results in the depletions at the  
18 stateline.

19 So we, in effect, by doing the  
20 differencing of the runs -- we allocate all of  
21 the change in consumptive use and the change in  
22 stateline flows and thus the depletions -- we  
23 allocate to the supply that changed, which is  
24 the pumping. So the with-and-without pumping we  
25 allocate all the change in consumptive use and  
26 the stateline depletions -- we allocate that as  
27 if it's due to the pumping. That's the process  
28 that has been developed in this case.

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SPECIAL MASTER: Okay.

BY MR. ROBBINS:

Q. Using Mr. Grasmick as an example below John Martin, they also may apply water to fields because there's a high salinity content -- isn't that right? -- at rates beyond what you might otherwise think is efficient?

A. Well, I believe Mr. Franzoy said that the irrigation efficiencies that are used are generally sufficient to provide leaching water, enough excess water for leaching in most cases.

Q. You do agree, don't you, that the farmers in the Arkansas Valley have developed management practices to deal with high salinity levels?

A. I don't know that.

Q. Now, marginal consumption isn't the same as the average efficiency, is it?

A. Maybe you better define those terms for me.

Q. Marginal consumption is what we have used here today, the change in consumption when you're comparing two things; right?

A. Yes. Like the change in consumptive use between two runs of the model, for example.

Q. Certainly. And average efficiency is what the model works upon, isn't it? You're using averages as far as irrigation efficiencies are concerned?

A. No.

- 1 Q. No?
- 2 A. (Wi tness shakes head.)
- 3 Q. That i sn' t what average effi ciency i s? They' re
- 4 not the same?
- 5 A. That' s not what the model works on, i s averages.
- 6 Q. It does not work on averages?
- 7 A. No.
- 8 Q. Okay. When you do a margi nal analysi s, an
- 9 analysi s of margi nal consumpti on, you are only
- 10 looking at the di fference that makes surface
- 11 water and preci pi tati on very effi ci ent and very
- 12 consumpti ve when you remove the pumpi ng; i sn' t
- 13 that ri ght?
- 14 A. Wel l, that' s consi stent wi th how the changes i n
- 15 consumpti ve use are handl ed i n thi s case.
- 16 They' re attri buted to pumpi ng.
- 17 Q. Do you agree that 1997 through 1999 were wet
- 18 years wi th lower pumpi ng compared to earl ier
- 19 peri ods?
- 20 A. I n general , yes.
- 21 Q. And were you present i n court when the CWPDA
- 22 fol ks and the LAWMA fol ks and the AGUA fol ks
- 23 testi fi ed?
- 24 A. Yes.
- 25 Q. And you understand that each of those
- 26 associ ati ons l i mi ts pumpi ng to the average of
- 27 the pri or fi ve years?
- 28 A. No, I' m not.

- 1 Q. You didn't hear them testify to that?
- 2 A. That's not what I understood. Average of the  
3 pumping -- there was some five-year averaging.  
4 I guess I don't recall exactly what it was.
- 5 Q. Okay. As I recall, the two upper associations  
6 said you could pump no more than your average of  
7 the past five years in the coming year; right?
- 8 A. Okay.
- 9 Q. And the testimony from LAWMA was that the shares  
10 that LAWMA allocated out were based upon the  
11 five-year average and thereafter limited the  
12 amount of water available to the number of  
13 shares you had.
- 14 A. Okay.
- 15 Q. Do you recall that?
- 16 A. Yeah. I follow what you're saying.
- 17 Q. In your prospective analysis you assumed that  
18 there would always be replacement water  
19 available for whatever amount of pumping you  
20 projected; is that right?
- 21 A. Right.
- 22 Q. You do understand that there are only limited  
23 sources of replacement water available, do you  
24 not?
- 25 A. Yes. But we were trying to test the Use Rules,  
26 and whether -- we could have tested the Use  
27 Rules by limiting pumping based on what supply  
28 was available or as we did it. We simply

1 assumed there would be sufficient supplies  
2 available for the pumping that we assumed. And  
3 I believe that both approaches are comparable,  
4 would be comparable.

5 Q. One of the reasons you indicated that there  
6 could be pumping as high as 200,000 acre-feet  
7 per year was because there might be a better  
8 farm economy in the future and therefore more  
9 impetus to pump; is that right?

10 A. No. One of the reasons we limited pumping -- or  
11 the reason we limited pumping when we came up  
12 with this analysis, the 200,000 acre-feet a  
13 year, was because Colorado told us that what we  
14 had before was too high. And not having any  
15 better information and there not being any  
16 pumping limits in the plans, we set about to  
17 develop some figures to use in our prospective  
18 analysis that were less than what Colorado had  
19 criticized, and those are the values that we  
20 selected.

21 But the analysis is somewhat insensitive  
22 to the exact pumping values because the pumping  
23 was generally not in excess of demand, and we  
24 assumed that whatever the pumping was, that  
25 enough replacement water would be developed to  
26 replace the depletions calculated under the Use  
27 Rules for that pumping.

28 SPECIAL MASTER: Do you think it



1 would have made no difference if you had gone  
2 the other way around and taken a small amount of  
3 pumping as a limited amount of pumping and then  
4 assumed a smaller amount of replacement?

5 THE WITNESS: Not a significant  
6 difference.

7 BY MR. ROBBINS:

8 Q. It does make a difference, though, doesn't it?  
9 The more pumping you have and the more water you  
10 spread, the more consumption there is; right?

11 A. And I would make the assumption that there's not  
12 substantial excess pumping. So the pumping  
13 would be consumed at more or less the same rate  
14 regardless of the exact amount that I chose  
15 because I wanted to simulate a situation when  
16 there wasn't a lot of excess pumping.

17 Q. And you assumed that a situation will exist in  
18 the future where there's 200,000 acre-feet of  
19 pumping in Colorado?

20 A. That particular assumption does not have a big  
21 impact on the results. If there's less pumping,  
22 there will be less replacement water. So they  
23 move up and down with each other. So the  
24 overall results can be a little bit different,  
25 but I don't think it would change my conclusion  
26 in terms of the magnitude of the difference.

27 For example, in -- you know, we are  
28 proposing that additional funding be provided to

1 the offset account as a percentage of pumpi ng.  
2 Well, if that pumpi ng is lower, is not 200,000  
3 acre-feet in the future, then we're just  
4 proposi ng that less water be delivered to the  
5 offset account.

6 Q. But you based your recommendati on on deli veries  
7 to the offset account based upon 200,000  
8 acre-feet as a maxi mum; right?

9 A. Well, our recommendati on is based on a  
10 percentage of pumpi ng. So if the pumpi ng is  
11 lower, the deli veries will be lower.

12 MR. ROBBINS: We'll take thi s up  
13 agai n tomorrow.

14 SPECIAL MASTER: All right. We're  
15 adjourned until tomorrow.

16 MR. ROBBINS: Thank you.

17 MR. DRAPER: Thank you

18 (Whereupon, the proceedings were  
19 adjourned at 4:04 p.m.)

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I, Stephanie Slone, Certified Shorthand Reporter No. 10609, declare:

That the foregoing transcript was taken before me at the time and place herein set forth and was taken down by me in shorthand and thereafter transcribed under my direction and supervision, and I hereby declare that the foregoing transcript is a true and correct transcript of my shorthand notes so taken.

I further declare that I am neither counsel for nor related to any party to said action, nor in any way interested in the outcome thereof.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

In witness whereof, I have hereunto subscribed my name this 2nd day of October 2002.

\_\_\_\_\_  
 Stephanie Slone, CSR No. 10609  
 RPR No. 832719

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